A MULTIPLE CASE STUDY ON THE INFORMATION SYSTEM TO SUPPORT SELF-MANAGING TEAMS

by

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(ABSTRACT)

There is a management revolution in American industry, where many organizations are switching from the old "control" paradigm to the new paradigm in "high involvement organizations." Assumptions of the involvement paradigm are employees can make important contributions and are capable of making decisions about their jobs given the right training and information. One characteristic of high involvement organizations is self-managing teams. Self-managing teams have received an increasing amount of attention and research recently in the management literature. Frequently researched areas are the role of the supervisor and outcomes (group and organizational performance) of self-managing teams. One area which has not been well documented is the information teams need to execute the additional responsibilities and decisions they have in a team environment. The purpose of this study is to fill this gap in the literature.

This study used the case study method to study how five organizations share information with self-managing teams. The organizations vary in the type of industry (manufacturing and service), the scope of the self-managing team effort (new design, or "greenfield", and redesign sites), the presence of a union, and in size. Data collection for the case studies included interviews with managers, supervisors, and team members, as well as organizational documentation, and observations. One of the outputs of this research study was detailed case descriptions of each organization. Another output of this study is a list of "design features" for information systems to support self-managing teams. These design features are characteristics of information shared with teams and represent what has worked well for the set of organizations studied.

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CHAPTER 1 INTRODUCTION

1.1. Background

There is a revolution going on in American management. A major paradigm shift is taking place in the way work and people are managed - two competing management paradigms - control vs. involvement - are at the heart of this revolution (Cheney, 1990; Lawler, 1988; Walton, 1985). A paradigm is a way of viewing the world, and along with each of these competing management paradigms come assumptions about human behavior in the workplace.

The control paradigm has been prevalent in American organizations since the days of Frederick Taylor's scientific management (Walton, 1985), where work was divided into routine repetitive tasks, and tasks were tightly controlled through the use of detailed job descriptions and formal reward and punishment systems to motivate behavior. Under the control paradigm, lower-level employees are primarily in a performing role and do not participate in planning, scheduling, controlling, or strategy issues; their actions are coordinated through rules and procedures (Lawler, 1988). Because of the nature of American industry at that time (mass production, assembly line, etc.) the control paradigm achieved favorable results in the earlier and middle part of this century. Managers, therefore, were content to continue to operate under this paradigm.

The involvement paradigm is based on completely opposite assumptions and practices. Under the involvement paradigm, it is assumed that people are capable of making decisions about their jobs given the right training and information, and they can be intrinsically motivated and are capable of self-control and self-direction. In addition, management believes that employees have ideas about improving the organization and they are given opportunities to make important contributions (Lawler, 1988). This paradigm is based on research by Likert (1967), McGregor (1960), and Argyris (1964) - concepts and philosophies dating back to the 1940s and 1950s.

Only recently have many organizations taken part in the management revolution and adopted involvement-oriented management styles and practices (Collins et al., 1989; Walton, 1985). Companies undertaking organization-wide transformations include Honeywell, Mead, Xerox, Ford Motor Company, Motorola, and Proctor & Gamble, to name a few large corporations (Lawler, 1988).

Why has there been such a long delay in applying the concepts developed by Likert, McGregor and Argyris in the form of high-involvement management practices? Several reasons have been offered. First, rapidly declining relative performance of American organizations has served as a catalyst for the search for alternative ways to manage work and people (Macy et al., 1990). It has not been until the late 1970s and into the 1980s and 1990s that the "pain" of poor performance has been felt (Thurow, 1984), particularly in manufacturing organizations. Managers quickly began to realize that the control-oriented paradigm will no longer achieve the kind of business results necessary to compete and survive in a global market (Macy et al., 1990; Walton, 1985). In fact, in a survey of Fortune 1000 organizations, the number one reason managers reported for employee involvement efforts is to improve organizational performance, namely, quality and productivity (Lawler et al., 1989).

A second reason for the delay is not all of the results from involvement practices reported in the literature have been promising (Collins et al., 1989). Managers considering undertaking involvement programs or initiatives may have decided against them because of the inconsistency of results. However, a recent extensive meta-analysis of work innovations shows that organizations using sophisticated employee involvement techniques are among the best performing in the country (Macy et al., 1990).

Lawler (1986) states high-involvement organizations move information, knowledge, power, and rewards downward in the organization. There are a variety of initiatives managers use to achieve the transformation to high-involvement - some are more effective than others. These involvement initiatives range from simple suggestion systems to quality circles to self-managing work teams. Approximately 80% of Fortune 1000 organizations have undertaken one or more involvement initiatives, however, only about 25% have actually significantly changed the way employees are managed and the way work is managed (Lawler et al., 1989). Why is this true? Because the most popular initiatives (quality circles and other types of participation groups or employee involvement teams) really do little to significantly impact key organizational sub-systems. They are parallel activities (parallel to the organization structure) which maintain the organizational hierarchy and keep the power base intact.

Self-managing teams, on the other hand, have a significant impact on the organization. Key characteristics of self-managing teams (power to make decisions affecting the team, skill-based pay, multi-skilled team members, etc.) necessitate a significant change to many organizational sub-systems such as the reward system, problem-solving and decision-making system, the organizational structure, and the information system (chapter 3 contains more detail). Relatively few organizations have experimented with self-managing teams (self-managing teams are being used in 28% of the organizations systematically involving their employees - Lawler et al., 1989). Because of the significant resources required and risk involved with using self-managing teams, managers have tended to rely on things like quality circles or other focused problem-solving teams because they are less sophisticated and complex. However, as organizations gain experience with involvement, it is expected that the problem-solving teams they introduce will naturally evolve toward self-managing teams (Goodman et al., 1988).

Self-managing teams have been the recipient of increasing amounts of attention and research in the last several years. In fact, both Fortune and Businessweek have run cover stories on self-managing teams. Areas which have been heavily researched are outcomes (group and organizational performance) of using self-managing teams (Macy et al., 1990, Trist et al., 1977; Wall et al., 1986), leadership of self-managing teams (Manz & Sims, 1980, 1984, 1986, 1990), the types of decisions teams make (Collins et al., 1989; Easton, 1990; Katz and Laughlin, 1990) training needed by teams (Cabot, 1989; Musselwhite & Moran, 1990; Orsburn et al., 1990), and how team members are compensated (Myers, 1985; Orsburn et al., 1990). This research helps managers understand whether self-managing teams are worth the effort and how they should operate.

1.2. Scope of This Research

To generate a feasible topic for a master's thesis, it is necessary to narrow the phenomenon to a specific issue or concept. This narrowing process is often "a matter of progressively lowering your aspirations...you begin by wanting to study all the facets of an important problem or a fascinating social phenomenon... but it soon becomes clear that choices must be made" (Miles & Huberman, 1984: 36). Lawler's (1986) framework of involvement mentioned earlier (moving information, knowledge, power, and rewards downward in the organization) is useful to narrow the focus of this research.

Before an organization can share power (decision-making authority) with self-managing team members, the team must first be provided with the knowledge (skills) and information necessary to support decision-making. The work (task) design for teams will drive the types of decisions teams will make, which in turn drives the types of information (and knowledge) teams need. Not only must the information system be well designed (to support the teams' decisions and tasks), but it must be designed to be flexible and adaptable. The types of decisions teams make and training provided has been well documented, however, the research and literature does not answer questions about what information teams need, how it should be provided, how often they need it, and who should provide it.

Because of the importance of information for teams to be able to make decisions (Musselwhite and Moran, 1990) and because of the lack of documented research in this area, this research focuses on the information system necessary to support self-managing teams in order to fill a gap in the literature. This research will help managers considering using self-managing teams by providing operational guidelines and practical suggestions on how to proceed.

1.2.1. Purpose of This Research (Research Objective)

The purpose of this research is to study how a small set of organizations have operationalized moving information downward to support members of self-managing teams. My research questions are based on this purpose. The goal of my research is to provide operational guidance to managers in organizations in middle of, or just beginning, the transition to self-managing teams.

1.2.2. Conceptual Frameworks For This Research

A conceptual framework serves to bound and focus the research study by explaining the main dimensions to be studied and the presumed relationships among them. I use three conceptual frameworks, or models, to describe this research and place the specific focus in context. The first model describes the domain of responsibility for a self-managing team as a management system and identifies components and interfaces within the management system. This model puts the self-managing team in context in relation to its boundaries within a larger organizational system. It also serves to illustrate the focus of this research. The second model supports the first model by portraying a self-managing team as a system. The third model identifies key variables, or constructs, involved in the information system. These constructs form the basis for the research questions (later in this chapter).

1.2.2.1. A Self-Managing Team as a Management System

The first conceptual framework, or model, used for this research is the Management System Model (MSM) developed by Kurstedt (1989). A management system contains three components: who manages (the human decision-maker), what is managed (the organizational system), and what is used to manage (tools and techniques). A management system also has three interfaces: the decision/action interface, the measurement/data interface, and the information portrayal/information perception interface (Kurstedt, 1989). For this research, a modified management system model is used (see Figure 1.1).

In Figure 1.1, the "what is managed" component is a work group (a self-managing team), "who manages" are the members of the self-managing team, and "what is used to manage" are the tools and techniques used to convert data to information. "Other Audiences" in the MSM could include upstream systems for the team, such as top management, the team leader or coach, and/or other groups or individuals. There is an interface between Other Audiences and the self-managing team. The first part of the interface is an information portrayal/information perception interface, and represents information the team feeds back to Other Audiences *and* information provided by Other Audiences to the team. The second part of the interface is a decision to action interface. This interface represents decisions still made by management. As the team matures and becomes more autonomous, this interface is de-emphasized.

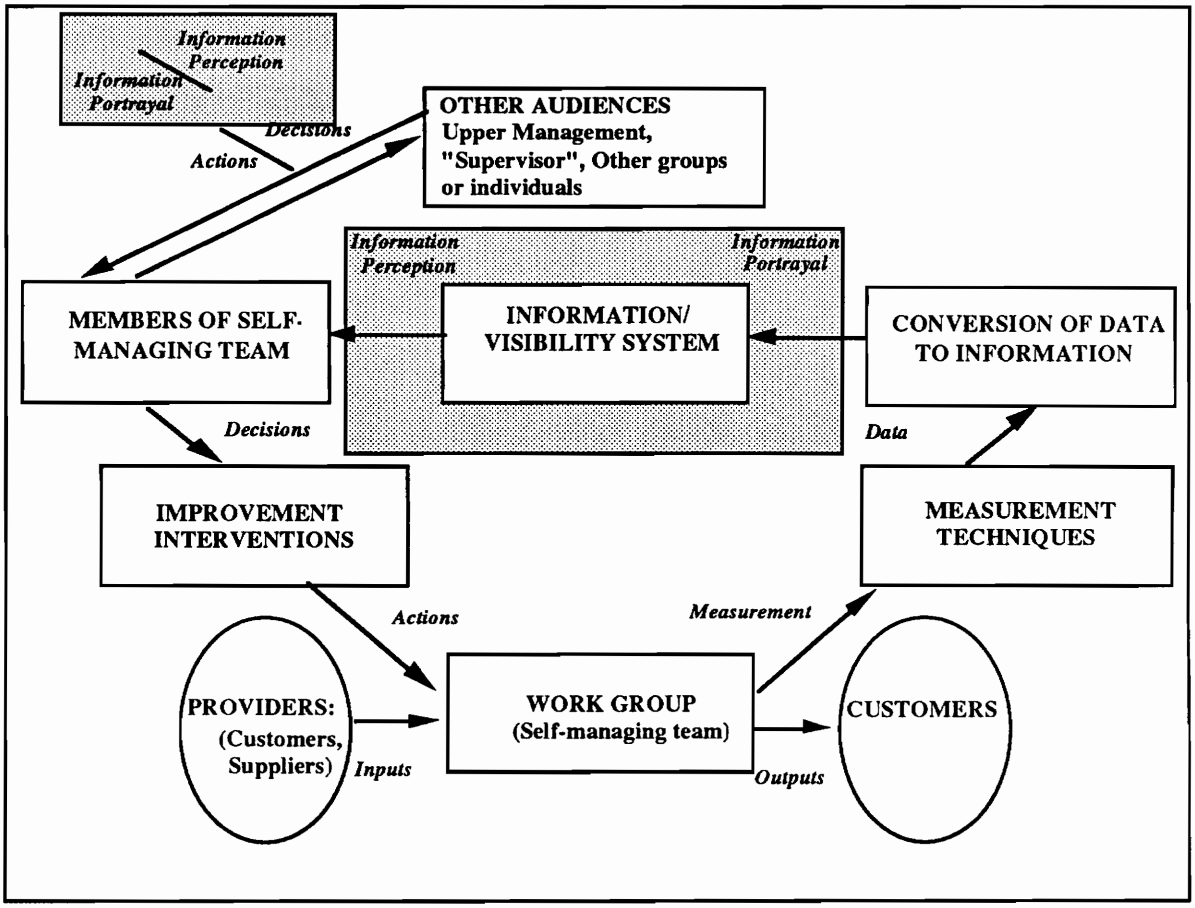


Figure 1.1. This Research Focuses on the Information System to Support Self-Managing Teams.
(Management System Model adapted from Kurstedt, 1988)

This research focuses on the two information elements of the modified MSM (highlighted in Figure 1.1). The first is the information team members receive on team performance (called the visibility system, generated from the team measuring and portraying its performance). The second element is the information interface between the team and Other Audiences (information teams receive from and provide to other groups or individuals). Together, these two elements make up what I refer to as the information system necessary to support a self-managing team. The information system includes any type of information teams receive, whether it is in the form of reports, charts, graphs, meetings, or face to face communication.

1.2.2.2. The Information System to Support Self-Managing Teams

Figure 1.2 depicts the "what is managed" component, the self-managing team, as a system, with providers, inputs, value-adding processes, outputs, and customers. Providers are both suppliers (internal and external) and customers (internal and external). Inputs are converted by the team to outputs using value-adding processes. Outputs are distributed to internal or external customers. The two highlighted areas in Figure 1.2 represent the focus of the research - the information inputs, which are antecedents to a team's decision-making, and information outputs, which is information teams provide to other groups or individuals. Information inputs can come from the visibility system, which provides feedback on the team's performance and from "other audiences" - other groups or individuals in the organization.

1.2.2.3. Key Variables and Constructs in the Information System

Figure 1.3 illustrates the key independent variables and constructs involved in the information system supporting self-managing teams. These constructs were identified based on the review of the body of knowledge of self-managing teams and my experience

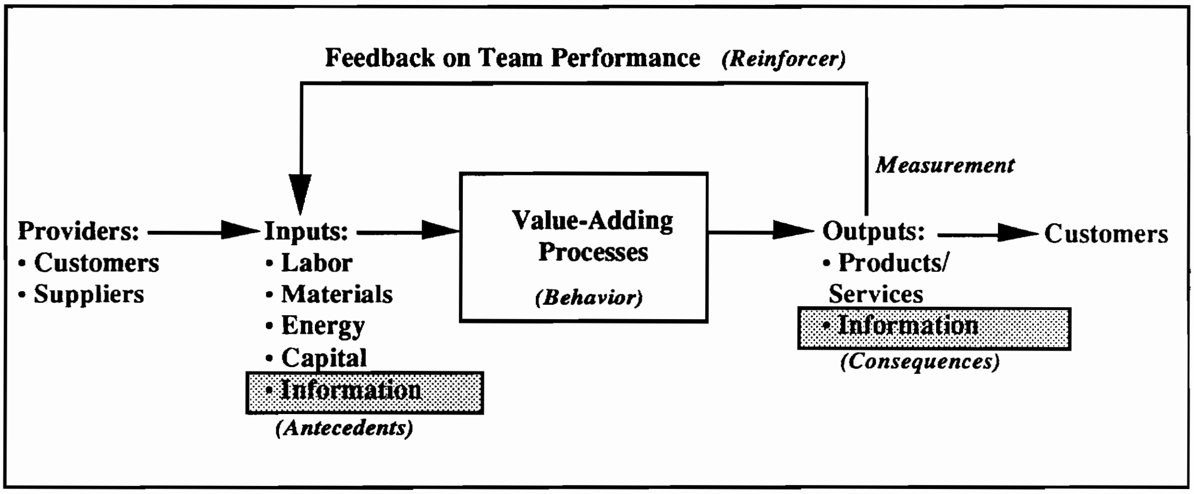


Figure 1.2. A Self-Managing Team as a System.

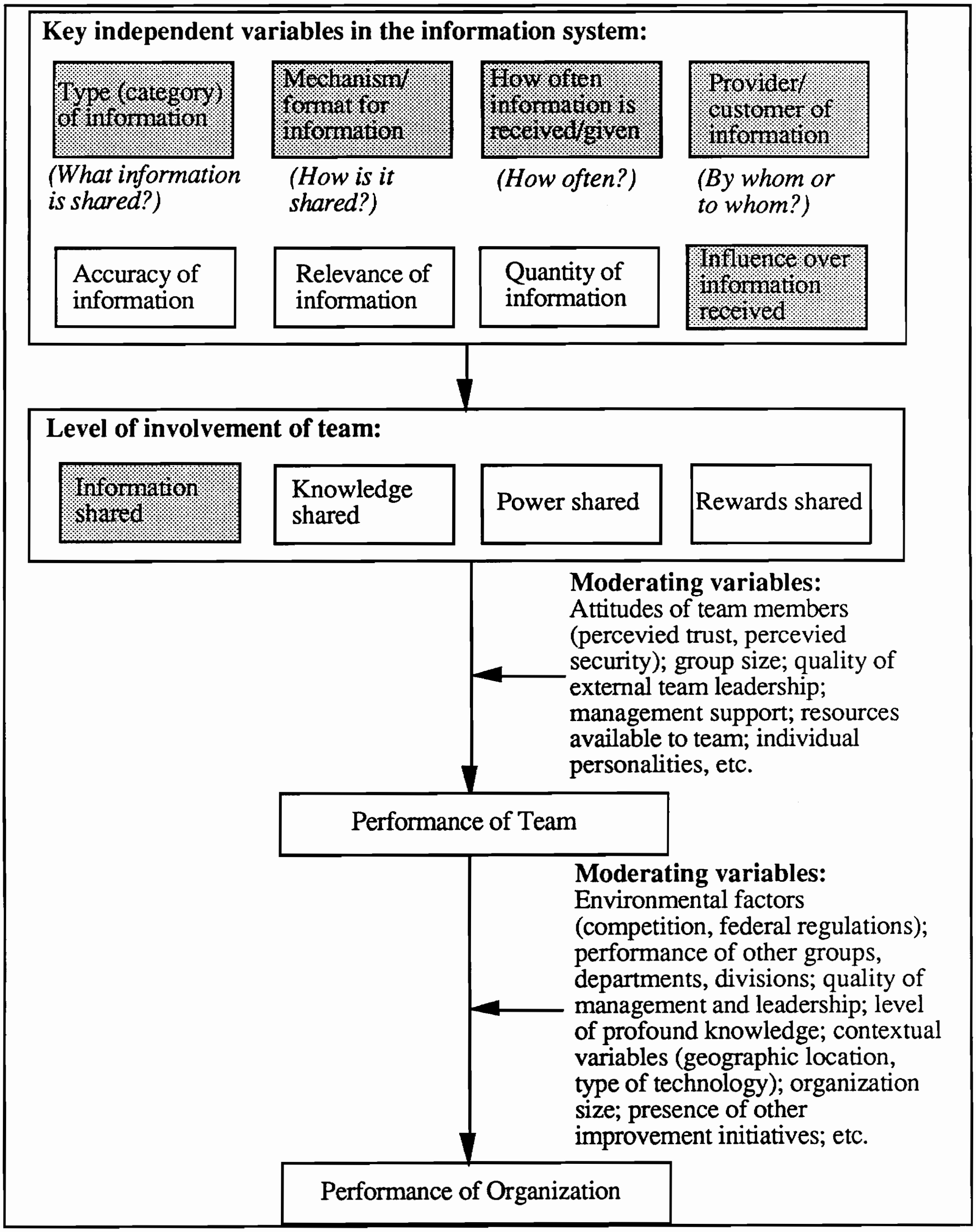


Figure 1.3. The Information System to Support Self-Managing Teams

gained at the VPC with designing and developing information systems (particularly performance measurement systems). The key independent variables which are the focus of this research include the type or category of information received; the mechanism or format for information; how often is information received or given; the provider or customer of information; and the influence over information received. These variables are highlighted in Figure 1.3 and the construct for the variable is shown beneath Other variables involved in the information system are beyond the scope of this research but are shown in the figure nonetheless. These include the quantity of information, accuracy of information, and relevance of information. The dependent variable in Figure 1.3 is the level of involvement of the team (the information, knowledge, power, and rewards shared). The level of involvement, and the information shared, will in turn affect the performance of the team with moderating variables such as attitudes, group size, quality of leadership, and resources available to the team. The performance of the team will affect the overall performance of the organization, with moderating variables such as quality of management and leadership, other improvement initiatives, organization size, geographic location, type of technology, and environmental factors. The highlighted variables serve as the foundation for the research questions, shown in the next section.

1.2.3. Research Questions

Formulating research questions are a direct step from the elaboration of a conceptual framework; research questions operationalize the conceptual framework and tell the researcher what s/he wants to know most or first. They also begin to make sampling decisions - sampling people, settings, events, and social processes. The research questions for this research are based on the conceptual frameworks.

1. What information do self-managing teams use to make decisions?
    1.1 What categories of information are shared, e.g., performance of the company and of the team, goals and objectives for the company and for the team, etc.?
    1.2 What is the portrayal mechanism and format for each type of information, e.g. written reports, electronic information, meetings, etc.?
    1.3 How often is each type of information received, e.g. weekly, monthly, quarterly?
    1.4 Who provides each type of information?

2. What information does the team provide to other groups or individuals in the organization?
    2.1 What types of information are provided?
    2.2 What is the portrayal mechanism and format for the information?
    2.3 How often?
    2.4 Who is the customer of the information?

3. What influence do teams have over the information they receive?
    3.1 Do they have all the information they need to do their job?
    3.2 Can they get any information they want but don't have, and how would they go about it?

In the proposal for this research, the third research question was somewhat different; the sub-questions dealt with how team members were involved in the development of the information system. As I became more involved in data collection and analysis, I realized the scope of the research questions was too broad, so I de-emphasized the third question and focused more on the first two.

1.3. Desired Outputs of This Research

In conducting the research and answering the research questions, I have created several outputs. Outputs are things which will be an immediate result upon the completion of this thesis.

- a review of the body of knowledge of Employee Involvement *(Chapter 2)*
- a review of the body of knowledge of self-managing teams *(Chapter 3)*
- refined conceptual framework, with sharpened key variables or constructs, for the information system *(the conceptual framework presented earlier in this chapter has been refined from the one presented in the thesis proposal)*
- answers to my research questions *(integrated in the case descriptions and Chapter 6, Conclusions and Interpretations)*
- detailed case descriptions for each case study site *(in Appendix G)*
- "design features" for the information system to support self-managing teams *(in Chapter 6 Conclusions and Interpretations)*
- areas for future research and next steps *(in Chapter 7 Next Steps)*

1.4. Desired Outcomes of This Research

Outcomes are things which I desire to occur as a result of conducting this research; they are more long-term. The desired outcomes for this research are:

- stimulate further research on self-managing teams *(through hypotheses for future research)*
- disseminate knowledge gained as a result of this research by publishing papers from this thesis and dissemination of thesis

- create a better operational understanding among managers of self-managing teams and the role of information sharing
- improve the implementation of self-managing teams in organizations

1.5. What This Research Did Not Yield

There are many key issues involved in the design and implementation of self-managing teams which I did not focus on. In order to complete a thesis within reasonable constraints, I had to focus on a certain area. One prevalent area which I did not research, is the leadership of self-managing teams and the changing role of supervisors. This area is a whole field in itself, which is beyond the scope of my research.

Another area of inquiry which is beyond the scope of this research is the relationship between the use of self-managing teams and group and organizational performance. I did not explore this area because I believe it's more important to better understand how to effectively implement self-managing teams, rather than understand how their use affects organizational performance.

The necessary conditions for self-managing teams is an additional area beyond the scope of this research. Other research areas revolve around the definition of involvement given earlier - the sharing of information, knowledge, power, and rewards. This research focused on information sharing. Sharing knowledge (skills developed through training), power (types of decisions made by self-managing teams) and rewards (how team members are compensated and rewarded) are all areas which are not the specific focus of this research. The issues mentioned above in addition to others, although not the specific focus of the research were, however, documented in the case descriptions in Appendix G, as a part of learning about each organization.

1.6. Justification for Research

I conducted research in the area of involvement because it is currently an area receiving a lot of attention in the management literature and practice. Involvement is an integral element of many of the most prevalent improvement interventions (for example, Total Quality Management, Strategic Planning, Just-in-Time). Teams of employees are often a design feature of improvement interventions, and involvement from all or most employees is actively solicited. For this reason, understanding the phenomenon of involvement is critical to the success of an organization's improvement efforts. Many organizations currently using problem-solving teams or other kinds of participation groups in their improvement efforts will naturally evolve toward using more sophisticated and complex involvement initiatives (Goodman et al., 1988), hence the importance of studying and learning about self-managing teams. Although self-managing teams are currently not in widespread use, they are predicted to experience slow but sure growth for various reasons. There has been quite a bit of research on self-managing teams and a recent increase in the number of books, articles, and conferences on the topic. Their potential for having a positive impact on organizational performance is very promising, therefore, research in this area and in particular, on the information system to support teams, will be useful to managers.

About this Thesis

hroughout this thesis, I have integrated experience and knowledge gained as a ...e research associate at the Virginia Productivity Center in the Industrial and Systems E... ring Department at Virginia Tech. The VPC makes a conscious effort to move in... ion, knowledge, power, and rewards downward in the organization so that associa...s become self-managing. I also refer to knowledge gained through: conversations with people (managers and team members) involved with self-managing teams; literature I have read in this area; and a conference I attended on self-managing teams. The purpose of integrating my knowledge and experience into the thesis document is to demonstrate my qualifications to research this topic.

Chapter 1 (Introduction) introduced briefly the concept of Employee Involvement and self-managing teams, and the need for research in this area. The chapter also identifies the scope of the research, which includes the research purpose, research questions, desired outputs and outcomes of the research, and the justification for the research. Chapter 2 (Background on Employee Involvement) of this thesis includes background information about Employee Involvement, including defining involvement and the types of involvement initiatives organizations use, as well as a discussion of when involvement is appropriate. Chapter 3 (Review of the Body of Knowledge) contains a review of the body of knowledge on self-managing teams. Sources for the review include the literature, attending a conference on self-managing teams, and conversations with managers and team members in organizations. Chapter 4 (Research Methodology) provides details on how this research was conducted. The stages of the research (data identification, data collection and storage, data analysis, and conclusions) are described in full detail, as well as tools and techniques used in the research process. Chapter 5 contains the results (the data) from the five organizations I worked with. Brief descriptions along with details about the information system are contained in this chapter, while the detailed case descriptions are in the Appendix. Chapter 6 contains Conclusions and Interpretations. This is the cross-case analysis, which considers similarities and differences among all five organizations. Chapter 7 contains Next Steps; this is what I believe what research could or should be done in the future to further investigate this topic. Chapter 8 contains Lessons Learned while conducting this research. This is the advice I would give to a new graduate student entering the Management Systems Engineering option.

The Appendix contains any supporting information or information not directly needed in the body of the thesis document. The Appendix contains a discussion of different types and perspectives of research and where this research fits in; the exploratory experiment I conducted with a self-managing team in the VPC and what I learned from it; general interview questions used; the code list used to code data; the format used for case descriptions; my Career Plan and Plan of Study Document; the five detailed case descriptions; data displays from cross case analysis; and my vita.

CHAPTER 2 BACKGROUND ON EMPLOYEE INVOLVEMENT

This chapter provides background on the topic of self-managing teams. The first section contains a discussion of and operational definition of involvement. Terms commonly used, such as participative management and empowerment, are clarified. Second, a framework of involvement initiatives is presented and various types of initiatives are discussed. Third, reasons for involvement are presented. They are: a changing business environment (global competition), changing products and technology, changing workforce, and for ethical reasons. The fourth section contains a discussion of when involvement is appropriate. Last, current practices in Fortune 1000 organizations are presented, based on a survey by Dr. Edward Lawler of the University of Southern California's Center for Effective Organizations published by the American Quality and Productivity Center.

2.1. What is Involvement?

There are many terms in the literature and in use in organizations to describe the growing trend of involving employees more in the management of organizations: involvement, participation, participative management, empowerment, and participative decision-making are common ones. To describe the same phenomenon, terms are often used inter-changeably, however, there are differences between these terms. The purpose of this section is to clarify and illuminate these differences.

Management is decision-making (Kurstedt, 1989). *Participative management* then, implies that employees other than managers have some influence over decisions made. This means a sharing of power with employees at lower levels - employees traditionally not included in the decision-making process. I make no distinction between this definition of participative management and *participative decision-making*, since management is the same as decision-making. Additionally, I view *empowerment* as equivalent to participative management and participative decision-making. They all include sharing power (the ability to influence decisions) with employees. (I will compare these three terms to *involvement* later in this section.)

Sharing power can be in varying degrees, from complete management control (no power shared) to some employee influence (some power shared) to complete employee control (much power shared). Power can be shared regarding a number of things managers influence: what tasks are done, how tasks are performed, when tasks are performed, resources allocated to tasks, work environment, task instructions, problem-solving, achievement expectations, reward expectations, and rewards valued (Sink, 1982). The extent to which management either tightly controls or shares decision-making depends upon the set of assumptions a manager has about human behavior and how it should be controlled, influenced, and managed (Sink, 1982). Theory X and Theory Y are bi-polar perceptions about human behavior (McGregor, 1960). Theory X assumes that: people inherently dislike work and will avoid it; they therefore must be coerced, controlled, directed, and threatened with punishment to do work; and the average person prefers to be directed and wishes to avoid responsibility, has little ambition and wants security. A belief in Theory X assumptions will result in tight organizational control and an autocratic management style.

Theory Y has opposite assumptions: work is as natural as play; people will exercise self-direction and self-control in the service of objectives to which they are committed; commitment is a function of rewards associated with goal achievement; and the average person seeks responsibility and has a high degree of imagination and ingenuity (McGregor, 1960). A belief in Theory Y will result in generous power-sharing and participative and delegative management styles. Of course, the two extremes are rare in reality; most managers and most organizations will be somewhere in between. Variables that moderate whether decision-making power will be shared are: manager psychological type, the specific situation, manager preferences, subordinate characteristics, and the environment, to name a few (Sink, 1982).

An important point to make is that neither autocratic (Theory X) or democratic (Theory Y) management style is inherently "bad." Depending upon the situation (one of the moderating variables listed above), different management styles will be more appropriate.

Involvement is a broader issue than simply sharing power. An operational definition of *involvement* is the extent to which information, knowledge, power, and rewards are moved downward in the organization and shared with employees at lower levels (Lawler, 1986). Sharing information can be in the form of verbal communication at meetings, written reports and memos, closed circuit TV, and computer networks. Sharing knowledge means developing skills in employees through training. As described above in defining empowerment, sharing power means allowing employees at lower levels to have influence or control over decision-making. Sharing rewards can be accomplished with non-financial rewards such as recognition and financial rewards such as gainsharing and redesigned compensation systems (e.g., skill-based pay systems). Any involvement initiative (such as quality circles, self-managing teams, or suggestions systems) can be described or characterized by the amount of information, knowledge, power, and rewards moved into the hands of employees performing the work.

Therefore, with this definition of involvement, if just information were shared with employees (a form of involvement), it would not be participative management or decision-making, because employees may have no influence over decision-making. *Participation* is the same as involvement; participation is also a broader issue and doesn't necessarily mean that employees are involved in decision-making. They may simply be given information and knowledge and be considered to be participating.

Figure 2.1 illustrates the relationship between sharing information, knowledge, power, and rewards. In a high-involvement organization, all four are moved downward in the organization. There are dangers associated with sharing less than all four (Lawler 1986: 1990):

- *Rewards for organizational performance without power, knowledge, and information lead to frustration and lack of motivation because people cannot influence their rewards.*
- *Information, knowledge, and power without rewards for organizational performance are dangerous because nothing will ensure that people will exercise their power in ways that will contribute to organizational effectiveness.*
- *Power without knowledge, information, and rewards is likely to lead to poor decisions.*
- *Information and knowledge without power leads to frustration because people cannot use their expertise.*

As the figure illustrates, there is a cumulative and integrative relationship between the four elements of involvement. The implication of the figure is that in general, information and knowledge must be shared before employees can be prepared to make effective decisions (power-sharing). For example, employees in a problem-solving team must first be given the necessary information and knowledge (e.g., problem-solving skills) to make high quality decisions (sharing power). However, Lawler (1990) states that all four must be moved downward in the organization in fairly close proximity, otherwise the dangers listed above will occur. From a behavioral perspective, sharing information and knowledge can be viewed as antecedents to behavior; sharing power (decision-making) is the actual desired behavior; and sharing rewards is the reinforcement to the behavior. To

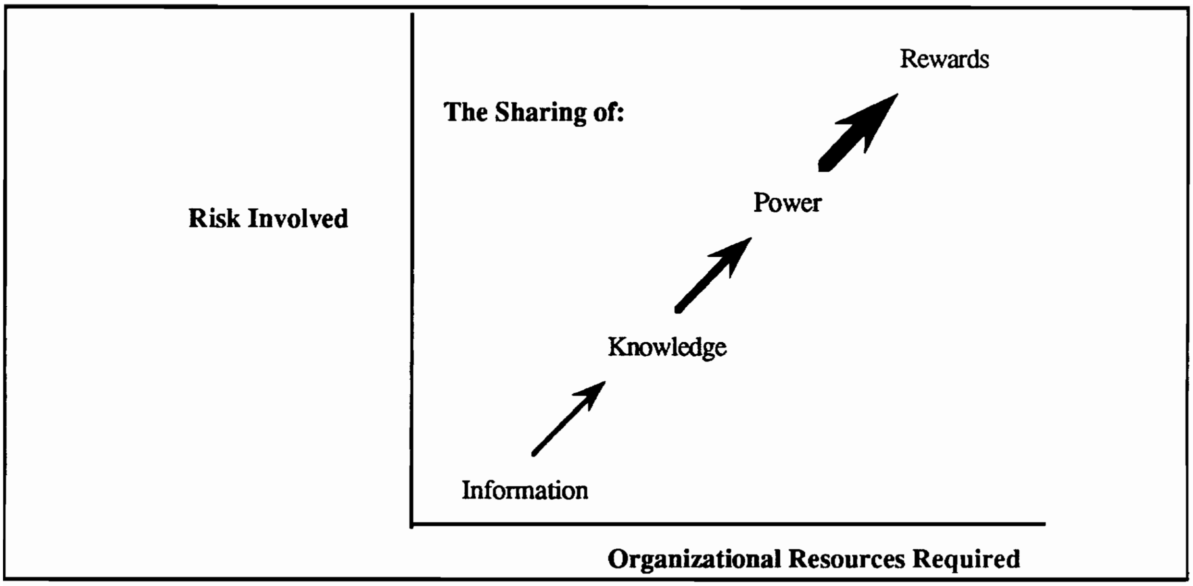


Figure 2.1. Sharing Information, Knowledge, Power, and Rewards (adapted from Employee Involvement Primer, presented by Ken Kiser)

effectively involve employees, antecedents, behavior, and consequences must be well-designed and planned to work together.

Various involvement initiatives (see next section) are the means to move information, knowledge, power, and rewards downward to employees performing the work. Some initiatives are more effective than others at doing this.

2.2. A Framework of Involvement Initiatives

There are a variety of initiatives to share information, knowledge, power, and rewards, ranging from the most basic - information sharing or individual suggestion systems - to the more sophisticated and complex - self-managing teams. Self-managing teams represent one of the most sophisticated and mature forms of involvement (Belcher, 1987).

A framework of involvement initiatives is shown in Table 2.1. Initiatives can be classified along two dimensions: whether the mechanism for involvement is the individual or a team, and whether the initiative has little - moderate or significant impact on key organizational sub-systems and the way work is managed. Examples of organizational sub-systems (or key management systems) affected by initiatives are: organizational structure, the problem-solving and decision-making system, the information system, the reward system, training and work design.

The two dimensions each have two distinctions, resulting in four cells. Several researchers in this area have used only one dimension (a continuum) to classify involvement initiatives. For example, Belcher (1987) uses increasing autonomy as a continuum. Another example is the breadth and depth of involvement (Cabot, 1989). Mohrman and Lawler (1984) use two dimensions, one of which is the type of participation group, from simple suggestion groups to problem-solving groups to self-managing groups. This dimension is similar to the first two mentioned (they all involve the amount

Table 2.1. Framework of Involvement Initiatives

Impact on Organization: / **Mechanism for Involvement:**	**Little- Moderate** *(Parallel Structures)*	**Significant** *(Institutionalized Initiatives)*
Individual Involvement Initiatives	Information sharing Employee survey feedback Cooperative goal setting Individual suggestion system	Job redesign
Team-Based Involvement Initiatives	Team suggestion systems Quality Circles Participation Groups Other Than QCs Union-Management Committees	Mini-Enterprise Units Self-Managing Work Teams

of autonomy employees have in different types of initiatives). I conceptualized my dimension of the impact on the organization from these examples. Impact on the organizational sub-systems is an *outcome* of what the previous examples illustrate - basically autonomy. I chose to define this dimension as an outcome because autonomy is sharing power, but involvement is more than just sharing power. It is also sharing information, knowledge, and rewards. The cumulative outcome of sharing *all four* is the overall impact on the organization.

The reason I added a second dimension to develop the framework in Table 2.1 is because not all involvement initiatives I came across fit neatly along one continuum (whether the single continuum was autonomy, sophistication of the initiative, organizational support required, etc.). Some initiatives are aimed at involving employees at the individual level (like suggestion systems and survey feedback) while others are aimed at involving teams or groups. So, in order to accurately portray the most prevalent involvement initiatives, I have used a framework based on the two dimensions described above.

The initiatives shown in the table are not meant to be an exhaustive list, rather simply representative of the kinds of initiatives which exist in organizations experimenting with involvement. Definitions are shown below.

Information sharing: The most basic involvement technique; it is the widespread sharing of information with employees. Types of information shared can include performance of the individual, group, and/or organization; organizational goals; and future directions for the organization. The mechanism for providing information may be large group meetings, informal meetings, memos, and/or reports. Information sharing should be a fundamental feature of all involvement efforts (Belcher, 1987).

Survey feedback: Use of employee attitude survey results, not simply as an employee opinion poll, but rather as part of a larger problem-solving process in which survey data are used to encourage, structure, and measure the effectiveness of employee participation. In other words, surveys can gather opinions, probe attitudes, gauge organizational climate, or identify improvement opportunities. Surveys can take on a variety of forms, such as written instruments, personal interviews, or observations (Lawler et al., 1989)

Cooperative goal-setting: This form of involvement allows employees to have some influence over individual goals. Generally, employees meet one-on-one with their supervisor or manager and they discuss accomplishments achieved to date and goals for the upcoming time period. Goals should be reviewed on a work-cycle basis (Cabot, 1989). A variation of this initiative is Management by Objectives (MBO).

Individual suggestion systems: A process by which individual employees can submit suggestions for improvement, usually in a "suggestion box." The suggestions are reviewed by a group or individual and either approved and implemented, or rejected. Often, employees are rewarded financially for suggestions which are approved and implemented. The reward may be a standard amount or it may be based on the percentage on the savings realized as a result of the suggestion (as with AT&T in Richmond, Virginia). The focus of the suggestion system may be quality, process or method improvements.

Job enrichment or redesign: Design of work that is intended to increase worker performance and job satisfaction by increasing skill variety, autonomy, significance and identity of the task, and performance feedback (Hackman & Lawler, 1971).

Quality Circles: Structured type of employee participation groups in which groups of volunteers from a particular work area meet regularly to identify and suggest improvements to work-related problems. The goals of quality circles are improved quality and productivity. There are no direct rewards for circle activity, group problem-solving training is provided, and the group's only power is to suggest changes to management (Lawler et al., 1989 and Ledford et al., 1988)

Participation groups other than quality circles: This includes any employee participation groups, such as task teams or employee work councils, that do not fall within the definitions of either self-managing work teams or quality circles. Team members can be production workers, supervisors, and/or middle managers (Lawler et al., 1989).

Team suggestion systems: This initiative is similar to the individual suggestion system, except here teams submit suggestions for improvement, rather than individuals. Again, it is usually a group or individual other than the team who either approves or rejects the suggestion.

Union-management quality of work life (QWL) committees: Joint union-management committees to increase union involvement, usually existing at multiple organizational levels, alongside the established union and management relationships and collective bargaining committees. QWL committees usually are prohibited from directly addressing contractual issues such as pay, and are charged with developing changes that improve both organizational performance and employee quality of work life (Cabot, 1989; Lawler et al., 1989).

Self-managing work team: The work group (in some cases, acting without a supervisor) is responsible for a whole product or service, and makes all or many decisions pertaining to the group. These include task-related decisions (such as task assignments and work methods) and administrative and personnel decisions (hiring and firing, pay increases). The team may also be responsible for its own support services such as maintenance, purchasing, production control, and quality control.

Mini-enterprise units: Relatively small, self-contained organizational unit (perhaps smaller than the plant level) that produces its own product or service and operates in a decentralized, partly autonomous fashion, as a small business. (Cabot, 1989; Lawler et al., 1989).

2.2.1. Individual-Based Involvement Initiatives

2.2.1.1. Parallel Structures

Individual initiatives having little to moderate impact on the organization include information sharing, employee surveys, cooperative goal setting, and individual suggestion systems. Information sharing should be a fundamental feature of any involvement effort. Sharing information demonstrates management's trust and commitment to employees and will result in a more effective workforce (Belcher, 1987). Types of information most commonly shared with employees in involvement efforts include: performance information about the company, work group performance, organizational goals, and goals for the work group (Lawler et al., 1989). Survey feedback allows employees to share information upward to management, however, it is even more than just sharing information, but also the opportunity to influence improvement interventions and have a say in problem-solving. After surveying employees, it is critical that managers provide feedback on the results and take action on them (Belcher, 1987). Cooperative goal-setting is also a mechanism for employees to exert influence - on their individual (or possibly group) goals. In individual suggestion systems, employees are able to influence decisions about things to improve or change.

Of the four initiatives in the top left cell of Table 2.1, one moves only information down in the organization (information sharing) and three move some power down to employees at lower levels. All three of these - employee survey feedback, cooperative goal-setting, and individual suggestion systems - allow employees to influence something related to their job. Individual suggestions systems, depending on their design, may also share some rewards.

In sum, these initiatives are all "parallel" organizational activities; that is, they are not part of the normal organizational structure nor are they part of people's normal day-to-day job (hence, the sub-title parallel structures). They are intended to perform functions (e.g., communication, exert influence, provide suggestions) that are hampered or slowed down by the normal organizational hierarchy and structure. These initiatives have little-to-moderate impact overall on the organization because they are parallel activities. They do not significantly change the organizational structure (the hierarchy remains intact), the information system, the problem-solving and decision-making system (management still makes the final decisions), or the reward system (the fundamental way employees are compensated is unchanged).

2.2.1.2. Institutionalized Initiatives

The only initiative listed in the top right cell of Table 2.1 is job redesign. Job redesign uses the job characteristics approach to work design. Work is designed to increase performance and job satisfaction by increasing autonomy, skill variety, feedback, task significance, and task identity (Hackman & Lawler, 1971; Roberts & Glick, 1981) (see "Related Fields and Concepts" in Chapter 3 for a more thorough discussion of job redesign). By increasing the autonomy employees have, the problem-solving and decision-making systems is changed (power is moved downward). Providing feedback on performance on a *regular* basis (daily, weekly, etc.) significantly impacts the information system (information is moved downward). Increasing skill variety of jobs necessitates developing skills in employees through training (knowledge is moved downward).

Job redesign is placed in the right side of Table 2.1 because it institutionalizes employee involvement practices into the day-to-day activities of the organization (hence, the sub-title "institutionalized initiatives").

2.2.2. Team-Based Initiatives

2.2.2.1. Parallel Structures

Involvement initiatives in the lower left of Table 2.1 are parallel structures aimed at involving teams or groups, of employees. These initiatives include team suggestion systems, quality circles, other types of participation groups (task forces, tiger teams, action teams), and union-management committees. These initiatives are parallel structures because, for example, in a participation group, team members will go off and work on a problem and then "return" to their normal work. Even if the team regularly works together in the same area, these problem-solving activities are not institutionalized into their work. Teams generally only propose solutions to problems and do not have the authority to decide on or implement solutions.

Team suggestion systems are similar to individual suggestion systems, except teams write and submit suggestions for improvements. This initiative shares some power with employees (because they influence management decisions) and it may share some rewards.

Quality circles consist of employees from a common work area who meet on a regular basis to identify problems and develop potential solutions (Ledford et al., 1987). Although members work together regularly, this is still a parallel activity because the problem-solving and involvement is not institutionalized into employees' day-to-day activities. In addition, circles don't have the power to make decisions on or implement problem solutions.

Members of other forms of participation groups also meet away from their normal work to identify problems and generate solutions. As with quality circles, management still makes final decisions. The difference between these types of groups and quality circles is that these team members don't usually work together in their normal jobs. They may have been pulled together from different functions or areas to work on a specific problem or issue. They may also be at any level in the organization: a team can be made up of production workers, supervisors, or middle managers (a team may even consist of employees from all these levels).

Union-management committees are a form of the previous initiative, but they are formed expressly to involve the union in management and decision-making. However, these committees are usually restricted in the issues they address (Lawler et al., 1989).

2.2.2.2. Institutionalized Initiatives

Involvement initiatives in the lower right cell of Table 2.1 are the most sophisticated and mature form of involvement and require more organizational commitment and support than any other initiative (Belcher, 1987). Mini-enterprise units are at more of a macro-level, rather than at the work group level (as self-managing teams are). However, they still involve large teams or groups of employees, so they are placed in this cell. These units operate as mini-businesses within a larger unit or organization and are highly autonomous. They are an example of what Hackman calls self-governing performing units (Hackman, 1986). An example of mini-enterprise units can be found at AT&T in Richmond, Virginia. The entire plant is divided into twenty internal business units, each with its own board of directors and with the responsibility to manage itself and make a profit.

An analogy of mini-enterprise units at the work group level is self-managing teams. Chapter 3 provides detailed definitions, but briefly, self-managing teams have a high degree of decision-making autonomy and behavioral control at the work group level (Cummings, 1978). The use of self-managing teams represent a dramatic change from other team-based initiatives such as quality circles in that involvement in managing work processes and problem-solving and decision-making *is* part of daily work. Rather than going off to meet to work on a problem (or even waiting until the regular meeting time to do it), team members identify and solve problems as they occur. And they not only identify problems; they solve them and implement solutions.

Mohrman and Lawler (1984) identify change levers (what I call key organizational sub-systems) typically affected in organizational development activities. They include participation in decision-making (what I call the problem-solving and decision-making system), the reward system, organization structure, training, work design, and information system. They review the effects of team-based involvement initiatives (what they call QWL projects) on these change levers. The types of initiatives I have listed in the lower left of Table 2.1 (parallel structures) are evaluated as *sometimes* having on impact on only two of these change levers. For example, participation groups don't affect the reward system and work design; they *may* affect the problem-solving and decision-making system, and the information system; and they do affect the organizational structure (but not dramatically like self-managing teams) and the training system. On the other hand, Mohrman and Lawler (1984) evaluated self-managing teams as having a significant impact on *all* change levers.

An organization just beginning involvement efforts would very likely fail if it jumped right in to some of the more sophisticated complex initiatives (Belcher, 1987). It is better to begin with simple initiatives, even at the individual level (such as information sharing), then perhaps progress on to team-based initiatives such as a form of a participation group. Then as collective organizational experience with involvement increases, a transition to self-managing teams can be made effectively (Macy et al., 1990).

2.3. Why Involvement?

Involvement is viewed as a critical element of an organization's overall improvement effort. It is important enough that it is a criteria used to evaluate quality and productivity improvement efforts in many national award programs, including the Malcolm Baldrige

National Quality Award (Sink, 1990a), the President's Award for Quality and Productivity Improvement (Harmon, 1990), the Quality Improvement Prototype awarded to federal government organizations (Harmon, 1990), the IIE Award for Excellence in Productivity Improvement (IIE SPPC, 1990) and the Senate Productivity Award for Virginia (Ingold, 1990).

What has served as a catalyst for the concepts and philosophies of involvement to only recently take hold and become critical elements of organizations' improvement efforts, especially given that the concepts are not new? Several reasons are offered by Lawler (1986) and Sashkin (1984): a changing business environment, differences in products and technology, a changing workforce with different expectations and needs, and lastly, for ethical reasons.

2.3.1. Changing Business Environment

A changing business environment characterized by global competition and marketplace, has necessitated that American managers take a serious look at alternative ways to improve performance (Cheney, 1990; Macy et al., 1990). The survival of many organizations depends on effective utilization of labor (the U.S. has the highest labor costs in the world), which in turn depends on how people are organized and managed (Lawler, 1986). The auto industry provides an example of how poorly American auto makers are performing compared to Japanese - in spite of higher prices, consumers still prefer Japanese cars because of the higher quality and better service records. This example can be repeated in any number of other industries.

To improve performance, organizations can either improve the effectiveness of their use of their current management paradigm (control), or change to a new paradigm (involvement). Improving the current paradigm (not making a major shift) will likely result in only a 15-20% improvement (Lawler, 1988). However, the "new competition" is performing orders of magnitude better than their American counterparts (Sink, 1990b). A dissatisfaction with the existing paradigm must be created before a change will be made; dissatisfaction in American organizations with the existing paradigm is occurring in the form of "pain" caused by lost market share, decreased customer satisfaction, and higher costs, particularly in manufacturing industries. This pain drives the search for and change to a new involvement paradigm.

2.3.2. Differences in Products and Technology

During the last several decades, the American economy has shifted more toward a service economy and toward work which requires specialized knowledge (Lawler, 1986). Prior to this, from the turn of the century through the middle decades of the century, work was divided into simple repetitive tasks. This perhaps explains why the control paradigm existed for so long. The control and involvement paradigms are each appropriate in different situations. Lawler (1988) predicts that: 1) the more interdependent that the work of individuals is, the more effective the involvement approach is likely to be; and 2) the more dynamic the environment in which the organization operates, the more effective the involvement approach is likely to be. Figure 2.2 illustrates these relationships. For complex knowledge work (as we've been moving toward), the involvement approach is likely to be more effective, and for simple repetitive tasks, the control approach is likely to be more effective.

As we now know, less and less work in American organizations is simple and repetitive. The control paradigm worked fine when most of the economy was concentrated in the manufacturing industry, but now most is in the service industry and this is growing.

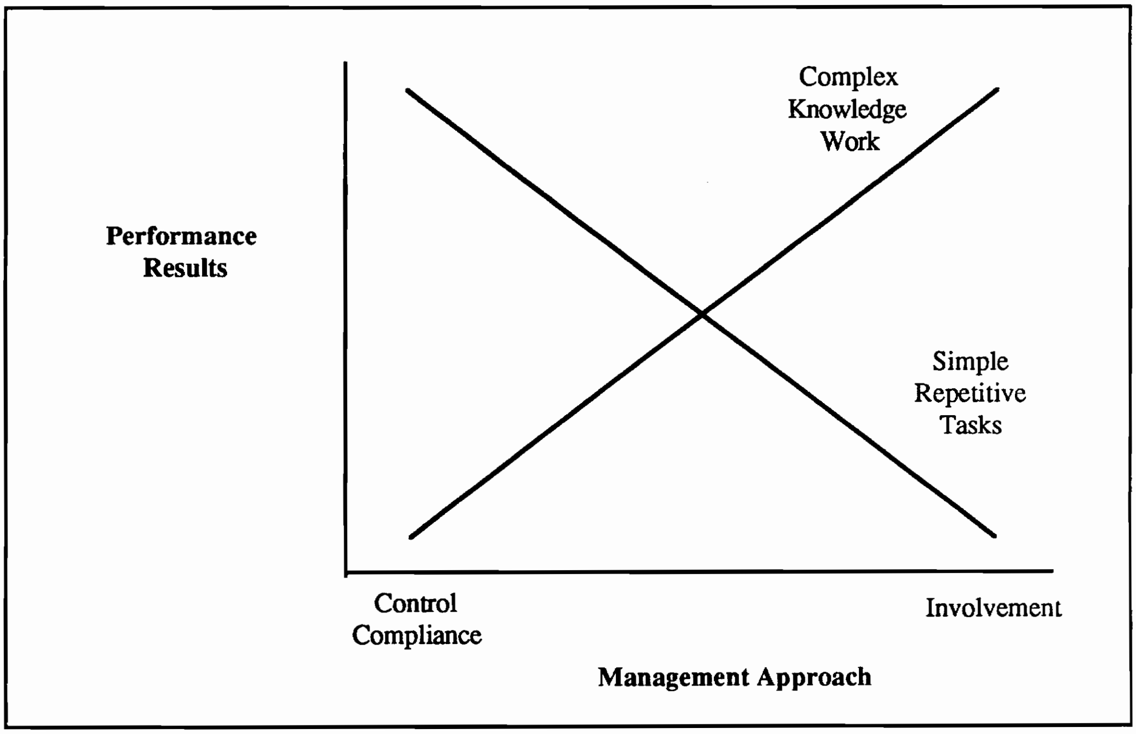


Figure 2.2. Performance Effectiveness of Management Approaches (taken from Lawler, 1988)

Approximately 73% of the workforce is in the service sector, which is expected to increase to anywhere between 80 and 95% by the year 2000 (Cetron et al., 1988). This growth in the service sector has produced more and more jobs where people are working with words, symbols, numbers, and personal services (Lawler, 1986). About half of all service workers will be involved in collecting, analyzing, synthesizing, structuring, storing, or retrieving information as a basis of knowledge by the year 2000, and 80% of all managers will be knowledge workers by 1995 (Cetron, et al., 1988). These data imply that the majority of work will be complex, knowledge work, and as shown from the figure, the involvement approach produces the best performance results for this situation.

2.3.3. Changing Workforce

A third reason for recent interest in involvement is to meet the needs of a dramatically changing workforce. One of the most important changes is the increasing level of education in society, where people are more willing and able to use their minds as well as their bodies to perform work. As Lawler points out, there is considerable evidence that people are less willing to simply take orders by someone in authority - people are more willing to question authority if they feel their rights are being compromised or if they feel they have important input into decisions. These expectations to have more input into decisions in the workplace are more consistent with a democratic society. It is not surprising that this revolution in the work place is taking place, since it aligns well with the democratic principles and values of America and other industrialized Western countries. In fact, these values and principles underlying our political and societal systems are precisely why Lawler (1990) has optimism for the successful transformation to high-involvement organizations in the U.S.

2.3.4. Involvement as an Ethical Imperative

Lastly, some organizations are becoming or have always been involvement-oriented because their managers believe involvement is an ethical imperative. In other words, managers use participative management styles not because it happens to improve quality, productivity, etc., but because it's just the right thing to do (Sashkin, 1984). It is an ethically superior way of managing people. Although this argument for involvement is intuitively sound, it still falls very low on managers' list of reasons for involving employees (Lawler et al., 1989). Semler (1989) provides a very articulate description of why his Brazilian company isn't just full of "participatory hot air":

> *Most of our programs are based on the notion of giving employees control over their own lives. In a word, we hire adults, and then we treat them like adults. Think about that. Outside the factory, workers are men and women who elect governments, serve in the army, lead community projects, raise and educate families, and make decisions every day about the future. Friends solicit their advice. Salespeople court them. Children and grandchildren look up to them for their wisdom and experience. But the moment they walk into the factory, the company transforms them into adolescents. They have to wear badges and name tags, arrive at a certain time, stand in line to punch the clock or eat their lunch, get permission to go to the bathroom, give lengthy explanations every time they're five minutes late, and follow instructions without asking a lot of questions.*

The managers of a high involvement paper mill believe employees should be treated with trust and respect and are just as important as top-level managers. Status barriers between management and lower-level employees are removed. Their guiding principles reflect their philosophies, which are converted to practice by their day-to-day behaviors.

2.4. When is Involvement Appropriate?

As mentioned earlier, there has been recent research on "contingency approaches" to management (Sink, 1982). Research results suggest that rather than always using *one* management style, managers should diagnose the situation and adjust their style appropriately. There are several factors which determine the appropriate management style (when involvement is appropriate).

First, it depends on the developmental or maturity, level of the followers. Developmental level is based on two things: competence and willingness to perform the task (or make the decision) Hersey and Blanchard (1982) have identified four types of leadership styles based on four developmental levels of followers: telling (autocratic), selling (consultative), participative, and delegative. Although useful, this model doesn't consider all the factors in deciding appropriate management styles. The second determining factor of when involvement is appropriate is where the necessary information to make the decision lies. If one person has it, then that person should make the decision (delegative or autocratic, if the leader has the information). If the information is disseminated over several people, then the decision-making strategy should be consultative or participative. The third factor is the availability of time. If there is not much time available to make the decision, then the leader should make the decision, however, if time allows (and depending on the other factors) then participation is appropriate. The last factor is the need for acceptance of the decision. If acceptance is considered important, then the decision should be participative or consultative because people involved in a decision will feel more committed to it and more likely to accept it (Morris, 1979). If the need for acceptance is low, then an autocratic or delegative strategy can be used.

Kanter, in her book *The Change Masters*, captures in narrative form the factors described above for deciding when involvement is appropriate and when it isn't (shown below):

When is involvement appropriate?

- to gain new sources of expertise and experience.
- to get collaboration that multiplies a person's effort by providing assistance, backup, or stimulation of better performance.
- to allow all of those who feel they know something about the subject to get involved.
- to build consensus on a controversial issue.
- to allow representatives of those affected by an issue to influence decisions and build commitment to them.
- to tackle a problem that no one "owns" by virtue of organizational assignment.
- to allow more wide-ranging or creative discussion/solutions than are available by normal means (for example to get an unusual group together).
- to balance or confront vested interests in the face of the need to change.
- to address conflicting approaches or views.
- to avoid precipitous action and explore a variety of effects.
- to create an opportunity and enough time to study a problem in depth.
- to develop and educate people through the participation: creating new skills, new information, and new contacts.

When is involvement not appropriate?

- when one person clearly has greater expertise on the subject than all the others.
- when those affected by the decision acknowledge and accept that expertise.
- when there is a "hip pocket solution": the manager or company already know the "right answer."

- when the subject is part of someone's regular job assignment, and it wasn't his or her idea to form the team.
- when no one really cares all that much about the issue.
- when no important development will result or others' knowledge would neither contribute to nor be served by their involvement.
- when there is not time for discussion.

Once it is determined that involvement *is* appropriate, the challenge still hasn't ended. Involvement is a complex issue, which needs to be managed and executed thoughtfully, to try to avoid predictable dilemmas. Kanter (1982, 1984) illustrates the dilemmas of participation with concrete examples. The six types of dilemmas described in Kanter's book are: dilemmas of beginning, structure and management, choice of issues, problems of teamwork, methods of linking teams to their environment, and evaluation/continuation.

2.5. Current Practices in Involvement

Table 2.2 was extracted from a survey of Fortune 1000 companies conducted by Lawler and others and was published through the American Productivity and Quality Center in Houston, Texas. The table illustrates the level of use of the most common involvement initiatives. The items in Table 2.2 do not correspond exactly to those in Table 2.1 ("A Framework of Involvement Initiatives") because Table 2.1 was compiled from a review of many books and articles, not just from the survey. Definitions from the survey for the initiatives listed in the table below were provided earlier in section 2.1.

As shown in the table, the most common involvement initiatives are those that have little to moderate impact on the organization (survey feedback, quality circles and other forms of participation groups). The least common initiatives are those that have significant impact on the organization (self-managing teams and mini-enterprise units).

Table 2.2. Current Practices in Employee Involvement (taken from Lawler et al., 1989)

About How Many of Your Corporation's Employees Are Currently Involved in Each of the Following Initiatives?

Involvement Initiative	None 0%	Almost None 1-20%	Some 21-40%	About Half 41-60%	Most 61-80%	Almost All 81-99%	All 100%
Individual Involvement Initiatives: Survey Feedback	32%	22%	17%	6%	7%	6%	10%
Job Enrichment	40	38	12	6	2	2	1
Team-based Involvement Initiatives: Quality Circles	39	32	18	7	2	0	1
Participation Groups Other Than QCs	30	33	21	9	3	2	1
Union-Management QWL Committees	70	20	7	2	1	1	0
Self-Managing Work Teams	72	20	6	1	0	0	0
Mini-Enterprise Units	75	18	4	1	1	0	0

2.6. Summary

Involvement is not another fad, but "an important and increasingly popular approach to management" (Lawler et al., 1989). The majority of Fortune 1000 companies have some form of involvement initiatives in practice. The overriding reason they have done so is to improve quality, productivity, or some other measure of performance. In fact, Employee Involvement is the most important initiative that organizations will undertake in the next several years to improve quality and productivity (Towe, 1989). Lawler's (1989) report surveyed almost half of the Fortune 1000 companies. Although this survey represents only large organizations, I suspect that the level of involvement in smaller organizations is just as much, if not more. When I attended an international conference on self-managing teams and listened to the case study presentations by managers, I noted that many of them were from small companies not listed in Fortune 1000.

CHAPTER 3 REVIEW OF THE BODY OF KNOWLEDGE

This chapter is titled "review of the body of knowledge" and not "literature review" because it contains a review of more than just the literature. To research a phenomenon, it is necessary to not only read books and journal articles, but also talk to managers who have knowledge and experience in the topic area. Many new and innovative things are being done in industry in areas such as this one, and managers don't always have the time to document their findings. Relying solely on the literature would ignore a lot of valuable information. For this research, the review of the body of knowledge included conversations with managers working with self-managing teams, team members, and team coaches. I was able to talk to people in organizations through previously established contacts through my work at the VPC and at a conference on self-managing work teams I attended.

3.1. What are Self-Managing Teams?

In order to fully understand the phenomenon of self-managing teams, it is necessary to review and clarify any differences in terminology, which is the purpose of this section. There are many terms used for what I'll universally call self-managing teams. The most common are: self-regulating groups, self-directing work teams, autonomous work groups, semi-autonomous work groups, high performance/high commitment teams, and superteams.

3.1.1. Definitions and Terminology

Hackman (1986) uses an "authority matrix" to distinguish between groups with varying control over what are traditionally "management functions" (see Figure 3.1). Hackman

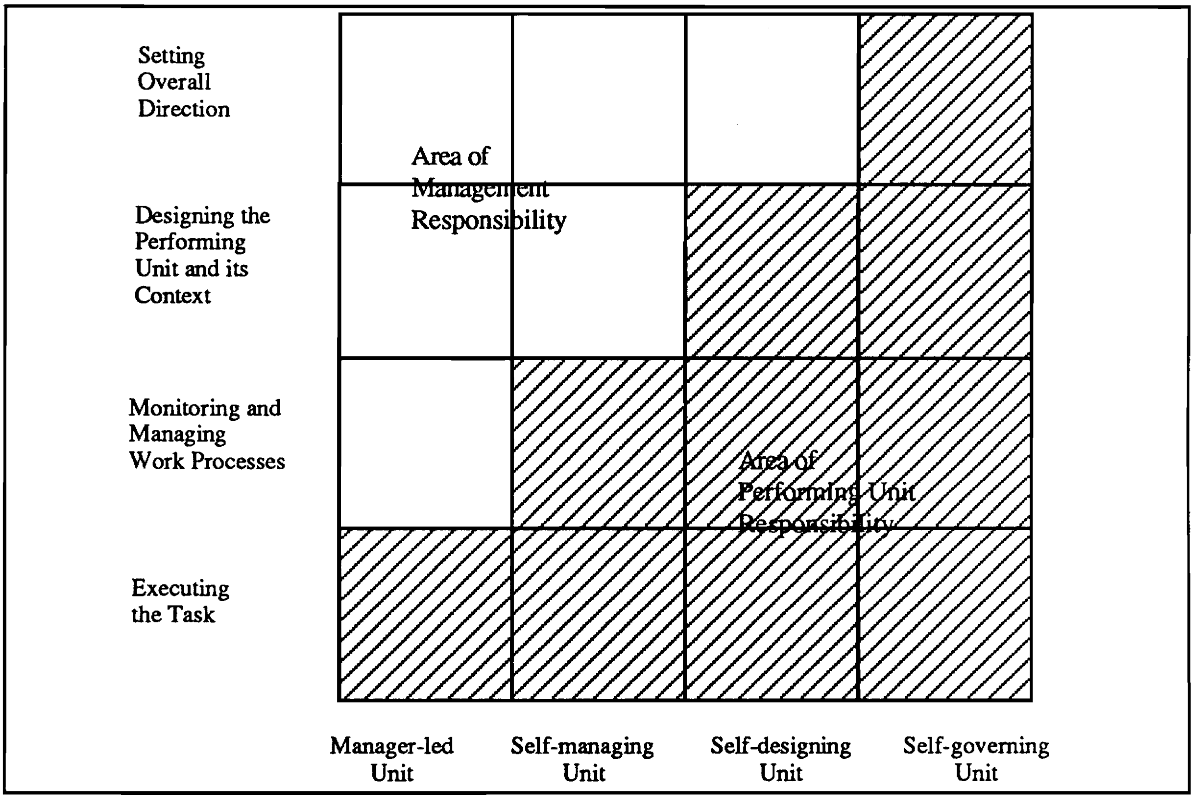


Figure 3.1. The Authority Matrix (taken from Hackman, 1986)

identifies four functions that must be performed in work: executing the task; monitoring and managing work processes; designing the performing unit and its context; and setting overall direction. From these functions, Hackman identifies four types of performing units (a performing unit can be a group or individual) based on how many of the management functions the performing unit is responsible for.

A *manager-led performing unit* represents the traditional work group or individual where the only function the unit performs is actually executing the task(s) (producing the product or service). The most common kind of work groups found in organizations are "coacting" groups, where members of the group report to the same supervisor and work close to one another, but they have individually defined tasks (Hackman, 1984). A different type of a manager-led performing unit is a *natural work team*, which consists of employees organized around a single work process or product, who are interdependent in their functioning and have a common supervisor (Belcher, 1987). However, a natural work team may still be manager-led. A *self-managing performing unit* monitors and manages work processes in addition to executing the task(s). These are common in managerial and professional work - an example is a team of research assistants who share responsibility for collecting a set of interviews and observations (Hackman, 1986). A *self-designing performing unit* has responsibility for executing the task, managing the work, and designing the unit and its context. Managers still set the overall direction for the performing unit. An example of a self-designing unit is a top management task force or an individual who is given autonomous responsibility for some task with the right to call on organizational resources to get the job done (Hackman, 1986).

A *self-governing unit* has responsibility for all four of the functions - they decide what is to be done, structure the unit to accomplish it, monitor and manage how it is done, and actually perform the task(s). Examples of self-governing units are boards of directors for corporations, worker cooperatives, and sole proprietorships (Hackman, 1986).

Hackman's types of performing units are not meant to refer to work groups in particular, but any performing unit, which could include individuals or groups at any organizational level. Another point to be made about the authority matrix is that it portrays the four types of performing units as if there were clear distinctions between each type. In reality, the increasing level of autonomy is a continuum.

The terms *autonomous work groups* and *semi-autonomous work groups* make a further distinction in the amount of autonomy work teams have. Macy (1990) defines a semi-autonomous work group as a "transition step" an organization goes through in the journey toward truly autonomous work groups. In semi-autonomous work groups, the team is responsible for task-related decisions - production schedules, work methods, etc. Team members may also begin to take on some "administrative" decisions, such as hiring and firing and pay, while many may still be made by management. Thus, (using Hackman's terminology) semi-autonomous work groups are self-managing and may also be self-designing performing units.

Truly autonomous work groups have no supervision and make all the decisions pertaining to the group - task-related and administrative decisions (hiring, firing, pay, quality standards, production schedules, work methods, scheduling vacations, etc.) (Goodman et al., 1989). Autonomous work groups also make strategic decisions, relative to the unit of analysis - the group. They can make decisions about their products and services, for example, whether to take on a new product (Easton, 1990), or whether to contract out inputs they need. Therefore (using Hackman's terminology), autonomous work groups are not only self-managing, but self-designing and self-governing performing units.

Figure 3.2 illustrates the relationship between the terms discussed above. Basically, the continuum from semi-autonomous to autonomous work groups is another perspective which can be superimposed onto Hackman's continuum from self-managing to self-governing performing units. Throughout this thesis, I use the term "self-managing teams" in the generic sense, and not in the specific sense as Hackman uses self-managing performing unit - his use of the term implies a group that only executes the task and manages work processes. For my use, self-managing teams may refer to any of the types of teams discussed so far (semi-autonomous work group, autonomous work group, etc.). I will further characterize a group's level of autonomy if necessary by using a more specific term.

Other terms in use are *self-regulating groups* (Cummings, 1978), *self-directing work teams* (Orsburn et al., 1990) *high performance teams*, and *high commitment teams* (Easton, 1990). I see no distinction between these four terms and my use of the generic self-managing teams. I do not see any difference between these terms in the way they've been used in the literature.

Goodman et al. (1989) provide a more descriptive definition of self-managing teams than Hackman's authority matrix :

> *Self-managing teams are groups of individuals who can self-regulate work on their interdependent tasks. The key elements of such teams are (1) groups (versus dyads or organizations) in which there typically is face-to-face interaction, (2) a physically defined areas, (3) a whole set of interdependent tasks, and (4) group members who have control over the management and execution of these tasks. Management refers to activities such as planning, directing, organizing, staffing, and monitoring. Control means that group members have authority and responsibility to initiate the management activities.*

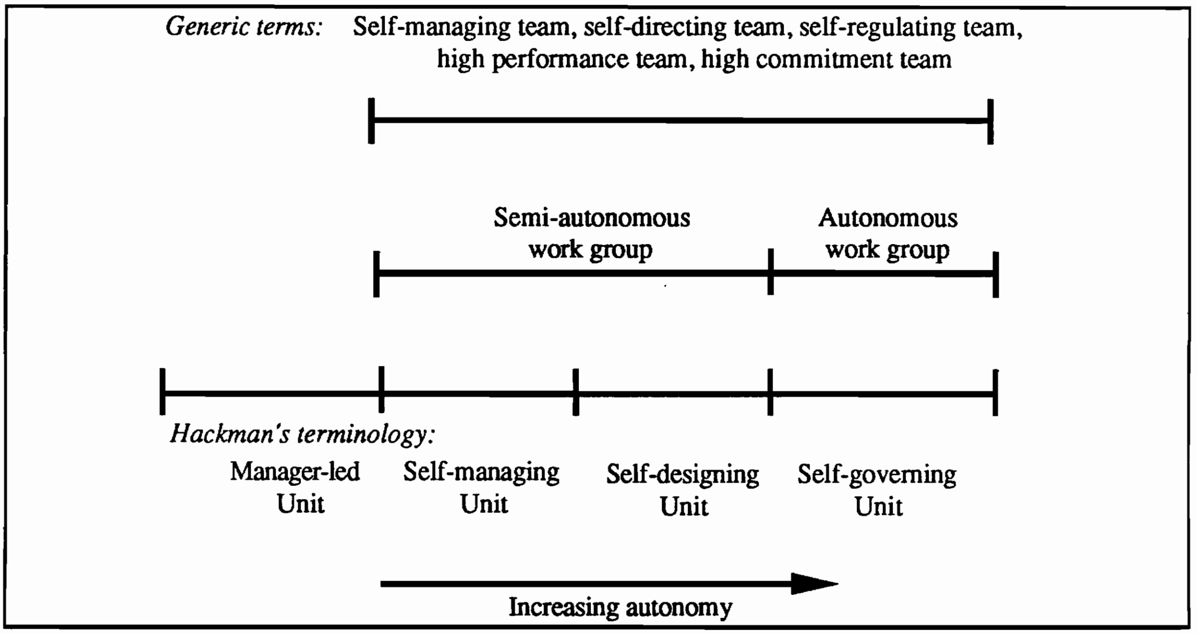


Figure 3.2 Differences in Terminology for Self-Management

A more pragmatic definition of self-managing teams is "a highly trained group of employees, from six to eighteen on average, fully responsible for turning out a well-defined segment of finished work " (Orsburn et al., 1990). Another approach to defining self-managing teams is to compare them to what they are not, that is, a traditional work group. Orsburn et al. (1990) list several dimensions to compare traditional work groups and self-managing teams (see Table 3.1).

There are several other terms which are related to this discussion and should be clarified. A *natural work team* (as discussed earlier) is one in which a team is created around a single product or process where employees are interdependent in their functioning. Self-managing teams are also natural work teams (although the reverse is not true). An example of a natural work team is a customer service team organized around an insurance service to consumers, where the team is responsible from the first to the last process of providing the service (Myers, 1985). Another example (from the VPC) is the QPM editorial board, which is a group of people who are organized around the product QPM (a quarterly publication).

A *new design plant*, or *greenfield plant*, is one in which self-managing teams are used throughout the entire organization (note that my use of self-managing team may imply semi-autonomous or autonomous work group). The plant may have been shut down and rebuilt (like the Corning Blacksburg plant - Burlingame, 1989), or it may be a newly built plant (such as the Digital plant in Enfield, Connecticut - Dillingham & Delaney, 1990). A *redesign plant* is one in which a transition from traditional work groups to self-managing teams was made, without shutting down the plant or starting from scratch as in a greenfield plant. Another term coming into use for this situation is *brownfield plant*. In redesign plants, the transition may have been made gradually, beginning with a pilot department or

Table 3.1. Self-Managing Teams: The Key Differences (adapted from Orsburn et al., 1990)

Issue	Traditional Work Group	Self-Managing Team
Job categories	Many narrow categories	One or two broad categories
Authority	Supervisor directly controls daily activities	Through group decisions, team controls daily activities
Reward system	Tied to type of job, individual performance, and seniority	Tied to team performance and individual breadth of skills.

division (as with Tennessee Eastman in Kingsport, Tennessee and Shenandoah Life Insurance in Roanoke, Virginia), or the transition may have been made all at once. Dillingham and Delaney (1990) suggest following the second approach in redesign plants. That way, all the organizational sub-systems can be redesigned to support self-managed teams, rather than having to support teams in one area and traditional groups and individuals in the rest of the plant. The term *high involvement organization,* or *high involvement plant,* refers to a site that uses self-managing teams system-wide. The site may have been either a new design or a redesign plant.

3.1.2. Behavioral Characteristics of Self-Managing Teams

Hackman (1986) identifies behavioral signs of self-management which serve to further describe characteristics of self-managing teams (see below). These behavioral signs are arranged from the most basic self-managing behaviors to those that one would find only in relatively mature self-managing groups or individuals.

1. *People take personal responsibility for the outcomes of their work and show in their behavior that they feel personally accountable for the results of what they do.*
2. *People monitor their own performance continuously, actively seeking data and feedback to learn how well they are accomplishing their tasks.*
3. *People manage their own performance, taking corrective action at their own initiative to improve their performance.*
4. *When people do not have what they need to perform well, they actively seek from the organization the guidance, help or resources they need for excellent performance - and they do so assertively and constructively.*
5. *People take initiatives to help people in other areas improve their performance, making sure that their own responsibilities are being met before reaching out to help others.*

These behavioral signs of self-management apply to any performing unit - a group or individual performing work to produce a product or service. These behavioral signs, then apply more broadly than just self-managing teams.

3.1.3. How Are They Different From Quality Circles?

Self-managing teams are quite different than other involvement initiatives, such as quality circles or other participation groups. The heart of these differences relates back to Table 2.2, which is a framework of involvement initiatives. Quality circles (and other participation groups) fall under the category of parallel structures, where team members meet to solve a problem or make a decision, but it is in addition to, or on the side from, their normal day-to-day job. They may not work together every day. They also rarely have the power to implement their problem solutions. More often, they submit problem solutions to management, and management makes the final decision and implements the solution. In addition, quality circles are typically given a specific problem to address. They do not identify and diagnose problems.

A way to illustrate these differences is using the problem-solving process from Kepner and Tregoe (1981). The problem-solving process involves using four basic patterns of thinking, each of which represent four kinds of questions and require different strategies (see Table 3.2).

Resolving a situation may involve using any of these strategies - situation appraisal, problem analysis, decision analysis, and potential problem analysis. For example, a situation may require only a decision, or it may require deciding first what the situation is (using Situation Analysis) - it may be a decision, a problem, or a potential problem. As I

Table 3.2. The Kepner-Tregoe Problem-Solving Process (taken from Kepner and Tregoe, 1981)

Pattern of thinking	Kind of question	Strategy	Steps of Strategy
What's going on?	Begs for clarification; this includes sorting out, a breaking down, a key to the map of current events, a means of achieving and maintaining control	Situation Appraisal	Identify concerns Set priority Plan next steps Plan involvement
Why did this happen?	This indicates the need for cause-and effect thinking; move from observing the effect of a problem to understanding its cause to take appropriate actions to correct the problem or lessons its effects	Problem Analysis	Describe problem Identify possible causes Evaluate possible causes Confirm true cause
Which course of action should we take?	This implies that some choice must be made; decide on the course of action most likely to accomplish a particular goal	Decision Analysis	Clarify purpose Evaluate alternatives Assess risks Make decision
What lies ahead?	This looks into the future; used to assess a problem that might happen, the decision that might be necessary next month, next year, or in five years	Potential Problem Analysis	Identify potential problems Identify likely causes Take preventive action Plan contingent action

mentioned, usually a quality circle is given the authority only to provide a suggested problem solution (perform problem analysis), and not the authority to identify or diagnose, the problem (situation appraisal), make the final decision (decision analysis), or implement the solution. In other words, the team does not decide where they are in the process.

Self-managing teams, on the other hand, generally have the authority to decide what type of situation they are facing and then take appropriate action. This increased authority in problem-solving is the reason why problem-solving skills are so important in self-managing teams (see section 3.2.2 Training for Self-Managing Teams). The unit of analysis for the problem-solving and decision-making is the problems and decisions that self-managing teams face and must address, related to the team itself (and not for a larger unit of analysis, such as the organizational system). The types of decisions self-managing teams make are discussed in section 3.2.3, but briefly, they include task-related decisions and administrative decisions - the majority of which are made by supervisors in traditional work groups.

As Glaser (1990: 4) states: "Quality circles are special problem-solving groups, retrofitted to a traditionally-managed work group. Self-managing teams replace the traditional structure and become the standard way work is organized and implemented. Quality circles represent an important evolutionary step in employee involvement but should not be confused with any of the forms of autonomous work groups." Quality circles are more popular than self-managing teams. They are a "small step toward participative management, quickly and easily installed....self-managing teams are too radical for most existing organizations" (Lawler, 1990b).

3.1.4. Related Fields and Concepts

The design, development, and implementation of self-managing teams are based on several related fields and concepts. First, socio-technical systems theory is an outcome of research done in the coal mining industry in England in the 1950s. The second related field is job redesign using the job characteristics approach, which dates back to the 1960s and 1970s. This section briefly describes these two fields and their contributions to the development of self-managing teams.

3.1.4.1. Socio-Technical Systems Theory

Self-managing teams are a concrete outcome of socio-technical systems theory. The concepts of self-managing teams and socio-technical systems theory date back to the late 1950s and early 1960s in England. Leading researchers and writers in this area are Trist and Emery and Bamforth with their work at the Tavistock Institute in London, England. Trist and Bamforth (1951) studied the social and psychological effects of the long-wall method of mining, which had dysfunctional consequences on teams. Previously, men worked in small, cohesive teams in close proximity and had to rely on each other for their lives. The mechanized long-wall method isolated team members and "destroyed the camaraderie of the face-to-face group" (Glaser, 1990: 4). Results of this method were lowered productivity and tension and anxiety for the miners.

The Tavistock Institute of London, England helped formulate socio-technical systems theory, which was developed from data and research from the Trist and Bamforth study. Socio-technical systems theory recognizes that organizations are systems, with both technical (equipment, materials, and methods) and social (work structure that relates people to the technology and to each other) systems (Cummings, 1978). The primary aim of socio-technical systems theory is to "design a work structure that is responsive to the task requirements of the technology and the social and psychological needs of employees" (Cummings, 1978: 261). Any work design must consider both the technical and social system. The socio-technical principles used in job redesign (shown below) were developed by Emery from research findings from several investigations through the Tavistock Institute (Trist, 1973).

"The judgement that it is possible to redesign jobs in this way rests upon the evidence that men have requirements of their work other than those usually specified in a contract of employment (i.e. other than wages, hours, safety, security of tenure, etc.). The following list represents at least some of the general psychological requirements that pertain to the content of a job (to what a person is called upon to carry out in his job from hour to hour and from year to year):

1. *The need for the content of a job to be reasonably demanding in terms other than sheer endurance and yet providing a minimum of variety (not necessarily novelty);*
2. *The need for being able to learn on the job and go on learning: again it is a question of neither too much nor too little;*
3. *The need for some minimal area of decision-making that the individual can call his own;*
4. *The need for some minimal degree of social support and recognition in the workplace;*
5. *The need to be able to relate what he does and what he produces to his social life;*
6. *The need to feel that the job leads to some sort of desirable future (not necessarily promotion)."*

When workplaces are designed or redesigned, socio-technical systems theory is often used (Myers, 1985). The self-managing team model "incorporates and exemplifies socio-technical systems theory" (Glaser, 1990: 4).

3.1.4.2. Job Redesign

The job characteristics approach to job (task) design is an alternative approach from designing work to be simplified, specialized, and routine - all characteristics of work in the earlier part of this century. Although job characteristics approach has been criticized for not evolving from exploratory to confirmatory stages (Roberts & Glick, 1981), it is the most popular approach to task design. Task design theory should "deal simultaneously with definitions of task content, how to change jobs in the interests of improving responses people make to those jobs, whether perceptions or other aspects of tasks contribute more to responses, and how tasks and responses to them are influenced by contexts in which they are done" (Roberts & Glick, 1981: 211).

The job characteristics model examines individual responses to jobs as a function of job characteristics moderated by individual characteristics. Job responses include satisfaction, turnover, absenteeism, etc. (Roberts & Glick, 1981: 195). Hackman and Lawler argue that jobs must be high on the following job characteristics in order for positive job responses: skill variety, autonomy, task identity, feedback, and task significance (Hackman, 1986; Hackman & Lawler, 1971). To evaluate jobs, these five characteristics are combined into one Motivating Potential Score (MPS) which can be high overall even if one of the characteristics is low (Roberts & Glick, 1981).

The design and properties of self-managing teams "parallel the hallmarks of the job characteristics approach to job design" (Wall et al., 1986). Hackman suggests that of the two approaches (self-managing teams and job characteristics approach to job design), the use of self-managing teams is the more "powerful approach because groups can undertake much larger pieces of work than individuals can and so allow more fundamental manipulation of work characteristics" (Wall et al., 1986). The main difference between the job redesign using job characteristics approach and self-managing teams is the level of application and analysis; in self-managing teams job characteristics are attributes of group work, rather than individual work, as in job redesign.

3.2. How Do Self-Managing Teams Work?

Some of the most common key issues and questions addressed in the literature are things like the leadership of self-managing teams (what does the leader, previously the supervisor, do? what role do they play?); training needed by team member; types of decisions and responsibilities teams take on as they mature; how team members are paid (what are elements of a pay for skills system? how does it work?); and what information teams need. This last issue is one of the least researched issues in the literature, hence, the need for this thesis research.

This section summarizes the research that has been done on the key issues and questions listed above. Answers from the literature to these issues and questions provide assistance to managers trying to create self-managing teams, in the form of guidelines and characteristics of self-managing teams in existence in other organizations.

3.2.1. Leadership of Self-Managing Teams

Supervisors (leaders of self-managing teams) have been one of the biggest sources of resistance to involvement and self-managing teams, primarily because they are not involved in the design and implementation of the teams (Klein, 1984, 1988; Walton and Schlesinger, 1979). An inherent paradox in self-managing teams, is if they are supposed to be self-managing, why is a supervisor needed? And if you have one, what is their role and how does it change?

In reality, very few organizations using self-managing teams have no supervisors at all (typically, the word supervisor is changed to something like coach or facilitator). Only the most mature teams (truly autonomous work groups) operate without external leaders. In most organizations using self-managing teams, the supervisor role is changed to an external team leader role. The role of the leader is significantly different from the traditional supervisor. Rather than the primary responsibility being monitoring and managing work processes, the external leader's primary responsibility is to get the team to be self-managing as quickly as possible, through coaching and facilitating the team. This includes facilitating team meetings if necessary, being a role model, not jumping in to solve problems as they did in the past, and reinforcing self-managing behavior by the team (Manz & Angle, 1986; Manz & Sims, 1980, 1984, 1986). "Letting go" like this can be very difficult for many supervisors. In one Texas Instruments plant, when the external team leader (previously the supervisor) made a decision that should have been made by the team (selecting a new team member), team members sanctioned his behavior by speaking up for their right to make the decision themselves.

Manz and Sims (1990) call leaders of self-managing teams "superleaders," and their main behavior is leading others to lead themselves (self-leadership). Self-leadership is the "influence we exert over ourselves to help us achieve the self-motivation and self-direction we need to behave in desirable ways" (Manz & Sims, 1990). Becoming a self-leader is the first step to being a superleader and leading others to self-leadership. The overall steps involved in superleadership are (Manz & Sims, 1990): become an effective self-leader; model self-leadership; encourage self-set goals; create positive thought patterns; reward self-leadership; promote self-leadership through teamwork; and facilitate a self-leadership culture.

Since the role of supervisors change drastically, new things for them to do must be defined. At first, external team leaders will still have to spend a great deal of time working directly with teams coaching and advising them until they are fully trained. When that happens, they will have direct involvement in team activities. Many organizations have supervisors working on projects which may have been put on the back burner because there was no time or no one available to work on them. Supervisors are very well qualified to work on development-type projects, working with new product development, and other types of projects, because they have the technical expertise. One organization defines the role of the supervisor (called a coach) as continuously learning new skills and transferring those skills to teams,, such as engineering skills and counseling skills. Listed below are some examples of some things that supervisors become involved with after the transition to self-managing teams (Orsburn et al., 1990).

- coaching the teams;
- developing an overall strategy for the teams;
- interfacing between the teams and the larger organization;
- championing innovative ideas;
- paying more attention to the technology side of the business;
- attending to team resource needs;
- working with vendors and customers; and
- making critical improvements long left on the back burner.

The previous paragraphs discuss the role of leadership in external team leaders (previously supervisors of traditional work groups). There is another type of leadership role in self-managing teams. Many teams include an internal team leader. Characteristics of the internal team leader are: they are generally elected; different people rotate through the role; the internal team leader is also a team member, they are paid a little more; and they also coach and facilitate the group in self-leadership (Dillingham & Delaney, 1990; O'Fallon, 1990; Sundstrom et al., 1990). Not all organizations use internal team leaders, or facilitators. Instead they rely on emergent or shared leadership in different situations. In other words, different people will have expertise in different situations and that expertise and leadership will emerge when needed.

Often managers express the concern that teams will always elect the same person - the strong dominant group members - as internal team leaders. However, in one Boeing plant, teams have never elected the same person for the internal team leader role for any consecutive six month period.

3.2.2. Training for Self-Managing Teams

Another key issue is the training and skills necessary for self-managing teams to be effective (sharing knowledge). Teams generally have four kinds of training: technical training, administrative training, interpersonal training, and group process training (adapted from Musselwhite & Moran, 1990). Technical training is necessary in order for everyone in the team to be cross-trained. Work team productivity and flexibility come from having team members cross-trained in team tasks (Musselwhite & Moran, 1990: 26). This cross-training contrasts with traditional work groups, where each member of the group is responsible for and specializes in a specific task. This arrangement restricts the flexibility of the team to meet varying production demands. A self-managing team is much more flexible because everyone has mastered all the necessary skills.

Administrative training is necessary so the team can perform tasks typically performed by their supervisor and other support functions in the organization. Administrative training can include: purchasing, preparing budgets, accounting, personnel (interviewing skills to hire new team members), performance appraisal, attendance records, work scheduling, to name just a few. The training in administrative skills will need to increase as the team takes on more and more administrative and support tasks.

Interpersonal training is necessary so the team can effectively communicate with one another. Team members need to "talk with, explain to, agree with, disagree with, decide, listen to, and convince more people than they probably ever have before....they need to be skilled communicators, both one-on-one and in group settings" (Musselwhite & Moran, 1990: 26). Training given in this area generally includes: conflict resolution, effective listening, giving and receiving feedback, and influencing others.

The last category of training common with self-managing teams is what I call process training. This includes problem-solving and decision-making, running effective meetings and facilitation skills, group dynamics and process, statistical analysis, and perhaps even business analysis skills for more mature teams (APQC, 1989a; Cabot, 1989; and Myers, 1985)

3.2.3. Decisions and Responsibilities of Self-Managing Teams

Self-managing teams have the authority and power to make many more and different types of decisions than traditional work groups. Since the work is designed differently, this work design drives the type of decisions teams must make. Self-managing teams typically have the authority to make *task-related decisions* (work methods, production schedule, quality standards, and output) and *administrative decisions* (when vacation is scheduled, when people work, hiring and firing, and when breaks are taken) (Cummings, 1978; Goodman et al., 1988; Hoerr, 1989; Hoerr et al., 1986; and Myers, 1985).

Another perspective to use to describe the autonomy of a self-managing teams relates back to Hackman's (1986) authority matrix and the things which managers influence, listed in section 2.1 (e.g., what tasks are worked on, when they are done, etc.). These decisions are superimposed upon Hackman's continuum in Figure 3.3. They are taken over by the team, perhaps gradually, as they become more autonomous.

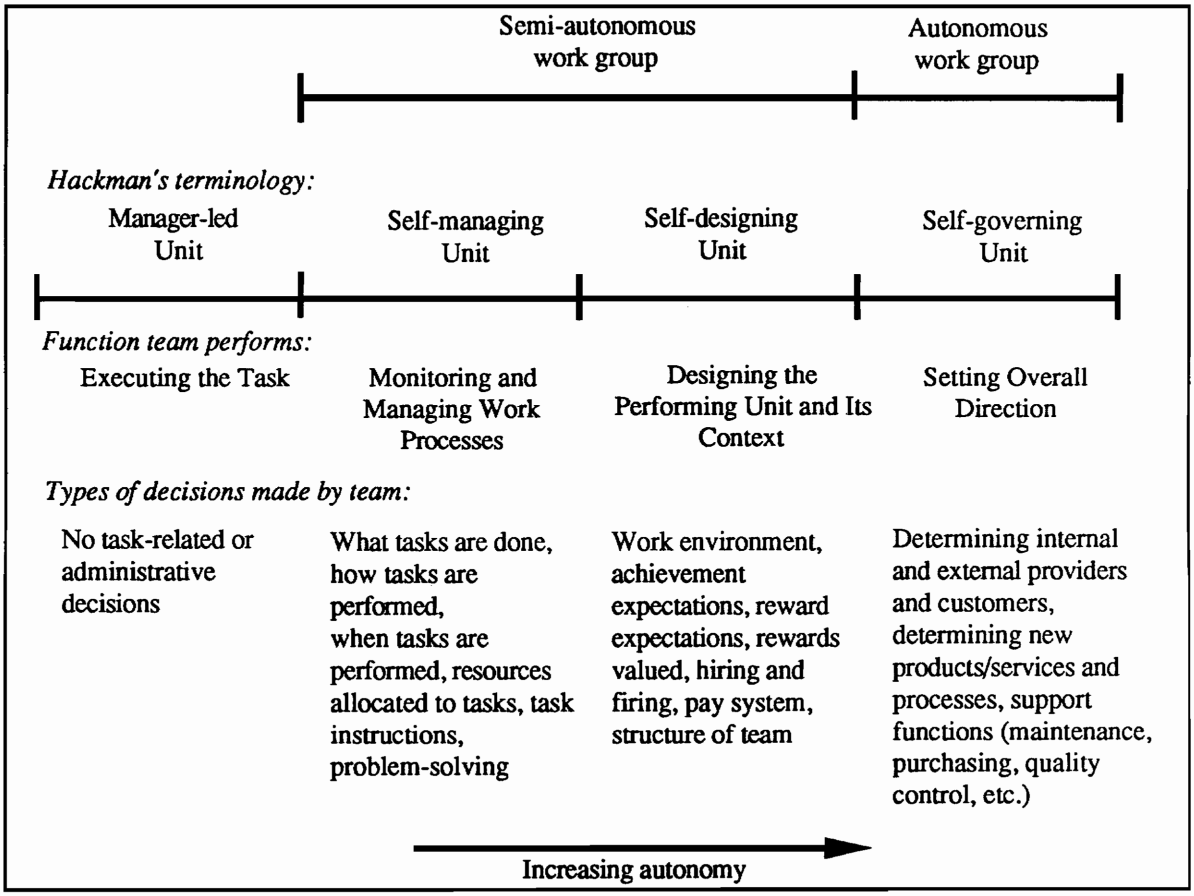


Figure 3.3. Decisions Made by Self-Managing Teams (adapted from Hackman, 1986)

Again, these decisions are typically made by management in a traditional work group (Hackman's manager-led performing unit). In a semi-autonomous team, the team would have responsibility for the task-related decisions, which are monitoring and managing work processes. In this situation, the team is what Hackman calls a self-managing performing unit. Semi-autonomous work groups may also have responsibility for designing the performing unit and its context, which includes decisions about group rewards (pay), the structure of the group, etc.

An autonomous work group (what Hackman calls self-governing), in addition to task-related and administrative decisions, may also have responsibility for decision-making for some or all of the support functions that the organization would typically supply through centralized support service departments. Examples of these are quality control, maintenance, purchasing, production control, and shipping and receiving. An autonomous work group is also responsible for strategic decisions for the team, which might include selection of suppliers and customers, new products or services, etc. Some teams, for example, determine whether or not they want to "purchase" their inputs from internal upstream systems (within the organization) or from external organizations. This enables the team to be almost entirely self-supporting and to operate as a small business.

Below is a list of examples of specific decisions and/or responsibilities of self-managing teams (Katz and Laughlin, 1990). This list illustrates the points made in the previous paragraphs:

- assign daily tasks to work team members
- determine and address training needs
- handle individual performance problems/disciplining team members
- handle technical problems
- handle performance appraisals
- handle vacation scheduling

- implement process improvements
- maintain safety and housekeeping
- make compensation decisions
- perform routine equipment maintenance
- prepare and manage cost budgets
- select production/work methods
- set production/team goals (output, quality, productivity, etc.)
- stop production line or work process to address quality concerns
- work with external customers and suppliers
- work with internal customers and suppliers
- selecting new team members
- firing team members
- make enhancements to work environment/QWL

Some teams are so mature that they have taken decision-making responsibility far beyond even what is listed above. For example, teams at Johnsonville Foods made the decisions to proceed with a major plant expansion (Dumain, 1990) and teams at Semco in Brazil made the decision for a site for a new plant which management didn't fully agree with but abided by the teams' decision (Semler, 1990). Volvo is so advanced at empowerment and involvement that teams in their new Uddavalle plant assemble entire cars (Hoerr, 1989).

3.2.4. Pay System for Self-Managing Teams

How members of self-managing teams are compensated (the reward system) is a very prevalent topic in the literature and in discussions among managers (based on conversations and discussions at the 1990 Self-Managing Work Teams conference). One of the most frequent characteristics of the compensation system for self-managing teams is a skill-based pay system, where team members' compensation is based on their cumulative skill level

(Easton, 1990; Hoerr, 1986; Myers 1985). Necessary skills are identified and team members are paid more for every skill they acquire and become proficient at. Usually, technical skills are mastered first, then administrative, interpersonal, and process skills are developed in parallel. Generally, team members rely on peer evaluation to determine when another team member has sufficiently mastered a skill to be compensated for it. Often, a team member is required to be performing a skill at a given proficiency level for some period of time before they receive additional compensation. Shenandoah Life Insurance Company has designed a skill-based pay system in which it takes a total of five years to master all skills (Myers, 1985).

The benefits of a pay for skill systems are many. This type of system provides employees with broader knowledge and skills, which increases creative potential (Myers, 1985). Another benefit is the team is much more flexible. For example, if a certain type of machine is down or someone is out sick, it is very easy to move people around to other work stations, because people are cross-trained in all team tasks.

One potential problem that arises in this type of system is "topping out" - acquiring all the specified skills and being unable to receive additional pay raises. This can lead to frustration and lack of motivation to perform. This issue needs to be addressed in the design of the compensation system for teams. The way one company has attempted to address this issue is when an employee has acquired all the necessary skills, s/he then continues to advance in the pay system by teaching the skills to other team members and other teams.

Another potential problem of pay for skills systems is that they don't consider high performers or absenteeism. In other words, someone who doesn't perform as well (in quality, number of outputs, etc.) as another team member and is absent frequently gets paid just as much as someone who is a high performer and is present all the time, provided they have the same skills. A pay for skills system rewards the "go-getters" who aggressively take all the training they can get and quickly by-pass more senior people learning new skills at a more leisurely rate. However, pay for skills system is designed specifically not to reward people just for showing up or for seniority, but instead for acquiring and using knowledge and skills.

Some potential solutions to the problems discussed above are: keep adding skills to the system (to prevent topping out); add an element of depth of knowledge as compared to just breadth; add an element for not only acquiring and using skills but then teaching them to others; or add a congruent gainsharing or profitsharing system on top of the pay for skills system to reward teams for outstanding team performance.

In organizations using self-managing teams, there is less opportunity for advancement (vertical career growth) since there are fewer management layers, so team members must be encouraged and rewarded for horizontal growth (acquiring additional skills and knowledge). The issue of compensation (and training) is also relevant for leaders of self-managing teams and management in general. In the trend of flatter leaner organizations, there will be less room for vertical advancement and promotions in general. Compensation systems must be overhauled to reward horizontal growth and development (Dillingham & Delaney, 1990; Lawler, 1990a).

3.2.5. Information System to Support Self-Managing Teams

In order to make the necessary decisions (section 3.2.3), self-managing teams need the appropriate skills (section 3.2.2) *and* information. The information they need will be much different than the typical information they are provided as members of traditional work groups. Information technology must support the teams (Lawler, 1990). Information typically provided to self-managing teams include feedback on the team's performance (quality, productivity, schedule, etc.), goals for the team, goals for the overall organization, performance of the organization, customer requirements, and other information about the organization and about its competitors (adapted from Easton, 1990; Lawler et al., 1989). The mechanism for sharing information can be reports and memos, charts and graphs, formal and informal meetings, as well as computer networks, closed circuit TV, electronic mail, and face to face communication. As a team matures and becomes more autonomous, their information needs will change. This results from the decisions they make changing (see section 3.2.3). In one redesign distribution center in New York, teams are provided with performance information at three levels: the overall center, the team, and the individual. Teams have requested individual performance information to confirm to themselves that they are performing well as individuals (this illustrates the power of the individual performance measurement paradigm pervasive in organizations). As the teams develop and mature, the plant manager expects that teams will case to request individual performance information.

Information needs will become more broad, as teams begin to take on more strategic decisions - as related to the team (Musselwhite & Moran, 1990). One critical element of the information system is the ability for team members to influence and change the design of the information system. Teams and their activities are dynamic, and the information system must also be dynamic (adaptive and flexible) to support them. Information also flows from the team to other groups or individuals in the organization. Teams may give presentations to management and other teams on their performance and their goals and accomplishments.

This is one of the least documented yet very important areas in the self-managing team literature; there are usually only passing references made to the type of information teams receive and give. The "willingness to share information is a key ingredient for success...teams need detailed information overall operations, including financial information...to manage themselves, work teams need management information" (Orsburn et al., 1990, p. 24). The details about the information system (the mechanism, portrayal format, and frequency, etc.) are left undocumented for the most part. As antecedents to behavior (where the desired behavior is team decision-making), information and knowledge are critical preparatory steps, or inputs, for teams.

3.3. The Transition to Self-Managing Teams

This section presents guidelines from the literature on important issues in the transition from traditional work groups to self-managing teams, for example, determining when self-managing teams are appropriate. Once it is decided teams are appropriate, managers must assess the organization's readiness for self-managing teams. Necessary conditions which need to exist or be made to exist are discussed. This section also describes a process used by an internal consulting group in Digital Equipment Corporation to introduce self-managing teams to an organization. Lastly, the phases of evolution self-managing teams progress through are discussed.

3.3.1. In What Situations Are They Appropriate?

Although the reasons for transitioning to self-managed teams seem intuitively sound and the results achieved are promising (results are discussed in a later section), not every situation may be conducive to teams (Dillingham & Delaney, 1990; Dumain, 1990; Easton, 1990; Musselwhite & Moran, 1990). Before an organization jumps into the team approach several questions must be considered: would more employee involvement improve productivity?; would employees with multiple skills improve productivity? (Musselwhite & Moran, 1990); is there dependency among three or more people? (Dumain, 1990). In many situations, the answers may be yes - "complex manufacturing processes common in the auto, chemical, paper, and high-tech industries can benefit from teams...so can complicated service jobs in insurance, banking, and telecommunications" (Orsburn et al., 1990).

In other situations, the answers may be no - "for work that is simple, routine, and repetitive, like assembly-line activities, teams probably don't make sense...as Ed Lawler says 'you have to ask - how complex is the work? The more complex, the more suited it is for teams'" (Dumain, 1990). In sum, self-managing teams require "an operation that includes a range of employee tasks, with some complex enough that improved skills and commitment can lead to improved productivity" (Orsburn et al., 1990).

In their process for making an organization-wide transition to self-managing teams, Dillingham and Delaney (1990) have a step early on for examining the work flow, technology, and work methods to assess whether or not the work and task design are appropriate for using teams. If work is assembly-line organized and not appropriate for teams as designed, the work can be totally redesigned using this process to make the tasks more complex and challenging, and therefore, more conducive to teams.

3.3.2. Assessing Readiness For Self-Managing Teams

Before an organization invests the inordinate amount of time and resources necessary for the transition to self-managing teams, there is a preliminary assessment step which should be taken. This will ensure that the organization is ready to take on such a large-scale change. Even if the change is in a pilot group, these elements should exist to some extent since there are most likely plans to diffuse the change throughout the rest of the organization if it proves successful. These "fronts" must be examined as an assessment tool before the first steps are taken (Musselwhite & Moran, 1990):

- top management commitment - strong and clear commitment
- operations conducive to work teams

- union participation - union management needs to be brought in early in the process
- enough time and resources - successful implementation calls for massive planning, retraining, and often a major physical redesign of plants and offices; the payoff may be months or years away
- commitment to training - work teams succeed or fail on the training they receive
- willingness to take risks - personal and organization risks; the fear of incompetence and failure can be significant among employees and managers (Milleman and Raben, 1990)
- willingness to share information - the more teams make decisions the more they will want and need information about the organization's overall operation, including financial information
- management-employee trust - there must be mutual trust and respect
- access to help - organizations using both external and internal consultants are the most likely to succeed (Macy et al., 1990)

The lack of these elements in an organization should not be used as an excuse not to change; it only indicates that perhaps some more work must be done in certain areas, such as building trust, for example, before the effort is formally initiated. As one manager said in one company making the transition - the question is not if we'll make this change, but when.

3.3.3. Process for Implementing Self-Managing Teams

The process presented in this section was developed by two managers, Dillingham and Delaney, with a great deal of experience with self-managing teams in Digital Equipment Corporation. Dillingham has been the plant manager of a new design plant in Enfield, Connecticut which has been using self-managing teams (they are autonomous work groups without supervisors) for over ten years. Based on their experience, Dillingham and Delaney formed a consulting group called Organization Technology within Digital, where they work with plants both inside and outside DEC to help them transition to self-managing teams. Their process has been successful in two dozen organizations.

Dillingham and Delaney recommend the transition to teams be done throughout the entire organization, rather than in a pilot group. The reason for this recommendation is to get all organizational sub-systems aligned, contributing toward common organizational goals, mission, and vision. The first step is similar to the first step of the VPC's Strategic Management Process, Organizational Systems Analysis (Sink, 1989) and looks at vision, mission, etc. Figure 3.4 portrays the process graphically, and the steps are also described below.

Steps of the Organization Technology Process:

1. Purposing System: look at goals, strategies, vision, and values; pulls in environmental data to look at "what is our purpose for being?" and "where do we want to go?"
2. Work/technology System: look at work flow, technology, and methods; the work system is based on the purposing system and the question is asked "are we doing any work that doesn't get us to our purposing system?"
3. Structural System: look at division of labor, reporting relationships, and physical layout; ask "what kind of structure will best get the necessary work done?"; decide whether we're a bowling team, a hockey team, or a swimming team.
4. Human System: look at linkages, norms, quantity, skills, and careers; need to think of people as "pulling themselves up."
5. Decision/Information System: look at decision processes, information needs, and information sources; given the type of work, the structure, the decisions to be made, what are the information needs of teams?; will be driven by types of decisions to be made.

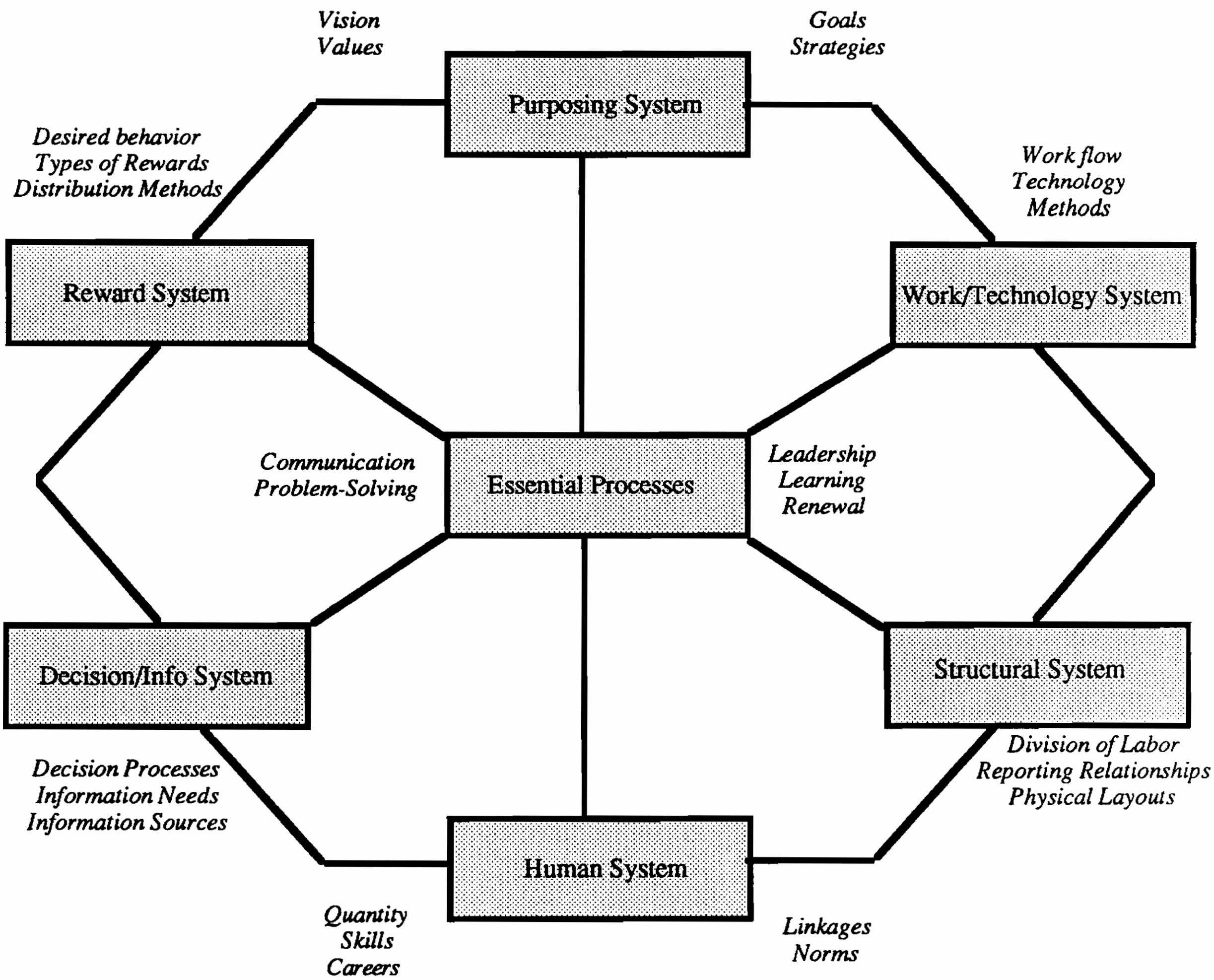


Figure 3.4 Organization Technology Framework (from Dillingham and Delaney, 1990; © Digital Equipment Corporation)

6. Reward System: look at desired behavior, types of rewards, and distribution methods; needs to be flexible; reward people for making change.
7. Essential Processes; look at leadership, learning, renewal, communication, and problem-solving; ask "how we as an organization continue to move forward?"

This process uses a systemic approach to changing the organization so that all sub-systems (work design, structure, training, information, problem-solving and decision-making and reward systems) are aligned with and support self-managing teams - they are designed, or re-designed, as necessary. Using this process can overcome one of the top barriers to successful self-managing teams - the misalignment of organizational systems, such as the compensation system (Katz and Laughlin, 1990).

Orsburn et al. (1990) take another approach to making the transition to self-managing teams. Their approach assumes the transition includes using a pilot area, so for organizations choosing this route, this process would be useful. Orsburn et al. also consider issues in selecting a design team for the effort. The major steps in their process are: clarify the mission and parameters, select the initial work-team sites, establish and prepare the design team, adopt a framework for planning, and draft a preliminary plan.

3.3.4. Phases of Evolution Through the Transition

Although the process in the previous section outlines the steps in designing self-managing teams, it does not describe the phases of evolution of teams. Musselwhite and Moran (1990) and Orsburn et al. (1990) describe phases through which teams progress, along with activities in each phase:

1. Stage 1 - Start-up
    - no structural change has occurred yet
    - management and union have made a commitment
    - communicating plan to all employees, get them to buy in and committed

Activities:
    - conduct awareness training
    - select initial work team members
    - specify team boundaries
    - revise the preliminary plan

2. Stage 2 - State of Confusion
    - work teams have started
    - team members have taken on some tasks from supervisors
    - a lot of meetings, everything is chaotic, anxiety and confusion reign
    - work team member struggle to communicate with each other and other groups in the organization
    - management struggles to provide the necessary support and training

Activities:
    - make managers visible
    - clarify team roles and responsibilities
    - reinforce positive behaviors

3. Stage 3 - Leader-Centered Work Teams
    - work team members are tired of confusion and chaos and may turn to strong members to take control and resolve issues
    - members may try to stick to team tasks they already know rather than taking on new assignments; productivity may increase
    - management becomes more comfortable as roles and responsibilities are clarified
    - temptation to cut off further growth as a last-ditch effort to recreate the safety and familiarity of the old structure.

Activities:
    - encourage the rise of strong team leaders
    - infuse the teams with a sense of their own identity

4. Stage 4 - Tightly Formed Work Teams
   - at this stage, most indicators are up
   - management is positive and more team members are assuming leadership duties
   - teams are competitive with each other and individual members feel strong commitment to each other
   - inter-team competitiveness can lead to efforts to sabotage other work teams

Activities:
   - build and maintain two-way information-sharing
   - make sure the teams get ongoing performance feedback
   - hand off responsibilities according to plan

5. Self-Directed Work Teams
   - teams are now functioning at their peak and productivity is up
   - work teams are flexible and members feel confident and know how to acquire the resources they need
   - teams have developed a sense of identity with the larger organization; they take a broader view of work, and subsequently need broader information

Activities:
   - keep on training
   - tailor systems to support team productivity
   - improve internal customer-supplier partnerships
   - act out self-direction daily

As teams progress from Stage 1 through Stage 5, more decision-making authority is transferred from managers to teams. In Stage 1, managers still retain most of the decision-making authority (for decisions that affect the team's functioning), while in Stage 3, it's about even, and in Stage 5, teams have the majority of decision-making authority.

These phases of evolution are comforting to team members and managers, because they identify where they are, know that they're 'not alone', and read what someone has articulated about what people feel. These phases are comforting to read about, just as Adizes' book on corporate life cycles (Adizes, 1988) is comforting to managers in the throes of organizational growth and development. However, this evolutionary process is simplified; it is more complex in reality in organizations, especially in those who have been using teams for quite awhile (more than three to five years). Several managers I have spoken with said that about three years into the process, performance of the teams reached a plateau, while it had been significantly improving up until then. The general agreement among managers and consultants at the conference seemed to be that the plateau was a result of the organization ceasing to be flexible and change to fit the changing needs of the teams.

3.4. How Widespread is the Use of Self-Managing Teams?

Although self-managing teams have been receiving an increasing amount of publicity and recognition in the last several years, they have actually been in use for many years in some American organizations. It is the widespread use of teams that is only just getting underway. Some people believe they are an 'import' from Japan, but in fact they were pioneered in Britain and Sweden (Orsburn et al., 1990). In the United States, the pioneers were Proctor & Gamble, Cummins Engine, and several other companies, as shown in Table 3.3.

There has been a fair amount of success in implementing self-managing teams in widely varied industries - manufacturing/service, private sector/public sector, large/small organizations, union/non-union, and so on. Examples of applications in manufacturing organizations are coal mining industry (Trist et al., 1977), pet food manufacturing plant (Walton, 1977), paper mill (APQC, 1989a), steel mill (Dumain, 1990), chemicals and plastics plant, engine plant, electronics assembly plant, automotive components plant, and

Table 3.3. Major Companies Using Self-Managing Teams (taken from Hoerr, 1989)

Company	Year Started	Company	Year Started
Boeing	1987	GE	1985
Caterpillar	1986	General Motors	1975
Champion International	1985	LTV Steel	1985
Cummins Engine	1973	Proctor & Gamble	1962
Digital Equipment	1982	A.O. Smith	1987
Ford	1982	Tektronix	1983

a food processing (sausage) plant, to name just a few. The examples represent both union and non-union plants, as well as new design plants and redesign plants.

Some examples of companies experimenting with the self-managing teams in the service sector are a cable TV service company (APQC, 1989b); mutual life insurance firm (Myers, 1985; Hoerr et al., 1986); AT&T Transtech, a credit financing company (Hoerr, 1989; Micossi, 1990); AT&T credit corporation (Micossi, 1990); IDS, an American Express subsidiary in mutual funds services (Micossi, 1990); Aid Association for Lutherans, a benefit society (Micossi, 1990); and Aetna Life and Casualty (Dumain, 1990). There are more applications in manufacturing than service, although the number of cases in the service industry is increasing, and there is evidence that self-managing teams in service organizations will work just as well as in manufacturing organizations (Macy et al., 1990; Goodman et al., 1988; Lawler et al., 1989). One reason proposed for the fewer number of applications in the service sector is that the service industry isn't hurting enough - yet (Micossi, 1990).

There are also many more applications in the private sector than the public sector, although, again, there is no reason to believe that teams will not work in the public sector. One application is ongoing now in the Defense Logistics Agency. Approximately half of the agency's field offices are experimenting with self-managing teams. City governments are also beginning to look into self-managing teams. At the conference on self-managing teams, there were representatives from two city governments, one of which was the host city for the conference - the City of Denton, Texas.

There have been successful applications in both non-union and union plants. Corning has been using self-managing teams in a small automotive components manufacturing union plant in Blacksburg, Virginia for a little over two years. Provided that union representatives are involved from the very beginning stages of design and implementation and provided management can clearly communicate the benefits for all parties, there is no reason why self-managing teams can't be successful in any union plant.

Self-managing teams have been successfully implemented in large and small facilities. Although it is easier to implement teams in a smaller plant (the same is true for any organizational change), it's not impossible. Tennessee Eastman Company in Kingsport, Tennessee (with over 13,000 employees) is currently making the transition to self-managing teams. Approximately fifteen percent of their work force is either organized into self-managing teams now or on the verge of making the transition.

Some estimates of the number of new design plants that exist are 300-500 plants (Lawler, 1990b). I have seen no estimate of the number of total organizations experimenting in some form with self-managing teams (would include both new design and redesign sites). However, Lawler et al. (1989) found that 27% of companies using some form of Employee Involvement are experimenting with self-managing teams (they found that over 80% of Fortune 500 companies sampled have some form of Employee Involvement). And in this 27% of companies, most of the experimentation is being done on a small scale, in a small fraction of the total work force (Lawler et al., 1989). Additionally, the majority of the companies experimenting with self-managing teams have only been doing so for several years.

It is estimated that there are approximately twenty companies experimenting with white-collar self-managing teams (Micossi, 1990). With all the examples that are appearing in the literature recently, I suspect that this number is somewhat low. As an overall estimate, Lawler (1990b) suggests that approximately 10% of the American work force is involved in some form of self-managing teams.

3.5. Results and Outcomes of Self-Managing Teams

Many managers are interested in the outcomes of using self-managing teams. One of their main questions is, is it worth the effort? After all, the promise of improved performance is the number one reason organizations are moving toward self-managing teams, so it is understandable that there is a lot of interest and research on performance results. In this thesis, performance is used in a broad sense, to include more than just productivity or quality, for example. Performance is a function of seven inter-related criteria - effectiveness, efficiency, productivity, quality, quality of work life, innovation, and profitability/budgetability (Sink, 1989).

The results of research in this area have not always been consistent. Some studies show significant impact on such measures as extrinsic and intrinsic job satisfaction (Wall et al., 1986), turnover, absenteeism, and productivity (Trist et al., 1977), while other studies show less than promising results. Many organizations who have plants using both traditional work groups and self-managing teams report significant differences. General Motors, for example, says its plants with teams have 20-40% higher productivity than traditional factories (Orsburn et al., 1990). Xerox Corporation plants using self-managing teams are 30% more productive than traditional plants (Hoerr et al., 1986). In a new design Diebold plant in Virginia, employees are producing at a higher rate with lower overhead than counterparts in other facilities (Central Virginia Business, 1990).

Macy et al. (1990), at the Texas Center for Productivity and Quality of Work Life, have found very promising results through a meta-analysis which examines the results of work innovations in North America from 1961 to 1990. Their purpose for conducting the study was because of the inadequacy of existing studies on work innovations which lack longitudinal data and are fraught with methodological weaknesses (Macy et al., 1990). This study, to be published as a chapter in an upcoming book, is certain to be a landmark analysis of the results of work innovations. They began with thousands of studies of work innovations and successively narrowed the number down to 131 through the use of three criteria: the study had to be in North America; it had to have empirical data (quantitative results) to permit comparison; and it had to be longitudinal. The most frequently cited resources from the 131 studies were the Journal of Applied Psychology and the Journal of Applied Behavioral Sciences.

Macy et al. divided the work innovations into three different categories of what they called "action levers" - structural (included things such as MBO, autonomous work groups, semi-autonomous work groups, physical layout/human factors, etc.); human resources (included management development/training, job enrichment, problem-solving teams) and technology (CAD/CAM, robotics, automation, and computer networks). In other words, the three main categories of work innovations (what Macy et al. call action levers) were structural, human resources, and technology. These three categories are not comprehensive nor are they mutually exclusive. For example, the work innovation (action lever) problem-solving teams is listed under human resources, however, these teams impact the organization structure, and it could be argued that it belongs under the structural category.

They used statistical meta-analysis to aggregate individual level data from across multiple experiments by standardizing the data. Twenty-nine moderating/intervening variables and fifty-five dependent variables/outcomes were identified. Categories of moderating variables included contextual, organizational, general attitudes, and improvement program variables. Categories of dependent variables included quality, quantity, costs, behavioral, attitudes about the work environment, group characteristics, and individual characteristics.

The results of the study showed that both semi-autonomous and autonomous work groups have positive results, but the biggest improvements by far come with using autonomous work groups. These types of teams were found to result in anywhere from forty to seventy percent improvement (along any number of performance dimensions). This improvement was far greater than improvement shown from *any* of the other work innovations. The organizations using autonomous work groups have been using them for a number of years, so these types of gains do not come quickly. I suspect that many of the ambiguous or disappointing results obtained from introducing self-managing teams in other studies would have turned around for the better had the teams been allowed to mature and develop further.

There are several other implications from this study for the use of self-managing teams. First, the transition from traditional manager-led work groups with parallel problem-solving teams to semi-autonomous work groups may take five to seven years. The transition from semi-autonomous to autonomous work groups may take another several years. It is a lesson that organizations considering this undertaking must learn from the beginning. The use of self-managing teams is *not* a quick fix by any means.

Another interesting finding is that the innovations that began to approach the level of improvement realized with autonomous work groups were organizational restructuring, multi-skilling, and team-building with group process training. The implementation of autonomous work groups includes all three of these work innovations (see earlier sections in this chapter). The point is that semi-autonomous and autonomous work groups are an integrative strategy that uses many of the specific work innovations (action levers) reported in the studies Macy et al. looked at. This type of change is more holistic and systemic, and it requires examining and changing a significant number of organizational sub-systems. Work innovations which change only one or a few sub-systems (such as financial rewards, training, automation, etc.) are less likely to succeed and will produce significantly smaller performance gains than autonomous work groups (Macy et al., 1990).

One last note should be made about the benefits of self-managing teams. Teams are definitely viewed to be a win-win-win situation (for employees, the company, and customers) and companies are experiencing tremendous gains in productivity, quality, customer satisfaction, cost reduction, to name a few measures. However, as Dr. Edwards Deming states, the most important gains are unknown and unknowable (Deming, 1991). Nobody knows or can measure the benefit of a well-trained employee armed with the information, knowledge, and skills needed to do the job. Nobody can measure the benefit of a satisfied customer who brags about a company's products and services. So even though we can measure some of the beneficial effects of using self-managing teams, we cannot forget that the most important gains will never be fully known.

3.6. Problems with Self-Managing Teams

The up-side of self-managing teams are all the benefits described in the previous section - the downside are the problems that come with the territory, described in this section. However, with any improvement, problems always exist. It's just a matter of which problems a company chooses to deal with - problems associated with the old paradigm of managing work and people or problems associated with the new paradigm. Common problems experienced are briefly described below, with potential solutions:

- Resistance of first-line supervisors - they may be reluctant to share, or give up, power; also, they may not know what their role will be in the future, or if they even will have a job, so they feel threatened. Solutions: involve supervisors from the very beginning in the change process; clearly define their needed role as coach and facilitator; move some supervisors to work on technical projects needing to be completed.

- People needing individual recognition and praise may not like the team environment. May begin to lose individual identity. Solutions: periodically give individual recognition when appropriate; encourage team members to give each other praise and recognition.
- Difficulty in getting everyone trained on all the technical skills and other skills. Training is a long-term investment, which many organizations find too easy to cut back on and it falls by the wayside (Hoerr, 1989). Solutions: develop and stick to a training plan for all team members.
- Topping out on the pay for skills system. Solutions: add elements to the system which encourage reward depth as well as breadth of knowledge.
- The difficulty in getting people to put to use their training and make decisions without someone else's approval. Solutions: one on one encouragement and counseling to get people to make decisions.
- There can sometimes be higher than expected levels of absenteeism and turnover, due to the increased pressures and stress on employees, to learn and perform. Solution: continue to provide employees with necessary information, knowledge, and skills so they feel confident in performing the job; continue to involve them in how the teams evolve to reduce uncertainty and ambiguity.

These problems can be avoided, or the effects of the problems mitigated, if the design, or plan for implementation of teams, considers these potential problems and includes ways to deal with them. And if they do occur but are expected and people are prepared to deal with them, it is better than being caught by surprise.

3.7. Future Trends

One researcher fears that the use of self-managing teams is losing momentum. Because they don't want to risk failure, many managers may be shying away from using self-managing teams (Hoerr, 1986). Others, however, believe, as does the CEO of ITT, Jerry Jenkins, that "no matter what your business, these teams are the wave of the future" (Dumain, 1990). Union leaders in the Corning Blacksburg plant believe this team concept is a way to preserve jobs for the future (Howes, 1989).

Goodman et al. (1988) project a slow but sure growth of their use. They predict *slow* growth because of the complexity and sophistication of self-managing teams as an involvement initiative. They predict *growth* for several reasons. First, self-managing teams are congruent with the cultural trend of participation and democracy in the workplace (also see section 2.3.3). Secondly, organizations experimenting with less sophisticated involvement initiatives will gradually move on to more complex ones such as self-managing teams. Referring to Table 2.2, organizations will move from initiatives having little to moderate impact on the organization to initiatives having significant impact. A third reason they list is new technology. For example, the spread of computer integrated manufacturing is changing the nature of work toward more integration, more flexibility and faster reaction time - all consistent with the use of self-managing teams.

With the increase in use of self-managing teams, Goodman et al. predict several changes in their form. Currently, most applications of self-managing teams are in manufacturing organizations, however, their use in non-manufacturing, white-collar, environments is expected to increase (Lawler et al., 1989; Micossi, 1990) as well as in managerial levels (Goodman et al., 1988; Lawler, 1990). Additionally, satellite organizations which represent linked autonomous units, appear to be conducive to the use of self-managing teams. Telecommuting may have an influence on the form of self-managing teams. Typically, teams are face-to-face groups, however, telecommuting allows employees to work outside traditional boundaries. Goodman et al. predict that as telecommuting increases, self-managing teams linked by computer networks may develop. The VPC has already experienced the effect of telecommuting on the self-managing team of project managers; two members of the project managers' team are physically located in remote areas with the rest of the team in one location.

Goodman et al. (1988) conclude by observing that "self-managing teams are in place in the United States and other industrialized countries [and] there are strong forces - from cultural values about participation, the evolution of new forms of involvement, and changes in new technology - that will support the growth and redesign of self-managing teams" (p. 325). Self-managing teams are said to be one of the most important work innovations to come along in the past two hundred years (Harper & Harper, 1988). Whether or not this is true, there is no doubt that they are beginning to represent a preferred way of managing work, for a variety of reasons (performance reasons or ethical reasons). Their use is becoming more and more widespread. In the most recent set of data collected by Dr. Lawler, at the USC's Center for Effective Organizations, the use of self-managing teams has increased although it is still limited compared to other involvement initiatives (personal conversation with Lawler). The issue of wide spread dissemination of the use of self-managing teams could be facilitated if the United States government were to promote and encourage participation, or Employee Involvement, as is done in other countries. In Japan, the Japanese Union of Scientists and Engineers advocated Quality Circles and helps companies set them up. In Sweden, the Employers Federation acted as a consultant for companies introducing participation (Hoerr, 1989).

3.8. Summary

This review of the body of knowledge has been an attempt to comprehensively explore the issues and questions related to self-managing teams. This chapter was not titled simply Literature Review, because I reviewed more than just the literature. This section reflects reading I have done from journals, books, and papers, as well as attending a conference on self-managing teams and talking with managers who are involved with self-managing teams, and even team members in some cases. The question to answer at this point is what's missing in the documented literature? What questions from managers are left unanswered or inadequately answered?

In general, there are several areas in the literature which are well-documented and for which it seems that managers have no more "burning questions." There is a quite a bit of research at a very theoretical level. This theoretical research tends to look at the conditions for self-management, what is self-management, job and organizational characteristics of self-managing teams, etc. This research, while useful for conceptual and theoretical discussions, does little for the practitioner struggling to implement teams.

One heavily researched area is the results obtained by using self-managing teams. Although the results have been inconsistent, I believe the study discussed in section 3.5 will clear up many remaining questions. Another area of much research is the role of the leader of self-managing teams and what to do with supervisors. This is a very pressing problem, since organizations don't want to turn their backs on their supervisors, yet at the same time, they don't want to hinder teams' development. Organizations must continue to articulate the role of team leaders and plan for them to work themselves out of a job. They must also plan for and come up with innovative things for them to do once this happens. There are many articles written on this area, and at least three doctoral dissertations that I know of, on this subject.

The training teams need also seems to be a well-documented area. Some organizations presenting case studies at the conference I attended even shared their training plans and agendas with participants (Westlund et al., 1990). Other well-documented areas are the types of decisions made by teams (there are dozens of articles I have come across giving lists of examples of decisions made by self-managing teams) and the reward system for teams (e.g., skill-based pay systems).

One area which is not heavily researched is the necessary information teams need to make the decisions they are expected to. The reason may be because this issue is at a very practical operational level, while other more heavily researched issues tend to be either more theoretical, or not as specific as this issue. The information technology is an important element to support self-managing teams (Dillingham & Delaney, 1990; Lawler, 1990), and the willingness to share information is a key necessary condition for self-managing teams to be successful (Musselwhite & Moran, 1990). The purpose of this research is to fill this gap in documented research in an attempt to make the road easier for organizations making the transition.

CHAPTER 4 RESEARCH METHODOLOGY

This chapter is divided into two parts. The first part is a detailed discussion of design issues and choices for this thesis. Design issues and choices represent the design of the research, and they support the activities in the research methodology, which is in the second part of this chapter. The research methodology maps out the research activities and describes what is involved in each activity. The research methodology is an overall plan for accomplishing the research objectives, including the specific research method for this thesis and *how* the method was applied to answer the research questions.

4.1. Design Issues and Choices of the Research

Table 4.1 presents a list of the design issues and choices, adapted from Patton (1990). Table 4.1 contains the design issue/choice, alternative options and considerations for that issue, the option/choice for this research, and what section in the chapter that particular issue is discussed. The issues/choices made for this research guided the research activities described in the second part of this chapter. For example, the case study site visits were made to organizations selected using the sampling strategies discussed in this part.

4.1.1. What Type of Research Was This?

Appendix A contains a description of three dimensions which can be used to classify research. They are: the primary purpose of the research (basic research, applied research, etc.); the focus, or nature, of the research (exploratory, descriptive, explanatory, or predictive); and whether the research builds or confirms theory. These dimensions are

Table 4.1. Design Issues and Options (adapted from Patton, 1990: 197)

Issues	*Sample Options and Considerations*	*Option/Choice for This Research*	*Where Discussed*
1. What type of research was this?			
1a. What was the primary purpose of the study?	Basic research, applied research, summative evaluation, formative evaluation, action research	Applied Research	Section 4.1.1
1b. What was the focus (nature) of the study?	Exploratory, descriptive, explanatory, predictive	Exploratory and Descriptive	Section 4.1.1
1c. Did the research build or confirm theory?	Theory-building, confirming theory	Theory-building	Section 4.1.1
2. What were the units of analysis?	Individuals, groups, program components, whole programs, organizations, communities, critical incidents, time periods, and so on	For new design sites, the entire organization; for redesign sites, departments using self-managing teams	Section 4.1.2
3. What were the sampling strategies for case sites?	Purposeful sampling, probability sampling; variations in sample size from a single case study to a generalizable sample	Purposeful sampling, in particular, theory-based (operational construct), typical case, and opportunistic sampling.	Section 4.1.3
4. What people, settings, events, and social processes were sampled (Miles and Huberman, 1984)?	Purposefully or randomly select key people, settings, events and social processes	People (interviews), events (meetings), and settings (team work areas) were purposefully selected	Section 4.1.4
5. What type of inquiry paradigm was used?			
5a. What controls were exercised?	Naturalistic inquiry, experimental design, quasi-experimental options	Naturalistic inquiry	Section 4.1.5
5b. What analytical approach was used?	Inductive, deductive	Inductive	Section 4.1.5
5c. What types of data were collected?	Qualitative, quantitative or both	Qualitative	Section 4.1.5

Table 4.1. Design Issues and Options (cont'd) (adapted from Patton, 1990: 197)

Issues	*Sample Options and Considerations*	*Option/Choice for This Research*	*Where Discussed*
6. What was the source of data?	Documentation, archival records, interviews, direct observations, participant-observation, and physical artifacts (Yin, 1989)	Documentation, interviews, direct observation, and physical artifacts	Section 4.1.6
7. What research method was used?	Case study method, experimental method, historical method, etc.	Case study method	Section 4.1.7
8. How were validity of and confidence in the findings addressed?	Construct validity, internal validity, external validity, and reliability (Triangulation options, multiple data sources, multiple methods, multiple perspectives, and multiple investigators)	This research addressed construct validity, external validity, and reliability, through the use of triangulation, establishing a chain of evidence, review of draft case descriptions, replication logic, and developing a case study protocol data base.	Section 4.1.8
9. Time issues: When did the study occur? How was the study be sequenced or phased?	Long-term fieldwork, rapid reconnaissance, exploratory phase to confirmatory phase, fixed times versus open time lines	Rapid reconnaissance	Section 4.1.9
10. How were logistics and practicalities handled?	Gaining entry to the setting, access to people and records, contracts, training, endurance, and so on	Gain access through established contacts; set up interviews with key people	Section 4.1.10
11 How were ethical issues and matters of confidentiality handled?	Informed consent, protection of human subjects, reactivity, presentation of self, and so on	Informed consent	Section 4.1.11
12. What resources were available? What did the study cost?	Personnel, supplies, data collection, materials, analysis time and costs, reporting/publishing costs	VPC funding obtained for attending conference; all other research expenses covered by researcher	Section 4.1.12

described in more detail in Appendix A. The three dimensions correspond to design issues 1a, b, and c, as shown in Table 4.1.

To address issue 1a, the primary purpose of this study was applied research, to better understand the phenomenon of self-managing teams, in particular information sharing with self-managing teams. I believe this issue is a pressing one in the business world. I have described in earlier chapters why organizations are interested in involvement and participation in general, and evidence exists that self-managing teams will become a more common involvement initiative in organizations. The overall research purpose was not knowledge as an end in itself (as with basic research) but to investigate an important phenomenon in order to contribute to theories that can be used in practical applications. Further, the overall purpose was not to try to determine the effectiveness of self-managing teams (summative evaluation), to improve the effectiveness of a particular application of self-managing teams (formative evaluation), or to develop a specific application of self-managing teams (action research).

The research methodology included a quasi-experiment to create a self-managing team in the VPC. Although I made an intervention to the organization, this was not action research since the aim of the experiment was not expressly to collect data on a self-managing team. Instead, the purpose was to increase my understanding and insight to self-managing teams (the second part of this chapter and Appendix B contain more details on the experiment).

To address issue 1b from Table 4.1, the nature of this research was both exploratory and descriptive. I explored the role of information sharing in the implementation of self-managing teams, and provided detailed descriptions of how a small set of organizations shares information with teams. If the research had been explanatory, I might try to explain why a particular organization decided to create self-managing teams. Alternatively, if the research had been predictive, I might try to predict the effect self-managing teams have on group and/or organizational performance.

This research was theory-building research, as opposed to testing theory. The practice of self-managing teams is relatively new. Although the underlying concepts and theories have been around for quite some time, self-managing teams have experienced limited use thus far. Additionally, there is a lack of research in this specific area (see Chapter 3, Review of the Body of Knowledge for more details). For these reasons, theory-building research is appropriate for this topic area.

4.1.2. What Were the Units of Analysis?

For this research, there are five case studies, two of which are new design sites and three are redesign sites (more on this issue in the next section). The unit of analysis differed for each of the two types. For the new design sites, which use self-managing teams throughout the organization, the unit of analysis was the entire organization. In redesign sites, self-managing teams are used only in part of the organization, which may be one or a few departments. The unit of analysis for this type of case was the department using self-managing teams. If there was more than one department using self-managing teams, the unit of analysis was the department which I have chosen to focus on. This does not imply that I ignored other parts of the organization in these cases. On the contrary, I collected information about the overall organization as well, however, I directed the specific detailed questions about the self-managing teams to people in that department.

4.1.3. What Are the Sampling Strategy or Strategies?

I used theoretical (Eisenhardt, 1989) or purposeful sampling (Patton, 1990) to select case study sites. The aim of purposeful sampling is to select information-rich cases for in-depth study. Table 4.2 lists the types of purposeful sampling strategies available. A strategy may include more than one category shown in the table.

The first criteria I used for selecting cases was that the organization had undertaken a conscious effort to create self-managing teams, whether in a pilot group (department or division) within the larger organization, or throughout the entire organization. The term used did not have to be "self-managing teams." Each organization generally uses their own terminology which they feel comfortable with. However, the teams used had to have the characteristics of self-managing teams discussed in Chapter 3 (natural work team, autonomy to make administrative and task-related decisions, etc.). A second criteria for selecting case studies is that the teams had to have been in existence for at least six months. I believe this time frame is long enough so that teams would be somewhat stabilized and team members were comfortable working with one another. On the other hand, it is not so long that any adaptations and changes made in how the teams operate were so far in the past that no one remembered them and the data was unavailable.

I used multiple case studies, which is appropriate if the same phenomenon is thought to exist in different situations (Yin, 1981b). For theory-building from (multiple) case studies, Eisenhardt (1989) suggests using anywhere between four and ten cases, although there is no ideal number. Unless there are mini-cases embedded in the case studies, it is difficult to generate theory with much complexity with less than four cases. Table 4.3 lists the five case studies used for this research and describes the organizations along several constructs.

The strategies used to select cases were theory-based or operational construct sampling, typical case sampling and opportunistic sampling. The operational constructs the five cases cover (from Table 4.3) are the type of industry (service and manufacturing); scope of use of self-managing teams (redesign and new design); union presence (union and non-union); size of the organization (from quite small to very large); age of teams being studied (from

Table 4.2. Purposeful Sampling Strategies (taken from Patton, 1990: 183)

Type of Sampling Strategy	*Purpose*
1. Extreme or deviant case sampling	Learning from highly unusual manifestations of the phenomenon of interest, such as outstanding successes/notable failures.
2. Intensity sampling	Information-rich cases that manifest the phenomenon intensely, but not extremely, such as good students/poor students, above average/below average.
3. Maximum variation sampling	Documents unique variations that have emerged in adapting to different conditions. Identifies important common patterns.
4. Homogeneous sampling	Focuses, reduces variation, simplifies analysis, facilitates group interviewing.
5. Typical case sampling	Illustrates or highlights what is typical, normal, average.
6. Stratified purposeful sampling	Illustrates characteristics of particular subgroups of interest; facilitates comparisons.
7. Critical case sampling	Permits logical generalization and maximum application of information to other cases because if it's true of this one case it's likely to be true of all other cases.
8. Snowball or chain sampling	Identifies cases of interest from people who know people who people who know what cases are information-rich, that is, good examples for study, good interview subjects.
9. Criterion sampling	Picking all cases that meet some criterion, such as all children abused in a treatment facility. Quality assurance.
10. Theory-based or operational construct sampling	Finding manifestations of a theoretical construct of interest so as to elaborate and examine the construct.
11. Confirming and disconfirming cases	Elaborating initial analysis, seeking exceptions, testing variation.
12. Opportunistic sampling	Following new leads during fieldwork, taking advantage of the unexpected, flexibility.
13. Random purposeful sampling (still small sample size)	Adds credibility to sample when potential purposeful sample is larger than one can handle. Reduces judgment within a purposeful category.
14. Sampling politically important cases	Attracts attention to the study (or avoids attracting undesired attention by purposefully eliminating politically sensitive cases).
15. Convenience sampling	Saves time, money, and effort. Poorest rationale; lowest credibility. Yields information-poor cases.
16. Combination or mixed purposeful sampling	Triangulation, flexibility, meets multiple interests and needs.

Table 4.3. Case Study Site Information

Constructs	*Corning Blacksburg plant*	*Shenandoah Life*	*Tennessee Eastman Company*	*Virginia Fibre Corporation*	*Boeing Corinth plant*
Type of industry:					
• Service		√			
• Manufacturing	√		√	√	√
Scope of use of self-managing teams:					
• Redesign		√	√	√	
• New design	√				√
Union presence:					
• Union	√				√
• Non-union		√	√	√	
Size of team workforce vs. size of overall organization	150/150	22/200 (one department of four teams)	535/13,000 across three divisions; research focus is on one dept. of 250 people	8/270 (two teams in one department)	200/200
Age of teams being studied	2 years	6 years	> 1 year	> 1 year	2 -3 years
Specific industry	Ceramic automotive components	Mutual life insurance	Chemicals, plastics, fibers	Paper mill	Electronics assembly
Location	Blacksburg, Virginia	Roanoke, Virginia	Kingsport, Tennessee	Amherst, Virginia	Corinth, Texas
Contact person	Mr. John Yearick, Employee Relations Manager	Mr. Jack Cochran, Assistant VP of IIS Department	Mr. Ed Reynolds, New Work System Resource Team	Mr. Stew Thomas, VP of Mill Operations	Mr. Ron Schenberger Human Resources

one to six years); specific industry; and location. The first four constructs listed (type of industry, scope of use of self-managing teams, union presence, and size of the organization) are those which I believed were important to select a range of organizations along these constructs. These constructs then, were used to select the cases using the theory-based, or operational construct, sampling strategy. The other constructs listed in Table 4.3 (specific industry, location, and age of teams) were secondary in importance and are listed simply to describe the cases along those dimensions. The age of teams was also a criteria used to select cases, as described earlier.

Most applications of self-managing teams are in the manufacturing industry, however, more and more applications are appearing in the service industry. Examples in non-manufacturing environments include insurance firms, city governments, and a cable TV company. Because these applications are becoming more common, I believe it was important to study how a service organization implemented teams.

The second important construct was the scope of the use of self-managing teams, i.e., whether the organization is a new design or a redesign site. There are similarities and differences in new design and redesign efforts. Some common issues are group dynamics issues, personality conflicts in the group, and getting people to make decisions and feel comfortable with their decisions. One difference is that redesign sites have to deal with support functions in the organization not being congruent or supportive of self-managing teams, e.g., personnel, information systems, and marketing. Therefore, it is important to learn what both types of organizations have done to implement self-managing teams and what problems they have come across.

The third important construct was whether or not the workforce was unionized. One of the first questions people typically ask about this research study was if any of the sites had unions. Many people believe it is extremely difficult to move toward self-managing teams in a union environment. In a union environment, union leadership is simply another stakeholder in the change effort. The selection of the case studies covers both union and non-union environments. The organizations selected also range from quite small in size (less than 200 employees) to very large (13,000 employees in one plant). The size of the organization was the fourth important construct used to select cases. The organizations are described in much more detail along these constructs, as well as other dimensions, in Appendix G.

The second sampling strategy I used is typical case sampling. Each of the five cases also represent what I believe is the "typical case" for its industry, size, etc. There is no special feature of any one, given the constructs it represents. In other words, none of the cases are critical cases or politically important cases, for example. The third sampling strategy used is opportunistic sampling. While attending a conference on self-managing teams, I met a manager from the Boeing plant, who invited me to visit and study the plant. Prior to this, I had not intended to use Boeing (in fact, I didn't know about the plant). However, I took advantage of an opportunity presented to me.

The aim in selecting multiple cases is literal replication, as opposed to theoretical replication (Yin, 1989). In literal replication, the same research findings across cases are expected. Theoretical replication expects different results and the researcher must explain the differences based on the nature of the cases. This replication logic is in contrast with sampling logic of traditional within-experiment hypothesis testing research in which the aggregate relationships across the data points are tested using summary statistics (Eisenhardt, 1989: 542). The goal is analytic not statistical generalization, where each case is similar to an experiment in the experimental method (Eisenhardt, 1989; Yin, 1989).

4.1.4. What People, Events, and Settings Were Sampled?

Table 4.4 describes the people I interviewed, the events (team meetings) and settings (team work areas) I observed. In each case, my goal was to interview at least one team member, coach/supervisor, and member of management (or someone not working in a team or coaching a team). I believed talking with people in each of these roles would give me insight on the differing perspectives of self-managing teams. My goal was to also observe at least one team meeting, if possible. In coordinating the site visits with my contact person at each organization, I informed them of these goals, and they set up the visit. During the site visits, I also took advantage of whatever opportunities came up to talk with someone or sit in on a team meeting.

In two of the sites, I had limited access and could only interview one or two people, as shown in Table 4.4. At Shenandoah Life, I interviewed the Assistant Vice President of the department using teams. The teams report to this person, and he is considered to be "in charge" of the self-managing team effort. At Corning Blacksburg plant, I interviewed the Employee Relations Manager and had a brief tour of the shop floor. In the other three cases, I had more control over the site visit and was basically able to talk with whomever I wanted to.

I was able to observe regular team meetings at Boeing and Tennessee Eastman. At Corning and Shenandoah Life, I was unable to sit in on team meetings, and at Virginia Fibre they do not have regular team meetings. I was also able to attend the daily production review meeting at Boeing for two days. Sitting in on the meetings gave me the opportunity to observe how teams share information with each other, and make decisions, as well as the group dynamics, such as personality conflicts and emergent leadership. In all five cases, I had at the least a brief tour of the team work area, and in several sites, I received a

Table 4.4. People, Events, and Settings Sampled in Case Study Sites

People, Events, Settings Sampled	Corning Blacksburg Plant	Shenandoah Life Insurance Company	Tennessee Eastman Company (TEC)
Interviews			
Team members	None	None	Formal group interview with three team members (all were coordinators)
Coach/supervisor	None	None	Formal group interview with two team coaches
Engineering or other support functions	None	None	None
Middle/upper Management	Formal interview with Employee Relations Manager	Informal interview with Vice President of department	Formal interview with department manager
Internal consultant / champion of change effort	N/A	Formal interview with Assistant Vice President of department; considered to be "champion" of self-managing teams	Formal interview with member of the New Work System Resource Team; also participated in one day visit by outside company with presentations by Resource Team
Events			
Regular Team Meetings	None	None	Observed two daily team meetings (from two different teams) and one monthly team meeting
Other types of Team Meetings	None	None	None
Settings			
Tour of team work area	Brief tour of shop floor by Employee Relations manager	Brief tour of team work area by Assistant VP of department	Tour of the shop floor by two team coaches

Table 4.4. People, Events, and Settings Sampled in Case Study Sites (cont'd)

People, Event, Setting Sampled	Virginia Fibre Corporation (VFC)	Boeing Corinth
Interviews		
Team members	Formal interview and informal discussions with one team member; informal discussions with two other team members	Formal interviews with one team member (was the team facilitator); informal discussions with six team members
Coach/supervisor	Phone interview with supervisor	Formal interviews with two Area Team Leaders (ATLs); formal interview with two Area Team Coordinators (ATCs)
Engineering or other support functions	None	Informal group interview with three plant engineers
Middle/upper Management	Formal interview and phone interviews with Vice President of Mill Operations	Informal interview with two managers from Human Resources
Internal consultant / champion of change effort	N/A	N/A
Events		
Regular Team Meetings	N/A (they do not have regular team meetings)	Observed one daily area meeting (several teams in an area); observed two regular team meetings
Other types of Team Meetings	None	Observed two daily meetings for all Area Team Leaders (production review meeting)
Settings		
Tour of work area	Tour of mill by team member	Extensive tour of shop floor; was permitted to walk around unescorted

more extensive tour. At Boeing, I was permitted to walk around the plant unescorted and see any area I wanted to.

4.1.5. What Inquiry Paradigm Was Used?

This research followed the holistic-inductive paradigm, emphasizing three qualitative themes: naturalistic inquiry, inductive analysis, and qualitative data (Patton, 1990). Naturalistic inquiry consists of "studying real-world situations as they unfold naturally; [in a] non-manipulative, unobtrusive, and non-controlling [manner]" with "openness to whatever emerges" and a "lack of predetermined constraints on outcomes" (Patton, 1990: 40). Data was analyzed and interpreted inductively; inductive analysis is "immersion in the details and specifics of the data to discover important categories, dimensions, and interrelationships; exploring genuinely open questions rather than testing theoretically derived (deductive) hypotheses" (Patton, 1990: 40). Qualitative data is "detailed, thick description; inquiry in depth; direct quotations capturing people's personal perspectives and experiences" (Patton, 1990: 40). The holistic-inductive paradigm with qualitative data is more likely to result in new theoretical integrations and the ensuing qualitative studies have a quality of undeniability because of the "concrete, vivid, meaningful flavor that often proves far more convincing to a reader" (Miles & Huberman, 1984: 15).

Although I used inductive analysis rather than deductive analysis, it does not imply that this research began with a completely blank page. On the contrary, researchers using inductive analysis do operate with research questions and conceptual frameworks, but the choices are more implicit and the links between framework and procedures are less linear (Miles & Huberman, 1984: 34). I presented conceptual frameworks and identified research questions in Chapter 1.

The choice of paradigms and qualitative inquiry themes depends on the purpose and nature of the research. I believe the holistic-inductive paradigm using naturalistic inquiry and inductive analysis was appropriate for this research, given the purpose (applied research), and the nature (exploratory and descriptive) of the research. Because this is theory-building research and not theory testing, inductive analysis (vs. deductive analysis) was appropriate.

4.1.6. What Was the Source of Data?

There are three ways to collect data from a system: ask, observe, and use system documentation. These three basic ways to collect data can be broken down into six more specific sources of data: interviews, direct observation, participant-observation, documentation, artifacts, and archival records (Yin, 1989). This research relied on interviews, direct observations, documentation, and artifacts. I conducted interviews with selected people in the case studies and documented observations of events and settings described in an earlier section. I also collected any available and appropriate organizational documentation which could be made available to me. In some cases, I could not take documentation with me because it was "sensitive information." Examples of documents include organizational charts, background information on the organization, and documents relating to the use of self-managing teams such as memos or reports documenting the evolution of the self-managing teams. Artifacts in a sense, are a form of documentation. Artifacts include evidence of organizational processes and systems, such as the information or visibility systems.

Another design issue related to the interview as a source of data is the type of interview. An interview can be open-ended (the interviewee is free to answer in their own terms and language), focused (over a short period of time, following a certain set of questions), or a structured survey (the questions are structured and the response categories are fixed) (Yin, 1989). The four types of interview described below illustrate this range of characteristics (Patton,1990 p. 289):

Informal conversational interview	*Questions emerge from the immediate context and are asked in the natural course of things; there is no predetermination of question topics or wording.*
Interview guide approach	*Topics and issues to be covered are specified in advance, in outline form; interviewer decides sequence and wording of questions in the course of the interview.*
Standardized open-ended interview	*The exact wording and sequence of questions are determined in advance. All interviewees are asked the same basic questions in the same order. Questions are worded in a completely open-ended format.*
Closed, fixed field response interview	*Questions and response categories are determined in advance. Responses are fixed; respondent chooses from among these fixed responses.*

The type of interview used in this thesis was a mix between the interview guide approach and standardized open-ended interview. I had a specific list of questions to begin each interview (as in a standardized open-ended interview), however, depending on the person's knowledge of the subject or their understanding of the question, I had to probe and ask more detailed questions or follow-up a question which I felt the interviewee knew more about but could not articulate an answer. Because of the real-time adjustments made, the interviews were similar to the interview guide approach, where I covered the areas addressed in the questions, but the questions were asked in a different order or worded slightly differently depending on the interviewee.

In designing the interview (except for the informal conversational interview), the researcher must also decide what types of questions to ask. Questions can be experience/behavior questions (about what a person does or has done); opinions/values questions (about the cognitive and interpretive processes of people); feeling questions (about emotional responses of people to their experiences and thoughts); knowledge questions (what factual information the respondent has); sensory questions (about what is seen, heard, touched, tasted, and smelled); and background/demographic questions (identifying characteristics of the person being interviewed) (Patton, 1990). The interviews for this research were based on experience/behavior, opinions/values, knowledge questions, and to a lesser extent, background/demographic questions. Appendix C contains a list of interview questions used.

4.1.7. What Research Method Was Used?

The research method used for this thesis is the case study. The case study method allows the researcher to investigate a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used (Yin, 1989). Case studies provide the depth, detail, and individual meaning (Patton, 1990: 17) necessary for relatively new phenomenon, which is true of self-managing teams. The case study approach to qualitative analysis (qualitative inquiry) is a "specific way of collecting, organizing, and analyzing data ... the purpose is to gather comprehensive, systematic, and in-depth information about each case of interest" (Patton, 1990: 384). The case study method allows people being interviewed to describe experiences in their own language, rather than the researchers'. The case study is the most appropriate research method for the conditions of this research: the type of research questions ("how," i.e., how is information shared); the lack of control over behavioral events I had as an outside observer; and the focus on contemporary events (on current practices) (Yin, 1989). Table A.4. in Appendix A contains a more detailed discussion on when the case study method is appropriate.

4.1.8. How Were Validity of and Confidence in the Findings Addressed?

In evaluating the quality of any research study, four tests are relevant: construct validity, internal validity, external validity, and reliability (Yin, 1989). Internal validity is relevant only for explanatory or causal studies, and not for descriptive or exploratory studies, and hence, is not relevant for this research. The remaining three are relevant, and there are various case study tactics to address each evaluative test (see Table 4.5).

To address construct validity, the first case study tactic is the use of triangulation - combining different sources of evidence in a single study (Rossman & Wilson, 1985). This combination of different sources is one of the major strengths of the case study (Yin, 1989). The sources I used, as mentioned earlier, were interviews, documents, observations, and artifacts. Additionally, the interviews were with different people, for instance, I asked the same questions to team members, supervisors, and managers. The second tactic to address construct validity is to establish and maintain a chain of evidence - allow an external observer "to follow the derivation of any evidence from initial research questions to ultimate case study conclusions... [and] trace the steps in either direction (from conclusions back to initial research questions or from questions to conclusions)" (Yin, 1989: 102). I have kept complete and detailed files on each case study which include all correspondence with people in the organizations, notes from phone conversations, notes from site visits, transcripts from interviews, organizational documentation, and any articles published about the organization. These comprehensive files enable me to back track from any conclusions I draw to the raw data which supports those conclusions.

The third tactic for construct validity is to have key case informants review draft(s) of the case study description. This is a way to corroborate the essential facts and evidence presented in the case description. These reviews will enhance the accuracy of the case

Table 4.5. Case Study Tactics for Four Design Tests (taken from Yin, 1989)

Tests	*Definition*	*Case-Study Tactic*	*Phase of Research in Which Tactic Occurs*
Construct validity	establishing correct operational measures for the concepts being studied	• use multiple sources of evidence • establish chain of evidence • have key informants review draft case study report	data collection data collection composition
Internal validity	establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships *(for explanatory or causal studies only, and not for descriptive or exploratory studies)*	• do pattern matching • do explanation-building • do time-series analysis	data analysis data analysis data analysis
External validity	establishing the domain to which a study's findings can be generalized	• use replication logic in multiple-case studies	research design
Reliability	demonstrating that the operations of a study - such as the data collection procedures- can be repeated, with the same results	• use case study protocol • develop case study data base	data collection data collection

study and hence, increase the construct validity of the study. For each case study, I have had at least one person (and two people in some cases) review the case description for accuracy and comprehensiveness. In all cases, the contact person was one of the reviewers. I incorporated all changes the reviewers had. The subjective feedback I received from reviewers about the case descriptions was very positive.

Using replication logic in selecting case studies (as opposed to sampling logic) addresses external validity. Case study research relies on *analytical* generalization (Eisenhardt, 1989; Yin, 1989), not statistical generalization as with experimental hypothesis-testing research. In analytical generalization, the researcher attempts to generalize a particular set of results to some broader theory (not from one case to another). Emergent theory must be tested through replication of the findings in a second or third case study. Once the replication is made, the results might be accepted even though further replications have not been performed (Yin, 1989). This replication logic is the same that allows scientists to generalize from one experiment to another, where one case is analogous to one experiment (and not to one subject in an experiment).

To address reliability, I used a case study protocol and developed case study data bases (the case study files mentioned earlier). A case study protocol guides the researcher in carrying out the case study. It includes the instrument (in this research, the list of interview questions), as well as procedures and general rules that should be followed. It is especially necessary when there are multiple investigators in a research study. For this research, the protocol was not formally documented, but rather a consistent process I followed for each case. The informal protocol included procedures for setting up the site visits and interviews (using the contact person to coordinate site visits), a standard list of interview questions, and a standard format for the case descriptions. The interview questions are shown in Appendix C, and the standard format for case descriptions is shown in Appendix

E. Developing the case study data bases entailed assembling all the raw data from the case, constructing a case record, and writing the case description (more on this is in the second part of this chapter).

4.1.9. When Did the Study Occur and How Was it Sequenced?

The sequencing of the study and the research activities is mapped out in Figure 4.1 in the second part of this chapter. I began collecting data on the case studies through phone conversations approximately in September 1990, and I collected data at a conference on self-managing teams in September. I began conducting site visits in October 1990. I completed site visits and data collection in March 1991. For each case, I collected and analyzed data. The data analysis for earlier cases and data collection for subsequent cases overlapped one another, so I was able to refine my data collection in later cases as I learned form earlier cases. In addition, most of the case study visits occurred after the quasi-experiment of creating a self-managing team in the VPC, so I was able to integrate what I learned in the experiment into my data collection and analysis for the case studies.

4.1.10. How Were Logistics and Practicalities Handled?

I gained access to the case study sites through previously established contacts. Generally, these contact persons coordinated my site visits for me and set up interviews with people after discussions with me about who I needed to talk with. I used a tape recorder for interviews (in each case, I had the consent of the interviewee) to eliminate errors in note-taking, and I later transcribed the interviews. I also took notes during the site visits to record observations of the physical surroundings, body language of the interviewees, attitudes, tone of the interviews, and any other information not captured by the tape recorder. Immediately following a site visit, I either wrote down or dictated into the tape recorder any additional thoughts or comments from the site visits.

4.1.11. How Were Ethical Issues and Matters of Confidentiality Handled?

No one I interviewed asked me to keep their name anonymous nor was anyone uncomfortable being recorded during the interviews. In the case descriptions, I have directly quoted people and no one has asked me to remove their name. In addition, I have asked and received permission to disclose the company name in the case descriptions and in the thesis.

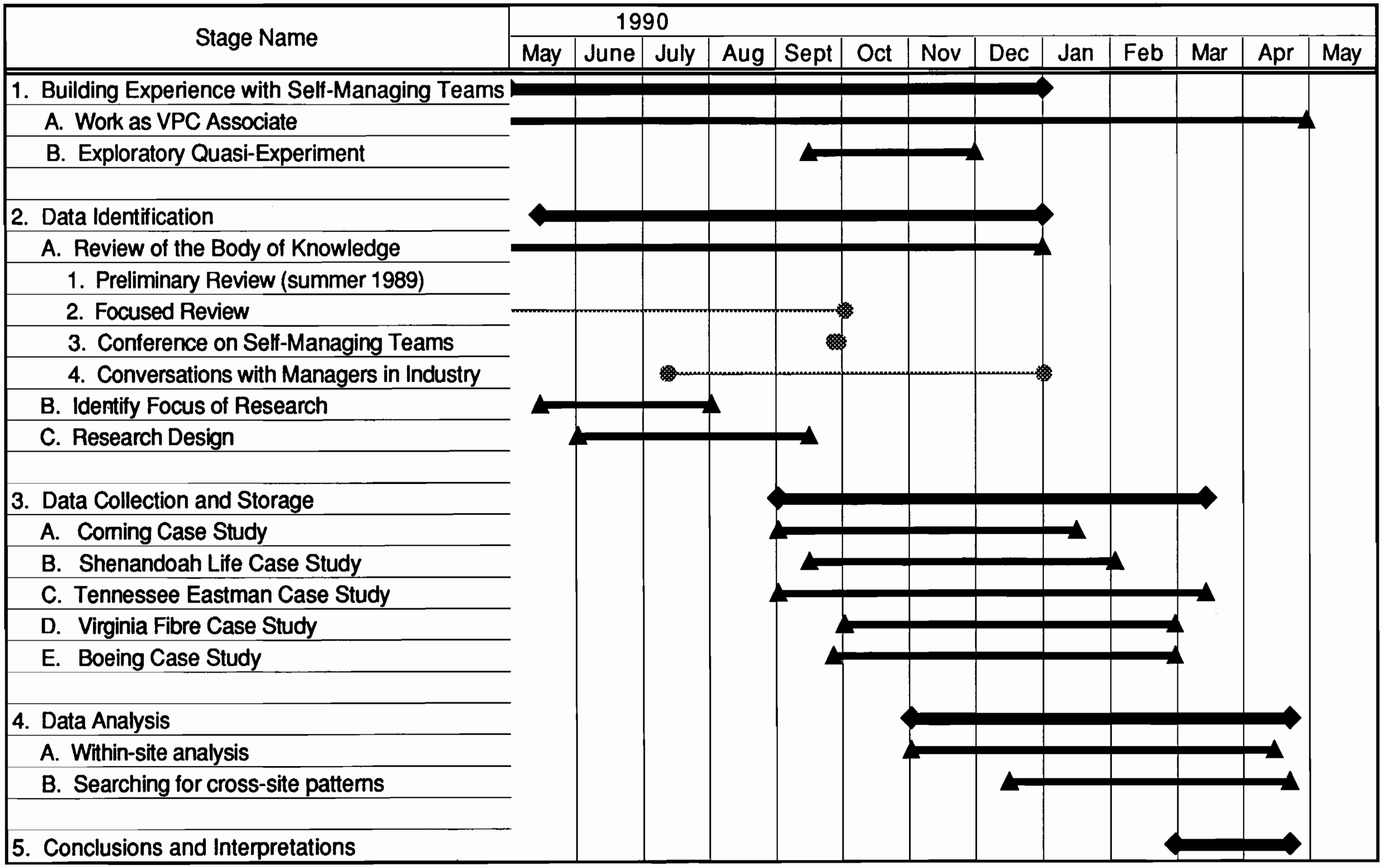
4.1.12. What Resources Were Available?

The costs of conducting this research were: my labor, travel expenses associated with making site visits; travel expenses associated with attending the conference; and costs associated with computer use and printing. The first two costs listed were covered by the researcher - my labor and travel for site visits (with the exception of the site visit to Boeing, which the VPC covered because I was in that area for business). The last two costs were funded by the VPC. The VPC has a funding mechanism for conducting research on the "Organization of the Future." I submitted a proposal, which was approved, for funding from this Internal Research and Development account for attending the conference. The VPC also supported this research by allowing me the use of computer time and access to printing.

4.2. Description of Activities in Research Methodology

Figure 4.1 portrays the major research activities and approximate time intervals for each major activity and sub-activity. This section provides an accompanying narrative

Figure 4.1 Research Methodology



description to Figure 4.1, and provides more details than the figure. The research methodology is based on methodology descriptions and guidelines provided in Yin (1989), Eisenhardt (1989), and Patton (1990).

4.2.1. Building Experience with Self-Managing Teams

Building experience with self-managing teams included my experience in the VPC as a project manager and an exploratory quasi-experiment. As described below, the VPC encourages self-management in general in all associates, and there are no formal supervisors. My experience as a member of a self-managing organization increased my insight into the phenomenon studied. However, I still had no first hand experience with self-managing teams, hence the reason for conducting the exploratory experiment to gain experience with a self-managing team. This experience at the VPC and with the experiment helped me in the next stage, Data Identification, specifically in the identifying the focus of the research.

4.2.1.1. Work as VPC Associate

For two and a half years, I have been a member of the VPC, an organization which involves all its members (VPC associates) in the management and improvement of the organization. VPC is committed to sharing information, knowledge, power, and rewards with associates (it is stated in the VPC guiding principles) to make members more self-managing. The VPC is managed and led not by one Director, but a Strategic Management Team, which is a self-managing group of Directors and other full-time personnel. The VPC also has sub-groups trying to evolve from manager-led to self-managing: the project managers as a group, various project teams, the support staff, and the QPM editorial board.

Although in general, the VPC is trying to evolve to being self-managing, it is different from an organization that is undertaking a specific initiative to formally create self-managing teams which are natural work teams with clear physical boundaries and a product/service for which the group is solely responsible. In the VPC, many associates are members of more than one team because their job responsibilities may overlap the functions of some of the sub-groups. In addition, the sub-groups are not physically located together. Although physical proximity is a very common characteristic of self-managing teams, it is not necessarily a pre-condition (Goodman et al., 1988). In fact, one organization "swaps" people from one self-managing team to another occasionally to help meet deadlines. So team members don't always have to be physically located together and teams may be overlapping.

As a member of these self-managing sub-groups, I have been a recipient of information sharing (i.e., others have determined what information to share and how), but I have not had to decide what information to share with a self-managing team. My experience at the VPC had not been with the phenomenon studied. Although it enhanced my insight to the phenomenon, I still had no experiential knowledge. The experiment provided me with direct experience with a self-managing team.

4.2.1.2. Exploratory Quasi-Experiment

The primary objective of the experiment was to enhance my understanding and insight to the challenges of sharing information with self-managing team members. In the experiment, I formed a self-managing project team and decided what information to share, how, when, and why. Appendix B contains a detailed discussion of the background of the project, the design of the experiment, results, lessons learned, and limitations of the experiment. The setting of the experiment was a project at the VPC, the three day short course Total Quality and Productivity Management (referred to as the "3-dayer"), for which I was project manager. I formed a self-managing team for the 3-dayer project, consisting of the new Graduate Research Associate who replaced me as project manager, a secretary, and the VPC's resource center administrator. The experiment represented not only a change in that people worked together as a team rather than as somewhat isolated individuals, but they also would be more autonomous rather than manager-led. The nature of this project is such that there are things that need to be done to prepare for delivering the short course twice a year, but the rest of the year, the project is relatively inactive. There are also follow-up activities after delivering the course. The time frame of the experiment was during the preparation phase for delivering the 3-dayer in San Antonio. I stopped data collection after the team had completed follow-up activities from San Antonio, which was approximately one and a half months after the course.

Design of the experiment. The design of the experiment included deciding how the team would operate and deciding what information to share with the team. I used elements of the existing VPC information and visibility system where possible and appropriate. I basically provided two types of information. The first type is technical task-related information about the 3-dayer project, explaining what the team's responsibilities were and how to carry them out. This type of information was necessary because the new project manager was not yet familiar with the overall 3-dayer process, and the other two team members only knew their own specific tasks. The second type of information I provided was supporting information; some was needed to support team decisions (such as the budget for the short course and goals for new course development), while some was simply for the purpose of information sharing and not to support decisions (such as overall goals of the VPC and overall VPC performance). Some information the team already had because the VPC is an open environment and shares a lot of information with everyone.

Hold Initial Meeting With Team. After the experiment was designed, I held an initial meeting with the team approximately three weeks before the course was to be delivered. The purpose of the initial meeting was to provide an overview explanation of the "3-dayer project team" and how things would be different working as a team rather than individually. My role on the project had changed from project manager to co-presenter, independent of this experiment, so I also explained my new role and how it would change from what it had been as project manager. I explained how the role of project manager would change from autocratic or delegative to participative and consultative. Also at this initial meeting, I provided the team with the technical and supporting information described earlier. This information outlined the team's responsibilities and how to carry them out.

Regular Team Meetings. The purpose of regular team meetings (about twice a week) was to share information and make decisions to perform the team tasks in preparing for the 3-dayer. Another purpose of the meetings was for me to collect data on how the team was operating, how decisions were made, emergent leadership, and how team members felt about the team. Collecting feedback provided the opportunity to make mid-course adjustments in the team structure if necessary.

Collect Feedback From the Team. At the end of the experiment (approximately one month after the delivery of the short course), I collected feedback from the team on what they thought about working as a team rather than individually. Everyone on the team had worked in the VPC long enough to be involved in other projects where most of the work was done individually and few team meetings were held. The data collected in this phase was developed into lessons learned.

Generate Lessons Learned. The purpose of generating lessons learned was so that I could integrate the knowledge I gained into my data collection for the case study site visits. The sequencing of the case studies was such that most of the site visits occurred after the experiment. The increased insight into the problems and challenges of a self-managing team enabled me to relate better to the challenges described to me by team members and coaches in interviews.

Appendix B contains a detailed discussion of the results of the experiment, what specific lessons I learned from the 3-dayer project team, as well as limitations of the experiment.

4.2.2. Data Identification

In this stage of research, there were three main activities: a review of the body of knowledge on self-managing teams, identifying the focus of the research, and the research design. The review served as input to the last two activities. That is, reviewing the body of knowledge (the formal literature, attending a conference, and talking with managers) helped to identify the focus of the research, which in turn, shaped the research design. In addition, the experience gained at the VPC and with the experiment helped in this stage.

4.2.2.1. Review of the Body of Knowledge

This section is titled "Review of the Body of Knowledge" rather than "Literature Review" because the literature review is only one element of the review of relevant data.

There is data on self-managing teams not only in the formal literature from books and journals, but there is also data presented at conferences. Managers who are involved with the implementation of self-managing teams in their organizations are also another valuable resource. They are actually doing what's described in the literature. Talking with managers provides concrete examples of many of the theoretical issues found in the literature. For this review, I researched not only self-managing teams, but also the more broad concept of Employee Involvement, to more fully understand the phenomenon I would be studying. The outputs of this Review were discussed in Chapter 2 (Background on Employee Involvement) and Chapter 3 (Review of the Body of Knowledge).

The review of the body of knowledge serves four broad purposes (Marshall & Rossman, 1989). First, it demonstrates the underlying assumptions behind the general research questions. Second, it demonstrates the researcher has a thorough understanding of related research and practice in industry. Third, it shows that the researcher has identified some gaps in the literature, which the current research attempts to fill. Last, the review can refine and redefine the research questions and any tentative hypotheses.

Preliminary Review of Self-Managing Teams. In the summer of 1989, I conducted a preliminary review in the area of self-managing teams to fulfill requirements for a graduate seminar, ISE 6015. Sources for the review were the documented literature (books and journal articles) and also material sent to me on what Tennessee Eastman was doing with self-managing teams. For the graduate seminar, I led a class discussion on self-managing teams. This preliminary review was broad in nature (with respect to self-managing teams) and included material on: what are self-managing teams; conditions necessary for self-managing teams; implementation issues; underlying theories and concepts, such as socio-technical systems theory and job redesign; leadership of self-managing teams; and the effect of self-managing teams on group and organizational performance. This initial review identified the more important issues being researched in the literature and eventually helped me identify the focus and scope of the research.

Review of the Body of Knowledge. The second review of the body of knowledge differed from the preliminary one in several ways. First, it was more broad, in that I researched the area of Employee Involvement (a more broad topic which includes self-managing teams) and where self-managing teams fit in this area. The purpose of reading and learning about Employee Involvement was to be able to more fully understand the phenomenon. During this time period, I also assisted with the development and delivery of a one day seminar on Employee Involvement. Second, this review extended over a longer period of time than the preliminary one. I was able to spend a significant amount of time collecting and reading books and articles about self-managing teams.

Attend Conference on Self-Managing Teams. In September, I attended the 1990 International Conference on Self-Managed Work Teams, jointly sponsored by the University of North Texas and Texas Instruments, Inc. Conference activities included skill-building workshops, case presentations, paper sessions, panel discussions, and informal [illegible]nversation groups. Topics dealt with keys to successful implementation includin[illegible]ction of team members, training, reward systems, culture, norms, and lessons [illegible] from successes and failures. The additional insight I gained from listening to preser[illegible]and talking with managers and team members was invaluable to me in preparing [illegible] as much as possible from the case studies. I particularly found the informal [illegible]tion groups interesting. In addition, I had the opportunity to hear Dr. Ed

Lawler from the USC speak. Dr. Lawler is a widely recognized expert in the field of involvement and self-managing teams.

Informal Conversations with Managers of Teams and Team Members. As a VPC associate, I have had the opportunity to establish contact with managers who are struggling with many of the issues the VPC studies and teaches. For example, I have had conversations with managers at Pennsylvania Power and Light, the Defense Logistics Agency, and other organizations about their Employee Involvement efforts and in some cases, efforts to implement self-managing teams. These contacts all came about through my work at the VPC. In addition, I have collected many examples of self-managing teams and how they were implemented from talking with managers, team members, academicians, and consultants at the self-managing team conference.

4.2.2.2. Identify the Focus of Research

This research activity involved identifying a specific focus for the study. In Chapter 1, I discussed what is within and what is outside the scope of the research, for example, I am focusing on information sharing with self-managing teams, but not on knowledge sharing, the changing role of supervisors of self-managing teams, or effects on group/organizational performance. I also have identified specific research questions for this study, which were the foundation for the interview questions in the data collection stage. I identified a priori constructs for this research, as described in the conceptual frameworks presented in Chapter 1. The activities prior to this one which helped me identify the focus of the research were my experience (as a VPC associate and from the experiment) and reviewing the body of knowledge (from the formal literature, conference, and talking with managers).

4.2.2.3. Research Design

After identifying what to study (the focus of the research), the next step is to determine how to do it (the research design and methodology). In actuality, designing the research overlapped somewhat with identifying the focus because some design issues could be resolved before the research focus was completely identified. For example, I had determined the specific topic and title of the research, but I began the research design before the research questions were completely refined. The research design activity consisted of developing the research methodology (this second part of this chapter) and making choices for design options listed in Table 4.1 (the first part of this chapter).

4.2.3. Data Collection and Storage

The primary activities in the data collection stage were conducting the site visits for the five case studies and collecting data as needed before and after a site visit. The activities which served as input to the Data Collection stage were the experiment and the Review of the Body of Knowledge. These activities helped refine interview questions before going into the organizations.

In Figure 4.1, the sequencing of the cases is such that the bulk of data collection for the first case study (the site visit) occurred about mid-way through the experiment. The site visits for the rest of the cases began after the completion of the experiment *and* after the data collection from the first case study. In this way, initial feedback and lessons learned from the experiment helped prepare me for the first site visit. Results from the experiment and experience gained during the first site visit gave me more insight for the next one. Collecting data, learning how to better collect data, and then collecting more data was an iterative process in conducting the site visits for the five case studies. I had opportunities to refine my interviewing technique and to word the interview questions better so people could more easily understand what I wanted to know. Each case study basically had the same activities: initial contact, preparing for the site visit, conducting the site visit, and follow-up. These activities are described below and apply to all five organizations.

4.2.3.1. Initial Contact

In the initial contact with managers at potential case sites, I asked them if they would be willing to participate in my research. Everyone I contacted was willing, although two of the organizations could spend only limited time with me. I learned about the organization and who to call usually by a referral from someone else or from my work at the VPC. Part of the initial contact was also to set up the site visit(s) and interviews. Usually this was done over the phone. During the initial contact, I also asked the contact person to send me any materials they could before hand about the organization and about the self-managing teams.

4.2.3.2. Preparation For Site Visits

To help me prepare for site visits, I collected and studied some initial data about the organization. In informal phone interviews, I asked the contact person about the self-managing teams in the organization, the history of the teams, and any other background information on the organization or on the teams. The reason for collecting this data over the phone was so that time spent in on-site interviews could be more effectively used. I also prepared for the site visits by reading any materials sent to me, which could include background information. I also read any articles published about the organization. For instance, I looked up one article about Corning in the newspaper and procured a copy of a case study written by a former class mate on the Blacksburg plant. Jack Cochran at Shenandoah Life sent me about five articles previously published about the company.

Another preparation activity included tailoring the interview questions to the organization. Some specific questions had to be modified for redesign vs. new design sites, because some questions don't apply to one or the other. I also integrated my experience from the exploratory experiment and preceding site visits.

Patton (1990) provides some excellent guidelines and advice on interviewing and observation strategies and techniques, which I tried to incorporate wherever possible during the site visits. For example, some of the guidelines include tips about taking notes in the field, using creativity and opportunism in interviews, how to write observations and descriptions, observing body language of interviewees, and how to phrase interview questions.

4.2.3.3. Conduct Site Visit(s)

Site visit(s) constituted the bulk of the data collection. During the site visit, I collected data through interviews, direct observation, any documentation that was not sent to me ahead of time, and artifacts (as described in the first part of this chapter). Using a tape recorder in the interviews assisted with data collection and ensured accuracy. Field notes written during and immediately after the site visit(s) captured my observations of any relevant events and descriptions. These field notes and transcripts from the interviews became the core of the case descriptions (see Within Case Analysis).

4.2.3.4. Follow-Up

Follow-up included several activities. Within a week of each site visit, I wrote thank you letters to people interviewed and to the contact person for setting up the visit. After reviewing typed up notes and interview transcripts and beginning to write the case descriptions, I often had follow-up questions. Sometimes, they were questions I didn't have the opportunity to ask during the site visit because of time limitations, and sometimes they were clarifications of responses. Another follow-up activity was sending the contact person (and sometimes one other key person) a copy of the case description to review for accuracy and comprehensiveness. I explained in accompanying letters how valuable their feedback and changes were to the research. I incorporated all changes made by reviewers into the case descriptions.

4.2.4. Data Analysis

The purpose of qualitative inquiry is to produce findings through analysis, interpretation and presentation of findings. The challenge in Data Analysis is to "make sense of massive amounts of data, reduce the volume of information, identify significant patterns, and construct a framework for communicating the essence of what the data reveal" (Patton, 1990:371). The problem is that there are no absolute rules or guidelines on how to analyze qualitative data, and hence, data analysis is the least structured phase of qualitative research (Eisenhardt, 1989; Miles & Huberman, 1984). Because qualitative analysts don't use statistical tests to tell when a pattern is significant, they must rely on their judgment, experience, and insight.

This research used inductive analysis to identify patterns from the data. As mentioned earlier, inductive analysis means that patterns emerge from the data rather than being imposed on them prior to data collection and analysis (Eisenhardt, 1989; Patton, 1990). In the research methodology (Figure 4.1), there is not a clear distinction for when data collection ends and data analysis begins; instead they overlap with one another. This overlap speeds analysis and reveals helpful adjustments to data collection for subsequent case studies (Eisenhardt, 1989).

Data Analysis contains two major steps - Within Case Analysis and Cross Case Analysis. Within Case Analysis entails becoming intimately familiar with each case individually and documenting each thoroughly. In Cross Case Analysis, the researcher looks for similarities and differences across cases. Findings from Within Case Analysis which are corroborated in Cross Case Analysis are strengthened.

4.2.4.1. Within Case Analysis

Within-site analysis involves organizing the data by specific cases for in-depth study (Patton, 1990: 384) and is necessary to reduce the staggering volume of data (Eisenhardt, 1989). Within-case analysis involved detailed write-ups (what I call case descriptions) for each case which are purely descriptive. The purpose of constructing these case descriptions is to become intimately familiar with each case (Eisenhardt, 1989). To construct case studies, I followed several steps, modified from Patton (1990: 388):

1. Assemble the raw case data: interview transcripts, typed notes from observations, organizational documentation, artifacts, and other published articles about the case if there are any.
2. Code all notes, transcripts, documentation and enter coded data into one file.
3. Edit data: condense file by sorting out redundancies and organizing topically for ready access.
4. Write a case description: a readable descriptive picture of the case making accessible to the reader all the information necessary to understand the case; the case study is presented topically (an alternative is to present it chronologically) and presents a holistic portrayal of the case.
5. Build data displays for single-site data; these data displays are integrated into the case descriptions.

The first step, assembling all the raw case data, is the step in which the case study data base mentioned earlier is compiled. I gathered all the case data and organized it into files for each of the five organizations. Each case file has folders within it: correspondence, site visit, organizational documentation, and data analysis folders. Letters and notes from phone conversations are kept in the correspondence folder. Interview transcripts, my handwritten notes and observations from the site visit, copies of the typed notes, the tailored list of questions for that site, an agenda for the visit if there was one, and any artifacts I collected during the site visit are kept in the site visit folder. Any organizational documentation is kept in a separate folder. This folder might contain organizational brochures, marketing information, organization charts, and any published articles about the organization. The data analysis folder contains the edited condensed file, drafts of the case description, and data displays.

Once the case data was assembled, I coded field notes, transcripts from interviews, and relevant organizational documentation to deal with the potential overload of words. A code is an "abbreviation or symbol applied to a segment of words - most often a sentence or paragraph of transcribed field notes - in order to classify the words" (Miles & Huberman, 1984: 56). Codes usually derive from the conceptual framework, research questions, key concepts or important themes, and they allow the researcher to "spot quickly, pull out, then cluster all the segments relating to the particular question, hypothesis, concept, or theme" (Miles & Huberman, 1984: 56). The code list used for this research is shown in Appendix D. An initial code list was presented in the thesis proposal and was refined for use. I coded each piece of data as I read over it, writing the codes in the margins. Next, key phrases and words from the coded information on each piece of case data was entered into one computer file. When data was entered, the source of data (e.g., interview with Mr. John Smith, article written by Jane Doe) was also recorded in the file. The computer file was organized in the same format as the code list and the case descriptions (see Appendix D for code list and Appendix E for format for case descriptions). This method of organizing the data file made writing the case description easier.

The third step was to eliminate redundant data in the file. Data that was entered more than once because it was present in more than one source was eliminated. The resulting file was a condensed version of all the raw case data. The first version of the file with all the data entered was kept to maintain a chain of evidence.

The fourth step was to write the case description. The condensed data files from the third step became the foundation for the case descriptions. The case description was organized topically (as opposed to chronologically). There are four major sections in each case description: an overview, background on the organization, self-managing teams, and a summary. The overview gives a macro view of what the case is about and what the description was based on. Background information on the organization is in the second section. This section includes such things as the history of the organization, customers, competitors, the external environment, the culture, the organization structure, and organizational communications. The third section contains information about the self-managing teams in the organization. It includes sub-sections not just on the information system to support the teams, but the pay for skills system (if there is one), the team structure, team leadership, training received, team decisions and responsibilities, and problems experienced with teams, to name a few. The summary wraps up the case description and includes future directions for self-managing teams in the organization. Each case description follows the same standard format (in Appendix E). The full case descriptions are presented in Appendix G.

Displays are developed in the fifth step. A data display is a format that systematically portrays data about the case. For this research, displays were constructed for the information system supporting self-managing teams. I believed there was sufficient level of detail in the case descriptions about other aspects of the organization that displays were not necessary for these areas. Two displays were developed for each case, one for the information teams receive as inputs, and one for the information teams provide to other groups and individuals. An example of the display is shown in Table 4.6 (both types are combined in the table). The displays for each case were integrated in the case descriptions.

This process for Within-Case Analysis was significantly streamlined as I gained experience in developing the case descriptions. For example, in later cases, I did not code all case data, but instead entered the data directly into the computer as I read over the data. Additionally, rather than enter redundant data (all data is entered in step 2) and then later eliminate redundant data (in step 3), I did not enter a piece of data I came across if it was already in the file. I am still able to back track to the original data from the case description (because I still have all the original data in the case study files), but would be more difficult.

4.2.4.2. Cross Case Analysis

Once the case descriptions for each of the sites were completed (this includes the case study description as well as the displays for each site), the search for cross-case patterns could begin. In reality, Cross Case Analysis overlaps Within Case Analysis and patterns began to emerge before the case descriptions were completed. Searching for patterns across cases forces the researcher to go beyond initial impressions and look at the data in divergent ways (Eisenhardt, 1989). Studying the data in different ways enabled me to decrease the potential for errors and bias in information processing. Patterns in qualitative data can be represented as dimensions, categories, classification schemes, and themes (Patton, 1990: 411).

Table 4.6. Example of Display for Information to Support Self-Managing Teams

Information Inputs to Team	How Information is Provided	Frequency	Provider of Information
Information Output by Team	**How Information is Provided**	**Frequency**	**Customer of Information**

Eisenhardt (1989) identifies a tactic I used to facilitate the search for cross-case patterns. I used the research questions as categories to look for within-case similarities and between-case differences. In other words, I looked at the following categories individually across all five cases: the type of information shared, how it is shared, how often, and the provider/customer of the information.

As in Within Case Analysis, data displays were useful in Cross Case Analysis to facilitate the search for patterns across cases. The primary purpose of displays is to describe, based on analysis of the patterns that appear in the data. I used an Unordered Meta-Matrix, which is a master chart assembling descriptive data from each of several sites in a standard format (Miles & Huberman, 1984: 152). The simplest form is a juxtaposition of all the single-site summarizing charts. For this research, the Unordered Meta-Matrices contained data on the type of information shared with teams for all five cases in one display. This juxtaposition of data began to illuminate similarities and differences. Data was then further reduced by partitioning and clustering. These data displays for Cross Case Analysis are shown in Appendix H.

One lesson I have learned about Data Analysis and tools in Data Analysis, is that it is very difficult if not impossible, to specify what tools (types of data displays) will be used in Data Analysis before any data is collected. In this thesis proposal, I identified several Data Analysis tools (data displays) I believed would be appropriate for this research. However, specifying so much before hand was in reality over-complicating things before I even had any data. I actually used fewer different types of displays for analysis, because the topic of the research is quite specific. I found that I did not need to use many different types of displays to analyze the data. Using more than what I did would have complicated the analysis process more than necessary.

4.2.5. Conclusions and Interpretations

Interpretation involves going beyond the descriptive data. It is "attaching significance to what was found, offering explanations, drawing conclusions, extrapolating lessons, making inferences, building linkages, attaching meanings, imposing order, and dealing with rival explanations, disconfirming cases, and data irregularities as part of testing the viability of an interpretation" (Patton, 1990: 423). Schlechty and Nbolit (1982) identify three forms of interpretation:

- making the obvious obvious (confirm what is already known that is supported by data);
- making the obvious dubious (resolve misconceptions); and
- making the hidden obvious (illuminate important things that aren't known but should be)

In this research, interpretation is of the third type, since there is very little documented formal knowledge of the issues being studied.

Interpretation doesn't yield the same type of knowledge as quantitative analysis and explanation. In qualitative analysis, the emphasis is on illumination, understanding, and extrapolation rather than causal determination, prediction, and generalization. Interpretation may result in speculation and hypothesizing, which is alright as long as it is clearly identified as such (Patton, 1990: 422). Someone "who has studied the case, lived with the data from the field, and reflected at length about the patterns and themes that run through the data is in as good a position as anyone else to speculate, interpret and hypothesize, and make conjectures about significance" (Patton, 1990: 422-3).

The final product of case study research (the theory-building that Eisenhardt calls the "emergent frame") may be "concepts, a conceptual framework, hypotheses, or propositions or possibly mid-range theory; or it may be disappointing - it may replicate prior theory, or there may be not clear patterns within the data" (Eisenhardt, 1989, p. 545).

4.2.5.1. Shaping the Emergent Frame

For this research, the search for patterns in within-site analyses and cross-site analyses resulted in a list of "design features" for information systems to support self-managing teams. Based on the data from the five case studies, I developed a list of common characteristics of the information teams receive and provide to other groups or individuals. These design features are what has worked well for the set of organizations studied. The design features not only include types of information shared, but also how it is shared and how often.

4.2.5.2. Compare to Enfolding Literature

I compared the emergent frame to relevant literature in this field. Although there are little to no studies on this specific topic, comparisons can still be made. I considered a broad range of literature, for example, research on information shared with employees (not necessarily in self-managing teams), and action research on information system design and development. I have been involved in action research at the VPC in designing, developing, and implementing performance measurement systems (a form of information system) for the VPC and client organizations. I compared my knowledge and experience in this area to the emergent results (the design features) from my research.

Examining a broad range of literature increases the validity of the findings. The purpose of the comparison is to ask what the research results are similar to and what they contradict. Literature with similar findings strengthen the research findings and "tie together underlying similarities in phenomena normally not associated with each other"

(Eisenhardt, 1989: 544). Contrasting literature gives an opportunity to probe deeper into the research findings to explain why the differences exist.

4.2.6. Composing Thesis Report

Composing the thesis report is a research activity which encompassed a significant portion of the time interval of the entire research process. I have attempted to document the research as I conducted it so as not to "cram" all the writing at the end of the process. This decreased the likelihood that certain events were forgotten, and increased accuracy of the documentation. Much of the writing for the thesis report (approximately half) was completed before the proposal defense. The bulk of the two chapters reviewing of the body of knowledge (Chapters 2 and 3) and research methodology (chapter 4) chapters were complete prior to the proposal defense. Writing the case descriptions was done as I conducted the case studies and the site visits. For example, the case descriptions for the earlier cases were complete before I went on the site visit for the last case.

CHAPTER 5 RESULTS

This chapter presents the data I collected in a summarized and organized format from the five case sites. Detailed case descriptions (in Appendix G) describe each organization comprehensively, not just the information system supporting self-managing teams, but also the background of the organization (history, organization structure, culture, external environment, performance of the organization, etc.) and other details about the team environment (team structure, role of the supervisor, the pay for skills system, training received, problems experienced with teams, etc.). The sections in this chapter are similar to the sub-sections on Information System to Support Self-Managing Teams from the case descriptions. This information is shown here, and repeated again in the case descriptions. It is included here because this information represents the results of this research. It is also included again in the case descriptions in Appendix G so that the descriptions are comprehensive stand-alone documents.

This chapter contains one section for each case. Each section has sub-sections for: a brief overview of each case (not much detail is presented here because sufficient detail is contained on each case in Appendix G), the information system supporting self-managing teams; and a summary of what was learned from the case. These summaries include lessons learned not only about the information teams need and provide to others, but also about self-managing teams in general. Although the focus of the research is on the information system to support teams, I learned some very useful things about self-managing teams in general at each case site. The lessons learned about the information system were used to develop conclusions and interpretations (in the next chapter).

Table 5.1 contains information from each of the case study sites, such as type of industry, location, and the size of the workforce involved in self-managing teams. This information from Table 5.1 was presented in Chapter 4, but is included here again to refresh the reader's memory on some of the specifics of each case.

5.1. Corning Blacksburg Plant

5.1.1. Overview of Corning Blacksburg Plant

After being closed for four years, the Corning Blacksburg plant re-opened as a 'new design plant' using teams of production employees who manage themselves without first-line supervision. The plant began hiring employees in the fall of 1988 and shipped its first product in early 1989. Since re-opening, the plant has expanded from one production line to two lines of four shift crew teams each and from only a handful of production employees (called 'operations associates') to over 150. According to plant leadership, the plant is viewed as a success story within Corning corporation. Although one of the smallest Corning plants, it is one of the most profitable. Team members at the Blacksburg plant are members of the American Flint Glass Workers Union.

The plant supplies ceramic components for catalytic converters to car manufacturers, and its two biggest customers are Honda and Toyota. In fact, Corning was the first American company to supply parts for the Honda Accord. The plant's competition includes no American companies, only Japanese competitors. The Blacksburg plant, along with two sister plants in New York and West Germany, produce about 30 million units per year. The Blacksburg plant specializes in tough complex products with low volume and quick turnaround time. The plant has a smaller

Table 5.1. Case Study Site Information

Constructs	*Corning Blacksburg plant*	*Shenandoah Life*	*Tennessee Eastman Company*	*Virginia Fibre Corporation*	*Boeing Corinth plant*
Type of industry:					
• Service		√			
• Manufacturing	√		√	√	√
Scope of use of self-managing teams:					
• Redesign		√	√	√	
• New design	√				√
Union presence:					
• Union	√				√
• Non-union		√	√	√	
Size of team workforce vs. size of overall organization	150/150	22/200 (one department of four teams)	535/13,000 across three divisions; research focus is on one dept. of 250 people	8/270 (two teams in one department)	200/200
Age of teams being studied	2 years	6 years	> 1 year	> 1 year	2 - 3 years
Specific industry	Ceramic automotive components	Mutual life insurance	Chemicals, plastics, fibers	Paper mill	Electronics assembly
Location	Blacksburg, Virginia	Roanoke, Virginia	Kingsport, Tennessee	Amherst, Virginia	Corinth, Texas

capacity, smaller equipment, slower line speed, a much lower number of processes, quicker job changeover, and fewer job classifications than its sister plants.

There are eight shift teams in the plant, four on each production line. Each team has five coordinator roles which are rotated among team members: scheduler, production, site maintenance/safety, quality, and training. There is a line leader for each of the two lines, so each line leader has responsibility for four shift teams. An assistant line leader helps with administrative duties. Teams meet twice daily, at the beginning of their shift to meet with the off-going team, and at the end of the shift to meet with the on-coming team. Team members are on a pay for skills compensation system and are paid an additional amount for each new skill they learn. Teams rely on peer evaluation for feedback and development, and to decide when another team member has mastered a skill sufficiently to be paid for it.

A significant number of people within Corning have visited the plant to learn how the teams operate and what they are capable of. Based on the success of the plant, Corning plans to retrofit many of its existing manufacturing plants.

5.1.2. Information System to Support Corning Self-Managing Teams

5.1.2.1. Information Teams Receive

Tables 5.2 summarizes what information teams receive, how the information is provided, how often, and the provider of the information. The specific types of information teams receive are:

- Performance of the team
- Team production information
- Team issues
- Technical product/process information

- Performance of other teams
- Performance of plant
- Plant-wide issues
- Performance of Corning corporation
- Corning corporate issues

The pre and post shift exchange meetings are a major source of information for teams. This is the mechanism for a team to get information from the off-going shift team on *production information* - problems experienced, production changes, equipment problems, and any other related information. The off-going shift team also reviews their own *team performance* as compared to the goals they set for the shift. The on-coming shift team sets production goals for the shift based on production information (how many units are needed) from the off-going team. Therefore, the pre and post shift exchange meetings are a source of information for reviewing *performance of the team, team production information, team issues, and performance of other teams*. All information about team performance for the shift and other production information are recorded on a standard report format several pages long, which is kept in a binder in the team meeting room. Each line has its own team meeting room, so this binder is the place where all relevant production information for the line is stored.

A bi-weekly "town meeting" is another source for information on team issues. The purpose of the town meeting is to bring together teams to talk about issues that are somewhat more longer term than day to day issues discussed at the pre and post shift exchange meeting.

Table 5.2. Information Inputs Provided to Corning Blacksburg Self-Managing Teams

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Feedback on team performance (performance measures are: select, pieces handled per hour, parts loaded and unloaded)	Pre and post shift exchange meetings; information is posted on whiteboards, bulletin boards, Remarkable boards; a standard report format is used to record daily performance information and is kept in the team meeting room; teams can also pull up information on the computer system	Performance information posted on the shop floor on bulletin boards is updated every 2-3 hours; daily performance is reviewed at meeting	Team (team measures own performance)
Team production information (production goals, equipment problems, production changes)	Pre and post shift exchange meetings; at shift exchange meeting, the on-coming team sets production goals for the shift with the help of off-going team; goals are posted on whiteboards and bulletin boards on the shop floor; review any problems, changes, etc.	Daily	Team (team generates own goals)
Team Issues (concerns, activities, action items, changes, interpersonal problems or activities, etc.)	Teams exchange information on problems, concerns, and other related daily team activities at the pre and post shift exchange meetings	Daily	Other teams
	Biweekly town meeting for shift teams that work together to discuss issues which need to be communicated to other teams; held in team meeting room	Every two weeks two shift teams meet	Other teams, leadership, engineering

Table 5.2. Information Inputs Provided to Corning Blacksburg Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Technical Product/Process Information	PDC - process documentation - system; technical information about changes to products or processes is posted on bulletin boards and communicated to all teams	As needed	Engineering, other teams
Performance of Other Teams	Teams learn about how other teams performed at the pre and post shift exchange meetings when the off-going team reviews its performance	Daily - review performance of other shift team	Teams
Performance of Blacksburg Plant (state of the plant, plant-wide goals, performance to goals, profitability of plant)	Plant review meetings conducted by plant leadership; several meetings are held to cover all operations associates; review the performance against goals	Monthly	Leadership
	Biannual manufacturing review	Two times per year	Corporate (division senior vice-president of manufacturing)
	Plant newsletter	Bi-monthly	Newsletter team and leadership
	Quarterly Vision Review team meeting	Quarterly	Team of leadership and OAs

Table 5.2. Information Inputs Provided to Corning Blacksburg Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Company Issues (activities, changes, problems, social/QWL issues, etc.)	Plant review meetings; discuss issues and activities affecting all teams	Monthly	Leadership
	Plant newsletter includes information on plant activities, social events, updates, etc.	Bi-monthly	Newsletter team and leadership
	Quarterly Vision Review team meeting	Quarterly	Team of leadership and OAs
	Social QIT addresses social/QWL issues and posts relevant information on bulletin boards	As needed	Social QIT team
Performance of Corning Corporation	Plant review meetings	Quarterly (receive corporate financial results quarterly)	Corning Corporation
Corporate Issues (problems, activities, concerns, etc.)	Corning Live Videotape	Monthly	Corning Corporation

Technical information about changes to the processes or products is provided to teams through a process documentation control (PDC) system. This information is posted on

bulletin boards and communicated to all teams so operations associates know what changes engineering has made.

Monthly plant review meetings are held to share information on the *performance of the plant, plant-wide issues, performance of the Corning corporation, and corporate issues*. Several review meetings are held so as to cover all shifts. The meetings are usually conducted by plant leadership, either the plant manager or the Employee Relations Manager. Plant leadership reviews the performance of the plant as compared to the goals. This information is also important because the plant is on a goal sharing system in which bonuses are tied to whether or not the plant meets its goals on process loss, customer service, cost per cubic inch, and outgoing quality (parts per million defective). Goals for the plant for the upcoming period are also reviewed at the meetings. Any other issues pertaining to the plant as a whole are discussed at the meeting. These meetings are a source of information at the corporate level as well. Corporate performance and issues are reviewed when results come out.

Other sources of information for plant performance and plant-wide issues are the newsletter published for the Blacksburg plant, results from a Quarterly Vision Review Team made up of leadership and operations associates, and results from a social quality improvement team (QIT) which addresses social and quality of work life issues, such as absenteeism policy.

5.1.2.2. Information Teams Provide

Table 5.3 summarizes the information teams provide to other groups or individuals in the plant. There are five types of information outputs:

- General information about the team
- Performance of the team
- Team issues
- Plant activities and issues
- Requests for approval

Teams provide *general information about the team* environment to external visitors (external to the plant, internal to Corning) on Visitors' Day, held about once a month. Operations associates are responsible for giving tours of the shop floor to visitors and answering questions about their jobs and the team environment.

Information about the *performance of the team* is exchanged at the pre and post shift exchange meetings. As mentioned in the previous section, the off-going team reviews their performance against the production goals for that shift, so they are providing information to the on-coming team about their performance. The off-going team also passes along information to the on-coming team on production problems, changes, equipment problems, etc. (*team issues*) at the meetings.

Recently, operations associates have had the opportunity to make presentations on the *plant activities and issues* pertaining to the team environment for one of the Biannual Review meetings conducted by the Corning senior vice president of manufacturing. Many of the presentations on projects were made by operations associates, including one on the newly created social QIT.

Teams *request approval* for making changes to improve the process through the PDC experiment plan. If an operations associate wants to make a process

Table 5.3. Information Outputs Provided by Corning Blacksburg Self-Managing Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
General Information About Team	Visitors' Day; group question and answer session with operations associates	Once a month	Internal Corning visitors
Performance of Team	Team performance is reviewed at pre and post shift exchange meeting; leadership sometimes attends meetings	Meetings are held daily; leadership sometimes attends meetings	Other teams and leadership
Team Issues (problems, concerns, activities)	Pre and post shift exchange meeting; leadership sometimes attends meetings	Daily	Other teams and leadership
	Coffee klatch	Periodically	Leadership
Plant Issues and Activities	Biannual Review meeting conducted by senior VP of manufacturing and staff; many presentations in meeting to be made by operations associates	Twice a year	Corning corporation (division senior VP of manufacturing)
Requests for approval to make process improvements	PDC experiment plan	As needed	Leadership, technology manager, engineering

improvement, they fill out an experiment plan which must be approved by engineering and the technology manager. The reason for requiring approval is so that something won't be tried that was perhaps tried several years before and known to have failed, or to prevent a costly mistake.

5.1.2.3. Influence Over Information Received

Operations associates have influence over the information they receive in several ways. First, they can access any information that the plant manager has access to, through the computer system containing all the production figures for the plant. Secondly, plant leadership shares all numbers with everyone during the monthly plant review meetings. There are no production or financial figures that are hidden from employees or the union.

5.1.3. Summary of What Was Learned From Corning

The purpose of this summary is to highlight things I believed were particularly important or interesting from the Corning Blacksburg case. The "gems of wisdom" I learned from this case are:

- The mechanisms for sharing information which appear most frequently are the pre/post shift exchange meetings held two times per day and the monthly plant review meetings. These two appear to be the most important sources of information for teams, judging by the amount of information gained at these meetings and the importance of the information received at these meetings.
- A binder is used to store all production information for each line and is kept in the team meeting room. Using a standard report format for each shift and storing in a

binder makes the information readily accessible to anyone who needs to look up the information for the previous day's production, or the previous month's.

- The plant is filled with "communication tools" to facilitate communication among teams and between teams and leadership. Communication tools which appear frequently are flipcharts, whiteboards, 'Remarkable' boards, and bulletin boards
- Critical information, such as the performance of the teams is updated constantly, about every few hours. This information is important for teams to have very frequently so they can make mid-shift adjustments if necessary. Other types of information, such as the performance of the plant, are less important to the team's day-to-day activities and hence, are shared relatively less frequently, i.e., monthly.
- The nature of communications throughout the plant is very open. Anyone can access any information on the computer. There are no hidden figures and no "two sets of books." This commitment to the open exchange of information is an important element in building trust between leadership and operations associates.
- There is a great deal of informal communication. While formal meetings are structured to exchange information, such as the pre and post shift exchange meetings, there is also a lot of informal face to face communication to supplement information received in other mediums.
- The physical layout of the plant makes informal communication easy. When the plant was re-opened, large control panels were moved so that teams working on the two separate lines could see each other and hence, easily communicate. According to the plant manager, the ability to simply see the other team was viewed as very important to facilitate communication among teams.
- One of the responsibilities of teams is to spend time with visitors from other parts of the Corning corporation telling them about the team environment Operations

associates usually give the tour of the shop floor and then answer questions from visitors.

5.2. Shenandoah Life Insurance Company

5.2.1. Overview of Shenandoah Life

Shenandoah Life Insurance Company is a mutual life insurance firm which employs 220 people in its home office in Roanoke, Virginia. Shenandoah Life has been using self-managing teams in their Individual Insurance Services (IIS) Department (one of six departments) for over six years. An experimental self-managing team was formed in 1983, and the remaining employees in the department were formed into four self-managing customer service teams in late 1984. Results show that teams have successfully improved their work volume, productivity, and quality of service to customers over the six years.

Twenty-two employees are organized into four customer service teams in the IIS Department. The previous supervisors, along with the Assistant Vice President of the department, Jack Cochran, were organized into an Advisory Team, called Directors of Customer Service. The Advisory Team serves as a resource to the teams, providing guidance and expertise and acquiring necessary resources for the teams. The mission of the Team is to serve as a role model for the customer service teams and help them become self-managing. Teams have been on a pay for skills compensation system since they were formed, but have recently been taken off that system so that all Shenandoah Life employees are on the same compensation system. There are no formal coordinator roles on teams, but there is a rotating "team rep," who represents their team at weekly Team Rep meetings with managers and other team reps.

The company has had over 30 articles or papers written about their experiences with self-managing teams. Based on what has been published about Shenandoah Life, which includes tangible results, over 35 companies have come to visit to talk with managers and team members about the use of teams. Shenandoah Life is one of the pioneer companies in the service sector experimenting with self-managing teams; most applications of teams are in manufacturing organizations. Many visiting organizations are service companies, in particular, insurance firms.

Largely due to the successes experienced with self-managing teams, Shenandoah Life was the recipient of the Senate Productivity Award for Virginia in 1988. The company is considering applying for the Award for Continuing Excellence when eligible based on its continued success with the teams.

5.2.2. Information System to Support Shenandoah Life Customer Service Teams

5.2.2.1. Information Teams Receive

Table 5.4 summarizes the information provided to the customer service teams: the type of information, how it's provided, how often, and the provider of the information. The types of information provided to customer service teams are:

- Feedback on team performance
- Skill level of team members
- Team issues
- Technical product/process information
- External customer feedback
- Performance of other teams
- IIS Department performance
- IIS Department goals
- IIS Department issues
- Performance of company

- Company goals
- Company issues

Teams receive *feedback on team performance* on a weekly basis on an "IIS Team Production Summary" which is distributed to all teams. The Production Summary contains each team's work volume (number of transactions per team) and the average transaction per person for each team. The teams provide the data on their work volume to Jack Cochran, and he compiles the summary on a weekly basis. Teams receive feedback once a year on several other performance measures: accuracy of transactions and average processing time. Twenty-five transactions are selected every week (a total of 1300 per year) for an internal audit on accuracy. Managers randomly select the transactions and give them to team members who are fully trained on the skills needed to process the transaction selected (but not the team member who initially performed the transaction). The resulting accuracy of the transactions and the average time it took to process a transaction are calculated at the end of the year and shared with teams.

A Skills Analysis matrix is updated twice a year and distributed to team members so every person knows the *skill levels of other team members* and which team members are one hundred percent trained on which skills. The matrix lists every skill for the teams' tasks down the rows and all team members names are entered across the columns. For each team member, those skills which s/he is fully trained is indicated on the matrix.

The Team Rep meeting held every week is attended by the four team reps, managers, and Jack Cochran. The purpose of the meetings are for the four teams to exchange information on *team issues* through their team reps. Another purpose of the meetings is for managers to provide information to teams and for teams to provide information to management. The team issues exchanged are any problems one team

Table 5.4. Information Inputs Provided to Shenandoah Life Customer Service Teams

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Feedback on team performance	Form called "IIS Team Production Summary" is distributed to all teams, with feedback on work volume (no. transactions per team) and average transaction per person on each team	Summary is compiled weekly, monthly, quarterly, semi-annually, and annually	Teams provide data to Cochran (management) who then compiles summary
	25 transactions are selected weekly (1300 per year) for internal audit to check accuracy; managers randomly select transactions and give them to people who are 100% skilled in processing those transactions to check accuracy; results (accuracy and average processing time) are compiled and distributed to teams	Transactions are selected weekly, and results on average processing time are calculated once a year, at the end of the year	Management and internal auditors
Team Production Information	Informal communication among team members, between teams, and between teams and managers as necessary	As necessary	Other teams, managers
	Team Rep meetings (attended by team reps, managers, and Cochran) get information on action items, changes, etc.	Weekly, every Tuesday	Managers, Cochran, and other team reps

Table 5.4. Information Inputs Provided to Shenandoah Life Customer Service Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Skill Level of Team Members	Skills Analysis matrix is distributed to teams after each skills analysis update; each skill is across the top and each person who is 100% in a skills is marked as such in the matrix.	Updated twice a year	Cochran compiles and distributes data
Team Issues	Team Rep meeting - information on problems, concerns, activities, etc.	Weekly	Managers, Cochran, and other team reps
	Informal communication among team members	As necessary	Other teams, managers
Technical Product/Process Information	At Team Rep meetings team members get information on new products coming in, technical assistance in resolving problems, etc.	Information is provided as necessary at weekly meetings	Cochran, managers
	Presentation/discussion with teams to give product overview on new products	As necessary when new products are developed	Actuaries in marketing department
	Informally; one on one communication to solve problems	As necessary	Managers, other team members, other teams
External Customer Feedback	Customer survey asks agents to evaluate accuracy, timeliness, courtesy, and overall service provided by teams; Cochran compiles, distributes, and discusses results with each team	Once a year (from 1986 to 1990, excluding 1989)	Agents fill out survey and Cochran summarizes data for all four teams overall and also for each team

Table 5.4. Information Inputs Provided to Shenandoah Life Customer Service Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
External Customer Feedback (cont'd)	Written feedback, praise, commendations, from agents are posted on bulletin board in team meeting room	Irregular	Agents
	Team members conducted ten field trips to meet with 5 agents each trip to gain better awareness of agents' problems and issues and how to improve service to agents.	Once a year conduct field trips (first ones were conducted in 1990)	Agents
Performance of Other Teams	IIS Team Production Summary form includes performance for each team so teams know how their "work volume is stacking up" and they know "whether they're high or low among the other teams"	Summary is compiled weekly, monthly, quarterly, semi-annually, and annually	Teams provide data to Cochran who then compiles summary
Department Performance	IIS Department Meeting conducted by Vice President for IIS Department	Quarterly	IIS Department Vice President, Dick Wagner
Department Issues (includes departmental goals, departmental activities, changes, etc.)	IIS Department Meeting	Quarterly	IIS Vice President
Performance of Company	Company-wide Meeting led by President to review company's performance	Quarterly	Company president, Joe Stephenson

Table 5.4. Information Inputs Provided to Shenandoah Life Customer Service Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Performance of Company (cont'd)	Report with comparison of company's performance to "peer" companies selected by Marketing	Irregular; IIS Department doesn't consistently receive information	Cochran passes on information to teams when he receives it from Marketing Department
Company Issues	Company-wide Meeting; issues and activities such as exercise program, attendance bonus program, moving to five day work week, company-wide goals, etc.	Quarterly	Company president

may be having with the computer equipment, any relevant team activities, lessons learned, any interpersonal problems, etc. The meeting is a forum to resolve any issues pertaining to all four teams.

Managers give teams any *technical information* they may need, for example, they inform teams of any new insurance products which will be coming their way in the near future. They also provide assistance on technical problems at these meetings and informally as needed throughout the week. Technical information on new products also comes from the actuaries in the Marketing Department who have developed new products. They usually give presentations on the new product to review anything teams need to know about processing the product.

Another form of feedback teams receive is *external customer feedback*, which comes in several ways. Once a year, the department sends out a customer survey to all the agents in the field who are the teams' customers (both agents in the field and policyholders are customers to the teams). The customer survey solicits feedback on accuracy, timeliness, courtesy, and overall service provided by teams to the agents. The results are summarized for the four teams overall and for each team individually. The teams also periodically receive customer feedback from agents in the form of written praise and commendations which are posted on the bulletin board in the team meeting room. A third way teams receive feedback from agents is through field trips to visit agents and talk with them about how to improve the teams' service. The first field trips were conducted in 1990. Team members went on ten field trips to talk with five agents on each trip about what they could do to improve their service.

Teams receive information about the *performance of other teams* through the Production Summary mentioned earlier. The performance of all four teams is summarized so a team can see how they compare to other teams.

An IIS Department Meeting is held quarterly with all employees in the department (and not just customer service team members). At the meeting, the Vice President of the IIS department reviews *department performance, department goals, and department issues*. Company-wide meetings are also held quarterly and are conducted by the company president. *Company performance, company goals, and company issues* are discussed at these meetings. Examples of company issues are a new exercise program, attendance bonus program, and moving from a four and a half day work week to a five day work week.

5.2.2.2. Information Teams Provide

Table 5.5 summarizes the information teams provide to other groups or individuals in the company, as well as how the information is provided, how often, and to whom. The types of information teams provide as outputs to others in the company are:

- General information about team
- Performance of team
- Team issues
- Requests for assistance
- Requests for approval

When visits are coordinated with external companies, several team reps spend a few hours as part of the visit answering questions and providing other *general information about the team environment* at Shenandoah Life. These visits occur periodically. Teams provide weekly production information about *team performance* to Jack Cochran so he can compile the IIS Team Production Summary.

Prior to the weekly Team Rep meetings, the team reps poll the other members of their team for *team issues* to bring up at the meeting. These issues may be problems the

Table 5.5. Information Outputs Provided by Shenandoah Life Customer Service Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
General Information About Team	Question and answer sessions set up with visiting companies	Irregular	External visitors, from outside companies
Performance of Team	Teams provide weekly production information for compilation	Weekly	Cochran
Team Issues	All team members are polled informally by team rep before Team Rep meeting to bring up any problems, concerns, activities at the meeting	Weekly	Managers, Cochran, other team reps, and hence, other teams
	Team issues or problems are also shared on an informal basis as needed in the work area	As needed	Managers, other teams
Requests for Assistance	Teams ask for assistance with a specific issue or task as needed	As needed	Managers, Cochran
Requests for Approval	Informally request approval from management for equipment, additional training, etc.	As needed	Managers, Cochran
	Informally request approval to deviate from established guidelines in order to respond to unusual request from agent or policyholder	As needed	Managers, Cochran
Suggestions for improvement	Team members informally provide suggested improvements to other teams and managers	As needed	Other teams, managers, Cochran

team is having with a screen on the computer, or with a policy. Or the issue may be something new someone has tried that has worked well, such as a shortcut. Team reps communicate the change to other team members and to management to make sure that no legal procedures are violated. Team issues are also communicated to other teams and to managers informally as needed. For example, if one team member is having a problem with a policy, and they need assistance from a manager or from another team, they don't wait for the Team Rep meeting, but bring it to someone's attention right then.

Teams *request assistance* on technical or interpersonal problems as needed from managers or from Jack Cochran. Sometimes, the team is struggling with a touchy interpersonal problem, such as disciplining one team member, and they need help from a manager to resolve the problem.

Requests for approval are necessary to purchase additional equipment or to receive additional training which was not planned. Teams also request approval to deviate from established procedures in order to respond to an unusual request from an agent or policyholder. Some agents request team members circumvent established procedures to provide better service to a policyholder. These shortcuts may cause problems later. Depending on which agent it is, a team member may grant the request if the agent has been with the company a long time and is reliable.

5.2.2.3 Influence Over Information Received

According to Jack Cochran, teams "can get anything that they want to know." If a team member believed they needed some information they didn't currently have, they would be able to get it, by asking Jack Cochran, a manager, or even upper management. The company has an open door policy, and anyone can get to see Jack

Cochran, the Vice President of the department, or even the company president if they wish. One of the managers' roles is as a "getter of things" which includes information. Although there are always things that fall through the cracks, Cochran believes that teams have all the necessary information to do their jobs.

5.2.3. Summary of What Was Learned From Shenandoah Life

The lessons learned from studying Shenandoah Life's self-managing customer service teams are:

- The importance of informal communication in teams resolving daily issues and problems. When I toured the teams' work area, I observed that each team has their own clearly distinguished work area which are all close together, and each work area is designed such that the team members can easily see each other and communicate. Team members talk to one another informally as the need arises, to other team members, and to managers. The issues may be of a technical or interpersonal nature.
- The physical layout of each team's work area is conducive to informal and face to face communication. The desks are arranged in an open office layout so that they only need to look up from their desk and see other team members. This is important if one person is on the phone with a customer and needs to get the attention of another team member by gesturing to them to help with something.
- One of the expectations and responsibilities of teams (specifically team reps) is to spend time with external visitors telling them about the team environment and answering their questions. Part of the typical agenda for a visit with an outside company is for several team reps to spend an hour or two with visitors.

- Teams do not have daily meetings with just their team, but the team task is such that there are really no decisions that need to be made on a daily basis, as there are in manufacturing sites, for example. Additionally, team members' desks are located right next to each other and they can and do talk one on one or meet informally as a team whenever they need to.
- The weekly Team Rep meetings are a forum for *two way* communication. Important information is communicated to teams (technical information on new products and changes to processes, activities affecting the teams, etc.). This meeting is also an important way for teams to voice concerns and/or problems to managers, keep managers informed on important team issues, and get the necessary resources to resolve issues.
- The role of the manager (previously supervisor) is as a "getter of things," which includes information. Team Rep meetings are the forum for teams to communicate their needs to managers, and managers are there to enable the teams and support them by providing whatever resources (and information) are necessary.
- There are mechanisms in place for teams to receive information about department and company performance, such as quarterly company-wide meetings as well as information being filtered down from weekly company and department meetings to Team Rep meetings
- Teams appear to have the ability to get whatever information they need by asking any manager, including the Vice President of the department or the company president.
- Shenandoah Life had one department on pay for skills for six years while the rest of the organization was on a more traditional compensation system. The new company president decided he wanted to have the entire company on one pay

system, so the pay for skills system for the IIS department was eliminated. Sustaining different pay systems for departments or divisions with self-managing teams may not be possible for a significant length of time. People in other departments begin to feel inequity and resentful of the additional pay team members earn, even though they are required to learn and use more skills.

- The evolution toward self-managing teams took place over a number of years and began with quality circles. These were evolved into the four self-managing customer service teams. This site demonstrated the importance of laying a foundation over a period of years for teams in redesign sites. It doesn't happen overnight.

5.3. Tennessee Eastman Company

5.3.1. Overview of Tennessee Eastman Company

Tennessee Eastman Company (TEC), one of several manufacturing plants in Eastman Chemicals Company (ECC), is located in Kingsport, Tennessee. As part of its overall quality management efforts, TEC has initiated work redesign efforts to move to what they call the New Work System (NWS) in several divisions within the plant. The NWS is based on socio-technical systems theory and the concepts of self-managing teams. Three of the seven manufacturing divisions are in various stages of design or implementation with self-managing teams. It is expected that approximately fifteen percent of the workforce at TEC will be functioning in self-managing teams by the end of 1991.

Redesign efforts with the NWS and self-managing teams have evolved over the years and represent the next phase of TEC's quality management efforts. All improvement efforts at TEC are under the umbrella of quality management, for example, focused problem-solving teams, natural unit teams, and now, the New Work System. Efforts in applying socio-technical systems theory and self-managing team concepts began in late 1987. A team was formed, now called the Integration Team, to investigate and explore concepts in how to evolve TEC's current natural unit teams to the next phase. The first department to begin the transition to the NWS was the Kodel Department in the Textile Fibers Division in late 1988. FT1 Department, in the Filter Products Division was the second department to begin the transition, in early 1990. Several other departments in these two divisions and a department in a third division, Organic Chemicals Division, are in different stages of design and implementation. The focus of this research is on the FT1 Department and what they have done to make the transition to the NWS. I focused on only one department because studying two departments would be like studying two different plants. Each department involved in redesign has a design team that applies STS concepts to their unique department. Therefore, each department is different in how they have set up self-managing teams. I chose to focus on FT1 because it was the second department to begin the transition and was able to learn from Kodel.

The FT1 Department is one of four departments in Filter Products Division, and it provides filter tow to cigarette manufacturers such as RJ Reynolds and Philip Morris. An FT1 Design Team began working on the design of the department in the spring of 1988, and it was approved by the Division Steering Team in the summer of 1989. FT1 began the transition to the NWS (i.e., working as self-managing teams) in February 1990. Teams have been working together for over a year, but are not yet on a pay for applied skills and knowledge system. When a team goes through what is called the "rites of passage" they are eligible to enter pay for skills. Rites of passage are criteria teams must meet before they can enter pay for skills and be considered "fully functioning teams." Rites of passage are: developing team citizenship standards, having all coordinator roles filled and functioning, team members give and receive feedback, the team has performance measures called Key Results Indicators (KRIs), and the pay for applied skills and knowledge plan is approved. No teams yet in FT1 have gone through the rites of passage but it is expected that some soon will.

The FT1 Department is divided into three overall Teams - A, B, and C. Each overall Team has four crew teams to cover seven days a week, twenty-four hours a day. There are three work areas, one for each overall Team. Therefore, there are a total of twelve production crew teams in the department, supported by two day support teams (they work days only), a team of coaches, a department leadership team, and a Policy Advisory Team (PAT) which has representatives from all production teams. Production teams work rotating twelve hour shifts.

Each team is capable of performing any task in the entire department. The three overall Teams were designed to include all the major processing functions in the department, rather than being divided by functional areas. Each team has nine coordinator roles plus a PAT representative: safety, quality, production, maintenance, training, labor, development, environmental, and housekeeping. Coordinator roles are rotating positions and they do not receive additional pay except for the extra time they put in as coordinators. Coordinators come in earlier than the rest of the team to meet with coordinators from the three teams on the off-going shift and coordinators from the other two teams on the on-coming shift. Only the labor, production, and maintenance coordinators attend the first part of what is called the shift hand-off meeting. Coordinators then join their own team for a daily team meeting with their entire team before the shift starts. Therefore, all team members are present at this second part of the shift hand-off meeting.

Teams also meet once a month for issues requiring more time than is available in the daily meetings. These meetings usually last about four hours and are devoted to working on requirements the team must meet, such as developing the team's citizenship standards, one of the criteria for going through the rites of passage. Team coordinators also meet on Standing Teams. There is a Standing Team for each of the types of coordinators (with the exception of production and labor). The purpose of the Standing Teams is to ensure standardization, consistency among all coordinators of one type, continually improve the coordinator role, and communicate any necessary information about lessons learned, new things that have been tried, what works, and what doesn't work. For instance, all the quality coordinators meet about every five weeks on their Standing Team, which has a representative from the department leadership team and from Quality Assurance.

5.3.2. Information System to Support TEC Crew Teams

5.3.2.1. Information Teams Receive

Table 5.6 summarizes the information teams receive. The specific types of information the twelve production teams receive are:

- Feedback on team performance
- Feedback on team production information
- Skill level of team members
- Team issues
- Technical product/process information
- External customer feedback
- Performance of other teams
- FT1 Department performance
- FT1 Department issues
- Performance of Filter Products Division

- Performance of company/plant (TEC) and corporation (ECC)
- Company (TEC) and corporate (ECC) issues

The major and most frequent types of information the twelve production teams receive are *feedback on team performance, feedback on team production information, internal team issues, and the department's performance.* The main source for these four types of information is the daily hand-off meeting, both the first part with just the coordinators from the three off-going and three on-coming shift team, and the second part just with each team. These meetings occur from 6:00 to 6:25 (a.m. or p.m., depending on whether the team is working days or nights). Feedback on the previous shift *teams' performance* is reviewed at the first part of the hand-off meeting with just the coordinators. The measures used are safety (accidents and/or inspections), roll breaks (breaks in the line), specific quality problems, number of bales approved (number of 'good' bales), number of bales held and rejected (number of 'bad' bales), waste in pounds, and number of interruptions in the line. Goals are not set for production measures, such as the numbers of bales produced, because as one team member put it, "everybody knows what their job is...you go out and do your job and hope for the most tow produced." *Department performance* on percent approved (the percentage of bales produced which is approved for shipment) is reviewed at the first part of the hand-off meeting. *Feedback on team performance* is also received at the monthly team meeting. Each coordinator has responsibility for one Key Results Indicator (KRI) and collects data and shares information with their team on their KRI at the monthly team meeting. Each team then, has a set of KRIs. Some KRIs are the same measures reviewed at the daily hand-off meetings, e.g., bales produced and held bales. The only difference is that the KRI is measured for the entire month and then shared at the monthly team meeting. Other KRIs are *only* measured on a monthly basis

Table 5.6. Information Inputs Provided to Tennessee Eastman Crew Teams

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Feedback on team performance: safety (accidents, inspections), roll breaks, specific quality problems, bales held and rejected, waste in pounds, number of interruptions	Production coordinator's notebook contains all team performance information; reviewed at first part of hand-off meeting	Daily, from 6:00 to 6:12	Production, labor, and maintenance coordinators from other teams
	Key Results Indicators for team are reviewed at monthly team meetings	Monthly	Each coordinator collects data and shares information on their KRI(s) for the team
Feedback on team production information: production changes, baler switches, crimper changes, equipment problems, team members unexpectedly out sick	Production coordinator's notebook contains production information; reviewed at first part of hand-off meeting	Daily, from 6:00 to 6:12	Production, labor, and maintenance coordinators from other teams
Skill level of team members	Skill profile - a matrix of team members and team skills which is filled in to show which team members have which skills; portrayed on remarkable boards	Updated as necessary (as team members acquire skills)	Individual team members
Team Issues (problems, concerns, personality conflicts, action items, changes in procedures)	Reviewed when time is available at second part of team hand-off meeting	Daily, from 6:12 to 6:25	Individual team members, other teams, coaches, management
	Reviewed at four hour monthly team meetings	Monthly	Individual team members, other teams, coaches, management

Table 5.6. Information Inputs Provided to Tennessee Eastman Crew Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Technical Product/Process Information - changes to procedures, processes	Standing Team meetings (quality, safety, maintenance, training, development, environmental and housekeeping Standing Teams)	Every five weeks	Other team coordinators, management, division coordinators and representatives
	Policy Advisory Team meetings	PAT meets every five weeks	Management, coaches
	Informally; one on one communication to solve problems	As necessary	Team members, other teams, coaches
External Customer Feedback (problems, complaints, defects)	Customer feedback is filtered to team through the quality coordinator, using PROFS computer system or one on one communication	As needed	External customer provides feedback to department manager
	Customer visits; some team members participate in customer visits to TEC and some go to visit customers	Irregular	External customers (Philip Morris, RJR)
Performance of Other Teams	Team performance is subjectively assessed at first part of hand-off meeting when production coordinators from off-going shift report on the previous shift teams' performance	Daily, from 6:00 to 6:12	Production, labor, and maintenance coordinators from other teams

Table 5.6. Information Inputs Provided to Tennessee Eastman Crew Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
FT1 Department Performance (percent approved)	Percent approved for department is reviewed at hand-off meeting	Daily, from 6:00 to 6:25	Management provides information to production coordinator who shares with other coordinators and their team at the hand-off meeting
FT1 Department Issues (problems, concerns, changes, etc.)	PAT meeting	Every five weeks	Management, coaches, other teams
	Daily Production meetings, review "Hit list" of problems needing to be addressed	Daily at 8:30	Attended by coaches, managers, and production coordinators
	Coordinators receive electronic messages on the PROFS system on any relevant department issues from other coordinators, coaches, management	As needed	Other team coordinators, management, coaches
Performance of Filter Products Division	Meetings with presentation by division head on cost information for division and other financial information	As requested by teams	Division management
	TV monitors	Continuous information is displayed on monitors	Top management

Table 5.6. Information Inputs Provided to Tennessee Eastman Crew Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Performance of Company (TEC) and Corporation (ECC)	TV monitors contain safety information, customer survey information, financial performance, etc. of company	Continuous information is displayed on monitors	Top management
	Company newsletter includes performance information on company	Bi-weekly	Top management
	Coordinators receive messages on PROFS system on safety performance, etc.	As needed	Top management
	Charts and graphs on company performance	Monthly	Top management
Company (TEC) and Corporation (ECC) Issues (procedural changes, activities, social information)	Company newsletter includes information on retirements, company anniversaries, TEC activities, new things going on such as the NWS, financial performance of company	Bi-weekly	Top management
	PAT meetings; company issues which have been filtered down to FT1 department management are communicated to teams through their PAT representative at PAT meetings	Every five weeks	Top management
	TV monitors includes information on TEC and ECC issues	Continuous information is displayed on monitors	Top management

and reviewed at the monthly team meeting, for example, absenteeism and average time to resolve a roll break.

Feedback on team production information (any other general information about how the previous shift went which is not directly related to the team's performance) includes production changes, baler switches, crimper changes, and equipment problems. This production information is needed by the on-coming shift teams so they can make any necessary adjustments in production plans and scheduling the labor (who works where). *Feedback on team performance* and *feedback on team production information* is reviewed from 6:00 to 6:12 and is contained in a production coordinators' notebook which one overall team (Team A, for instance) shares and is simply passed on from one shift to another.

Team issues are also discussed at the hand-off meeting, in the second part from 6:12 to 6:25 if time permits. Team issues include many different types of things: problems, concerns, team activities, personality conflicts, etc. Team issues are reviewed at the daily meeting if there is time. Issues requiring more time for discussion are saved for the monthly team meeting.

Other types of information teams receive about the team or about the department are things like updates on the *team's skill profile* (what team members are trained in what skills), *technical product/process information, external customer feedback, performance of other teams, and department issues*. Much of the information comes directly from coaches or managers informally in one on one communication, particularly the technical product/process information (for example, changes to the process, how to correctly operate a machine, how to schedule people effectively, etc.). Another main source of this kind of information, especially department issues, comes from the Standing Team meetings and the PAT meetings which each occur about every five weeks. There meetings are forums for representatives from each team to share information, lessons learned, things that work well for their team, things that don't work well, common problems, and issues needing to be addressed for the entire department. The coordinators/PAT representative bring necessary information to the Standing Team meetings and PAT meetings, and bring back any appropriate information to their teams.

Teams do not receive quantitative information on how their team performance compares to *performance of other teams*. In other words, charts or graphs are not posted for each team. Comparison between teams is not encouraged; management believes providing information so teams could easily compare themselves to other teams would encourage competition between teams. Instead, teams are encouraged to compare their performance to their own past performance.

Teams also receive external information (external meaning that it pertains to things outside FT1 Department): *division performance, company (TEC) and corporate (ECC) performance, and company/corporate issues*. The main sources for this information is the PROFS computer system (for team coordinators), the TV monitors which display information continuously, and the company newsletter. The PAT meetings are also a source of information from the division, company, and corporation. Information which has been filtered down from top management or from other areas in the company are passed on at the PAT meeting. In traditional organizations, the "rumor mill" is generally a source of information for things going on in the company, changes coming in the company structure, personnel changes, etc. Because management has been so open with sharing information, FT1 team members do not believe the rumor mill in general is a source of accurate information about what's going on in the company.

5.3.2.2. Information Teams Provide

The types of information teams provide to other groups or individuals outside their team (this could mean to other teams inside FT1 or outside the department) are (see Table 5.7):

- General information about the teams and the department
- Team issues
- Requests for assistance on technical, administrative, and personnel problems
- Requests for help from other teams
- Requests for approval

When visitors come into FT1 (whether they are internal or external to FT1), team members give presentations, tours, and/or hold panel discussions to share *general information on the teams and the FT1 Department. Team issues* are provided to other teams, coaches, and managers at the first part of the hand-off meeting with coordinators, and at Standing Team meetings. *Requests for assistance with technical, administrative, and personnel problems* are generally handled informally as help is needed, and the requests go to coaches, managers, and members from other teams. *Requests for help* from other teams for support if someone is out sick or on vacation are handled at the first part of the hand-off meeting. This is when the daily labor plan is finalized for all three on-coming teams, so if one team is short of people, other teams "loan out" some of their team members. If a team has an idea for something new, or a change to a process, they *request approval* to initiate the change at the Standing Team meetings.

Table 5.7. Information Outputs Provided by Tennessee Eastman Crew Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
General Information About Teams and FT1 Department	Presentations, tours, and question and answer panel sessions set up with both internal 'visitors' (other departments) and external visitors (other companies)	On average, about once a month	Other departments in TEC, and external visitors, from outside companies
Team performance	Coordinators exchange information on their team's performance at first part of hand-off meeting; also in production coordinator's notebook	Daily, from 6:00 to 6:12	Coordinators on other teams
Team Issues	First part of hand-off meeting, coordinators bring up any issues from their team as necessary	Daily, from 6:00 to 6:12	Coordinators on other teams
	Coordinators send electronic messages on PROFS to other team coordinators on team issues	As necessary	Coordinators on other teams
	Standing Team Meetings; coordinators bring up any issues from their team as necessary and that are related to that Standing Team	Every five weeks	Coordinators from other teams on Standing Team
Requests for assistance on technical, administrative, and personnel problems	Informally request assistance one on one	As needed	Coaches, managers

Table 5.7. Information Outputs Provided by Tennessee Eastman Crew Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
Requests for help from other teams	At first part of hand-off meeting, coordinators decide to borrow or lend team members to help out other teams in need	Help is provided as needed, but reviewed on a daily basis	Other teams
Requests for approval to try new things	Standing Team meetings; review ideas for changes and develop policy	Every five weeks	Coordinators from other teams on Standing Team
Suggestions for improvement	Teams informally provide suggestions for process improvements	As necessary	Coaches, managers

5.3.2.3. Other Issues Pertaining to the Information System

There are several important elements to the information system supporting the teams in FT1. Having the necessary tools, or materials, such as flipcharts, remarkable boards, and a team meeting room to meet in, having all team coordinators on the PROFS computer system, and TV monitors are important so teams receive the information they need to perform their job. According to several coaches and team members, coordinators can get any kind of financial figures from PROFS and bring back that information to their team. Coordinators can and do send messages to coordinators on other teams. This was not available to teams until relatively recently. The open sharing of information as far as dollars and hard production numbers which were never provided to production employees in the past, is important in building trust between management and employees. According to a team coach, "the information is out there" in the forms of charts and graphs on company performance and "there are no secrets." The next step is to make sure that everybody understands what the charts and graphs say about company performance, which is not true yet. Whenever the teams request it, the Filter Products Division head will come in and give a presentation on the company performance and break down and explain the figures so people clearly understand division performance.

Teams still come up against obstacles in getting the information they want or need. An example illustrates this point. FT1 wanted to install an 800 number on the shop floor so customers could directly contact the teams if there were quality problems or defects. But marketing objected, because they are the "customer contact." This is an example of having support functions which are not yet congruent with, or supportive of, self-managing teams.

One issue FT1 is dealing with now is the redesign of the accounting information system to provide the necessary information to teams. TEC in general is striving for a line of business focus. Each department in each division will be, or is, divided into business units. The goal is to manage each business unit as an autonomous mini-business. To get the focus on those business units, management recognizes that a key ingredient is providing line of business information. In other words, each business unit will need financial information (costs and revenues). The current accounting information system is very old and difficult to change. It is difficult to change the format in which information is provided. There are efforts underway to overhaul the information system. This redesign of the system was needed anyway, but it is spurred by the departments in the NWS, like FT1, which need information in a certain way and can't get it. FT1 needs to have separate business information for not only the department, but for each overall team (i.e., Teams A, B, and C). Each of the three overall teams are mini-business units and will be managed as such. The aim is to have the system provide information (not only on costs but on production numbers and quality level) on a monthly basis and eventually move to providing this information on a daily basis.

Currently, teams in FT1 (and in other departments in the NWS) have the production information (e.g., number of bales produced) they need, but the manufacturing information system had to be changed to give the information the way teams need it. Other NWS departments may have set up "bootleg information systems" as a quick fix to give teams the information they need. According to Ed Reynolds, a member of the Integration Team, one of their lessons learned in implementing the NWS, is that "the information system will lag the requirements of the teams [in the NWS] and need to be driven by teams' needs." But the information system at TEC lags more than is desirable, and hence, "bootleg systems may be started to give teams what they need." TEC is currently working on aligning the information system with teams' needs and integrating all the needs and requirements into one system. However, information system people and accounting people have been "compliant" but are not leading the change. To illustrate the reluctance to change the information system to match NWS needs, information systems people were reluctant to put all team members on the PROFS computer system because they were concerned about a loss of control (e.g., computer viruses and personal use). However, according to Ed Reynolds, if team members really wanted to, they could do those things without even formally being on the system.

5.3.2.4. Influence Over Information Received

If teams find they do not have some information they need, it is generally believed by team members and coaches that they could get it, either through their coordinator from PROFS or from coaches or managers. FT1 department management and coaches filter down any information they have which they think teams need. According to a team coach, teams "have all the information they need...but they don't fully use it yet because this is new to them." Some team members may also be involved in the r design of the information system and may therefore influence the design of the ...m and what information will be provided to teams and how.

5 ...mmary of What Was Learned from Tennessee Eastman Company

... below are the key lessons I learned from studying the FT1 Department at TE(

- Having the necessary tools, or materials, such as flipcharts, remarkable boards, and a team meeting room to meet in, having all team coordinators on the PROFS computer system, and TV monitors are important communication tools so teams can receive the information they need to perform their job.
- The first part of the daily shift hand-off meetings are critical for teams to get the necessary production information from the previous shift's coordinators, such as production changes, equipment problems, quality problems, etc. It is also an important meeting for the coordinators from the on-coming shift to get together and decide if they need to "swap" any team members if people are out sick, on vacation, or in training. Each labor coordinator can then finalize their labor schedule for the day after they find out information from the first part of the hand-off meeting.
- The production coordinator's notebook used to record production information and team performance is important to store the information for easy access.
- The second part of the daily shift hand-off meetings is an important source of information for team members on each team to find out where they are working that day and on what piece of machinery, any quality problems the previous shift had, any equipment problems they need to be aware of, how the previous shift performed, and any other production information.
- The coordinators are an "information focal point" for the teams. They bring back any necessary information to the teams related to their role, and they provide any information related to their role to other groups or individuals in the department. For example, the coordinators can bring up a recurring quality problem at the quality Standing Team. The PAT representative can bring up an issue relating to the design of the NWS at the PAT meeting and have it resolved. This is not to say that team members who are not coordinators do not communicate with other teams

and managers, because they can and do. However, it is the responsibility of the coordinators to bring back to the team any information the team needs and to provide any information to other teams or management on issues for which the team needs action or resources.

- The Standing Teams facilitate communication among all coordinators of one type in the department. At these meetings, coordinators can exchange information about performing their role, in an attempt to solve problems and capture opportunities to improve the role. Consistency in how the roles are performed is an outcome from these Teams.
- Having all the team coordinators on the PROFS computer system enables the teams to communicate with each other across shifts. The next step TEC is exploring is getting all team members on the PROFS system, although the expense would be very great.
- The formal accounting and manufacturing information systems did not provide the information teams need, in the form they needed it. The manufacturing system had to be redesigned to some extent to provide the production information teams need and in the necessary format. For example, teams need to know the number of bales produced the previous shift, the number approved, the number rejected, etc. The accounting information system does not currently provide cost information the way the department needs it. Eventually, the goal is to have business information (costs, revenues, profits) for not only each department, but each overall Team in the department (Teams A, B, and C). These Teams are like mini-businesses within the department and to manage them as a business, teams need business information broken down this way. The accounting information currently can't do this (it is broken down by division, and information for the department can be manually

computed). The system compiles information only on a monthly basis. Eventually, the department would like this information on a daily basis.

- Since TEC is so large, they have a team of internal consultants, the Integration Team, whose mission is to explore and investigate innovative approaches to work redesign and integrate those approaches into what TEC does. Because of TEC's size and complexity, the Integration Team members are really more of "external consultants" to the NWS departments, providing technical expertise on the NWS and some amount of consistency among all the departments involved in the NWS.
- Each department in the NWS has a Design Team which designed how the department would operate in the NWS. This means that each department is somewhat unique in their structure, their pay for skills plan, etc. It is almost as if each department is like a "mini-plant" within TEC. Having a Design Team for each department I believe is important for commitment and buy-in from people in the departments. If an "external" design had been imposed on a department, it probably would have had many problems being accepted because people would not have been involved in the design.
- The pay for applied skills and knowledge seems to be comprehensive and innovative. The design of the plan includes opportunities for team members to learn (and receive pay for) "team support skills," which the team determined would be desirable for at least one team member to have. Team support skills include CPR, word processing, photographer, team narrator, stress management, physical fitness, ergonomics, and an artist.
- The role of the coach will be continually redefined as teams mature and develop. Currently, coaches are an essential part of the NWS and in getting teams fully trained in administrative duties. As teams learn these duties, they will no longer

need this kind of teaching and training. The role of the coach will be to continue to learn new technical and interpersonal skills (such as engineering assistant skills, SPC expert, counseling, etc.) and then transfer those skills to the teams. This definition of the role of the coach ensures that there will always be a need for coaches, however, it will continually evolve so as to keep supporting teams.

- FT1 has a peer evaluation and feedback system where team members give and receive feedback on how they perform on team citizenship standards developed by the team. Each team member must get up in front of the team and present their self-evaluation and receive feedback on it. This process can be very difficult for many people, and it is generally giving the feedback that people find particularly difficult. Team members will also evaluate the department manager in the future.
- This case illustrated the important of laying a foundation of experience with working in teams before the transition to self-managing teams. For several years, all TEC employees had been working as "natural unit teams" where they met regularly to address problems relating to their work area. These teams are similar to quality circles. Other TEC employees not in the NWS are still in the stage of natural unit teams. The experience of working in natural unit teams became the foundation for FT1 to work as self-managing crew teams. Because of their previous experience, all employees had received training in problem-solving, SPC, and team skills training, which included listening, brainstorming, and communication skills (this is similar to what I have called group process training). Without this foundation and experience working in teams, it is doubtful that the transition to the NWS in FT1 (and other departments in the NWS) would have been as smooth.

- TEC has spent a great deal of effort to communicate the link between the NWS and their Quality Management efforts. All continual improvement efforts are considered to be under the umbrella of Quality Management, including the NWS. TEC is even changing the name of the NWS to "Empowerment" so that the link is more easily understood.
- The design and implementation process for the transition to the NWS has proven to be extremely lengthy and costly. This is partly due to the design of the process, and partly to the unexpected length of time required to obtain approval for the design for the departments. The Integration Team has developed an Empowerment Template which identifies the "vital few" criteria other departments will need to meet in order to have a truly empowered workforce. All of these criteria are, or soon will be, present in NWS departments. Some examples of criteria are having a pay for skills system, new roles for all supervisors, shared leadership, and peer feedback. The Integration Team realized that it would not be wise to try to get every department in the plant to use the same approach used by FT1 and other NWS departments. First, the design and implementation process has required so much time and effort, that if the same approach were used in all departments, it would be too big of a drain on TEC resources. Secondly, other areas are evolving their natural unit teams their own way and it may be working well for them. The purpose of the Empowerment Template is to provide a sufficient amount of consistency in what each department aims for in their efforts to develop self-managing teams.
- TEC's culture (paternalistic, resistant to change, job security with no lay-offs) has often hampered the ability to change. Many people are resistant to change the way they do business because they know that even if things get bad and operations are

shut down in their division, the company will find them another job somewhere. According to Ed Reynolds, that might not be true anymore, with the global marketplace and competition the company now faces.

5.4. Virginia Fibre Corporation

5.4.1. Overview of Virginia Fibre Corporation

Virginia Fibre Corporation (VFC), located in central Virginia, is an independent paper mill which manufactures semi-chemical corrugating medium - the wavy, center-ply found between the walls of corrugated boxes. Virginia Fibre began operations in 1975, and from the beginning the company's chairman and its president both wanted VFC to be a different kind of company. They envisioned it as a partnership with employees, and they developed principles of the partnership, which are guiding principles for behaviors of all members of the partnership.

For a little over year, VFC has operated an Old Corrugated Container plant, called the OCC plant, in a small separate building. The OCC plant uses recycled boxes to produce pulp for VFC's papermaking operation. The OCC plant was the first phase of a major mill modernization and expansion program which is being implemented as a result of VFC's strategic planning efforts. Since the OCC plant started up in December 1989, VFC has used what they call self-directed work teams to operate the plant. The OCC plant operates twelve hours a day (one shift) and two teams cover seven days a week. There is one superintendent over the two teams in the OCC plant. Team members were selected using a series of skills tests and trained for their new jobs in the OCC plant from October to December 1990.

Each of the two teams has four members. There are basically four jobs to perform on the team. One is to work nights and perform preventive maintenance, lubrication, unloading bales of recycled boxes from trucks coming in overnight, inventory control, and fire watch. Team members rotate the job of working nights. The other three team members work days and rotate working three different jobs about every three to four hours. The three other team jobs are the control room, working out on the floor and loading bales. If a team member is out sick or on vacation, teams get someone from the VFC "extra board" - a labor pool - to help out, usually loading bales.

5.4.2. Information System to Support VFC Self-Managing Teams

5.4.2.1. Information Teams Receive

Table 5.8 contains details on what information teams receive, how the information is received, how often, and who provides it. The types of information teams receive are:

- Feedback on team performance
- Feedback on team production information
- Team issues
- Technical information
- Internal customer feedback
- VFC issues
- VFC performance

The *feedback on performance* teams receive is subjective in nature and not on a regular basis. The superintendent, Ron Waters, verbally praises them when they have done a good job on something, and other managers in VFC write memos praising the teams' efforts. *Production information* comes from three basic sources. The first is a log book filled out by both teams which they use to record any problems they had with the equipment and what they did to solve it, any changes or new information they need to know from the other team. The information in the log book then, comes from the other team in the OCC plant. Teams can also get production information they need from the computer monitoring the OCC equipment. This computer is not tied into the VFC computer system. From the displays, the person working in the control room can pull up any of the process parameters and adjust them if necessary. The computer also shows a visual display of some of the equipment, so team members can visually check that everything is running as it should. Production information may also come from the VFC computer system. There are almost twenty different screens available on the VFC computer system. Each department tailors their screens to the department's unique information needs. The OCC plant, for example, has screens for entering and storing the quality information on each load of bales that comes in. Teams can also pull up how much material the paper machine (their internal customer) is pulling from them so they can keep up with it.

Whenever the need arises, a team will meet informally in the control room to talk about *team issues* - any problems that have occurred, or concerns about potential problems. These meetings are not formal nor are they held regularly. The day I visited VFC, some of the equipment had some problems, and the entire team stopped production and met together in the control room along with several people from maintenance. They decided to shut down the OCC plant until maintenance could fix the problem.

Whenever the teams need *technical information* to assist with equipment problems, they call on engineering to answer their questions. They call engineering if they have a question or they don't know how to do something. Engineering worked more closely with the teams during start-up because they were still learning how to operate the plant. Teams receive *internal customer feedback* from the paper machine only when there is a

Table 5.8. Information Inputs Provided to Virginia Fibre Self-Directed Teams

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Feedback on team performance	Informal one on one praise/recognition when the team has done a good job	As needed	Supervisor
	Written memos to praise teams when they have performed well to keep the paper machine running	As needed	Other VFC managers, top management
Feedback on team production information (problems from other shift, changes, etc.)	Log book filled out by other team provides any information the team needs	Daily	Other team
	Team members use the computer displays (on the computer for just the OCC plant equipment) to monitor process parameters and make necessary adjustments; they also use the computer for visual checks on some equipment	As needed; can be every few minutes	Computer for the OCC mill (not the VFC computer system)
	Team members can use the VFC computer system to get production information they need, such as how much material the paper machine (internal customer) has "pulled" from them the last hour; incoming bale shipments from rail and truck; safety information on how to dispose of chemicals	As needed; can be as frequently as every hour	People operating paper machine update the VFC computer system on what they pull from the OCC on an hourly basis

Table 5.8. Information Inputs Provided to Virginia Fibre Self-Directed Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Team Issues (problems, concerns, changes in procedures, other new information)	Each team informally meets together as a team as needed in the control room to solve equipment problems, decide who will work where, get relevant information from supervisor, etc.	As needed	Supervisor, other team members
Technical Product/Process Information	Engineering lets teams know if there any changes in operating procedures	Infrequently	Engineering
	Operations Manual is a source of information for operations procedures; each team member has a manual	Manuals are used as needed	Equipment manufacturer
Internal Customer Feedback (problems, complaints, defects)	Teams are notified if there is a problem with the paper machine which they might have caused	As needed	Paper machine process
Performance of Other Team	Subjective assessment of other team's performance through information in log book	Daily	Other team
Company Issues (procedural changes, activities, improvement efforts, concerns, social information)	Supervisor brings back information to teams as needed	As needed	Supervisor
	VFC Newsletter including "human interest stories, new things going on in the mill, purchase of major piece of equipment, a major shutdown"	About every two months	Human Resources (Bill Cooper)

Table 5.8. Information Inputs Provided to Virginia Fibre Self-Directed Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Company Issues (cont'd)	Weekly Operations Report ("major source of information") sent to all departments; employees call it a "newsletter"; includes a report from each department; includes problems in the mill, activities, status of improvement projects, status of engineering and environmental projects, visitors, production forecast for upcoming month, employee relations information, and training scheduled.	Weekly	Each department submits a weekly summary of operations
	Communications Meeting held for all employees; the agenda is: comments from the president, sales/marketing report, financial report, operations report, miscellaneous issues, and questions/concerns.	Semi-annually, in March and September	Top management (President and Vice-Presidents)
	VFC Annual Report; this report is a summary of the annual address; includes information on strategic planning efforts, accomplishments, benefits plan, pay issues	Annually; report usually is published in December	Top management

Table 5.8. Information Inputs Provided to Virginia Fibre Self-Directed Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Performance of VFC (includes other departments and VFC overall)	Daily Operations Report is sent to all departments and posted on all bulletin boards; report includes specific measures for each department, some are common to various departments (such as lost time) and others are unique to some departments (such as machine speed, porosity, and moisture for the paper machine); includes a "safety scoreboard" with accidents, injuries.	Daily	Each department contributes to report by entering information into VFC computer system
	The tons produced the previous day and month-to-date daily average is posted every day on huge bulletin boards for employees to see as they walk into work	Daily	The computer calculates tons produced
	Weekly Operations Report; contains some performance information such as customer complaints, defects, safety report (accidents, injuries)	Weekly	Each department writes a weekly summary of operations
	Communications Meeting	Semi-annually, in March and September	Top management (President and Vice-Presidents)
	VFC Annual Report	Annually; report usually is published in December	Top management

problem. According to Waters, "no news is good news." The bottom line for the OCC plant is to keep the paper machine running.

Teams find out about *company issues* and the *performance of the company* from several sources. First, the superintendent brings back any information he feels is relevant for the teams. A Daily Operations Report contains primarily production performance for the previous day. The Daily Operations Report is compiled from the VFC computer system and distributed to every department every day. In the report, there is about a page on each department, with measures such as lost time, tons per hour (for the paper machine), a safety scoreboard, a sales report (orders received), shipments made to customers, etc. There are also comments for each department, such as "good run." Another source of information on VFC performance is the number of tons produced the previous day being posted where everyone can see it walking in to work in the morning.

A Weekly Operations Report emphasizes company issues more than production performance. Each department writes a weekly summary of operations and activities for the report, so there is a section on each department (usually written by department managers). There is information on activities in the department, status of improvement projects, engineering and environmental projects, training scheduled, etc. A company newsletter put out by Human Resources every other month also contains issues such as human interest stories and other employee relations information.

Semi-annual Communications meetings are a major source of information on the comprehensive performance of the company and any company issues, such as the annual pay raise and benefits information. The typical agenda for these meetings is:

- comments from the president - perception of overall business climate, update on the strategic planning process, and any other relevant topics
- sales/marketing report - VFC's marketplace, strength of customer orders, pricing situation, new and lost opportunities
- financial report - review of financial performance of the company
- operations report - review of the status of operations at VFC and relevant production information
- miscellaneous - announcement of major maintenance shut down for the summer, safety, training, and/or environmental issues
- questions/concerns - management tries to address any questions or concerns employees have

The meetings are a chance for top management to share information with employees and to address any questions or concerns they might have. The September Communications meeting is referred to as an annual address to all employees and provides more detailed information on the financial performance of VFC. The VFC Annual Report is a written version of the information shared at the September annual address.

5.4.2.2. Information Teams Provide

Teams are responsible for providing several types of information to other groups or individuals in VFC (see Table 5.9 for details):

- Team issues
- Team performance
- Requests for information

- Suggestions for improvement
- Requests for approval
- Responses to questions

Any relevant *team issues, production information,* and information on the *team performance* for the shift is passed along in several ways. First, each team enters any production problems they had and what they did, anything that is new or changed, or any other information which the other shift team needs to know in a log book each day. General production information is also entered daily into the VFC computer system, for example, what the process parameters were set at for that shift, quality information, and qualitative information on how the shift went. The OCC mill also submits a weekly report of operations (which includes the type of information just listed in addition to status updates on projects and other general activities). It is usually written by the supervisor. This report becomes part of the Weekly Operations Report distributed to all departments and posted on bulletin boards. The Weekly Operations Report is almost more of a newsletter than just a production report.

Any *requests for information* teams have to assist with technical problems are directed to engineering or maintenance. During start-up, engineering worked closely with the teams to iron out problems, but now there is less need for their technical assistance. They call maintenance when something has broken down or isn't operating as it should. They sometimes help the mechanic(s) fix the equipment and in this way, learn even more. Team members direct any questions for general information to the supervisor, or any other VFC manager. Teams provide *suggestions for improvement* to engineering periodically. Since the mill is still relatively new, teams are constantly coming up with ideas to make things run better. Most of the changes made have been their ideas. For any large purchases for supplies or parts, teams *request approval.*

Table 5.9. Information Outputs Provided by Virginia Fibre Self-Directed Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
Team Issues and production information	Both teams use log book to record any equipment problems, procedure changes, etc.	Daily	Other OCC team
	Each department enters production information, problems, or other relevant information for the shift into the VFC computer system for the Daily Operations Report	Daily	Other areas in VFC
	OCC plant submits a summary (usually written by the supervisor) of activities, problems, production information, etc., for Weekly Operations Report	Weekly	Management; other areas in VFC
	Teams bring issues needing to be resolved to the supervisor	As needed	Supervisor
Team performance	Teams enter information on how the OCC plant performed for the shift into the VFC computer system for the Daily Operations Report	Daily	Other areas in VFC
	Teams enter information on how they performed that shift in the log book for the other team		
	OCC plant submits a summary for the Weekly Operations Report, which includes information on how the OCC plant performed for the week	Weekly	Management; other areas in VFC

Table 5.9. Information Outputs Provided by Virginia Fibre Self-Directed Teams (cont'd)

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
Requests for information	Teams request technical information to answer questions about equipment	As needed	Engineering
	Teams request technical information to help with or fix equipment problems	As needed	Maintenance
	Team members ask supervisor or other managers for information of any type they need (benefits, pay issues, etc.)	As needed	Supervisor; other VFC managers
Suggestions for improvement	Teams provide ideas and suggestions for improvement to engineering; the "majority of changes have come from their ideas"	As ideas are generated	Engineering
Requests for approval for purchases	Beyond a certain point, teams (and the supervisor) need approval for purchases	As needed	Top management
Responses to questions	Other managers often call with questions about OCC plant production and teams answer them	As needed	Other VFC managers
	People from other mills sometimes call with question about operating the plant; every team member is capable of answering the questions	As needed	People in other mills

Depending on how big the purchase is, the request may have to go to top management, instead of just the supervisor.

Responses to questions from other managers in VFC are usually given informally over the phone. The questions may have to do with production on a previous day or month, and the teams try to look up the information and respond to the request as best they can. They also receive questions about the OCC plant from people outside VFC. They call in with questions about how the plant operates, about the recycled materials, etc. Any team member is capable of answering these questions, according to Waters. At many other mills, only one or a few team members might be able to answer them.

5.4.2.3. Influence Over Information Received

If a team member needs some information they don't have, they have several options, all of which will result in getting the information they need. If it is not already published in a report somewhere (Weekly Operations Report or the Annual Report), they can look in the computer system and access anything they want. If it's not in the computer, they can ask their supervisor, or any member of management, including any of the vice presidents or the company president to get their question answered.

5.4.3. Summary of What Was Learned from Virginia Fibre Corporation

I learned the following lessons from studying the self-directed teams at Virginia Fibre:

- VFC has always been very open with information with all production employees, and this has contributed to building trust between management and employees. Team members and the superintendent in the OCC plant believed that management is very open. This environment of shared information also contributed to building a culture conducive to change and improvement, because there is a great deal of trust between all VFC partners. Concern over losing jobs due to improvements in productivity or efficiency just don't exist at VFC.

- There are mechanisms in place for teams (and all VFC employees) to learn about company issues and company performance (i.e., Weekly Operations Report, the Communications meetings, and the VFC Annual Report).
- Teams do not have formal meetings each day, although the supervisor said that was one thing they might need to do. However, if there is anything that needs to be discussed together as a group, they can do so before they begin their shift, in the control room. Team members need to meet informally at least at the beginning of each shift to decide who is going to work where first. The superintendent can also pass along any information at that time. Additionally, any information they need from the other team on how their production run was is written in the log book.
- VFC provides an excellent example of developing an Annual Report for employees. VFC's Annual Report has been continually improved each year and provides a comprehensive, detailed review of VFC total performance for the previous year. It has sections on the market, results from the strategic planning process, financial performance, safety performance, attendance, benefits, training, and charitable contributions. The Annual Report reviews much more than just financial performance, but other dimensions of performance as well.
- VFC provides an example of self-managing teams being successful partly because of the management style of the supervisor. Team members attribute the differences between working in the OCC plant and other parts of VFC mostly to Waters' management style. This issue has been brought up in the literature as a potential

weakness of self-managing teams. Their success may rely too much on the individual style of one or several team supervisors. If the OCC superintendent leaves, a replacement may try to more closely monitor the teams. However, top management has made a commitment to keeping the teams self-directing.

- The culture of VFC has been nurtured for years to embrace change and improvement, and it has characteristics which support self-managing teams - trust, extensive information sharing, and mutual respect.

5.5. Boeing Corinth Plant

5.5.1. Overview of Boeing Corinth Plant

Boeing Aerospace and Electronics - Corinth is a wholly owned subsidiary of the Boeing Company. The Boeing Corinth plant is located in Corinth, Texas and was begun as a new design plant in December 1987. The plant produces electronic assemblies which support other segments of Boeing. The Boeing Company is both a customer and a supplier to the Corinth plant, in that it supplies the designs for the electronic assemblies produced at Corinth. The plant began primarily as a defense production facility and still operates with that primary purpose, however, the plant now produces electronics assemblies for commercial use as well.

There are approximately 400 employees at the plant, who work on a four day, ten hour a day work week. About 250 of the payroll are production employees, called production associates, quality control associates, material associates, electronics technicians, or fabrication technicians. The rest of the employees are classified as support payroll, which includes engineering, technical, administrative, systems, and finance people.

The plant's top management team is called the Strategic Planning Team (SPT) and was formed in the summer of 1987 to design the plant. The structure of the plant is "nested teams," with the Strategic Planning Team composed of the plant manager and six Functional Team Leaders (FTLs). The six functions in the plant are Finance, Materiel, Human Resources, Manufacturing/production, Engineering, and Quality. Each function is divided into areas with Area Team Leaders (ATLs). There are a total of twenty-four areas and ATLs in the plant, two of which are production ATLs. The rest are ATLs for support functions such as engineering, quality, etc.

The two production ATLs each have a manufacturing shop area. One ATL has responsibility for the military work in the plant. The other production ATL has responsibility for the shop which performs all the plant's commercial work. Each of the two production shops is divided into several teams. Approximately 80% of the production personnel are in the commercial shop and 20% are in the military shop. There are approximately sixteen to twenty production associates (PAs) on a team. To assist them in coaching and advising the teams, the ATLs have Area Team Coordinators (ATCs). The ATCs work more closely with the teams and provide one on one coaching and guidance, however, they are *not* supervisors. ATCs are not assigned to any one team but share responsibility for coaching all teams in each shop.

The production teams have responsibility for the administrative functions typically performed by a supervisor. These responsibilities are called "leaderships" (what I call coordinator roles) and team members rotate filling these roles on a yearly basis. The eleven coordinators are: administrative, training, customer relations, safety, methods, materiel/parts supply, scheduler, quality, productivity, planning, and tool and equipment. Some roles require more time than others, for instance, the scheduler. The scheduler acts as the dispatcher and decides how work is moved through the shop.

This is a difficult and important role to perform. None of the leaderships are paid positions. Teams also have back-up coordinators, so that everyone has an opportunity to lead. Teams also have an elected, rotating facilitator who is paid a ten percent pay premium. The role of the facilitator is to lead team meetings, initiate and lead problem-solving, coordinate completion of team action items, and serve as an information source and bring back necessary information to the teams through the meetings or informal communication.

5.5.2. Information to Support Boeing Corinth Self-Managing Teams

5.5.2.1. Information Teams Receive

Table 5.10 summarizes the information teams receive. The specific types of information teams receive are:

- Feedback on team performance
- Team production information
- Team issues
- Technical product/process information
- Internal customer feedback
- Performance of other teams
- Plant-wide issues
- Performance of the plant
- Corporate issues
- Performance of the corporation

Teams receive *feedback on team performance* several ways. At individual team meetings, they review the team's performance for the previous day, or previous week if it is a Monday. It is left up to each team to decide how often they want to have regular team meetings. Some teams meet on a daily basis, while other teams whose work flow and performance is less dynamic, meet once a week, or once every two weeks. Each team has somewhat of a standard agenda for the meeting with reports from the coordinators (schedule, productivity, quality, safety, administrative, and any others as necessary), as well as status of action items, and announcements. The facilitator leads the team meetings and brings up any issues and reports any necessary information for the team. The key measures for each team are quality, schedule, and cost. There are specific sub-measures for each of these three.

The military and commercial shop each have what are called area team stand-up meetings. They are called stand-up meetings because they are held out on the shop floor, "standing up." The commercial shop has meetings every day, while the military shop has meetings twice weekly. The meetings are conducted by the ATL, with report outs as necessary from ATCs, coordinators, and other team members. At the meeting, key measurements (quality, schedule, and cost) are reviewed for the whole area. Measurements are reviewed for the previous day and for the previous week on Mondays. The standard agenda for the stand-up meetings is: announcements, material concerns, summary of measurements, identify actions, and review past actions. The meetings are held first thing in the morning when everyone comes in and usually last about fifteen minutes. This meeting is an important source of information for feedback on how individual teams and the entire area team performed. Each area also has meetings every four to six weeks in the cafeteria to discuss longer-term issues. Part of these meetings is devoted to reviewing team performance.

There are detailed charts and graphs portraying key measurements for each team posted on bulletin boards out on the shop floor. Charts and graphs are posted in very visible places. They have directional indicators on them, such as down is good or up is

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Feedback on Individual Team and Area Team Performance; key measures for team are quality, schedule, and cost	Individual team meetings out on the shop floor or in cafeteria led by team facilitator; each team meeting has somewhat standard agenda with reports from coordinators (schedule, productivity, quality, safety, administrative, and any others as necessary), as well as status of action items, and announcements. Facilitator brings up any issues that need to be addressed and coordinators bring information to team as necessary.	Varies from team to team; anywhere from daily to every other week	Team measures own performance (production and quality coordinators)

Table 5.10 Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Feedback on Team Performance (cont'd)	Area Team stand-up meeting out on the shop floor led by Area Team Leader or Area Team Coordinator; review key measurements (quality, schedule, cost) for previous day and week (on Mondays). The standard agenda for one of the areas (PWA shop) is: Announcements; Material Concerns; Summary of Measurements; Identify actions; Review all key measurements (on Mondays); Review past actions. ATL relays relevant information to teams from the ATL meeting at 8:30. Each Area also has meetings every 4 - 6 weeks in the cafeteria to discuss longer-term performance issues.	One Area has daily meetings and the other has meetings twice a week	ATL, ATC other teams in Area

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Feedback on Team Performance (cont'd)	Charts and graphs posted for each individual team in each area on bulletin boards out on the shop; updated daily by appropriate coordinator: quality (1st pass yield), schedule (output/backlog, behind schedule hours, flow time), and cost (realization rate - labor productivity, scrap, percent of BFL hours - direct labor); bulletin board is "very important...everyone watches it"; all charts have directional indications on them, i.e., up is good or down is good; all charts have goals.	Daily	Teams measure performance and update charts/graphs
	Weekly Performance charts compiled for two Areas and every other cost center; report includes BFL, realization rate; ATLs, ATCs, and productivity coordinators get report.	Weekly, on Monday mornings	Generated by Industrial Engineering
	Monthly performance report for two Areas and every other cost center.	Monthly	Generated by Industrial Engineering, production and planning

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Team Production Information (problems, status of jobs through the shop, production changes, production goals, customer requirements, changes in procedures, new products hitting the floor, overtime needs)	Individual team meetings cover status of team action items, goals, problems, etc.	Varies from daily or to every other week, depending on the team	Coordinators and facilitator bring back necessary information to team; ATC sometimes attends meetings
	Area Team stand-up meeting; ATL or ATC reviews production goals for the current week, any other relevant production information; ATL brings back relevant information for teams from the ATL meeting at 8:30.	Daily or twice weekly, depending on which Area	ATL, ATC, other teams
	SOCZ20 report broken down by cost center with part numbers by priority; received by schedule coordinator, ATLs, ATCs, and anyone else who wants to pull it up; is the scheduler's "bible"; gives information on each job in the shop and what process it is at; comes from TMS.	New print out is obtained several times a day	Planning group

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Team Production Information (cont'd)	TMS (total manufacturing system) has finance, accounting, payroll, production, planning information; each coordinator on each team pulls up information they need to perform their role, e.g., scheduler uses production information, admin coordinator uses payroll information, etc.	As needed	TMS system
	Messages and relevant production information is written on whiteboards and flipcharts, e.g., one message was "Test operation is trying to get another tester from Seattle, or renting one - theirs is broke"	As needed; could be as frequently as daily or more often	Primarily other teams
	Teams informally receive necessary production information one on one with ATC, ATL, or facilitator; ATC often goes around the shop floor talking to teams	As needed	ATL, ATC

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Team Issues (team problems, concerns, tours coming through, changes in personnel, social issues, status of action items, other new information)	Individual team meetings to discuss team issues.	Varies from team to team; daily or at least every other week	Coordinators and facilitator bring back necessary information to team
	Ad-hoc informal team meetings called by facilitator or any team member as needed to resolve problems, issues; "a lot of informal meetings"	As needed	Coordinators and facilitator bring any necessary information to meeting
	Informal communication between team members as necessary without a formal meeting.	As needed	Other members of team
	Area Team Stand-up meeting; review announcements - "tours, items of general interest" social issues, personnel issues, problems common to all teams such as safety, housekeeping, customer requirements, but "no problem-solving" done at these meetings.	Daily for one area and twice weekly for the other	ATL, ATC, Other teams
	Messages are written on flipcharts and whiteboards; problems, social information, etc.	As needed	Other teams

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Team Issues (cont'd)	Facilitators meeting for all facilitators in each Area to exchange information, new things tried, lessons learned	Weekly	Facilitators from other teams
Technical Product/Process Information	Engineering provides teams with suggested changes to processes and technical assistance through face to face verbal communication; "teams can choose not to implement an engineering change."	As needed	Engineering
	Operations Manual is a source of information for operations procedures; manuals are kept out on the floor.	Manuals are used as needed	Engineering updates manuals if necessary
	Government liaison who has oversight function; "if process problem, product deficiencies, better way to do something, making teams understand what document they need and why" "helping them understand the mil std and specs."	As needed	Government liaison person
Internal Customer Feedback (problems, complaints, defects)	Customer relations coordinator is notified if there is a problem downstream.	As needed	Other teams

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Performance of Other Teams	Teams can see performance of other teams from all the charts and graphs posted	Updated daily	Other team coordinators update their charts
Plant-wide Issues (plant-wide procedural changes, activities, improvement efforts, new contracts for the plant, social information)	ATLs bring information to teams from ATL meeting for all ATLs in plant to discuss plant issues. Daily agenda: Daily measurements, Hit list, Weekly measurements, Visitors/audits/meetings, Product concerns, Area functional review, Staffing, Steady state II goals, and General discussion; facilitators attend meeting to give performance report and bring back information to team.	Daily at 8:30 a.m.	Other ATLs, people from other areas
	Plant Review ("town") meeting in cafeteria mandatory for everyone run by plant manager, Tom O'Fallon; opportunity to "tell what's going on with the company", meet new PAs, status of operations, problems, status review by FTLs, presentations by TQM project teams, review suggestions from suggestion box, and answer questions. Also review things like United Way Campaign.	Monthly (used to be every week, then every two weeks, now every month)	Plant manager

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Plant-wide Issues (cont'd)	Facilitator brings back information to teams from Facilitator meeting for all team facilitators in the plant to share information and resolve issues.	Monthly	Facilitators in other areas
Performance of the Plant (includes other areas and the plant overall, includes external customer feedback)	ATL meeting for all ATLs; facilitators from each shop give a performance report from the previous day and update charts in meeting room.	Daily	Other ATLs and people in other areas
	Charts for each of the two shops and other areas (Receiving, Stores, Rec/Insp) in the ATL meeting room; facilitators who attend ATL meeting update charts at the meeting; charts for plant wide performance measures such as shipping status, labor distribution, FOB performance, safety, are also updated.	Updated daily	Other areas
	Town meeting in cafeteria; "usually review plant performance charts", review "health of the company."	Monthly	Plant manager
	Performance charts hung up in cafeteria show performance compared to goals.	Updated monthly	Strategic Planning Team

Table 5.10. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Corporate Issues (Boeing)	Boeing newsletter	Monthly	Corporate
	Town meeting; plant manager brings in information about corporate as necessary.	Monthly	Plant manager
Performance of Boeing corporation	Boeing newsletter	Monthly	Corporate
	Town meeting; plant manager reviews Boeing Company performance.	Monthly	Plant manager

good, and they also have goals clearly indicated on them. Charts are updated on a daily basis by the appropriate coordinator. For example, the quality coordinator "owns" the charts for first pass yield, and the productivity coordinator owns the charts for realization rate (similar to labor productivity) and BFL (direct labor). Charts are also compiled on a weekly basis by Industrial Engineering for each of the two shops as well as every other cost center in the plant. The productivity coordinators, ATLs, and ATCs receive the report on Monday mornings. A monthly performance report is compiled by the planning group and engineering for the two shops and other cost centers.

Team production information includes such things as problems, status of jobs through the shop, production changes, production goals, customer requirements, changes in procedures, new products coming soon, and overtime needs. This information is anything the teams need to know to directly support performing their job responsibilities. The individual team meetings cover production information such as goals for the teams, problems which have been resolved, or need to be resolved, any changes in the production requirements, etc. Another main source for team production information is the stand-up meeting. The ATL reminds everyone of the production goals for the week, as well as any other necessary information.

The scheduler receives a report, the SOCZ20, which is their "bible" and is a major source of production information for him/her, and hence, for the team. The report shows each job (part number) in the shop and what process it is at. It also shows when the job was released and when it is due to the customer. The scheduler uses this report to decide how work moves through the shop, whether to switch jobs around, who works on what, etc. They receive a fresh report first thing in the morning and usually print out at least one updated version throughout the day. The report is generated by the planning group from the Total Manufacturing System (TMS).

Other coordinators and team members use the TMS to pull up whatever information they need throughout the day to do their jobs. TMS contains finance, accounting, payroll, production, and planning information, all in one system. For example, the scheduler uses it for production information, the administrative coordinator uses it for payroll information, and the training coordinator uses it to schedule team members in training classes. In addition to using TMS to get relevant production information, teams also rely on their ATCs and ATL to provide them with information they need. The ATCs in particular spend a great deal of time out on the floor talking with teams.

There are many whiteboards and flipcharts all around the shop, which are used frequently by team members to write messages to each other and to other teams. One flipchart had a message to all teams about a tester being broken down and the team was trying to rent another one or get one from Seattle (Boeing headquarters). Other teams needed to know this information to plan for work being slowed down at this operation. There is a great deal of informal communication within a team and between teams. Team members work close to one another, and if a problem arises, it is easy to talk to another team member about it. ATCs spend a lot of time on the shop floor, so team members can easily access their time and get information from them.

Teams learn about *team issues* mainly from individual team meetings and area stand-up meetings. The types of issues teams discuss at individual and area team meetings are problems common to all teams, concerns, tours coming through, changes in personnel, social issues, team relations, status of action items, and any new information on products or processes. At one individual team meeting I attended, team members discussed relations with a new team, the LCF cell team, which was formed from other teams as an experiment. The LCF team had to use this team's equipment for some work, and the team resented being "kicked off" their own equipment so the LCF team could keep busy. Several representatives from the LCF team attended the meeting and the discussion became heated for several minutes, but the conflict was handled maturely. The issue did not get resolved, but it was brought into the open which made team members feel better about it.

In addition to regular team meetings, teams often meet informally on an ad-hoc basis when necessary. For example, if a quality problem occurs, the facilitator and quality coordinator will call the team together to identify the root cause of the problem and decide what to do about it.

The individual team meetings emphasize more those issues and problems which are unique just to the team, while the stand-up meetings cover issues which affect all teams in the area. Problem-solving is done at individual team meetings, but not during stand-up meetings. Some of the issues covered at the stand-up meeting I observed were housekeeping of the entire commercial shop, cautioning against using "quick fixes" in the shop, and someone thanking everyone in the area for sending a card when she was ill.

Team issues are also communicated by writing messages on flipcharts, whiteboards, and bulletin boards throughout the shop. Information on social events, vacation schedules, and any other issues, even slogans, are written. One flipchart had the following message - "don't aspire to being average - average is as close to the bottom as it is to the top." Another flipchart had the mission of the new LCF team written on it to communicate to other teams, and each LCF team member had signed it.

Teams receive *technical product/process information* from several sources. Any technical information they need to help with the equipment, the processes, or the products comes from either the ATC or engineering. Since engineers' desks are right out on the shop floor, communication between the shop and engineering is made simple. Generally, teams receive technical information in an informal way, with face to face verbal communication. Engineering makes suggestions to teams on process improvements and other changes. One interesting thing to note is that teams can refuse to implement an engineering suggestion. It is the job of the engineer to convince the teams of the benefits of a proposed change.

A government liaison for the Military shop is located at the Corinth plant full-time, and she often goes out to the shop to talk with teams to help them understand "the military standard and specs." There are complete Operations Manuals developed by engineering out on the shop floor. Any team member can look up information about any product in the shop in the manuals. They received training from the engineers on how to use the manuals.

Teams receive *internal customer feedback* from the next process through the customer relations coordinator. In addition to giving visitors tours of their work area, the customer relations coordinator is also responsible for relations with upstream and downstream teams. If there is any quality problem with work downstream, the downstream team's customer relations coordinator informs the other team's customer relations coordinator of the problem.

Because of all the charts and graphs posted on each team's performance, teams can easily see the *performance of other teams*. Coordinators from each team are responsible for updating their team's charts. The same specific measures are used for all teams in an area. For example, first pass yield is an important measure of quality for a team. There are charts for first pass yield for each of the five teams in the commercial shop.

Plant-wide issues are communicated to teams first hand through monthly plant review meetings. The plant manager conducts these meetings. The purpose of the meetings (called "town" meetings) is to find out "what's going on with the company", meet new PAs, and keep informed on plant-wide issues. Some typical agenda items are: status of operations, status review by each of the FTLs, presentations on TQM projects, read and address suggestions/questions from suggestion box, going over the United Way campaign, and goals for the plant. These meetings used to be every week, then every two weeks, and now they are once a month.

Teams also receive information on plant-wide issues second hand, from their ATLs, ATCs, and facilitators. The ATLs bring back information from a daily ATL meeting at 8:30 held with all ATLs in the plant. The purpose of this meeting is to review production and performance for the previous day and cover issues for the upcoming day and week. A standard agenda is followed: daily measurements (team facilitators give a report of previous day's key measures), hit list (current problems in the shop), weekly measurements (on Mondays), visitors/audits/meetings, product concerns, area functional review, staffing, plant-wide goals, and general discussion. Any issues that might affect the team or that the ATL just wants to share with the teams are communicated at the next stand-up meeting. Facilitators also bring back information from the ATL meeting, and they also bring back relevant information from a monthly Facilitators' meeting for all facilitators in the plant.

ATLs and facilitators bring back information to the teams on the *plant's performance* from the ATL meetings. A facilitator from each shop gives a performance review at the ATL meetings and also updates the charts on their shop in the ATL meeting room. There are also charts having plant-wide performance measures posted in the ATL meeting room, such as shipping performance, safety, and labor distribution for the plant.

All employees also learn first hand about the performance of the plant at the town meetings, when the plant manager reviews plant-wide key measurements for the month. He gives an overview on the health of the company. There are also charts showing monthly performance on the key measurements posted in the cafeteria where the town meetings are held, so people can see them throughout the month.

Corporate issues and *performance of the corporation* are also reviewed at the town meetings when there is information to share. The Boeing Company newsletter which comes out each month also contains information about Boeing.

5.5.2.2. Information Teams Provide

Table 5.11 summarizes the types of informations teams provide to other groups or individuals in the plant:

- General information about teams and about the plant
- Team issues
- Team performance
- Requests for assistance
- Suggestions for improvement
- Requests for approval
- Responses to questions or problems

When outside visitors (internal and external to Boeing) come in to visit the plant, the customer relations coordinators provide *general information about the teams and the plant*. They give a tour of their team's work area and answer any questions the visitors have. Visitors are then "passed on" to the next team's customer relations coordinator to receive a tour.

Teams provide information on *team issues* to other teams and to the ATC and ATL at the area team stand-up meeting. If it is an issue which affects other teams, such as a quality problem or housekeeping in the area, the stand-up meeting is the appropriate forum to raise the issue. Team issues are communicated through other types of team meetings throughout the plant as well. For instance, team issues may be discussed at the ATL meeting if appropriate, or they may be communicated to other ad-hoc cross-functional teams as necessary.

Teams are responsible for providing information on *team performance* by updating the charts on performance of teams which are posted out on the shop floor. Coordinators are responsible for collecting data on key measures and updating the charts on a daily basis. The same charts (measures) are used for each team in an area. Coordinators and other team members also enter information on production for the day into the TMS. For example, they enter discrepancies (defects), number of units produced, and how many hours they spent working on each job in the shop.

Requests for assistance are generally handled informally, by talking one on one with the ATC, ATL, or engineering depending on the nature of the problem. For technical assistance on the equipment or on procedures, they may go to their ATC or directly to an engineer. They request help with interpersonal problems from the ATC or ATL. The teams try to address the problem by themselves first. If they are unable to solve the problem, then they bring in an ATC or the ATL. An example of an interpersonal problem is a disciplinary problem with a team member who frequently misses work.

Teams provide *suggestions for improvement* informally to engineering, if the suggestion is of a technical nature. If it is related to things like pay, company policies, etc., then it would be written out as a suggestion and put it in the suggestion box. The

Table 5.11. Information Outputs Provided by Boeing Corinth Self-Managing Teams

Information Output Provided by Team	How Information is Shared	Frequency	Customer of Information
General Information About Teams and About Plant	Customer relations coordinators answer questions and give tours to external visitors.	As needed	External visitors from outside companies
Team Issues	Area Team stand-up meeting; teams bring issues to meeting.	Daily or twice weekly	Other teams, ATC, ATL
	ATL meeting; ATLs and facilitators bring team issues to meeting if necessary.	Daily at 8:30	Other ATLs, people in other areas
	Other meetings throughout the plant, e.g., weekly and monthly Facilitators meeting, pay for knowledge team meeting, etc.	Varies from weekly to monthly	
Team performance	Coordinators update performance charts on quality, schedule, and cost.	Daily	Other teams
	Coordinators and team members enter relevant production and performance information into TMS.	Daily, or more often	Other areas
Requests for assistance	Teams informally request assistance with technical problems, about equipment, products.	As needed	ATC, ATL, Engineering
	Informally request any assistance with interpersonal problems, such as discipline. Facilitator and other appropriate coordinators will bring problem to attention of ATC/ATL.	As needed	ATC, ATL

Table 5.11. Information Outputs Provided by Boeing Corinth Self-Managing Teams

Information Outputs Provided by Teams	How Information is Shared	Frequency	Customer of Information
Suggestions for improvement	Informally provide suggestions for process improvements and work with process engineering	As needed	Process engineering
	Provide suggestions in suggestion box which is reviewed at Town meeting.	As needed	Strategic Planning Team
Requests for approval	Teams informally request approval from ATL, ATC, or write proposals to request whatever they need, e.g., painting their work area.	As needed	ATL, ATC, Strategic Planning Team
Responses to questions or problems	Solve problems, investigate a measure which doesn't look right; may require an informal variance analysis; performed by coordinator(s).	As needed	ATC, ATL, other teams
	If exceed a target for a month, need to fill out a formal variance analysis by productivity coordinator.	As needed	ATC, ATL, other teams

Strategic Planning Team reads over and formulates responses to the suggestions collected throughout the month, and then reads the suggestion and their response to it at the town meetings.

If a team wanted to do something which would require funds, such as painting their work area, they *request approval* starting first with the ATC and/or ATL. Depending on the nature of the request, it may go to the SPT, a different function in the plant, or the ATL may be able to grant the request.

When something on the production report doesn't look right, or a measure doesn't come out as expected, the ATC or ATL may ask a coordinator to investigate the problem and provide a response. The investigation may require what is called a "variance analysis" to determine the cause of the variance from what was expected. The analysis may require detailed calculations and the use of problem-solving skills. If the shop exceeds a target for a month, they must fill out a formal variance analysis. Measures are closely monitored throughout the month so that if something doesn't look right, a coordinator may perform an informal variance analysis for the week.

5.5.2.3. Influence Over Information Received

According to team members and ATCs, any PA could get any "information if [it was] needed." One ATC who was previously a scheduler on a team, stated that she believes teams have all the technical information they need to do their job. The "openness and freedom of information" in the plant is much different than traditionally-managed plants. Any PA can get any information they want from TMS. There are no hidden figures. The SPT is "very open with the plant performance and what it costs to do an hour of rework and what it costs to do an hour of work from an overall standpoint."

There are many meetings held- regular team meetings, informal team meetings, ATL meetings, and meetings for ad-hoc and cross-functional teams in the plant. These teams include members from all areas in the plant, including engineering, PAs, ATCs, ATLs, facilitators, and people from other support areas. Information from these meetings is shared liberally with anyone who is interested. The ATC, ATL, and particularly the team facilitator play a major role in the bringing back information to teams from other meetings in the plant.

5.5.3. Summary of What Was Learned from Boeing Corinth Plant

Listed below are the major lessons I learned from studying the Boeing Corinth plant:

- The amount of informal communication is phenomenal. According to one ATC, "95% of the information is very informal." Informal can mean it is one on one communication between two team members, or between an ATC and a team member, or it can mean information informally given at a team meeting. The main point is that it is not in a written memo. The layout of the shop is very conducive to informal information exchange. It is very open, with no walls constructed for offices for the ATLs, ATCs, engineers, or other support personnel. Support personnel are physically located on the shop floor, so someone with a question can easily go and talk to whoever they need.
- The plant rumor mill is not really a source of information for plant-wide issues or other information related to the job. There are, however, rumors on personal problems or issues. These issues are not related to work. In an open environment

like the Boeing Corinth plant, the rumor mill is not a major source for work-related issues and activities.

- Teams have the discretion to call informal team meetings when they feel it's necessary. Whoever notices or realizes a problem needing attention initiates the meeting, and the facilitator leads the meeting. There is no one looking over team members' shoulders to make sure they don't waste time. ATLs and ATCs will become concerned if one team is spending too much time in meetings, but for teams who are more mature and developed, they use their judgment in meeting when they need to.
- The use of charts and graphs is very effective. There is one huge bulletin board in each shop used to post all the charts on the teams' performance. The charts are well designed with directional indicators, illustrating which direction is desirable for each graph. Goals are clearly marked on each graph. These charts are religiously updated on a daily basis and team members discipline themselves to keep them updated. At one team meeting I observed, the productivity coordinator jokingly made a comment about being yelled at by his team because he wasn't doing a good job keeping his charts updated.
- Teams need and frequently use communication tools such as whiteboards, bulletin boards, and flipcharts. There are dozens of each throughout the shop and they are in obvious use. These tools are used to facilitate communication within a team and between teams.
- The facilitator is a major source of information for teams. The person filling this role attends a lot of meetings outside of the team (the ATL meeting, a weekly area Facilitators meeting and a monthly plant Facilitators meeting, to name a few) and brings back information to the team as necessary.

- Having support functions (engineering, planning, quality) and the ATLs and ATCs physically located on the shop floor makes it easy for teams to communicate with these people.
- The town meeting is an important source of information for plant-wide issues and plant performance. It is also a forum for the entire plant to get together and interact.
- ATCs and people from support functions such as engineering and quality, often attend individual team meetings. They do not play a leadership role in the meetings, but provide input and expertise on issues they can contribute to. The facilitator runs the meetings.
- Critical information is updated quite frequently. For example, the most important information for the scheduler, the SOCZ20 report, is updated several times a day by obtaining a fresh printout. Key measures for each team are updated on a daily basis. Less critical information, such as the performance of the plant, is updated monthly.
- The biggest sources of information for teams are individual team meetings, area team stand-up meetings, and feedback from ATLs, ATCs, and facilitators from the daily ATL meetings. All of these meetings generally occur daily (or twice weekly).
- There is a commitment to share information about the plant with others. One of the responsibilities of teams, specifically the customer relations coordinator, is to provide outside visitors with general information about the team environment. The plant is very open with sharing information about what they have done. In fact, I was permitted access to the production area and was able to talk to anyone I wanted to in the shop. The amount of tours given is significant. One engineer says he has never seen so many tours. Additionally, engineers are sometimes "loaned out" to other companies to assist them.

- In a new design plant, teams do not become self-managing overnight. Because very few employees hired previously worked for Boeing in other plants, almost none of the PAs had technical experience in electronic assembly. This lack of technical expertise hampers the teams at first. When they become competent at the technical tasks, they can then begin to take on more authority and responsibility. The amount of technical training needed (in addition to training on things like problem-solving, interpersonal skills, and coordinator roles) is significant.
- The military business has not been what was expected. The work flow in the military shop is quite low, and as a result, it was necessary to move PAs from the military to the commercial shop. It is frustrating for PAs to not be busy and search for things to do. The lack of work creates some tension between teams, as discussed earlier.
- The plant appears to have a high proportion of support (engineers, managers, finance personnel, etc.) employees as compared to production employees. The plant was designed to support many more production employees than it currently has. When production ramps up and more production employees are hired, the existing support staff will be sufficient.
- There is a lack of status symbols between production employees and management and support staff. Everyone dresses casually, and it is difficult if not impossible to tell an engineer from a PA from an ATL.

5.6. Summary

This chapter presented all the data, the results, from the five case studies. As mentioned earlier, details on other aspects of each case, such as background information, are provided in case descriptions on Appendix G. This chapter represented the "data" for this research study. The next chapter (Conclusions and Interpretations) will present the "information", which adds meaning to the data.

CHAPTER 6 CONCLUSIONS AND INTERPRETATIONS

This chapter takes the data from the five cases presented in the previous chapter and converts it to information. Chapter 5 represented the results of Within Case Analysis, while this chapter on conclusions and interpretations represents the results of Cross Case Analysis - taking the data across all sites and drawing conclusions.

The outputs from this research study, discussed in this chapter, are what I have called "design features" for the information system surrounding self-managing teams. The term "information system" as I have used it does not refer only to the formal computerized information (manufacturing or accounting) system typical in most organizations. Information system as I have used it refers to any information the teams receive from any source and in any format, which includes the formal manufacturing and/or accounting information system, as well as any of the other information teams receive.

Design features are what I believe are important aspects of the information system and information flow among teams, and between teams and other groups and individuals, i.e., supervisors, managers, and other support functions. Data was collected from the five case sites to develop these design features, and in this sense, they are *descriptive*. However, by analyzing the data across case sites, the design features becomes a *prescriptive* set of features for organizations having characteristics similar to the five studied in this thesis.

There are two sets of design features. The first set addresses the question of what information to share with teams, in other words, what specific types of information do teams need to make decisions and do their job? To address this question, I further condensed, clustered, and sifted through the individual case data on information teams receive and information teams provide which was presented in Chapter 5. I constructed a data display containing types of information received for all sites, and a data display for types of information provided by teams, shown in Appendix H. In these displays, related types of information were combined. For example, internal and external customer feedback as a type of information was included with feedback on team performance, since customer feedback is an aspect of performance. In the data displays in Appendix H and in this chapter, I have identified seven types of information teams need (information inputs) to effectively perform their responsibilities, based on the case data. For each of these types, I provide an operational definition and examples from the case data, discussed in section 6.1. I have also identified six types of information teams typically provide to other groups or individuals (information outputs). Again, I provide an operational definition and examples for each type discussed in section 6.2.

The second set of design features addresses the question of how the information is provided to or by teams. This second set of design features can be described as "characteristics" of information flows to and from self-managing teams, discussed in section 6.3. They represent the mechanisms by which information is shared, as well as other elements of the information system. For example, one of the characteristics is having daily or at least regular team meetings. At these meetings, several of the types of information identified may be shared (feedback on team performance, team issues, etc.). The two types of design features describe different dimensions of the information system - the first describes what information and the second describes how.

In section 6.4, I compare these research findings to the related literature on sharing information with self-managing teams and with employees in general. The last section of this chapter, section 6.5, contains a discussion on evaluating this research study.

6.1. Types of Information Teams Received by Self-Managing Teams

6.1.1. Definitions of Types of Information Received by Teams

The seven types of information teams receive are shown in Table 6.1 along with a definition and examples of each from the case data. They are:

Team Management Information:
- feedback on team performance
- team production information
- team issues
- technical product/process information
- performance of other teams

Overall Business Information:
- performance of larger systems
- issues for larger systems

This list was developed from analyzing the data on types of information received from all cases together. These seven types of information are shared with self-managing teams in each of the five case sites. There were some additional types of information identified in the tables in Chapter 5 which are not specified in the above list because they were integrated with another related type of information. As mentioned earlier, customer feedback was integrated with feedback on team performance. This list is not necessarily a comprehensive list of every piece of information self-managing teams receive (and need), because every organization and every application of self-managing teams is unique. However, the types of information listed in the table represent the "vital few" types of information teams need.

There are two overall categories for the types of information teams receive - what I call team management information and overall business information. Team

Table 6.1. Definitions of Types of Information Received by Self-Managing Teams

Team Management Information
1. Feedback on Team Performance - regular and frequent information to the team which summarizes either quantitatively or qualitatively how the team performed over some time period; the feedback relates to the team's performance on producing their product/service and may cover any of the seven performance criteria (effectiveness, efficiency, quality, productivity, innovation, quality of work life, and profitability/budgetability). Examples: • feedback on specific quantitative measures: number of units produced, number of defects, waste, absenteeism, average time for processing transactions, number of interruptions in the line, percentage of direct labor • internal and external customer feedback: problems, complaints, nature of defects, new customer requirements • qualitative feedback such as praise and recognition
2. Team Production Information - information which changes relatively frequently (hourly, daily, weekly) which the team needs on a *frequent regular* basis to *directly* support producing the product/service for which the team is responsible. Examples: • team production goals (daily, weekly, monthly) • equipment or other production problems from previous day or shift • changes in production schedule • team members out sick, on vacation, or in training • status of products/jobs/orders throughout processes in team work area • changed or special customer requirements • changes in team procedures, processes • overtime needs • updates on skill level of team members
3. Team Issues - information on problems, concerns, activities of the team which has to do with the team's functioning, growth and development and improving how the team functions; not necessarily received on a regular basis but as needed, and *indirectly* supports producing the team product/service. Examples: • status of team action items • interpersonal problems and personality conflicts • changes in team structure, team membership, supervisor/coach, etc. • visitors, tours coming through • future changes in policies/procedures • status of team improvement projects • improvement opportunities • future directions for the team

Table 6.1. Definitions of Types of Information Received by Self-Managing Teams (cont'd)

Team Management Information (cont'd)
4. Technical product/process information - specific technical information provided as needed to solve technical problems. Examples: • detailed technical information on new products or new processes • technical information to assist with resolving problems/issues (e.g., equipment problems) • standard operating instructions, procedures manuals • military standards and specifications
5. Performance of other teams - information on how other self-managing teams in the area, or in other areas, performed over some time period; feedback may cover any of the performance criteria. Examples: • feedback on quantitative measures (same types as listed in team performance) • subjective assessment of other teams' performance
Overall Business Information
6. Performance of larger systems - information on performance of systems encompassing the team, including the department, division, company/plant, and corporation in which the teams exist; may cover any of the performance criteria. Examples: • quantitative information: profitability, turnover for the plant, shipping performance, absenteeism • qualitative information: subjective customer satisfaction, markets penetrated
7. Issues for larger systems - information on problems, concerns, activities of systems encompassing the team, including the department, division, company/plant, and corporation in which the teams exist. Examples: • business goals and objectives • competitors' relative performance • new contracts received • major new products, new markets • changes in company/plant policies (e.g., new attendance policy, moving from 4 1/2 to 5 day work weeks, moving to twelve hour shifts) • visitors coming into the company/plant • changes in regulation or laws affecting the entire company • status of improvement efforts, e.g., strategic planning, TQM, JIT, TPM, etc.

management information is information for which the team is the unit of analysis, and the information directly relates to the team which receives the information, or to another team. Team management information includes feedback on team performance, team production information, team issues, technical product/process information, and how the team's performance compares to other teams. All this information is necessary for teams to manage themselves. Overall business information pertains to larger systems, such as the department in which teams operate, or the division, company/plant, or even corporation if appropriate. This information is necessary for teams to keep informed on the overall direction of the business and what it takes to be competitive in the business (Lawler et al., 1989).

Feedback on team performance is information to the team about how they performed over some time period, usually daily, weekly, and/or monthly. The feedback corresponds to the team's performance on producing their product/service. Teams need this type of information regularly and frequently. Performance can be evaluated objectively or subjectively. Objective performance is measured frequently, usually on a daily or at least a weekly basis. Charts may be posted on public bulletin boards as they are at Boeing Corinth, so all team members and other teams can see how the team has performed on key measures. Teams need feedback on their performance to make adjustments and address problem areas identified by the measures. Performance may be evaluated for short time periods such as daily or weekly, and then also over a month or a quarter. At Tennessee Eastman, performance is reviewed on key measures on a daily basis and also compiled for the month and reviewed at monthly team meetings.

Performance can be assessed objectively with quantitative measures *and* subjectively as well, as it is at Virginia Fibre where teams are not measured quantitatively on performance per se, but receive qualitative information from their downstream customer, the paper mill. Another form of subjective feedback teams receive is praise and recognition from customers, team coaches, and managers. Performance measurement may cover any of the seven performance criteria (Sink, 1989): effectiveness, efficiency, quality, productivity, innovation, quality of work life, and profitability/budgetability. For instance, some of the Key Results Indicators used by teams at Tennessee Eastman measure effectiveness (the number of bales produced), quality (number of good bales produced vs. total), and quality of work life (absenteeism). Note that this type of information is performance for the team, and does not include individual performance feedback for team members.

Team production information provides the team members with what they need to know on a regular basis, usually daily, to produce their product/service. This type of information includes any problems that have occurred on previous shifts, or with other teams, any production or scheduling changes, production goals for the team, status of jobs throughout a manufacturing shop, etc. Teams rely on this information to plan how work will be accomplished that day. Some production information may be quantitative, such as production goals and quantitative customer requirements, while some may be qualitative such as equipment problems, changes in processes, and team members out sick that day. In traditional work groups, usually only the supervisor receives this type of "management" information, and teams simply execute the supervisor's instructions. Team production information is most commonly passed along to teams in daily team meetings, through informal one on one communication with supervisors and managers, log books used between shifts, and/or electronic messages.

The third type of information listed in Table 6.1 is *team issues*, which is different in nature than performance feedback and team production information. Team issues are not used to directly support the team's producing product/service, but instead have to do with team growth, development, and how to improve the team's functioning. One way to look at the distinction is if the first two types of information are shared to support "A" activities- the team producing their product/service - then information on team issues has to do with "B" - how to improve the team and team members. Information on team issues include interpersonal problems, status of action items, future changes in the team (structure, team membership, etc.), improvement opportunities for the team, and team development including information to support giving and receiving feedback. Another difference between team issues and the first two types of information is that information on team issues is received as needed, instead of on a regular basis.

Teams receive *technical product/process information* as needed to assist them with solving technical problems with equipment or with processes they have not yet mastered. This type of information may be provided in the form of procedures or operations manuals which teams have access to, or one on one informal communication with supervisors, engineers, or other support functions.

The last type of team management information listed in Table 6.1 is how the team performance compares to *other teams' performance*. This is a form of competitive benchmarking for teams. Receiving information on how other teams are performing can help teams identify improvement opportunities for their team. Some organizations discourage teams from comparing their performance to other teams to avoid "destructive competition" and encourage them instead to compare to their own past performance, as at Tennessee Eastman, a redesign site. Boeing Corinth, a new design site, has charts, graphs, and reports widely posted and distributed which objectively portray performance of all teams in an area. Leadership in redesign sites is concerned about competition between teams, past history of competition, and wants to minimize or eliminate inter-team competition. In new design sites, since the information is not used to "punish" a poorly performing team but instead to help them identify where to improve, leadership may not be as concerned about dysfunctional consequences of comparing teams' performance.

Overall business information includes two types of information - *performance of larger systems* in which teams exist and *issues of larger systems*. In order to make meaningful contributions to the general direction of the business, Lawler et al. (1989) state that is it essential teams receive business information. Some teams may be part of only one larger system, for example, for teams at Virginia Fibre, the next larger unit of analysis is the company. Others like Tennessee Eastman, are part of several larger systems, the department (FT1 department), division (Filter Products Division), plant (Tennessee Eastman Company) and corporation (Eastman Chemicals Corporation).

Information on the performance of larger systems may also be quantitative or qualitative as it can be with team performance. Quantitative performance measures frequently include profitability of the company/plant, return on assets, turnover, shipping performance, and absenteeism. Company/plant performance may be subjectively assessed through customer satisfaction, new markets penetrated, new products/services offered, and winning an award (such as Shenandoah Life winning the Virginia Senate Productivity Award). Performance information on all larger systems is filtered down to teams in various ways. The most common way to share information on the performance of the company or plant is organization-wide review meetings. The Boeing Corinth plant manager reviews the plant's performance on key performance measures which are also portrayed on graphs in the plant cafeteria where the review meetings are held. Corning Blacksburg has several plant review meetings so as to cover all shifts. Other mechanisms include electronic messages on the computer system, TV monitors, word of mouth, and written reports or newsletters.

Issues for larger systems are similar to team issues discussed earlier, however, the issues apply to a department, division, company/plant, and/or corporation. Again, the most common mechanism for communicating company issues is organization-wide review meetings. In addition to reviewing performance, top management will share information on the vision for the company, long-term goals and objectives, changes in company policy, status of major improvement efforts such as TQM, external factors such as new federal regulations affecting the company, and information on any other important activities in the near future, as described in Table 6.1.

Although overall business information does not directly support the teams' tasks (producing their product/service), it is still critical to share this type of information to keep teams informed and to prepare them to contribute to the overall direction of the business. For instance, at Corning Blacksburg, operations associates are members of a Vision Review Team which reviews on a quarterly basis the long-term vision for the plant, and of a team which decides what plant capital investments to make for the coming years. If operations associates did not receive overall business information, they could not possibly be prepared to contribute to these types of teams.

6.1.2. General Findings on Types of Information Received

Information which teams need to directly support their day to day tasks is received frequently and also usually comes from more than one source. In other words, feedback on team performance and team production information are types of information needed on a regular (frequent) basis and they come from more than one source (e.g., meetings, reports, charts, informal communication, etc.). Other information, such as technical information to help resolve problems is provided as needed. Overall business information on performance and issues of larger systems is generally provided less frequently (i.e., monthly or quarterly) because it only indirectly supports teams' day to day decisions and responsibilities.

Some of the information comes from sources outside the team, such as team production information, which comes from other teams, management, or other support functions. Other types of information may be generated by the team itself. For example, the team may measure its own performance and update performance charts. Boeing Corinth teams update their own performance charts on a daily basis, and Tennessee Eastman team coordinators collect and distribute information on Key Results Indicators to their team. Additionally, teams raise and discuss team issues just within the team, as well as receiving information on team issues from other teams.

Some of the case data indicated that while some teams do get subjective information on performance of other teams, management may discourage comparison of key measures between teams because they believe the consequences of competition (i.e., being unwilling to help out another team) would be dysfunctional. Teams in other case sites have quantitative charts and graphs posted visibly in which it is easy for teams to compare themselves (although still discouraged).

6.2. Types of Information Provided by Self-Managing Teams

6.2.1. Definitions of Types of Information Provided by Teams

Table 6.2 contains the six types of information teams provide to other groups and individuals. They are:

- general information about team environment
- team performance

- team issues
- requests for approval
- requests for assistance
- responses to questions/problems

Teams provide *general information about the team environment* to visitors who come in to learn about what the company has done to implement self-managing teams. All of the case sites except one have standard agendas they use on a somewhat regular basis for visitors from outside the plant/company. Virginia Fibre has been using teams for only a short while, and hence, their use of self-managing teams may not be widely known among other paper mills or other companies. During the visits set up with outside visitors, the typical agenda includes a presentation by management, which could be the plant manager, someone from Human Resources, or the manager over the self-managing teams. Visitors then usually have the opportunity to talk with team members and ask questions about the team environment. In Boeing Corinth, coordinators give the visitors a tour and also answer questions along the way. Visitors come in as often as once a month with several of the case sites.

Teams (usually team coordinators) provide information about *team performance* to the rest of the team, as well as to supervisors and management. At Boeing Corinth and Tennessee Eastman, team coordinators are responsible for collecting data on key measures and reporting the results to the rest of the team, updating charts on a daily basis, and/or recording the information in the computer for management or support functions to compile into weekly or monthly performance reports.

Team issues is listed as a type of information teams provide because teams can raise issues to be discussed with other teams and with management. There are various mechanisms for teams to do this. Tennessee Eastman has Standing Teams which meet

Table 6.2. Definitions of Types of Information Provided by Self-Managing Teams

1. General information about team environment - information usually provided to internal or external visitors about the team and how it operates, and advantages and disadvantages. Examples: • answer questions from visitors, one on one, or in a group setting • informally over the phone, or in a structured visit/tour
2. Team performance - information provided by the team on its performance, usually measured by the team itself. Examples: • provide production figures, quality level, nature of defects, equipment or production problems, etc., to other groups or individuals
3. Team issues - information on problems, concerns, and/or team activities which affect other teams or other individuals and therefore need to be communicated. Examples: • communicate team issues (issues are as described in Table 6.1) to other teams, coaches, managers, etc.
4. Requests for approval - either a formal or informal request to do or buy something outside of the norm. Examples: • requests for purchases whether directly related to the team's task or not, such as to buy paint to paint the team's work area • suggestions for process improvements • requests to try something new • to circumvent established procedures to grant a customers' request

Table 6.2. Definitions of Types of Information Provided by Self-Managing Teams (cont'd)

5. Requests for assistance - a request for information and/or assistance to resolve technical, administrative, or interpersonal problems. Examples: • a request to engineering to help with technical equipment problems • asking managers to help by intervening on a disciplinary issue • a request to a manager to help processing a difficult policy • request to a team coach to help with performing an administrative coordinator role • request manpower help from other teams, to loan people to the team • request for information from a support function, e.g., quality, on interpreting standards and specifications
6. Responses to questions/problems - address and answer questions or problems raised by management, other teams, or external companies Examples: • performing a variance analysis on a measure which doesn't look right • answering technical questions about operations from other companies

every five weeks for all coordinators of one type. Coordinators bring issues from their team to the meeting which affect all teams. Team reps at Shenandoah Life bring issues needing to be resolved from their team to weekly Team Rep meetings with managers.

When teams want to do something out of the norm, they must *request approval*. Approvals may for purchasing something outside of the team's budget, changing something, or suggesting process improvements. The requests for approvals may be formal and written up in proposals as suggested process improvements are at Corning Blacksburg. Requests may alternatively be informal, where team members simply talk with supervisors or managers. Most requests begin informally, with formal proposals written if necessary.

Teams *request assistance* if they need resources, such as information or expertise from another group or individual. Requests for assistance on technical, administrative, or interpersonal problems are most commonly handled informally by talking one on one or over the phone. Teams request assistance from engineering or their supervisor/coach for technical equipment or process problems. They request assistance from supervisors or managers with administrative duties they have assumed from the supervisor. When teams are unable to resolve interpersonal problems, such as a team member not contributing their fair share to the team or having attendance problems, teams request help from their supervisor or manager.

Teams are often responsible for providing *responses to questions or problems* from their supervisor or other managers in the company. Managers in other areas of VFC often call the two teams to ask questions about the teams' past production to address problems in their own area. Teams are able to look up the necessary information and respond to their question. Virginia Fibre teams also answer technical questions about the mill for managers who call from other companies. At Boeing

Corinth, if a key measure doesn't look right or is headed in the wrong direction, team coordinators are responsible for investigating the problem using problem-solving and variance analysis, and providing a response to management on the problem.

6.2.2. General Findings on Types of Information Provided

Much of the information teams provide to others is done as needed or irregularly, such as information about the team environment, requests for approval, requests for assistance, and responses to questions/problems. These types of information are provided by teams to others only as necessary. When teams need approval to try something or they need assistance with a disciplinary problem, for example, only then will they bring in their supervisor or coach.

On the other hand, information on team performance and team issues is provided on regular basis to keep other teams and management informed on what is going on with the team. At Team Rep meetings at Shenandoah Life, it is emphasized that there should be *two way communication* - communication from managers to teams to share necessary information, and from team reps to managers to keep them informed on important team issues on a regular basis.

Another general finding is that much of the information teams provide to others is done in face to face interaction (in meetings or one on one communication) rather than in a written format. For instance, general information about the team environment, requests for approval, requests for assistance, responses to questions/problems, and team issues are generally provided in face to face interaction. The only non-verbal communication is for team performance if performance measures are entered into the computer for compilation or posted on charts.

There is generally more information flowing to the teams (information received by teams) than information coming from teams to other audiences. Although teams do contribute ideas for improvement and respond to questions from management, they still are on the receiving end of information sharing the majority of the time. Even in a team environment (and even in new design sites), team members still do not have all the necessary information and knowledge they need to make management-type decisions. So management must share a great deal of information to even out the imbalance, so to speak. As teams mature and cumulatively gain information, knowledge, and experience, they may provide as much information to management as management provides to them.

6.3. Characteristics of the Information System Supporting Teams

The second type of design feature discussed in the beginning of this chapter are characteristics of the information system supporting self-managing teams. Characteristics of the information system for teams address the question of how the types of information identified in the previous two sections are shared. Characteristics, then include such things as the types of meetings teams have. They also include other elements of the information system For example, another characteristic listed in this section is the ability for teams to access any information, including financial information, on the computer system. This characteristic is simply an aspect, or element, of the information system.

The characteristics presented in this section represent either what the case sites studied have in place and working well or plan for the future. They represent the most frequent mechanisms and communication tools for teams to receive information, as well as common elements of the information system supporting teams. Characteristics identified in this section focus on information teams receive and not on information teams provide, for two reasons. First, more information is received by teams than teams provide to others. Second, most information which teams do provide to others is done in face to face communication, usually informally, as mentioned earlier.

There are ten characteristics listed below. Again, these represent the most common elements or mechanisms to share information with teams from the five case sites.

1. For plants having more than one team, or more than one shift (as in manufacturing plants), teams need a *mechanism to exchange information.* Most common is a shift hand-off meeting for teams from on-coming and off-going shifts to meet and exchange any necessary information. Only coordinators may be present, or the entire team. Other common mechanisms are a log book to record production information the other team(s) need and the ability to send each other electronic messages.
2. There should be a *mechanism for teams to address longer-term issues and growth, development and improvement of the team* ("B" team activities), such as a weekly or monthly team meeting to address team development, to give and receive feedback from other team members, identify improvement opportunities for the team, etc.. The most common is for teams to have monthly meetings.
3. Teams need the *ability to have ad-hoc team meetings if necessary* to address unexpected urgent problems ("C" activities). Every team studied was able to use their discretion for when to meet as a team and how to address the problem.
4. There should be *daily or regular team meetings to review team management information* (team performance, team issues, team production information) to get the job done, build/produce product - "A" activities. In manufacturing plants, this

meeting usually occurs with the shift hand-off meeting in characteristic #1. Some teams meet daily, while others meet twice or once a week. Supervisors/coaches may be present for all or part of the meeting. If the team is small (around five or fewer team members) and production information does not change frequently or therefore need to be updated frequently, there may not need to be a formal team meeting, and informal communication at the beginning of the day may be sufficient. In this case, however, the work area must be conducive to informal communication (see # 5 below).

5. The team work area whether it is a manufacturing shop or office, should have an open layout, with no obstructions to informal communication Teams need to be able to easily talk with each other just by looking up from their work or walking a few steps. Corning Blacksburg management had huge control panels moved off the shop floor because they blocked teams view of each other.
6. Teams should have easy physical access to necessary support functions. In manufacturing organizations, personnel in engineering, quality, planning, production control, etc., should be located on the shop floor. Instead of offices with doors and walls, engineers and other support function personnel have cubicles which encourage informal communication and interaction. In service organizations, support functions the teams interact with frequently, such as data processing, should be located within close physical distance for quick one on one communication as necessary.
7. Team coordinators, facilitators, team reps and supervisors/coaches should serve as information focal points. That is, they bring back information to the team from their interactions with other groups in the company (e.g., from daily/weekly production review meetings, other regular team meetings, and cross-functional

teams they serve on). They also bring information from the team to other appropriate groups and individuals.

8. Teams should have access to any information, including financial information, on the computer system, or reports published. There should be no "hidden numbers" or "secrets" from employees. If the computer system has passwords with controlled access, team members (or at least team coordinators) should be given passwords.
9. To promote and facilitate the necessary communication, particularly informal communication, there should be a large number of "communication tools" - whiteboards, flipcharts, remarkable boards, and bulletin boards for charts and graphs. These tools enable teams to communicate among themselves during team meetings (using a flipchart or whiteboard) and with other teams by writing messages on whiteboards or flipcharts and posting their performance charts on bulletin boards. Teams should also have a team meeting room or access to an area where the team can sit down without distractions away from the shop or work area. In most sites, each team had their own meeting room, or if not, they had access to something like a cafeteria or common meeting room where they could meet for regular and ad-hoc meetings.
10. There should be company/plant wide meetings on a regular basis, usually monthly or quarterly to review overall business information (performance of and issues for larger systems). Every site studied except one had extensive organization-wide review meetings to review the performance of the company/plant and to share information about any issues employees need to know. Tennessee Eastman is too large to have plant-wide meetings (13,000 employees), so other mechanisms are used, such as TV monitors, electronic messages sent over the computer system,

and filtering down information through series of meetings - division meetings to department meetings to team meetings.

6.3.1. Other General Findings

In addition to the characteristics listed above, there were several other general findings which could not really be described as characteristics but are interesting and worthwhile to include.

- Team members need training in understanding conceptually difficult performance measures. Boeing Corinth uses "realization rate," a complicated measure having to do with the percentage of labor used to directly build product. Team members found it difficult to understand how the measure is calculated, and the team coach had to go over the calculation many many times. If teams cannot understand how a measure was calculated, they cannot make decisions based on the information the measure provides.
- Personnel from support systems (in particular, the formal information system) may be compliant in providing teams the resources they need, instead of being customer-oriented and viewing the teams as internal customers. This issue applies to redesign sites and not new design sites, since support systems are designed to be congruent with teams in new design sites. Potential reasons for being resistant or compliant at best may be not wanting to give up power and control over the system. Two examples illustrate this finding. In one redesign plant, information systems personnel resisted putting all team members on the computer system, because they were concerned about a loss of control, e.g., computer viruses and personal use. A second example in the same site concerns marketing. When teams wanted to install

an 800 number on the shop floor so external customers could call teams directly with problems, marketing objected, because they are the "customer contact."

6.4. Comparison to Related Literature

There are two main sources used to compare to these research findings. The first is a report by Dr. Ed Lawler of the Center of Effective Organizations at the University of Southern California. Dr. Lawler and his colleagues published a report studying Employee Involvement practices of Fortune 500 organizations. One section of the report addresses sharing information with employees. The second comparison is made with a book on self-directed work teams written by Jack Orsburn and his associates at Zenger-Miller, a consulting firm on organizational development. This book is considered by industry managers and academicians to be a very strong and comprehensive source of information and guidance for organizations making the transition to self-managing teams[1].

Lawler et al. (1989, p. 28) identify six types of information typically shared with all employees in organizations having Employee Involvement efforts. The six types are:

1. company's overall operating results
2. business plans/goals
3. new technologies that may affect them
4. competitors' relative performance
5. their unit's (team, department, division) operating results
6. how much fellow employees are paid

[1] From conversations with managers and academicians at the 1990 Self-Managed Work Team Conference and through personal conversations with managers.

I will discuss each type of information identified by Lawler et al. and compare to the types of information I have identified. The company's overall operating results is included in *performance of larger systems*, usually discussed at organization-wide review meetings. Performance of larger systems actually includes more information than just operating results because it is performance in a very broad sense, that is, it also includes performance on quality, quality of work life, etc.

The next three types of information Lawler identifies (business plans/goals, new technologies that may affect them, and competitors' relative performance) are all included in *issues for larger systems*, namely the company/plant. These types of issues are also typically discussed at the organization-wide review meetings, in the company newsletter, or in electronic messages. Together the first four types of information Lawler lists are included in overall business information, from Table 6.1.

The fifth type of information listed, their unit's operating results is included in two areas in my list. If the unit is a department or division, then it is included in *performance of larger systems*, where the system is a department or division. If the unit is a team, then it is included in *feedback on team performance*. Again, my categories are more broad than just operating results but also include performance criteria other than profitability.

The last type of information Lawler lists is not listed explicitly in my list, however, it is implicit that this type of information is shared with self-managing teams. Because most self-managing teams are on a pay for skills compensation system, all team members know exactly what other team members are paid. A pay for skills system has clearly defined levels, each with associated pay increments, and team members know what skills other members have acquired. Therefore, they know what each other is paid. Because it is part of the design of the pay for skills system self-managing teams use, this type of information did not appear in these findings.

In general, I see no inconsistencies with the results of this research and Lawler's. There are differences, however. Lawler's list is more dominated by overall business information, while most of the types of information shared identified in this research are what I have called team management information, directly relating to individual teams. The reason for the difference, I believe is that Lawler surveyed companies with Employee Involvement practices and not specifically self-managing teams. Some of the organizations were using self-managing teams, but they were in the minority by far. For this reason, Lawler's results show types of information shared in general with all employees in a typical organization which is trying to systematically involve employees, and not necessarily through self-managing teams.

I have synthesized the key elements relating to information flows to teams from the second source, Orsburn et al., 1990, in Table 6.3. Also shown in Table 6.3 is how the element listed relates to the findings of this research study. From the table, it appears that almost everything Orsburn states as necessary for self-managing teams is consistent with the findings of this research. Everything except one element listed in Table 6.3 is present either in the types of information teams receive in section 6.1 or in the characteristics in section 6.3.

There is one element listed by Orsburn, "cluster meetings," which did not really appear in these findings. Cluster meetings are stand-up meetings out in the shop with a team and its manager twice a week for about fifteen minutes. The purpose of the meeting is to review the team's progress with their supervisor/coach. Two of the sites had something similar to cluster meetings. Boeing Corinth has area team stand-up meetings with all the teams in an area (from three to five teams) and the managers either

Table 6.3. Comparison of Research Findings to Orsburn et al. (1990)

Key Elements from Orsburn et al.	How This Relates to This Research
• need to make sure that feedback procedures become an integral part of the way teams do business (p. 133)	• feedback on team performance is one of the types of information listed which teams receive, on a regular and frequent basis; performance is reviewed on a daily or weekly basis.
• teams benefit from a "communication wall" with a prominent display of their recent efforts...gives the team a public identity and invites dialogue with outsiders	• teams at Boeing Corinth have public bulletin boards to post charts and graphs on team performance; teams at Tennessee Eastman have their own team meeting room with relevant team information posted in the room; consistent with characteristic #9 (lots of communication tools, including bulletin boards, flipcharts, etc.)
• "any form of communication can increase the quantity and improve the timeliness of feedback on team performance"; gave example of installing telephone lines in the shop for customer to contact teams directly	• Tennessee Eastman teams wanted to install an 800 number for customers, but marketing objected - will be an issue to work on; at Shenandoah Life, the external customers can contact the teams at any time
• installing computer terminals right on the shop floor and give teams open access to up to the minute production data	• consistent with characteristic #8; in all manufacturing sites, there were terminals in the shop and teams, or at least team coordinators, had access to any information on the computer system
• "cluster meetings" with a team and manager in the production area for an informal stand-up meeting review of progress, typically twice a week for 15 minutes	• in characteristic #4, daily team meetings occur with the supervisor/coach usually present some of the time; Boeing Corinth has a meeting similar to "cluster meeting" on a daily basis but with all teams in the area and not just one team; Shenandoah Life has weekly Team Rep meetings with managers and team reps only (not the entire team). No other sites had this type of meeting.
• pre-shift meeting "which is both a feedback tool and communication tool, is almost a universal event among self-directed teams; each day with no manager present, the full team gathers around a production board, reviews results for the previous day, and brainstorms any special action needed to meet the goal for that day"	• consistent with characteristics #1 (shift exchange meeting) and #4 (daily team meeting) which are usually combined; at the meeting, previous shift performance is reviewed and goals are set for the shift, and any other information is discussed.

Table 6.3. Comparison of Research Findings to Orsburn et al. (1990) (cont'd)

Key Elements from Orsburn et al.	How This Relates to This Research
• teams need three types of information: "strategic information (about goals) typically held by executives; operational information about results held by middle managers, and tactical information about methods held by supervisors."	• strategic information (goals) is similar to *issues of larger systems*, which includes business goals and objectives as described in Table 6.1; operational information (results) is similar to *performance of larger systems* which includes operating results; tactical information does not really appear in Table 6.1 because it has already been provided to teams through training and education on administrative duties and work methods to prepare them for deciding how work is to be accomplished.
• "many systems and procedures in a conventional company not only fail to support self-direction, they actively block it"; examples are "an information systems group retains rights over computer hardware, software, and passwords...systems exist to make life easier for the experts, not to make frontline people more productive."	• consistent with general findings in section 6.3.1. of support systems, including information systems, being resistant and incongruent with self-managing teams in redesign sites
• if teams are to make decisions that support organization goals, they will need detailed information about overall operations, including financial information...in other words, to manage themselves, work teams need management information"	• consistent with types of information included in overall business information and consistent with characteristic #8 (having access to any information) and #10 (organization-wide review meetings to share overall business information)

daily or twice weekly. However, the meetings are not with just each team, but several teams. Shenandoah Life has weekly Team Rep meetings with managers and team reps to discuss issues and exchange information. However, only team reps attend, not the entire team, and the meetings include all team reps, not just a team rep from one team. In the five organizations studied, the purposes for having the cluster meetings are achieved in other ways, and not necessarily in meetings with a manager and each team individually. For instance, Boeing Corinth has their area team stand-up meetings, Shenandoah Life has weekly Team Rep meetings, team coaches at Tennessee Eastman and Corning Blacksburg often attend (but do not lead) daily team meetings, and teams at Virginia Fibre informally communicate with their supervisor.

Another difference is that Orsburn makes no mention of information teams provide to other groups and individuals in the organization. Because employees have never received much information in the past, particularly overall business information, the focus in the literature in general, is the information teams should receive.

Another comparison which can be made is to my experience working as a Graduate Research Associate in the Virginia Productivity Center. Although the VPC does not use teams in the same sense as the five case sites studied, the VPC nevertheless shares a great deal of information with all associates in an effort to arm them with the necessary information to do their jobs and become more self-managing. The VPC shares all of the types of information listed in Table 6.1, some formally and others informally. For instance, information on performance of the VPC and VPC issues are communicated in monthly financial reports which anybody can read (although it is distributed to only the Strategic Management Team) and through electronic messages. There is no information which is hidden from associates.

One of the general findings listed in section 6.3.1. and in Table 6.3 is also consistent with my experience at the VPC. The lack of a customer orientation of the formal (accounting) information system personnel is something the VPC has struggled with for several years. There is a formal system which provides financial information, however, the Director of the VPC has had difficulties in getting the information portrayed in a desired format. Although this issue is not the same as the research finding in section 6.3.1., it is related.

6.5. Evaluation of This Research

As discussed in Chapter 4 (section 4.1.8), there are several tests which are relevant for evaluating the quality of a research study. The three which are applicable to this study are construct validity, external validity, and reliability. Construct validity involves the issue of whether the data collected by the researcher addresses the research questions, i.e., are you measuring what you want to measure? To address construct validity, a case study tactic, triangulation, is recommended. Triangulation is combining different sources of evidence. I collected data from several types of sources for this research: interviews, observations, documentation, and artifacts. The primary source was interviews. Additionally, I interviewed people in different positions - team members, supervisors/coaches, managers - and asked the same, or similar, questions.

A second recommended case study tactic to address construct validity is maintaining a chain of evidence, which allows an external observer to trace the research findings back to original data collected, and vice versa. To maintain the chain of evidence, I have kept detailed and comprehensive files on each case study which include all correspondence with people in the case sites, notes from phone conversations, original hand-written notes from site visits, tapes and transcripts from interviews, organizational documentation provided to me, and any articles published about the organization. These files enable me, and any outside observer, to back track from the research findings to the raw data supporting the conclusions.

The third case study tactic to address construct validity is to have key case informants review a draft of the case description. This is a way to corroborate the essential facts of the case. The reviews enhance the accuracy of the case description and hence, increase the construct validity of the study. For each case description in Appendix G, I had at least one (in some cases, two) key people in each site review the case description. Every change requested by the reviewers was made; almost all were very minor changes.

External validity is addressed through using what is called replication logic in selecting cases as opposed to sampling logic. In case study research, the researcher is aiming for analytical generalization of the results to some broader theory, and not statistical generalization of the results. The sampling strategies used in this research (as discussed in Chapter 4 section 4.1.3.) were theory-based or operational construct sampling, typical case sampling, and opportunistic sampling. I used several key constructs to select cases: service/manufacturing, new design/redesign, union/non-union, and size of the organization. The five organizations studied cover a range along these constructs, which represent the population to which the results are generalizable.

To address reliability, I used a case study protocol (a standard method for conducting the case studies) and developed the case study files mentioned in the previous paragraph. A case study protocol ensures that the same method is used for all cases. The case study protocol for this research included a standard set of interview questions (see Appendix C for interview questions used) and a standard format used to write the case descriptions (see Appendix E for format).

The preceding paragraphs discuss the question of the quality of this research - construct validity, external validity, and reliability. Another form of evaluation is to ask how can this research be used? I believe these research findings are portrayed in a format such that practitioners managing the transition to self-managing teams can apply them to their organizations. The research findings are what I have called design features (types of information received and provided by teams and characteristics of the information system). Design features can serve as a check list for managers in organizations with self-managing teams to ensure they are all present in some form or another in their organizations. Design features can also be used by managers in organizations beginning the transition by designing them into the structure of the self-managing teams and the environment surrounding teams.

CHAPTER 7 NEXT STEPS

The purpose of this chapter is to identify future areas for research on this topic, based on what I learned from the case sites. Next steps for research are listed below:

1. One next step is to develop a questionnaire from the design features identified in Chapter 6 and administer it to members of self-managing teams. The purpose would be to see to what extent the types of information shared with teams, types of information teams provide, and characteristics of the information system in the teams surveyed, match the design features in this research study. The questionnaire could be administered to teams in new design sites (having only self-managing teams). Or a comparison could be made to traditional work groups by administering the questionnaire to both traditional work groups and self-managing teams in a pilot area.

2. Another next step is to research the changing information needs of teams as they mature and develop, and take on more strategic decisions. As teams gain experience, more authority, and additional decision-making responsibility, the nature of the decisions they make will become more strategic in nature (strategic as relative to the team). In other words, they may not be making organizational strategic decisions, but the decisions will be strategic in nature relative to the team. For example, teams may begin to decide whether to purchase their inputs from external suppliers as opposed to internal suppliers. They may decide to produce a new product. As their decisions change, so should their information needs. I hypothesize that the information they receive will begin to be more dominated by strategic information, related to their business, to the external market, etc. Research questions would be: how do

information requirements of teams change over time? is how the information is shared changed over time? This would require a longitudinal research study.

3. In the research findings presented in Chapter 6, it was found that the majority of the information flow was from management to teams. A longitudinal study could examine whether as teams mature and gain information, knowledge, and experience, they provide as much information to management as management provides to them.

4. A possible research study would be to research the effectiveness of different mechanisms to share information. In other words, examine whether face to face communication in meetings or one on one communication is more or less effective than written reports, charts and graphs.

CHAPTER 8 LESSONS LEARNED

There are many things I learned, often the hard way, in conducting this research. The purpose of this chapter is to list those lessons learned for the benefit of current and future Management Systems Engineering students. Although some of the lessons I have learned pertain to working at the Virginia Productivity Center as a Graduate Research Associate while working on my master's degree, I believe the lessons are applicable to anyone who works during their graduate program. These lessons represent what advice I would give to a new graduate student entering the MgtSE option, to avoid making mistakes I made, or to emulate things that I found worked well for me.

Lessons learned from this thesis are:

- Be disciplined about spending some time every day thinking about or doing something for your research. When you start to neglect it, it becomes harder every day to get back into it. Your research is like exercising - it's easy to lose momentum, so keep your momentum no matter what.
- Find someone who will constantly bug you about your thesis and ask you what you've done on it. This could be another graduate student who is at a similar stage and you can help each other. It's also valuable to have someone to bounce ideas off or to review/read things you've written for an initial check for logical flow, readability, etc. Having someone to do this for you can be extremely valuable; I did it for a former graduate student, but I did not really find anyone to do it for me on a regular basis.
- A database of articles/papers/books you have read is a must. A useful tool for this is Foxbase or Word. Put the full reference - author, title, journal (if appropriate),

issue, publisher, year - and the main points that are relevant for your research in the database. Keeping a database will also help for future research in your area.

- Keep contact with any people you've met throughout your graduate program who can help with your research. I kept in touch with a professor I met at a conference and he helped me quite a bit, by reading over my thesis proposal and giving me feedback.
- From the very beginning, write your thesis (that includes your thesis proposal) in the correct graduate school requirements, i.e., margin width, page numbering, labeling figures and tables, etc. This will save a lot of time later on at the end of the process, when you can ill afford it.
- File management is critical - you need to be disciplined about keeping track of what is the most recent version of files or you may lose a file or updates you've made to a file. I had files stored on the computer system at the VPC, on disks, and on a hard drive at home. It become increasingly difficult to keep track of revised files and different versions. One thing that worked well was to re-name the file using the date to keep track of the most current versions.
- If you use the case study method or are making any other kind of site visits, assume that you'll have scheduling delays in getting site visits scheduled. When you rely on people who have many day-to-day pressures, helping coordinate a graduate student's visit is understandably not very high on their list of priorities.
- Mix up your activities. Coding notes or transcribing tapes is boring, tedious work. Try to mix it up with reading new articles or papers you've gathered, or writing or even re-organizing your disk or paper files.
- Find your best creative, writing time. Throughout my graduate program with all the papers I had to write, I never discovered my best writing time, until I wrote my

thesis. I discovered that I wrote the most efficiently and with the highest quality in the mornings. Once I realized this, I protected that morning time, and I did my VPC work in the afternoons. At night, I either went back to writing, or did other thesis-related activities, such as reading, editing, and filing.

- If you use the case study method and need to have people in your case sites review your work, make sure you leave sufficient time for them to review what you've written.
- Document what you have done along the way in data analysis. As long as you keep track of what you did and as long as it generally matches what you said you would do in your thesis proposal, your committee should accept it. If you use the case study method, it is important to document exactly what process you followed for each case site, including names, dates, phone conversations, etc.
- Keep in touch with your industry contacts. Even if it's been a while since you've contacted them, or even if you have all the data you need, continue to keep them informed about what you're doing, what stage you're at, and ask them if there's anything new that has come up you should know about for your research. I collected a few important pieces of information from my industry contacts unexpectedly this way.
- Keep in touch with your committee. You should meet with them periodically to bounce ideas around, give them a progress review, get feedback, etc. Take advantage of different mediums to keep them informed - memo, phone, and/or meetings.
- Keep your advisor informed of what you're doing. You should keep in contact with him/her more frequently than anyone else. Again, take advantage of different mediums to keep them updated.

- Using your advisor's time effectively to review written material is critical. Toward the end, when I was submitting several chapters at a time for my advisor to read, I kept everything in a "shuttle" binder notebook. When he was finished reading over new material, he gave it back to me to make changes. I would insert the changed material and new material as well, and give it back to him to review, and so on. In this way, the notebook was shuttled back and forth between my advisor and me. I used tabs to separate each chapter in the binder, and I inserted changed material in the appropriate tab on top of old material. In other words, I always kept older versions of chapters in the notebook with my advisor's comments, and then just put the new version on top of that. Each time I gave the notebook to my advisor with new and/or changed material, I clearly indicated on a cover sheet what was new, what was changed, and what was unchanged. The cover sheet listed each chapter, and had a space for my advisor to check off when he reviewed that chapter, the date it was reviewed, and any comments about it. This shuttle notebook with the cover sheet indicating new and changed material proved to be very effective and helpful to my advisor in accessing his time. I would *strongly* recommend this method to every graduate student.
- When you submit the thesis to your committee prior to your defense meeting (about a week or so), make sure you include a cover memo to explain what you are giving them. Also, if you prioritize what chapters are more important to read, it is very helpful for them. For example, one of my committee members is a manager in industry and is extremely busy. I emphasized to him that if all he could read was Chapter 5 (Results) and 6 (Conclusions), that would be alright. I also highlighted in the cover memo important tables, figures, or sections from the chapters. Table

8.1 includes the parts of the cover memo which accompanied my thesis document to my committee.

Table 8.1. Excerpts From Cover Memo to Graduate Committee Accompanying Thesis Document Prior to Defense Meeting

Excerpt from memo to Graduate Committee:

The chapters I believe you should read fairly closely are bolded below. I've identified important tables or sections in the chapters that you can glance over and gain the necessary information without reading the accompanying narrative. The chapters that are not bolded I believe you can just skim over, or glance at.

Chapter 1 Introduction
- skim over to refresh your memory on the research purpose, research questions, and conceptual frameworks

Chapter 2 Background on Employee Involvement
- briefly skim over if you want to; all of this was in the proposal; important pages:
  - **Table 2.1 on p. 24** - describes different Employee Involvement initiatives

Chapter 3 Review of the Body of Knowledge
- skim over; this was in the proposal; important pages you might want to look at:
  - **Figure 3.1 on p. 44 and Figure 3.2 on p. 48**
  - **Section 3.1.1. (p. 43 -51)** - definitions and terminology for teams
  - **Section 3.2 (p. 58-69)** - describes important elements of teams

Chapter 4 Research Methodology
- much of this was in the proposal, but it has been modified to reflect what I actually did; important pages:
  - **Table 4.3 on p. 97** - contains case study site information
  - **Table 4.4 on p. 100-1** - describes who I interviewed and meetings I observed
  - **Figure 4.1 on p. 112** - Research methodology Gantt chart
  - **Section 4.2.3. (p. 121-4)** - Data Collection
  - **Section 4.2.4. (p. 124-131)** - Data Analysis

Chapter 5 Results
- this chapter represents the data I collected from the five sites

Chapter 6 Conclusions and Interpretations
- this is my interpretations of the data

Chapter 7 Next Steps
- this is areas for future research

Chapter 8 Lessons Learned
- this is lessons learned and advice I would give to a new graduate student

Table 8.1 (cont'd). Excerpts From Cover Memo to Graduate Committee Accompanying Thesis Document Prior to Defense Meeting

References and Bibliography

Appendices:
Appendix A What is Research
- you don't need to read; this was in the proposal and it is supporting information

Appendix B Exploratory Quasi-Experiment
- this is the experiment I conducted with a project team in the VPC; includes design of experiment, results, and lessons learned

Appendix C Code List
- just glance over; you don't really need to read; this is the code list I used to code notes and transcripts

Appendix D Interview Questions
- just glance over; these are the interview questions I used

Appendix E Format for Case Descriptions
- just glance over; this is the standard format I used for all case descriptions

Appendix F Career Plan and Plan of Study Document
- just skim over; this is my five year plan and plan of study

Appendix G Case Descriptions
- read over these if you have time; they are comprehensive descriptions of the case sites (except for Boeing). These contain all the data about each case; Chapter 5 summarizes the data just on the information shared with self-managing teams, so the chapter contains some of the information from the case descriptions.

I have given you the materials in a 3-ring binder so that I could give you additional material or changed pages later and insert them easily. If you would prefer to have a bound copy, I'll provide you with one once all corrections are made. If you'd rather keep it in a 3-ring binder, that's fine, too. I'll just give you any corrections to insert or replace other pages.

Just a reminder - the defense is scheduled for May 1st from 1:30 to 3:30 in Whittemore 542. I'm looking forward to seeing you there.

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APPENDICES

APPENDIX A What is Research?

Research is "the manner in which we attempt to solve problems in a systematic effort to push back the frontiers of human ignorance or to confirm the validity of the solutions to problems others have presumably resolved" (Leedy, 1985). There are many ways to do research. This section uses three dimensions to describe different types of research. The first is the overall purpose of the research. For example, the purpose of the research may be for the sake of knowledge itself (basic research), or to better understand a human or societal problem (applied research). Figure A.1 describes this first dimension of research. The continuum represents theory and concepts through organizational practice and shows where different types of research fall on this continuum.

Table A.1 from Patton (1990) expands upon the five types of research on the theoretical end of the continuum of Figure A.1. For each type of research, the purpose, the focus of the research, the desired results, the desired level of generalization, and key assumptions are listed. The primary purpose of basic research is to gain knowledge and understanding of a particular phenomenon, and not for a practical application with specific commercial objectives (National Science Board, 1982; Patton, 1990). Applied research contributes knowledge and understanding of a phenomenon so that a specific and recognized need may be met through the generation of potential solutions (National Science Board, 1982; Patton, 1990). Development is the "systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes" (National Science Board, 1982). Development can further be broken down into summative evaluation, formative evaluation, and action research, as shown in Table A.1.

A second dimension is the nature of the research - exploratory, descriptive, explanatory, and/or predictive (Marshall and Rossman, 1989; Yin, 1989). Research can explore a phenomenon to try to identify important issues, constructs, or develop hypotheses. Second, research can aim to simply describe by documenting a phenomenon in detail. Third, research can attempt to explain relationships between variables or constructs. Lastly, research can attempt to predict outcomes. These four are not necessarily mutually exclusive; a research study can have more than one aim.

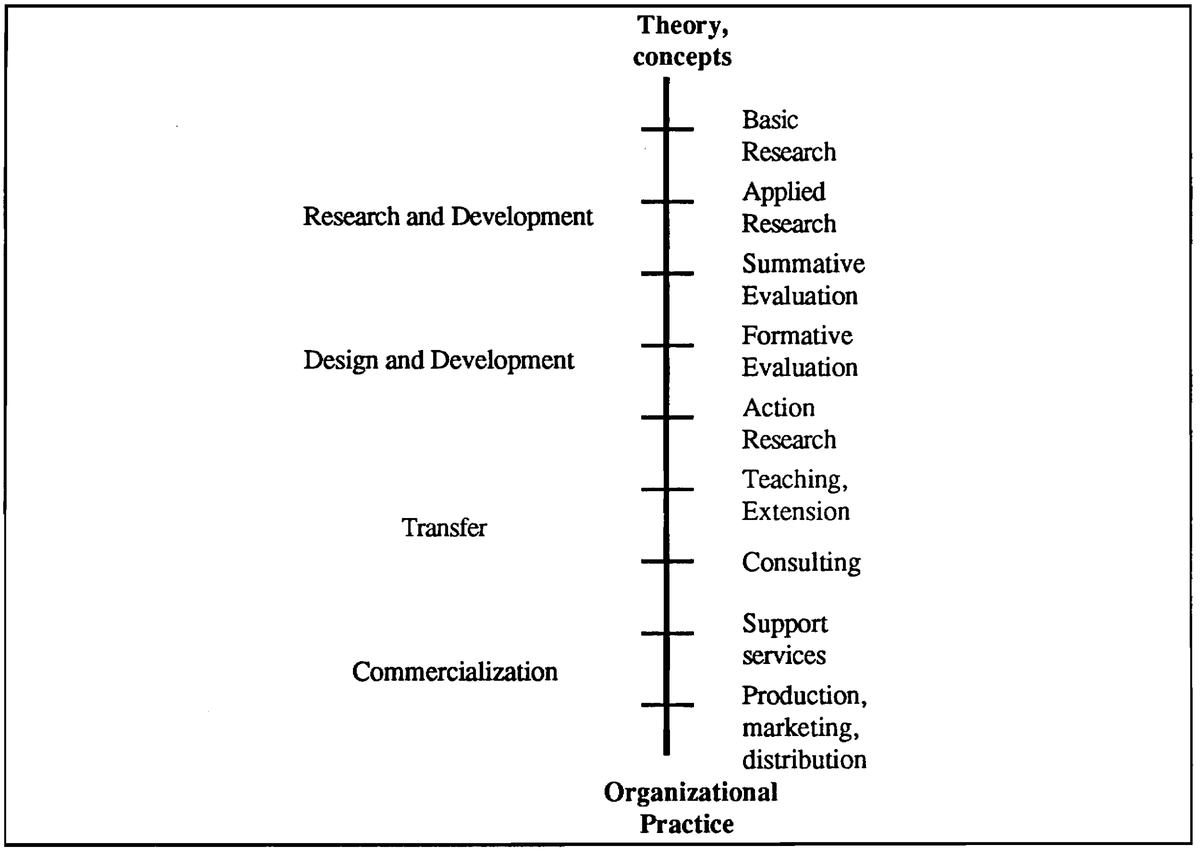

Figure A.1. A Continuum of Theory to Organizational Practice

Table A.1. A Typology of Research Purposes (taken from Patton, 1990)

Types of Research	*Purpose*	*Focus of Research*	*Desired Results*	*Desired Level of Generalization*	*Key Assumptions*
Basic Research	Knowledge as an end in itself; discover truth.	Questions deemed important by one's discipline or personal intellectual interest.	Contribution to theory.	Across time and space (ideal).	The world is patterned; those patterns are knowable and explainable.
Applied Research	Understand the nature and sources of human and societal problems.	Questions deemed important by society.	Contributions to theories used to formulate problem-solving programs and interventions.	Within as general a time and space as possible, but clearly limited application context.	Human and societal problems can be understood and solved with knowledge.
Summative Evaluation	Determine effectiveness of human interventions and actions (programs, policies, personnel, products).	Goals of the intervention.	Judgments and generalizations about effective types of interventions and the conditions under which those efforts are effective.	All interventions with similar goals.	What works one place under specified conditions should work elsewhere.
Formative Evaluation	Improving an intervention: a program, policy, organization, or product.	Strengths and weaknesses of the specific program, policy, product, or personnel being studied.	Recommendations for improvements.	Limited to specific setting studied.	People can and will use information to improve what they're doing.
Action Research	Solve problems in a program, organization, or community.	Organization and community problems.	Immediate action; solving problems as quickly as possible.	Here and now.	People in a setting can solve problems by studying themselves.

A third dimension of research is whether it attempts to test theory (confirmatory research) or build theory. Research can be conducted to confirm existing knowledge or theory, or to generate new theory. I use the term theory-building as Eisenhardt (1989) has described it. Theory-building research can result in concepts, constructs, hypotheses, theoretical propositions, and/or frameworks. It is appropriate for new topic areas, because the "resultant theory is often novel, testable, and empirically valid" (Eisenhardt, 1989: 532). Theory-building research is also appropriate to provide a new perspective to an already researched topic.

Competing Inquiry Paradigms

There is a continuing debate among researchers about how best to conduct research. The debate centers around two competing inquiry paradigms: logical-positivism, which uses quantitative and experimental methods to test hypothetical-deductive generalizations (hypothetical-deductive paradigm), and phenomenological inquiry, using qualitative and naturalistic approaches to inductively and holistically understand human experience in context-specific settings (holistic-inductive paradigm) (Patton, 1990: 37). Both paradigms can rely on qualitative or quantitative data with content analysis or statistical analysis to analyze the data. Table A.2 lists attributes of the two paradigms.

There are three views on the combination of the two paradigms: purist, situationalist, and pragmatist (Rossman & Wilson, 1985). The purist viewpoint argues that the two paradigms are inherently contradictory, and mutually exclusive, and a synthesis of the two approaches cannot be done. The situationalist viewpoint is that both approaches have merits, as well as weaknesses, and that there are situations where each approach is most appropriate. The pragmatists argue for combining both approaches and methods in one study, in order to enhance the credibility of the research results.

What Research Methods Are Available?

A research method is a systematic way to collect and analyze data. Table A.3 lists alternative research methods, as well as their characteristics and/or goals. This is not meant to be an exhaustive list, rather representative of the various methods available. Determining which method is most appropriate for a particular research problem depends on several factors. Yin suggests using criteria: the form of research question, the degree of control over behavioral events of subject(s) under study, and whether the focus is on contemporary events. Table A.4 shows these three criteria along with several research methods. The

Table A.2. Attributes of Competing Inquiry Paradigms (Excerpt from Reichardt and Cook, 1979: 10)

Holistic-inductive Paradigm (Qualitative Paradigm)	Hypothetical-deductive Paradigm (Quantitative Paradigm)
Advocates the use of qualitative methods	Advocates the use of quantitative methods
Phenomonologism and verstehen; "concerned with understanding human behavior from the actor's own frame of reference."	Logical-positivism; "seeks the facts or causes of social phenomena with little regard for the subjective states of individuals."
Naturalistic and uncontrolled observation	Obtrusive and controlled measurement
Subjective	Objective
Close to the data; the "insider" perspective	Removed from the data; the "outsider" perspective
Grounded, discovery-oriented, exploratory, expansionist, descriptive, and inductive	Ungrounded, verification-oriented, confirmatory, reductionist, inferential, and hypothetic-deductive
Process-oriented	Outcome-oriented
Valid; "real," "rich," and "deep" data	Reliable; "hard," and replicable data
Ungeneralizable; single case studies	Generalizable; multiple case studies
Holistic	Particularistic
Assumes a dynamic reality	Assumes a stable reality

**Table A.3. Research Methods
(taken from Leedy, 1985)**

Method	*Characteristics of the Method and the Research Goals*
Action Research	The approach in action research is to do something to see if it works. Will playing video games improve eye-hand coordination in typing? Method: Get a bank of computers, a group of typists; set up a training session. See if typing skills improve.
Case and Field Study Research	A type of descriptive research in which data is directly gathered from individuals (individual cases) or social or community groups in their natural environment for the purpose of studying interactions, attitudes, or characteristics of individuals or groups. A case study is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used" (Yin, 1989). A case study is a research strategy which focuses on understanding the dynamics present within single settings (Eisenhardt, 1989).
Descriptive (or Normative) Survey	The descriptive survey method, also called the normative survey method, is employed to process the data that come to the researcher through observation. This method looks with intense accuracy at the phenomena of the moment and then describes precisely what the researcher sees.
Developmental	This type of research is an observational-descriptive genre of investigation that usually stretches over a period of time and is frequently called "the longitudinal study." Trend studies and projections of future trends are sometimes considered as developmental research projects.

Table A.3. Research Methods (cont'd)
(taken from Leedy, 1985)

Method	*Characteristics of the Method and the Research Goals*
Historical	The historical method attempts to solve certain problems arising out of a historical context through a gathering and examination of relevant data.
Experimental Method	The experimental method attempts to control the entire research situation, except for certain input variables which then become suspect as the cause of whatever change has taken place within the investigative design.
True Experimental Method	The true experiment evinces a greater degree of control and refinement and a greater insurance of both internal and external validity.
Quasi-Experimental Method	Quasi-experimental designs are used in situations where random selection and assignment are not possible. The researcher must be aware of the specific variables the design fails to control and take these into account in the interpretation of data.
Ex Post Facto	This method observes existing conditions and searches back through the data for plausible causal factors. It is the "detective method" in which the situation of the crime is discovered and then the search for the cause or motivation for the crime is sought.

information in Table A.4 doesn't necessarily imply that a researcher can't use a method that doesn't match the conditions. It suggests the method that will be the best fit. Which inquiry paradigm the researcher has chosen will narrow down the research methods to use. For example, for the holistic-inductive paradigm with naturalistic inquiry, clearly, the experimental method would not be appropriate.

Some factors should not be used in determining the appropriate research method. A researcher should not choose a research method based on whether they will collect and analyze qualitative or quantitative data since various research methods can rely on both types of data. Additionally, the overall purpose of the research (explanatory, exploratory, descriptive, or predictive) should not be used to determine research method. Different methods can be any one of the above (Yin, 1989).

The Case Study Method

As described in Chapter 4, the case study method was used in this research. Hence, a discussion of the case study is appropriate in this section to further elaborate on the method and explain why it was selected for this research.

The case study method does not limit a researcher to only using qualitative data, because case studies can rely on both qualitative and quantitative data (Eisenhardt, 1989; Marshall & Rossman, 1989; Yin, 1989). Case studies can be used for different purposes: to provide description, test theory or generate theory (Eisenhardt, 1989). A characteristic of case studies is the combination of data collection methods, such as interviews, questionnaires, observation, archives, and even the use of experiments. Data collection techniques used in this research were interviews, direct observation, documents, and artifacts, as described in Chapter 4.

In the case study method, typically case sites are selected using purposeful (Patton, 1990) or theoretical (Eisenhardt, 1989) sampling strategies, and not random sampling. In quantitative research using random sampling, the goal is statistical generalization of the research results. However, with qualitative research using the case study method, each case is treated as one experiment (and not as one subject in an experiment), and the goal is analytic generalization (Eisenhardt, 1989; Yin, 1989). The case(s) are described such that the reader can clearly understand to what population the research results are generalizable.

A researcher using the case study method must have a firm grasp and insight of the issues being studied (Yin, 1989). I have been a member of an organization (the VPC) for almost two years which moves information, knowledge, power, and rewards downward in

Table A.4. Relevant Situations for Different Research Methods (taken from Yin, 1989)

Strategy	Form of Research Question	Requires Control over Behavioral Events?	Focuses on Contemporary Events?
Experiment	how, why	yes	yes
Survey	who, what, where, how many, how much	no	yes
Archival Analysis	who, what, where, how many, how much	no	yes/no
History	how, why	no	no
Case study	how, why	no	yes

the organization in a conscious effort to make its members more self-managing. However, I have not had direct experience working as a member of or creating a self-managing team. Furthermore, I had limited opportunities in case site visits to directly observe and interact with self-managing teams. To increase my experience and insight, I conducted an exploratory quasi-experiment to create a self-managing team in the VPC. This experiment allowed me to gain direct experience with self-managing teams and the challenges of designing and implementing them. The experiment is discussed in more detail in Appendix B.

How is This Research Management Systems Engineering Research?

Management systems engineering focuses on the research, design, development, and implementation of improved management systems. A management system contains three components: who manages (the human decision-maker(s)), what is managed (the organizational system), and what is used to manage (tools and techniques). A management system also has three interfaces: the decision/action interface, the measurement/data interface, and the information portrayal/information perception interface (Kurstedt, 1989). A management systems engineer must be able to identify problems from a generalist's perspective, and solve them with a specialist's tools. Examples of management systems are: planning, compensation, measurement, information, decision-making and problem-solving systems.

A modified management systems model (MSM) was used in Chapter 1 as a basis for one of the conceptual frameworks for this research. The "what is managed" component of the MSM is a work group (a self-managing team), "who manages" are the members of the self-managing team, and "what is used to manage" are the tools and techniques used to convert data to information. The modified MSM is reproduced in Figure A.2. This research focused on the information teams need to make decisions, represented by the information portrayal/information perception interface for the team (who manages) as well as the information the team receives and sends to "other audiences." The information the team receives must support the decisions they make and convert to actions.

Scientists discover, mathematicians solve, and engineers design (Tompkins, 1989). A management systems engineer designs management systems. The focus of this research is the information system necessary to support self-managing teams. The information system is a management system which must be designed, developed, implemented like any mechanical or electrical system. In this research, I studied key variables (design issues)

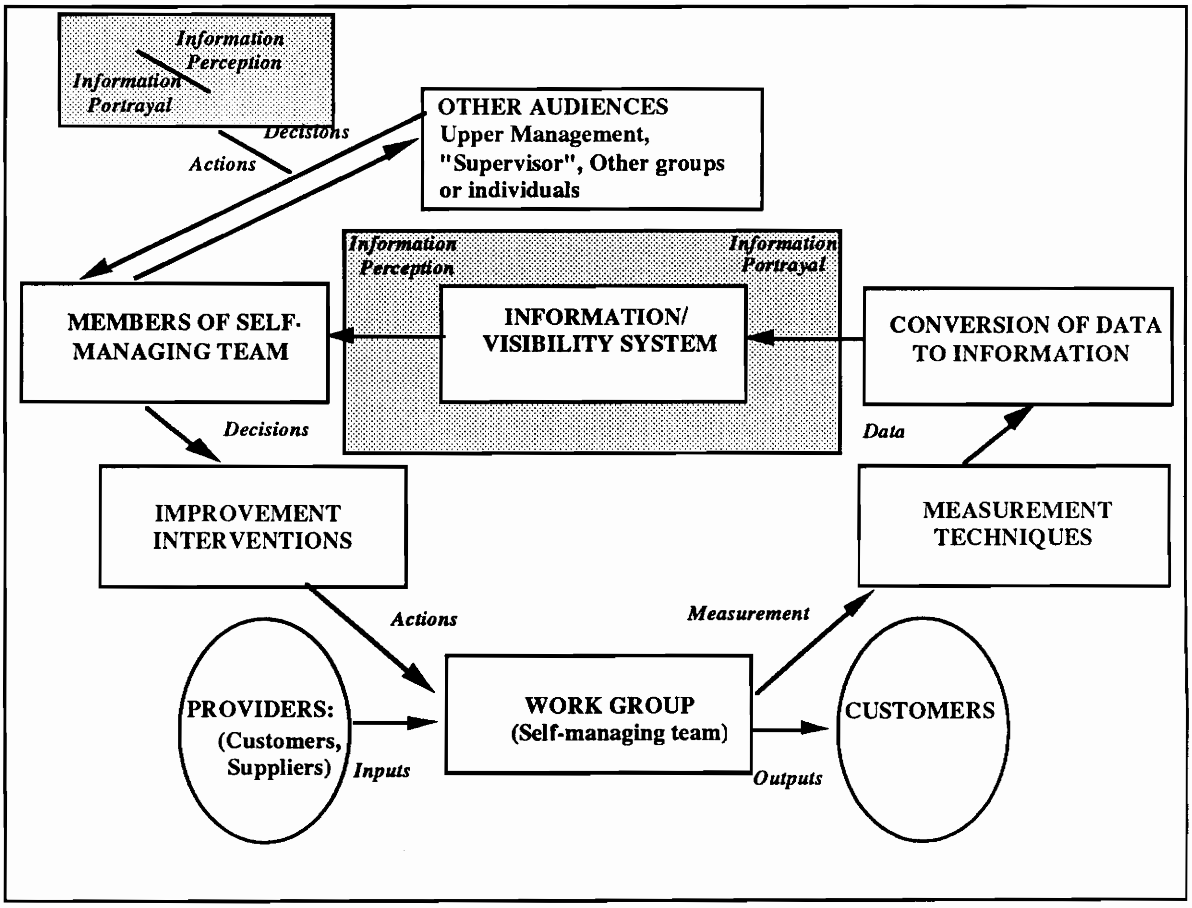

Figure A.2. This research focuses on the information system (MSM adapted from Kurstedt, 1989)

involved in the design, development, implementation, and continual improvement of information systems supporting self-managing teams.

APPENDIX B Exploratory Quasi-Experiment

The primary objective of the experiment was to increase my understanding and experience with self-managing teams. In the experiment, I formed a self-managing project team from people involved with one of the projects at the VPC, and I decided what information to share, how, when, and why. The team met regularly throughout the experiment, and I gathered feedback about how the team was functioning and to determine if the team felt they had enough information. Lessons learned from this experiment were integrated into data collection for the case studies, specifically in interviewing.

Background

The setting of the experiment is a project at the VPC, the three day short course Total Quality and Productivity Management (referred to as the "3-dayer"). I have been project manager of the 3-dayer and became co-presenter of the course before the experiment and independent of it. This course is presented twice a year as a pre-conference seminar prior to the Institute of Industrial Engineers' Conference. As project manager, I was responsible for collaborating with the course presenter (Dr. Scott Sink) on the design of the course materials (the accompanying notebook); development of the materials; logistical issues for preparation of the course and on-site support; assisting with budget development for the course; budget tracking; and slide and overhead development. To carry out these responsibilities, in a sense I supervised three people: the secretary supporting the course (making revisions to course materials, handling logistics items, etc.), the resource center administrator who assembles slides and overheads, and a new graduate research associate who replaced me as project manager. The nature of the 3-dayer project is such that things need to be done to prepare for delivering the short course twice a year, but the rest of the year, the project is relatively inactive. There are also follow-up activities after delivering the course.

In past 3-dayers, the three of us (secretary, resource center administrator and myself - the new graduate student serving as PM had only recently joined the VPC) had not really acted as a team with respect to this project. Instead, I had had one on one interaction with each person as necessary to accomplish the tasks.

For this experiment, I formed a self-managing team for the 3-dayer project, consisting of the new PM (John Rudolph), the secretary (LeAnn Daugherty), the resource center administrator (James Reaney), and myself as co-presenter of the course. This experiment represented not only a change in that we worked as a team rather than as somewhat isolated individuals, but we also became more of a self-managing team rather than being a manager-led team, with the project manager making all or most of the decisions. The time frame of the experiment was during the preparation phase for delivering the 3-dayer in San Antonio, Texas. I stopped data collection after the team had completed follow-up activities from San Antonio, which was approximately one month after the course.

Design of the Experiment

The design of the experiment included deciding who would be on the team, when to "start" and "stop" the experiment, how the team would operate, what my role would be, and deciding what information to share with the team. The four people on the team (John, LeAnn, James, and myself) were those who directly supported the 3-dayer project and spent a significant amount of their work time on it. As a PM, I spent on average about half of my working time on the 3-dayer (approximately ten hours per week), and the new PM would as well. During inactive time periods, the amount of time spent on the 3-dayer is generally minimal. The secretary spends a significant portion of working time on the 3-dayer during the month or so prior to and after the delivery of the course. The RCA spends from one quarter to half their working time getting ready for the 3-dayer. People who were not included as regular team members were Dr. Sink, the course presenter, and Cindy Johnston, who does all the VPC marketing, including marketing for the course. Dr. Sink is an immediate customer to the team rather than a team member, and Cindy is more of a supplier to the team, providing the necessary course marketing Cindy attended some of the team meetings when necessary, but was not a regular team member because she spends the majority of her time on other projects and other functions.

The experiment began about three weeks before the delivery of the San Antonio short course, in early October, and I stopped collecting data approximately the beginning of December, after the course follow-up activities were completed. From December until the time came to get ready for the next course offering in Detroit, the 3-dayer project was basically inactive. I decided to have the team meet twice a week before the San Antonio offering and meet once or twice as necessary, after the course for follow-up. The responsibility of sending out minutes of the meetings with action items was rotated.

My role on the team was different than it had been in the past because I was no longer the PM, and the role of the PM had changed anyway. The new PM would not have the same role I did as PM. On the team, everyone would be considered an equal team member. This doesn't mean that everyone had equal weight in every decision. Depending on the specific decision, one team member may have more expertise than others, and therefore, have "expert power" with regard to the decision. The shift was from formal position power to expert power, with emergent leadership as necessary. For example, in matters of making course content decisions, the new PM and myself had the most knowledge so our opinion carried more weight. In matters of assembling and preparing overheads, the RCA had the most direct knowledge, so decisions regarding overheads were either left to him (after consulting with the group), or became a team decision, rather than the PM making the decision, as in the past.

The experiment design also included deciding what information to provide to the team to directly and indirectly support decision-making. Where possible, I used elements of the existing VPC information and visibility system. I basically provided two types of information. The first type was technical task-related information about the 3-dayer project, explaining what specific tasks we needed to accomplish to prepare for, deliver, and follow-up a 3-dayer. This type of information was necessary because the new PM was not yet familiar with the overall 3-dayer process, and the other two team members only knew their own specific tasks. The second type of information I provided was supporting information, some of which was needed to influence team decisions (such as the budget for the short course and goals for new course development), while some was simply for the purpose of information sharing and not necessarily to support decisions (such as goals of the VPC and overall VPC performance). Some information team members already had because the VPC is an open environment committed to sharing information with everyone. The information shared is shown in Table B.1. We spent most of the first team meeting going over the technical task-related information and briefly covering the supporting information on the VPC and the 3-dayer.

The technical information consisted of the major activities to prepare for the San Antonio 3-dayer. LeAnn and James already knew some of this information because of performing their specific tasks in past 3-dayers, however, they had not had an opportunity to see the overall process and how everything fits together. There were five categories of supporting information: information about the VPC, performance of the VPC, information about the 3-dayer, goals for the 3-dayer, and performance of the 3-dayer. Team members were generally familiar with the first two categories because they had worked in the VPC for some time. Many of the specific documents listed in Table B.1. team members already

Table B.1. Information Provided to 3-dayer Team

Technical Task-Related Information	Supporting Information
1.Preparing notebook for IIE: • meet with support staff to discuss storyboard with changes from earlier version • integrate cut and pastes that were put in computer by graphics artist • coordinate getting changes made (initial review, revisions, etc.) • coordinate changes to exercises, reading list and other supporting materials • final check on entire notebook • assemble final original • make copies of notebook for various VPC associates • send to IIE • if any last minute corrections necessary, print out corrected pages, make copies, and pack to bring on plane. 2. Preparing slides and overheads (OHs) for San Antonio 3-dayer • make a list of all OHs that were changed • make new OHs for changed material • make new OHs for corrections from previous course offering • determine new slides to make • make new slides at LRC • assemble set of educational interventions (EIs) and OH notebook • assemble slide notebook 3. Logistics • packing list for materials • ship out materials that can be sent ahead of time • pack other materials to bring on plane 4. Maintain integrity of computer files 5. Budget tracking • record number of hours spent by all team members and others 6. Re-assemble slides and OHs into complete set upon return 7. Follow-up meeting • evaluation summary • discuss changes for next course offering • thank you letters to participants • ASSESS data and reports	1. Information about the VPC a. Background information: • *VPC Primer* prepared by DSS • also parts of *Red-loop plan* b. Goals and objectives for VPC: • Parts of *Red-loop plan* 2. Performance of the VPC a. Financial performance: • *monthly financial report* b. Other performance dimensions: • *DSS memo from mid year review 1990* • *Memo from DSS, GDC, and MS dated 9/6/90* • *VPC annual report* 3. Information about the 3-dayer a. Background: • *history* (verbal information) • *3-dayer brochure* • *trip reports from previous 3-dayers* b. Providers and customers (internal and external) • *verbal* c. The 3-dayer process • *excerpt from Key Processes study* by Vivek 4. Goals for 3-dayer a. Goals for TQPM • *Education and Development budget summary* b. New course opportunities • *letter to IIE from Cindy* about new courses • *Cindy's milestone chart* for new course development 5. Performance of 3-dayer a. Financial performance • *Macro budget summary* • *project budget report* b. Other performance dimensions • *Evaluation summaries* from past several 3-dayers • *summary of evaluations, attendance, etc. prepared by DSS.*

had in their own files, for example, the VPC Red-Loop Plan and the VPC Annual Report. The last three categories of information all pertained to the 3-dayer, and much of the information was shared with the team verbally, while the rest was contained in documents or memos given to the team.

The 3-dayer team, while having some characteristics of self-managing teams is not the same type of team I have studied in this thesis. However, I was still able to learn from the experience. The similarities were:

- working as a natural work team - the team was responsible for a whole task, the 3-dayer
- functioning autonomously with everyone as equal team members - no one had formal position power

Differences were:

- we were not fully cross-trained - only LeAnn knew all the details about the software to make complicated changes to the course notebook, although we all had a working knowledge of the software; only John and myself were intimately familiar with the course content, although the other team members were learning it.
- we were not on a pay for skills compensation system - being in a university, the VPC has very little control over what to pay people and we could not make changes to the formal compensation system
- we did not receive any specific training to prepare for working in a team environment, although some of us had had training in problem-solving. No one received training on interpersonal skills, effective communications, and listening skills, for example.

In spite of the differences, there were enough similarities to justify the experiment and for me to learn something about the challenges and problems of working as part of a team, and as a manager trying to get a team to make group decisions. I also learned several important things about sharing information with a team. Lessons learned from the experiment are discussed at the end of this Appendix.

Results

The results discussed in this next section include what occurred at the initial team meeting and the regular team meetings before and after the San Antonio course. Results also include other activities of team members which were related to the experiment.

Team Meetings

Initial Team Meeting

After the experiment was designed, I held an initial meeting with the team approximately three weeks before the course was to be delivered. The purpose of the initial meeting was to provide an overview explanation of the "3-dayer project team," explain what my role would be, and share with the team the technical task-related and supporting information listed in Table B.1. Explaining how we would operate as a 3-dayer project team entailed a discussion on group dynamics and group decision-making. We also discussed roles and responsibilities of team members. My role on the project had changed from project manager to co-presenter, independent of this experiment, so I also explained my new role and how it would change from what it had been as project manager. I explained how the role of project manager would change from autocratic or delegative to participative and consultative.

Also at this initial meeting, I provided the team with the technical and supporting information described earlier. The technical information described the major activities involved in preparing for a 3-dayer, such as preparing the course notebook, preparing overheads, and handling logistics. Supporting information included general information about the VPC, some of which team members already had, and other information about the 3-dayer, such as the 3-dayer budget, goals for new course development, and past 3-dayer trip reports. This information was not directly needed to perform the specific tasks of preparing for the San Antonio 3-dayer, however, it would be needed if the team were to make any decisions regarding the future of the course.

The response from team members during this initial meeting was very positive. Everyone "bought in" to the idea of working as a team, and they thought it was a good idea. There were also ideas generated for how to improve the preparation for San Antonio.

Regular Team Meetings

The purpose of regular team meetings (about twice a week) was to share information and make decisions to perform the team tasks in preparing for the 3-dayer. The team met four additional times after the initial meeting. A summary of each of the meetings is shown in Table B.2. Any critical incidences are also included in the table. Another purpose of the meetings was for me to collect data on how the team was operating, how decisions were made, emergent leadership, and how team members felt about the team. Collecting feedback provided the opportunity to make mid-course adjustments to the team structure if necessary. I did not make any adjustments to the team structure or to my role.

The last few days before leaving for San Antonio were very hectic for the team, because we did not know until two or three days before we were supposed to leave whether or not the course was still on. Because of this uncertainty, we were hesitant to spend a great deal of time getting some handouts ready since the probability of the course being cancelled was fairly high. However, when we found out the course would be offered after all, we had to scramble somewhat at the last minute to prepare the handouts. Because of the short time frame, I helped LeAnn type in many of the changes to the handout. In this way, we all pitched in at the end to get everything ready, whether or not that was our normal job.

Other Activities of Team Members

There were several other activities during the experiment. While they did not relate directly to the 3-dayer project, they affected the team members, so they are included here. The week before the San Antonio 3-dayer, the VPC offered a two day televised seminar on quality and productivity management in Blacksburg, which we referred to internally as the "NTU seminar." The NTU seminar was very similar in content to the 3-dayer, so the team decided to have James, LeAnn, and John attend parts of it. None of the team members had previously attended any of the VPC's short course or seminar offerings. Attending the seminar gave them a chance to see the end product of something they had worked on, and it also gave them an idea of what the customer sees. All three team members, particularly LeAnn, believed attending the seminar was extremely valuable. LeAnn has been involved with preparing for many other VPC seminars and projects, and so attending the seminar was very meaningful to her. In fact, after I had complimented her on her performance on the 3-dayer team, she replied that the NTU seminar "really did it for her," as far as feeling ownership and commitment to the 3-dayer.

Table B.2. 3-dayer Team Meetings

Meeting on Friday October 12 • John, LeAnn, and Eileen present • critical incident - James did not show up for the meeting nor call to let the team know he could not attend. The team had purposely scheduled the meeting at this time so he could attend; James did not have a legitimate excuse for missing the meeting; the team was uncomfortable sanctioning James' behavior after the meeting and avoided interpersonal conflict. We almost expected an incident like this because James had a tendency to be unreliable, but we were disappointed that we were starting off this way • reviewed status of action items to be accomplished before San Antonio; all were on schedule • at this point, the team still did not know for certain whether the course would still be presented because of low attendance; this caused ambiguity in accomplishing tasks because there was a significant probability that the course would be cancelled; however, we still assumed the course would be offered and proceeded as normal • decided to have James, LeAnn, and John attend parts of the NTU seminar • the team scheduled the next meeting on Monday, even though we knew James could not attend because the middle of the week was not available to meet
Meeting on Monday October 15 • John, LeAnn, and Eileen present • reviewed status of action items and planned out the week as far as accomplishing action items so we could meet Friday and have everything finished and ship out supplies to San Antonio on Tuesday • we still did not know for certain whether the course was on or not • scheduled the next meeting for Friday
Meeting on Friday October 19 • all team members present • review of action items; not all were done as expected, but nobody dropped the ball • still did not know about course • scheduled next meeting for Monday as a final check before we left for San Antonio
Meeting on Monday October 22 • all team members present • review last minute action items; touch base once more to make sure nothing "fell through the cracks" • IIE made decision to offer course and Dr. Sink, John and I left for San Antonio on Wednesday • critical incident - we never found two of the videotapes we use during the course; James "owns" the resource center which includes videotapes, however, he did not appear to feel responsible for finding the tapes or coming up with creative solutions to use alternative tapes

Table B.2. 3-dayer Team Meetings (cont'd)

Follow-up Meeting on Tuesday November 6 • John, LeAnn, and Eileen present; James missed the meeting and did not inform us ahead of time again • purpose of the meeting was to discuss action items from the trip report from the San Antonio 3-dayer and divide up the action items • LeAnn came up with an idea for a new way of making colored overheads by switching to a cheaper and more responsive supplier; she also contributed several other ideas or comments about the 3-dayer and other similar courses
Meeting on Monday November 19 • John, LeAnn, James, Eileen, Dr. Sink, and Cindy were present • typically this "debrief meeting" would be with just the course presenter and the PM, however, I decided the whole team should attend since we would be talking about the next 3-dayer • purpose of meeting was supposed to be discuss what changes in the course needed to be made for the Detroit 3-dayer (the next offering) while San Antonio was still fresh in our minds; however, we unexpectedly "switched gears" and discussed the Education and Development strategy (which includes more than just the 3-dayer); as a result James and LeAnn for example, could not contribute as much to the meeting as they could have if we stayed to the agenda; I believe it was still worthwhile to have the entire team present because it gave them an idea of where the 3-dayer fits into the bigger picture

Discussion and Conclusions

Feedback From the Team

Throughout the experiment and at the end (approximately one month after the delivery of the short course), I collected feedback from the team on what they thought about working as a team rather than individually. Everyone on the team had worked in the VPC long enough to be involved in other projects where most of the work was done individually and few team meetings were held. Everyone's view of the 3-dayer project team was positive, and they enjoyed working in a team. According to one team member "working on a project team, like the 3-dayer team, was the ideal way to get a job or project completed and continuously feel like everything was in control." This team member felt that the team "performed very well." In addition, other people in the VPC gave the team recognition and praise for our work as a team.

Effectiveness of the Team

Having been PM for the 3-dayer for two years and being involved in six offerings of the course, I believe that the preparation work for the San Antonio 3-dayer went more smoothly than any other 3-dayer I have been involved with. There were much fewer last minute changes and action items, and I had to spend much less time the last week getting ready. In the past, the PM is the only person who has the comprehensive check list of action items and things to bring on-site, however, with the project team, responsibility for action items was divided up among team members. Additionally, during the meetings, we were constantly reminding each other of things we had to do. Several times, someone had forgotten they were supposed to do something, and another team member reminded them of it. Because of this, nothing was forgotten or had to be done at the last minute. As one team member put it, you "ensure that nothing falls through the cracks" and you "feel more assured that every little thing down to the detail is taken care of." The only mistake was not being to find two videotapes for the course, however, these tapes were not forgotten. They just could not be found, and the team had little control over the situation.

Another measure of performance of the team was the number of corrected pages we had to bring on-site with us to replace in the notebook. IIE makes copies of the notebook from an original we send to them, and typically, there are anywhere from five to ten pages of pages we have to insert in all the notebooks the night before because they had errors. For the San Antonio 3-dayer, there were no corrected pages. There was a handout we brought with us, however, we knew we would be bringing that with us for several weeks.

The team probably spent more time collectively preparing for the 3-dayer than in past 3-dayers because of all the meetings, so we may not have been as efficient. I had to spend less time, as mentioned earlier, but the total number of hours for all team members may have been more than in previous 3-dayers. However, I believe the smoother preparation work and quality of the 3-dayer process was worth the investment of time.

Another indirect measure of the team's performance is the increased decision-making by the team as opposed to one person, the PM. The team made decisions as a group that normally the PM would make individually. The implicit assumption in this measure of performance is that the team decision will be of higher quality than an individual decision, because other team members may have additional information the PM does not have. An example of this happened in a preparatory meeting for the Detroit short course (since this meeting happened after I stopped collecting data, it is not documented in Table B.2 and not strictly considered part of the experiment). We were discussing how we could send out letters to past participants since our mail data base was not working and could not give us the names and addresses. LeAnn remembered that we had the names and addresses in the computer files in the thank you letters that we had written to them after the course. Without that information, we would not have been able to contact past participants at that time.

Because all stakeholders considered the 3-dayer team successful (the immediate internal customer, Dr. Sink, as well as other VPC associates), we continued working as a team for the next short course offering in Detroit. Some of the team members have changed. There is a different graduate research associate as PM now (Mindy Gross). James left the VPC and we hired someone new to fill that position, Chris Gravell. Now the team consists of LeAnn, Mindy, Chris, and myself.

Other Related Outcomes

Because of the perceived success of the 3-dayer team, other VPC associates have begun to increase the use of teams in other projects. In fact, the VPC administrative manager was overzealous in assigning people to teams for all active VPC projects, without explaining the reason for forming teams or how the decision was made on personnel assignments. This incident prompted me to make a presentation to all VPC staff on what self-managing teams are, the differences and similarities between self-managing teams and the 3-dayer project team (and other project teams in the VPC), and how the 3-dayer team worked.

Since the experiment, teams have been used more often on other projects in the VPC. For example, a recent seminar for the the Naval Explosive Ordnance and Disposal

Technology Center (called EOD) was prepared by a team. In one of the team meetings, it was suggested that the secretary on the project (LeAnn) go to the seminar as support, in order to meet the customer and see the end product (the seminar material) being used. The EOD project team also provides an example of one of the challenges of teams. The VPC administrative manager who is technically LeAnn's supervisor, was upset because she "didn't find out about LeAnn going to the EOD seminar first hand." In other words, she found out from LeAnn herself instead of from the VPC's Director. The administrative manager was accustomed to having every decision (no matter how small) discussed with her first, particularly if it affected the people who "work for" her. It is often difficult for people who have been supervisors to relinquish control over decisions and allow teams to make them. This was one of the lessons I learned from the experiment (see the end of this Appendix).

Another activity related to the experience with the 3-dayer team was LeAnn's ability to assemble a different presentation from the 3-dayer overheads. Because of her increased knowledge of the course content from working on the 3-dayer and from attending the NTU seminar, she was able to assemble all the necessary overheads, with minimal help from me or the PM on where overheads were in the course notebook.

Lessons Learned

The purpose of generating lessons learned was so that I could integrate the knowledge I gained into my data collection for the case study site visits. The sequencing of the case studies was such that most of the site visits occurred after the experiment. There were two types of lessons learned for me: lessons about self-managing teams in general, and lessons about sharing information with teams. What I learned about sharing information did not directly correspond to my specific research questions (for example, how often to share information on performance feedback), but it was still useful to learn. Lessons learned from this experiment are:

- It was hard for me as the previous PM not to step in and tell the team what to do and how to do it. It is more difficult to get someone else to understand what is the best thing to do than to do it yourself. There were several instances where I had to stop myself from telling the "answer" and instead lead a discussion on the issue to get other team members to say what they felt about it. It was hard to let go of something I had worked on as PM for two years and let other people make decisions that I would have made differently. You have to strike a balance between letting people feel ownership by participating in decisions and stepping in to prevent a mistake or bad decision. Sometimes, you may have to sacrifice the quality of the end product to some extent (due to lack of experience in making decisions) but you gain increased ownership and experience by team members.

- There were some things where I had to be autocratic because of time pressures. If we had had more time to accomplish our tasks, I could have let the team discuss the issue and make a decision, and it might not have mattered whether or not the decision was the one I would have made, as long as it would work. But because of having little time, there were a few times where I had to step in and say "this is what we need to do, and this is how to do it." When the deadline was approaching, other team members also wanted to rely on me and the PM because we knew what had to be done, instead of making a team decision.
- People are generally reluctant to make decisions at first when they have not been accustomed to doing so. The reluctance may stem from not feeling as if they have the information or experience necessary to make the decision Even if they have all the necessary information to make a decision, team members often do not have the confidence to make the decision and then trust their decision. Practice can overcome this problem. I found this to be true in the 3-dayer team; as we met more and as we are meeting now for the Detroit 3-dayer, the secretary in particular, is much more confident in her ability to contribute to a team.
- People are reluctant to discipline other team members when someone is not contributing their fair share. As mentioned in Table B.2., one team member missed several team meetings (one of them very important) without telling the team he wouldn't be there. It became an awkward situation because everyone was irritated that one member didn't show up and we felt that he "dropped the ball," but on the other hand, no one wanted to say anything to him at the next meeting. At the meeting he missed, we discussed whether or not we would say anything, and everyone was uncomfortable disciplining his behavior. It's very difficult for most people to give negative feedback to peers. Most people work in a system where the only feedback they get is from a supervisor, but in a self-managing team environment there is no supervisor.
- Once people start to feel ownership for something, there is no stopping them. The way we achieved ownership in team members for the 3-dayer was to have them attend a similar seminar to see what the end product looked like to the customer. Seeing the

seminar delivered provided "task significance" to team members - understanding what happens to your work after you're finished with it and understanding how it fits in to the bigger picture. As mentioned earlier, attending the NTU seminar was invaluable for LeAnn and her understanding of the VPC's products. The way she felt about working in the team was that it gave her a "sense of ownership, instead of burden...you take pride in something you belong to, or that you own." It's very rewarding to see people take ownership for their jobs and really feel as if they can make a difference.

- When the team was first formed and we had a deadline pending, the broad supporting information (information about the VPC, performance of the VPC) was not really used to support decisions because it was not necessary at the time. The more critical information was the technical task-related information which the team needed to perform. During the follow-up meetings, when we had the time to talk about future issues for the course, the broad supporting information was used more, in particular in the meeting on November 19th, in which we discussed the strategy for Education and Development. The point is that in the beginning of the experiment, when we were pressed for time, we just focused on getting the immediate tasks done to get ready to leave for San Antonio. The technical information supported accomplishing these tasks, and hence, was most important to the team.
- Important information needs to be reinforced through more than one media, for example, written and verbal face to face communication. The technical information which explained the activities in the 3-dayer process was given to the team in written format, but I also had to go over it verbally several times until everyone understood it. There were also other specific action items that came up which were critical, and a few almost fell into the cracks because someone forgot about them. I found when other team members reinforce the same information several ways, or at least several times, the possibility that something would be forgotten, or misunderstood, was minimized.

The bottom line is that a team is not going to automatically become a "self-managing team" just because they are put together in a room and given a task. For various reasons - the difficulty for the previous leader to let go, team members' reluctance to make decisions, lack of time for group decisions - becoming self-managing does not happen overnight. It is often frustrating for both team members and leaders of teams. This insight helped me to better relate to team coaches and team members in discussing the challenges and difficulties of being a part of self-managing team, or coaching a self-managing team. I gained first hand experience with many of the issues coaches and team members brought up in interviews.

Limitations of This Experiment

There are several limitations to this experiment which should be illuminated. First, this was not the same type of self-managing teams studied in this thesis. The differences between the 3-dayer team and self-managing teams studied in this thesis were described in the section on Design of the Experiment earlier in this Appendix. However, I was still able to learn several things about self-managing teams in general, and about sharing information with teams. The increased insight into the problems and challenges of a self-managing team enabled me to relate better to the challenges described to me by team members and coaches in interviews. Second, we had only three weeks to function as a team before the San Antonio 3-dayer and two meetings after the 3-dayer. This is a very short time period to try to collect data on the information shared with the team. Third, I was a participating member of the team, which some might argue biased the results. However, the purpose of the experiment was for me to gain experience. It was not expressly for the purpose of collecting data on types of information shared, therefore, this is not really a limitation. If the purpose of the experiment had been primarily to collect data on the information shared, how it was shared, how often, whether the team felt they had sufficient information , etc., then this would be a valid criticism of the experiment.

APPENDIX C Interview Questions

The questions shown below are grouped into two basic categories: background questions about the organization, and specific questions about the team environment. This list of interview questions is a general one; for each organization I had to tailor the list because I may have already had some of the information (from articles previously written or organizational documentation). Additionally, the questions had to be modified depending on whether the organization was a redesign or new design site. The questions were also tailored to the interviewee. For example, for team members, I did not emphasize questions about the background of the company or the background of the team environment, but instead focused on specific detailed questions about the teams. I reserved the background type of questions for the contact person at the organization.

Background

1. What is the history of the organization?

2. General organizational information:
    a. customers?
    b. competitors?
    c. industry?
    d. products/services?
    e. technology used?
    f. is it part of a corporation/superordinate organization?

3. Can you describe union-management relations? (for union sites)
    a. how was the union involved in the design process, or redesign process?

4. Can you describe the formal organization structure?

5. What is the infrastructure for improvement?
    a. standing teams?
    b. ad-hoc teams?

6. What is the nature of organizational communication?
    a. how open is management with sharing all kinds of information, including financial?
    b. what mechanisms are there to share information throughout the organization?

7. What is the culture like?

8. What other types of improvement interventions (besides self-managing teams and Employee Involvement) are ongoing?

9. What is the external environment like?

10. How is the organization performing?

Team Environment

<u>Background About the Team Environment</u>

11. Can you describe the evolution to self-managing teams in the organization? (for redesign sites) or Can you describe the history of the start-up for the plant? (for new design sites)

12. What outside companies did you visit to study self-managing teams?

13. What books did you read and what consultants did you use?

14. What is your definition of self-managing?

15. In your opinion, are teams generally self-managing?

16. How long have teams been working together?
    a. has everyone been working on the team since the beginning?

<u>Team Structure</u>

17. What is the structure of the team/how does it operate?
    a. is there a supervisor?
    b. is there an internal team leader?
    c. what are the coordinator roles?

d. what are the core skills?

e. how are performing core skills rotated?

18. What is the role of the internal team leader, if there is one?

19. Who are the teams' customers?

a. internal or external?

b. what are the teams' products/services?

20. Who are the teams' suppliers?

a. internal or external?

b. what do they provide as inputs to teams?

21. What support departments or groups in the company do teams interact with the most frequently?

a. how do they communicate/interact with teams?

b. how often?

<u>Role of Leadership/Supervisor</u>

22. What is the role of the supervisor?

a. what sorts of things does he/she do?

23. Has the number of supervisors been reduced? (for redesign sites)

a. if so, what are previous supervisors working on now?

<u>Performance of Team(s)</u>

24. What has been the performance of the teams, or department having teams? (for redesign sites)

a. better than expected?

b. how is it measured?

c. how often?

<u>Decisions and Responsibilities of Teams</u>

25. What decisions or responsibilities do teams have (without approval from supervisors) besides building product/providing the service?

26. What sorts of things would teams have to get approval for ?

27. How do teams go about determining new things to try, for example, process improvements?

28. Who sets production goals for the team?
    a. how are they determined?
    b. how often are they changed?

29. If a team had an idea for improvements, can they implement it?
    a. if not, what sort of approval do they have to get and what is the process?

30. If someone notices a problem, how is that handled?

Team Meetings

31. How often do teams meet? (daily, weekly)
    a. what sorts of things are discussed/decided at team meetings?
    b. who runs the meetings?
    c. is the supervisor present?

32. What other types of meetings are team members involved with?
    a. what is the purpose of the meetings?
    b. how often?
    c. who else is involved?

33. How do the teams within a department communicate with each other?
    a. what sorts of information is exchanged with other teams?
    b. how is it done? (log books, one on one, meeting, etc.)

Team Facilities

34. What facilities do teams have at their disposal? (meetings rooms, etc.)

Selection and Placement Process

35. How are team members selected?

a. who makes the final decision on hiring someone?
b. who makes the final decision on firing/terminating someone?
c. what is the process to fire someone?

<u>Rewards and Recognition</u>

36. How are team members compensated?
    a. is there a pay for skills system in place?
    b. if so, what are the elements?
    c. what is the process to progress through the system, e.g. certification, evaluation?

37. Do teams participate in any other kind of bonus program?

<u>Peer Evaluation and Feedback</u>

38. How are team members' evaluated?
    a. who evaluates them?
    b. what is the process for evaluation/performance appraisal?
    c. is it tied to pay?
    d. what are the consequences of the evaluation process?

<u>Training and Skill Development</u>

39. What kind of training did team members receive?
    a. what skills were taught?
    b. how much training, e.g. number of days?
    c. who gave the training?
    d. what training did coordinators (if there are any) receive and how much?

40. What training did supervisors receive?

<u>Information Inputs</u>

41. What sort of information do teams get on a regular basis?
    a. how often?
    b. what kind of format is it?
    c. who provides it?

42. How do teams get feedback on team performance?
    a. what measures are used for team performance?
    b. how often?
    c. what kind of format?
    d. who provides it?

43. Do teams receive performance information on other teams within the department? division? the company?

44. How do teams get information on product requirements/specifications?

45. What sort of information do teams get on customer requirements?

46. What sort of customer feedback do teams get?
    a. how often?
    b. in what form?

47. How do teams learn about changes to products or processes?

48. Is there any other information teams get, whether on a formal basis, or informal?

49. How would you describe the information flows between teams and other groups or individuals in the department? the division? the organization?

50. Do teams have all the necessary information they need to do the job?

51. If someone were to discover they needed some information they didn't have, how would they go about getting it?
    a. would they be able to get it?
    b. who would provide it?

52. How do teams learn about overall organizational performance?
    a. how often is organizational performance measured and communicated?
    b. in what format?

53. How do teams learn about things going on in the organization - issues, activities, changes, etc.?

55. Do teams get information on how competitors are performing?
   a. what type of information
   b. how often?
   c. what format?

56. How do teams learn about organizational goals/objectives?

Information Outputs of Team

57. What information do teams feed back to other groups or people in the organization? (examples are activities or accomplishments, team performance

58. Do team members give presentations on their team and what they have accomplished?
   a. to people inside the organization?
   b. to external visitors?

Intergroup Relations

59. How are teams perceived by top management?

60. How are teams perceived by others in the organization, not involved in redesign? (for redesign sites)

61. How do teams get along with each other?
   a. is there competition between teams?
   b. what is the nature of the competition?

Problems Experienced with Teams

62. What problems/significant issues has the organization had to deal with?

Disseminating Teams to Other Parts of Organization

63. What plans are there to diffuse the team structure to the rest of the organization? (for redesign sites)

Future Changes

64. What changes do you think should be made in how the teams operate?

65. What changes are planned for the near future?

APPENDIX D Code List

This code list was used to code the notes and transcripts from site visits and phone interviews. A start code list was generated from the "conceptual framework, list of research questions, hypotheses, problem areas, and key variables" (Miles & Huberman, 1984: 57) identified in Chapter 1. The start code list was included in the research proposal and was refined as necessary to reflect new knowledge about self-managing teams as I conducted the case studies. Notes and transcripts were coded using this list, and then the data was entered into one file and condensed. The case descriptions were developed from the condensed data files for each site.

Background of Organization

<u>General Information and History of Organization</u>	GI
Superordinate organization	GI-sup
Geographic location	GI-geo
Products	GI-prd
Customers	GI-cust
Industry	GI-inds
Technology	GI-tech
Competitors	GI-compet
History	GI-hist
<u>About the Union</u>	Union
(presence, involvement, activities)	
<u>Organization Structure</u>	STR
Formal structure - A structure	STR-A
Infrastructure - B structure	STR-B
(cross-functional teams, ad-hoc teams, task forces, etc.)	
<u>Organization Communication</u>	OC
Nature of organizational communication	OC-nat
Organization-wide information sharing meetings	OC-mtg

<u>Culture</u>	Atm
<u>Past and Present Improvement Initiatives</u>	Impr
<u>External Organizational Environment</u>	ExSI
Significant external issues, strategic factors, business environment, market	
<u>Performance of the Organization</u>	Orgperf
<u>Sharing Successes</u>	Visitors
Visitors	
Self-Managing Teams	
<u>Evolution of Self-Managing Teams</u>	Evol
Design team(s) for greenfield site or history of employee involvement for plant redesign	Design
Concepts - definition of self-managing	Conc
<u>Team Structure</u>	TStr
General information on team structure, internal customers	TSt-GI
Core skills	TSt-skm
Number and type of job classifications	TSt-jclass
Shifts worked	TSt-shift
Coordinator Roles	TSt-coord
Internal Team Leadership	TSt-ITL
Liaison With Support Departments in Organization,	TSt-link
<u>Role of Leadership/Supervisor</u>	Rleader
<u>Performance of Teams</u>	Tmperf
<u>Decisions and Responsibilities of Team</u>	Tmdec

Team Meetings	Tmmtg
Team Facilities	Tmfac
Selection and Placement Process	Selprc
Rewards and Recognition	Rw
How people are paid	Rw-pay
Other rewards for teams or individuals - financial	Rw-fin
Non-financial rewards - recognition	Rw-recg
Gainsharing, profit-sharing, goal-sharing	Rw-gain
Pay for skills system	Rw-pfs
Peer Evaluation and Feedback	Peer
Training and Skill Development	Train
Information System	IS
Information Inputs to Team	ISN
Information Outputs From Team	ISP
Influence Over Information Received	ISF
Intergroup Relations	TR
Communication, Information Sharing, Interaction Among Teams	TR-tmcomm
Perception of Teams Within Organization	TR-other
Problems Experienced With Teams	Disadv
Disseminating Teams to Other Parts of Organization	Dsem

APPENDIX E Format for Case Descriptions

Below are listed the major headings, sub-headings, and sub-sub-headings along with the section numbers, used in the case descriptions in Appendix G. The "x" used refers to the number of the case description. For example, the first section in the first case description would be "1.1." Not every case uses all the headings listed here, because this list was tailored somewhat for each case. But in general, the format of the case descriptions is the same. The four major headings are: Overview, Background of Organization, Self-Managing Teams, and Summary. The major headings are in bold, the sub-headings are underlined, and the sub-sub-headings are in italics. Also shown below are brief explanations of what is included in each heading to clarify the format of the case descriptions.

x.1. Overview

- an abstract of the case study; at a macro level what was done in the organization; general characteristics of the organization (e.g. redesign, new design); what interviews and/or site visits was the case description based on

x.2. Background of Organization

x.2.1. General Information and History of Organization

- superordinate organization (is it part of a larger corporation?); geographic location; products; major customers; industry (private sector/public sector, service/manufacturing); markets served; technology; major competitors; number of employees; whether it's a new design plant (greenfield site) or a redesign plant; how the organization was formed; when created; major elements in history of organization

x.2.2. About Organized Labor

- whether or not there is a union; if so, what union; union involvement; activities

x.2.3. Organization Structure

x.2.3.1. Formal Organization Structure

- functional sub-organizations; hierarchies; organization chart description *x.2.3.2. Infrastructure to Support Improvement*

- B structure - cross-functional teams, ad-hoc teams, task forces, etc.

x.2.4. Organizational Communications

x.2.4.1. Nature of Organizational Communication

- how do people describe organizational communications; characteristics of communication (subjective descriptions)

x.2.4.2. Organization-wide Information Sharing

- mechanism for sharing information throughout the company, such as meetings, newsletters, annual reports, computer system, closed circuit TV

x.2.5. Culture

- culture of the company; formality vs. informality of dress; communications; addressing people; guiding principles; trust between management and employees

x.2.6. Past and Present Improvement Initiatives

- past and present initiatives to improve performance; these initiatives may be related to self-managing teams but not necessarily part of the team structure or environment; examples are SPC, TQM, JIT, technology improvement initiative

x.2.7. External Organizational Environment

- significant external problems or issues (strategic factors) top management must address; having to do with the business environment, the global market, government regulations, etc.

x.2.8. Performance of the Organization

- performance of the company (the unit of analysis being studied) and of the corporation if appropriate and if available

x.2.9. Sharing Successes

- mechanism for sharing information on success achieved using self-managing teams with internal and external visitors

x.3. Self-Managing Teams

x.3.1. Evolution of Self-Managing Teams

- for redesign sites - what other employee involvement initiatives have been used in the past that have led up to using self-managing teams; how was it decided to use teams; what approach was used to design and form the teams
- for new design sites - this section is the same as the description of the history of the organization in General Information and History of Organization because the history of a new design plant describes how teams were designed and formed
- what is the understanding within the company of self-management and self-managing teams; what is their definition of self-managing?

x.3.2. Team Structure

- general information on team structure and how the teams operate: internal/external customers and suppliers; core skills involved in the teams' tasks; number and type of job classifications; shifts worked

x.3.2.1. Coordinator Roles

- what coordinator roles are there; how often are they rotated; how are coordinators selected; training received; additional compensation if any for filling the coordinator roles

x.3.2.2. Internal Team Leadership

- designated internal team leader, if there is one; emergent team leadership

x.3.2.3. Liaison With Support Departments in Organization

- internal suppliers in the company; links with support departments and coordinator roles; how do support departments interact with team and coordinators

x.3.3. Role of Leadership/Supervisor

- role of external leadership; includes previous supervisor(s) and "management"; what are leadership's responsibilities; what projects are previous supervisors working on x.3.4. Performance of Teams

- what is the performance of the teams or department using teams; are teams compared to one another

x.3.5. Decisions and Responsibilities of Teams

- what decisions do teams make; what are they responsible for

x.3.6. Team Meetings

- description of regular team meetings, if they have them; what sorts of things are done at the meetings; who runs them; are supervisors or managers present

x.3.7. Team Facilities

- what facilities do teams have at their disposal; includes things like meeting room, computers, communication tools (flipcharts, bulletin boards, etc.)

x.3.8. Selection and Placement Process

- how are new team members selected; for redesign plants this includes only employees for the self-managing teams; who makes final decision on selecting new team member; who makes final decision on firing a team member; what is the process for firing someone

x.3.9. Rewards and Recognition

- how people are paid; other types of non-financial rewards, e.g. recognition

x.3.9.1. Pay for Skills System

- pay for skills - what technical and social skills are involved; how are people certified in skills, etc.

x.3.9.2. Other Reward Sharing

- any other bonus or profit-sharing, gainsharing system; how does it work; how often are rewards distributed x.3.10. Peer Evaluation and Feedback

- how do team members evaluate each other, if they do; what is the process; how often; what is the purpose of the peer evaluation system; what are the consequences of the system

x.3.11. Training and Skill Development

- what training is received; when is it received; who gives it

x.3.12. Information System

x.3.12.1. Information Inputs to Teams

- what information do teams receive as an input, e.g. the specific category of information; how is it received; how often; who provides it

x.3.12.2. Information Outputs From Team

- what information do teams produce as an output, e.g. the specific category of information; how is it provided; how often; who is the customer

x.3.12.3. Other Issues Pertaining to the Information System

- redesign of current information system; any other relevant issues

x.3.12.4. Influence Over Information Received

- to what extent do team members influence the information they receive; do they have control over the information they get; can they get any information they want; who do they go to when they need information

x.3.13. Intergroup Relations

x.3.13.1. Communication, Information Sharing, Interaction Among Teams

- how to teams exchange information; what mechanism is there to support sharing information; how do teams interact, e.g. do different teams ever meet with each other.
- for redesign case studies, this includes interaction among teams and between teams and the rest of the organization
- for new design case studies, this is interaction among all the teams

x.3.13.2. Perception of Teams Within Organization

- how are teams perceived by other groups or individuals in the company; relevant for redesign case studies only; are there bad feelings, jealousy, etc. or are people interested in teams, proud of them, etc.

x.3.14. Problems Experienced With Teams

- what have been the problems with teams; critical incidents; disadvantages to the team concept; how have they been addressed (if information is available)

x.3.15. Disseminating Teams In Other Parts of Organization

- relevant for redesign case studies only; what plans are there to disseminate the team concept or characteristics of teams throughout the rest of the company; what has already been done to disseminate teams throughout company.

x.4. Summary

- what changes are planned in the team environment; new areas the organization is getting into (e.g., management redesign)

APPENDIX F Career Plan and Plan of Study Document

Introduction

I have prepared this career plan document for several reasons. This document serves toward meeting requirements for completing my M.S. degree in Management Systems Engineering. The main purpose is to outline a five year plan for my professional career and develop short- and long-term objectives to achieve my career goals. Included in this document are the following:

- general career goals and aspirations: the types of problems I wish to solve, the type of organization I wish to work for, and what it will require of me
- specific short-term (1-3 year) and longer-term (5-10 year) career objectives
- my plan of study for my M.S.

I will continually update this document and use it to measure my progress toward accomplishing my career objectives.

Career Goals and Aspirations

After my completing my master's degree in May 1991, I will enter the Ph.D. program in January 1992 and complete the Ph.D. in 1993. After completing my Ph.D., I would like to work in industry for a number of years and gain experience designing and implementing change interventions. I would then like to return to academia and obtain an Industrial Engineering faculty position. As a faculty member, I will teach IE and also consult with organizations to assist them with Employee Involvement efforts and implementing self-managing teams.

The rest of this section describes what I would like to do as an Industrial Engineer in industry.

<u>Type of Problems I Wish to Solve</u>

I would like to obtain an Industrial Engineering position in organization such that I function as an internal change agent for the organization, whether that means I work in a support function in one site or serve as a resource to several sites within a larger corporation. The support function, or department, may be a Quality Improvement department or "performance improvement engineering" department. I would like to work with internal "client" departments to design and implement change interventions and work to ensure they are institutionalized. This would entail being involved with many different departments in the organization and working with people at all levels. Process facilitation to help groups or teams solve problems or answer questions is another function I would like to have included in my job responsibilities. Eventually, I would like to be in a position where I can have a positive impact on bringing about organization-wide change to significantly improve organizational performance.

Type of Organization I Wish to Work For

Below I have listed characteristics of the type of organization which I envision myself working for:

- a small-medium site (preferably manufacturing) within a larger corporation; the reason for wanting to work for a large corporation is for the opportunity to work at different sites or to even work abroad at some point
- an atmosphere conducive to change with an experimental attitude, which encourages risk-taking, creativity, and innovation
- organization whose key decision-makers have consciously kept abreast of developments in organizational and management literature and research and are willing to use these state of the art management techniques and practices
- commitment to continuing education, such as sending employees to conferences, seminar, workshops, etc.
- aware of the need to continually improve and change to compete in a global market
- has carved a niche, knows overall direction and is making decisions consistent with overall vision
- systematically plans for the future
- people are generally self-managing and there is trust at all levels of the organization

These of course represent an ideal; it's unlikely that I will be able to find an organization which has all of these characteristics. However, I will choose an organization which has a significant number of the above characteristics.

What My Plan Will Require of Me

Performing the kind of responsibilities I've described will require several things of me. First, I must be a competent engineer and be able to use problem-solving skills for any type of problem. I must be able to identify problems with a generalist's perspective and solve them with a specialist's tools. I must also stay on the leading edge of the organizational performance management field. To do this, I will take advantage of any educational opportunities I can. This may include taking evening courses at a local university, attending conferences and seminars, or attending company-sponsored seminars.

I will need to become confident and proficient at taking on the various modes of professional functioning (e.g., teacher, facilitator, challenger, expert solution provider, etc.) and evolve my professional development to the client-centered stage. This will entail discipline on my part to continually practice and evaluate my proficiency at the professional modes of functioning. I must maintain an open mind and inquisitive nature and always be willing to try something new.

There are several other long-term career goals I am also considering. One is to live and work in Europe for a period of time, whether it is as an Industrial Engineer or not. Working for a multi-national corporation may provide this opportunity. Another long-term goal which is not necessarily mutually exclusive with my other goals is to own and manage my own business, which could be anything from a small consulting firm, an inn or restaurant, or some other service-providing company.

Short- and Long-Term Career Objectives

1 - 3 year objectives

- to author or co-author 3-5 papers to present at a conference. *(have co-authored three papers presented at IIE and ICPQR conferences)*
- to join a local Toastmaster's to further develop my public speaking skills and become more comfortable in front of an audience. *(I will be looking into starting a student chapter of Toastmaster's here in the ISE Department)*
- to gain knowledge of quality and productivity management .*(I have gained knowledge about quality and productivity management through working as a GRA at the VPC for two and a half years and will continue to learn)*
- to take and pass the E.I.T. *(I have taken and passed the E.I.T.)*
- to join and be active in the Society of Women Engineers.

- to continue to remain active in the student chapter of IIE and Alpha Pi Mu. *(I continue to be involved to some degree with IIE and Alpha Pi Mu).*
- to complete my master's degree in Management Systems Engineering *(will complete M.S.I.E. in May 1991)*
- to travel for 3 - 6 months in Europe and/or Asia after completing my master's degree *(I will be travelling Europe for several months in the fall of 1992)*
- to obtain my Ph.D. degree in Management Systems Engineering *(I will begin the Ph.D. program in January 1992)*
- to be involved in at least one community project every year
- to obtain a job in an organization having the characteristics described earlier

<u>5- 10 year objectives</u>

- to become a registered professional engineer
- to become proficient at taking on the different roles of the change agent
- to become an authority on designing, developing, and implementing improved management systems, and in particular, in the area of Employee Involvement and the use of self-managing teams
- to gain experience as well as additional knowledge in making organizational interventions
- to continue my professional education through conferences, seminars, classes, and constantly remaining abreast of the literature
- to obtain a Industrial Engineering faculty position at a university with a well-respected IE department, after working in industry for a number of years

PLAN OF STUDY
May, 1991

Concentration and Courses		Date	Credits
Management Systems and Performance Management			
ISE 5015	Management of Change, Innovation, and Performance in Organizational Systems	Fall 1988	3
ISE 5016	Measurement of Organizational Systems Performance	Spring 1989	3
ISE 6015	Advanced Organizational Performance Management I	Sum 1989	3
Seminar and Thesis			
ISE 5984	Graduate Seminar	Fall 1988	0
ISE 5990	Thesis		12+
IE and Basic Engineering			
ISE 5004	Information Systems Analysis	Fall 1988	3
ISE 4984	Applied Industrial Management	Spring 1990	Audit
Law and Ethics			
MGT 5304	Social, Legal, and Ethical Problems in Business	Fall 1988	3
MGT 4324	Business and Professional Ethics	Fall 1989	3
Business and Social Sciences			
FIN 5104	Financial Policies I	Spring 1990	3
MGT 5314	Dynamics of Organizational Behavior	Fall 1989	3
PSY 6404	Behavior Management in Large-Scale Systems	Spring 1989	3
SOC 5304	Sociological Perspectives in Social Psychology	Spring 1989	3
Math and Statistics			
STAT 5615	Statistics in Research I	Sum 1 1989	3
ISE 5615	Human Factors Research Design	Fall 1989	3
TOTAL			**48+**

Note: The required course sequence ISE 4015 and 4016 were taken as an undergraduate

APPENDIX G Case Descriptions

This appendix includes detailed case descriptions for the five case sites for this thesis (listed below). The process for developing the case descriptions was described in Within Case Analysis in Chapter 4 on Research Methodology. Briefly, the steps were: assemble the raw case data; code notes and enter data into computer; edit and condense data; write case description; and build data displays. Data displays were developed for the information teams receive and information teams provide to other groups or individuals. These displays are part of the case descriptions. As mentioned in Chapter 4, this process for developing the case descriptions was streamlined as I gained experience at writing them. For example, the process for writing the Corning description more closely followed the steps listed, however, the process for writing the Virginia Fibre description combined some steps and the coding was de-emphasized.

Each of the case descriptions is contained in a sub-section of this Appendix, and are presented in the order listed below. Therefore, Corning, is section 1, Shenandoah Life is section 2, and so on. Each case description follows the same format, which is shown in Appendix E. The major headings, sub-headings, and sub-sub-headings are the same for each case description. Using a standard format for developing the case descriptions provides uniformity across cases and facilitated Cross Case Analysis.

Corning Blacksburg Plant

Shenandoah Life Insurance Company

Tennessee Eastman Company

Virginia Fibre Corporation

Boeing Corinth Plant

1. CASE DESCRIPTION FOR CORNING BLACKSBURG PLANT

1.1 Overview

After being closed for four years, the Corning Blacksburg plant re-opened as a 'new design plant' using teams of production employees who manage themselves without first-line supervision. The plant began hiring employees in 1988 and shipped its first product in early 1989. Since re-opening, the plant has expanded from one production line to two lines and from only a handful of production employees (called 'operations associates') to over 150. The plant has been quite successful in its efforts using self-managing teams and is viewed as a success story within Corning corporation. Although one of the smallest Corning plants, it is one of the most profitable. A significant number of people within Corning have visited the plant to learn how the teams operate and what they are capable of. Based on the success of the plant, Corning plans to retrofit many of its existing manufacturing plants.

This case description is based on information from an interview with John Yearick, the Plant Supervisor for Employee Relations and Services; several articles published about the plant; a case study written by a graduate student in the College of Business; and a seminar conducted by Mr. Bob Hoover, the plant manager, to a group of graduate students in Industrial and Systems Engineering. This case description was reviewed by John Yearick.

1.2 Background of the Plant

1.2.1. General Information and History of the Corning Blacksburg Plant

The Blacksburg Corning plant is is a new design plant (Greenfield site) which is part of the Corning Corporation headquartered in upstate New York in the city of Corning. Corning Corporation employs 28,000 people world-wide in four major units: Specialty Materials, Telecommunications, Consumer Housewares, and Laboratory Sciences. The Blacksburg plant, along with its two sister plants in Erwin, New York and in West Germany, are part of the Specialty Materials unit. Corning's sales in 1989 were 2.4 billion dollars and 2.9 billion in 1990. In 1989, Corning was rated as twenty-eighth out of 305 companies in the Fortune Most Admired Corporation list. Corning's journey on total quality, which began in 1983, resulted in the Telecommunications group being a runner up in the Malcolm Baldrige National Quality Award. Corning is undertaking a thrust to win the Baldrige Award in 1993.

In the 1970s, the automotive industry was being pressured by the government to find solutions to the problem of noxious emissions from automobiles. CELCOR, a honey-combed cellular-ceramic core used in automotive catalytic converters invented by Corning's Research and Development group, became part of the solution to the problem. The business for CELCOR was growing and Corning decided to re-open the Blacksburg plant, located in southwest Virginia. The Blacksburg plant's customers include almost every auto manufacturer in the world, therefore, the industry in which the plant operates is as a supplier to the automotive industry in the private manufacturing sector. The behavior of the automotive industry has a significant impact on the Blacksburg plant. The business the plant is in is also driven by the government because of regulations on emissions. The majority of customers are in Asia (about 80-90% - Hoover, 1991). The two biggest customers are Honda and Toyota; in fact, Corning is the first American company to have components in the Honda Accord (Hoover, 1991). Bob Hoover's business cards are written in Japanese on one side for the benefit of his customers. The rest of the plant's customers are in the American heavy duty truck market. The Blacksburg plant competes with no American company - their competition is Japanese.

The Corning Blacksburg plant was originally opened in 1965 and operated for nineteen years before it closed its doors, laying off 200 employees (Howes, 1989). The plant stood idle for four years before Corning made the decision to invest 40 million dollars in starting it up again in October 1988 with a new product and a new design for the plant (Hoover, 1991). Corning saved about 12 million dollars in brick and mortar by deciding to use the closed Blacksburg plant, which was in excellent shape (Hoover, 1991). The 'new design plant' or 'greenfield site' was designed to help the Corning corporation respond to increasingly competitive global markets - based upon the success of the Blacksburg plant, Corning plans to 'retrofit' existing plants using self-managing teams (Burlingame, 1989).

The Blacksburg plant start-up was headed by Mr. Bob Hoover, the Blacksburg Plant Manager. A Design Team consisting of people from Corning Corporation (the Director of Organizational Design, Senior Vice-President of Manufacturing/Engineering, Senior Vice-President of Personnel), Blacksburg plant "leadership" (the Plant Manager, Mr. Bob Hoover and Employee Relations Manager), and two representatives from the American Flint Glass Workers Union (Burlingame, 1989) began to meet in early 1988 to design the plant. The Design Team used socio-technical systems theory to design the plant with characteristics consistent with new design plants (Lawler, 1990b): teams of employees who manage themselves, have responsibilities and make decisions typically 'owned' by managers or supervisors, are called operations associates rather than just workers, and are paid for learning all the technical and social skills related to their jobs. The Design Team also developed a Mission and Values and Beliefs Statement for the Blacksburg plant, shown in Table 1.1 (Burlingame, 1989). These values and beliefs were the foundation upon which the plant was designed; the practices, systems, and policies of the plant were designed to be aligned with these values and beliefs.

The selection process for new employees was begun in September 1988 (one month before the plant opened) (Howes, 1989). The intensive and detailed selection process (described in more detail later) was intended to select people with characteristics deemed necessary to succeed in the team-based environment. Former employees of the Corning plant were not purposely sought out. For the 85 opening positions, there were 5,000 applications (Howes, 1989) (for the existing 150 operations associate positions, there have been a total of more than 12,000 applications). The plant started with one production line (with initially about fourteen operations associates), and has expanded to two lines, with approximately 150 operations associates supported by fifteen maintenance engineers and thirty-five leadership (which includes what is typically management, engineers, and other support staff). The plant began operations in October of 1988 and shipped its first product to Chrysler-Jeep in March 1989 (Howes, 1989). Currently, about 45% of the space in the plant is being used for operations, with the remainder of the space being used for storage. There are no plans at this time to undertake any new projects to use the additional space (Howes, 1989).

The technology Corning uses is batch processing; products go through three main processes before the product is finished: forming, piece processing and the kiln. In the forming process, product is blended in dry batch and mixed with liquid; ingredients come mostly from mines under contract to Corning. Then product goes through an extruder to be cut into lengths (logs). Moisture is driven off in a dryer. Next a robot picks up product and it is cut by piece saws into lengths required by the customer. SPC is used at this point to measure the quality of the product (the accuracy of the length of pieces). Next the green unfired pieces are loaded into the continuous tunnel kiln, where they are fired at temperatures up to 1400 degrees Celsius. Pieces are continuously monitored, and lab samples are taken after the kiln to assure quality. The last steps in the overall process include quality audits, shrink wrapping, and shipping. Operations associates even use personalized stamps in final inspection before product is shipped. Rapid feedback on performance measures throughout the overall process is important for operations associates

Table 1.1. Mission, Values and Beliefs

Mission

We will delight our customers with the highest quality, lowest cost CELCOR products and services in the world.

Values and Beliefs

We believe:

- People are the competitive advantage.
- A team-based environment is fundamental to our success.
- Work will be challenging and meaningful.
- Everyone will have access to information relevant to accomplishing their objectives.
- Decisions will be made by those with the direct responsibility and the necessary skills and knowledge.
- Everyone is responsible and accountable for continual improvement.
- Creating and maintaining a safe, clean workplace is everyone's responsibility.
- Communications will be straightforward and open.
- Everyone will be treated with dignity and respect.
- Fairness, honesty, integrity and trust are essential qualities.
- Continuous learning and coaching is everyone's responsibility.
- High performance will be recognized and rewarded.

to be able to make adjustments if necessary. The bulk of the production process lies with forming (from batch mixing through to the dryer) and piece processing (inspection of the parts while they're still green). Forming and piece processing are very labor intensive.

The Blacksburg plant, along with two sister plants in Erwin, New York and West Germany, together produce about 30 million units per year (Hoover, 1991). The Blacksburg plant specializes in the tough complex products, having low volume runs and quick turnaround time, while the Erwin plant has kept the business with high volume runs and few product changeovers (Hoover, 1991). The Blacksburg plant has a relatively smaller capacity (in millions of units), smaller equipment, slower line speed, much fewer steps in the process (115 as opposed to over 200), quicker job changeover (10 minutes as opposed to 45 minutes), and fewer job classifications.

1.2.2. About Organized Labor

The Blacksburg plant is a union plant - the union is the American Flint Glass Workers Union. When the plant was designed, Corning negotiated a three year contract with the union (Howes, 1989). Relations with between union and management are described by John Yearick as "very, very cooperative" - to date no grievances have been filed (Burlingame, 1989). National union leaders are committed to the team environment of the Blacksburg plant - they think this type of team environment is the wave of the future and see it as a way to save their members' jobs (Howes, 1989). Two representatives served as members of the Design Team which designed the plant, ensuring union involvement and commitment. Union membership is at about 70%, high for a right to work state (Howes, 1989).

1.2.3. Organization Structure

1.2.3.1. Formal Organizational Structure

Corning's formal organization structure is very flat - there are only three levels in the entire plant, from operations associates to the plant manager. Reporting to the plant manager are four functional leaders (Administration/Logistics, Maintenance/Facilities, Quality/Technology, and Employee Relations), the Union leader (president of the local union) and two Line Leaders. Corning now has two production lines operating in the plant. Four shift teams report to the Line I Leader - A, B, C, and D, and another four teams report to Line II Leader -E, F, G, and H. There is an assistant line leader for each Line Leader, however, this person is there only for administrative reasons and is not in the chain of command. In sum, there are a total of eight shift teams, each with approximately 18 people, making a total of about 150 operations associates. There are also fifteen maintenance engineers (they are generalists who perform electrician, mechanics, and hydraulics jobs) and thirty-five leadership (engineering and support staff, as well as functional leaders, line leaders, employee relations manager, and the plant manager). This flat organization structure makes it easy for people throughout the organization (plant manager, leadership, and operations associate) to communicate with each other and make decisions quickly.

1.2.3.2. Infrastructure to Support Improvement

The infrastructure - the 'B' structure - exists to support improvement (see Appendix for discussion of formal organization structure vs. infrastructure). This infrastructure consists of cross-functional teams and ad-hoc teams created to address issues as they arise (see the Glossary in the Appendix for definitions of cross-functional and ad-hoc teams). There are several cross-functional teams within the plant. The first is a Social Quality Improvement Team (QIT) that was just developed in the last year. The team is made up of a cross-section of employees (elected by their peers), representing all teams and leadership as well. The types of issues the social QIT address are related to quality of work life - absenteeism, drug testing, and recognition systems are several specific issues for which the team is responsible. For example, the social QIT will establish an attendance and a recognition policy for the plant.

There is also a newly created technical QIT, which is also a cross-section of elected employees and leadership. The technical QIT will have more OAs on it than engineers. This team will look at issues such as where the plant as a whole will spend its capital for the next year - the team will control the technical budget - and setting goals for capital and technological investments. A third type of cross-functional team is a union-leadership team, also newly created. The team has met only a few times so far. The purpose of the team is to jointly solve problems and make decisions which both the union and plant leadership need to be involved in. John Yearick describes the union-leadership relationship as very cooperative, and not at all adversarial. The issues brought up by the union in the meetings are perceived by leadership as worthwhile issues they would have otherwise addressed. A fourth cross-functional team is a Goal-Sharing Committee which sets goals for the Goal Sharing program put in place in the last year and addresses other issues related to goal sharing (see Rewards and Recognition for more on goal sharing). The committee publishes information in the plant newsletter, such as whether plant-wide goals were met (and therefore all employees will share in rewards) and on results from meetings. For example, at one meeting, the Committee decided that there needed to be more 'nuts and bolts' training, which would help the plant as a whole achieve plant-wide goals. Another cross-functional team of sorts is a 'coffee klatch' that is now meeting on a regular basis. Team membership is not constant - Bob Hoover and John Yearick meet with a different group of employees each time to discuss issues, concerns, and problems people have. This regular meeting serves as a feedback mechanism for plant leadership to learn about the issues of concern to employees. A Vision Review Team consisting of a rotating team of leadership and operations associates meets quarterly to review progress at the plant - what is working, what is not working and what may need changing (Burlingame, 1989). The purpose of the team is to review the plant's activities and progress as compared to the vision for the plant and make any necessary adjustments. There is also a team that puts together the plant newsletter. People can submit articles or information for the newsletter, but the team is responsible for pulling everything together. An ongoing safety team addresses plant-wide safety issues.

There are many ad-hoc teams that have been created and disbanded for specific reasons. Some of the examples of ad-hoc teams are: cafeteria team to look at how to revamp the cafeteria and what vendors to choose, dress-code team to look at whether or not to have uniforms, a team for organizing the Christmas party, and a shift team to look at going to twelve hour shifts. These teams live and die - once they serve the purpose for which they were created, they are no longer needed.

1.2.4. Organizational Communications

1.2.4.1. Nature of Organizational Communication

Open, honest, and frequent seem to be the themes for organizational communications at the Blacksburg plant. Whenever communication is referred to, these are the words that most commonly come up. In fact, two of the statements from the Values and Beliefs Statement reflect leadership's philosophy regarding communication - 'everyone will have access to information relevant to accomplishing their objectives,' and 'communications will be straightforward and open.' The flat organization structure described earlier facilitates frequent, direct communication among leadership, between leadership and operations associates, and among operations associates (among the shift teams). There is a commitment to communication and sharing information with all employees - information typically only available to management in traditional plants. This commitment is evidenced in various ways - whether in formal plant-wide meetings to review performance (discussed in the next section), by operations associates having access to "any information the plant manager has" through the computer system, or through informal face-to-face communication. There is a lot of informal communication - John Yearick believes it is "very very important to maintain a lot of personal direct contact with people; [it takes] a lot of my time to know everyone and going out to talk to them directly about an issue or problem."

1.2.4.2. Organization-Wide Information Sharing Meetings

Every month, leadership holds plant review meetings to share information about the plant as a whole. There are several meetings each time so all shifts receive the information. The plant manager gives a 'state of the plant' address - what's happening, how the plant did on goals the previous period, how it is doing the current period, goal sharing information, problems, issues, etc. The meetings are generally focused on the plant, but the plant manager also shares information about the Corning corporation if available for that month's meeting. The corporation comes out with a Corning Live Tape shown at the plant review meeting each month, which has information on corporate issues ("whatever's hot"). Corporate business results are shared quarterly and are reviewed by the plant manager at a subsequent plant review. Other things such as the United Way campaign are also covered at the plant review meetings. Schedules for the plant review meetings are published in the plant newsletter, and the dates and times are also posted in the lobby of the plant.

The division senior vice-president of manufacturing & engineering performs a biannual plant review to evaluate the performance of the plant and then share feedback. The plant is evaluated on financial performance, safety, adherence to Equal Employment Opportunity requirements, recruiting, among other things. For one of the biannual reviews, many of the presentations were made by operations associates; presentations were made on the union relationship with leadership, on a project team in the kiln process, on the social QIT, and on the employee assimilation process.

1.2.5. Culture

The culture, or atmosphere, of the Blacksburg plant is a reflection of the Values and Beliefs Statement fashioned by the Design Team (see History of Organization). There is a camaraderie between operations associates and leadership typically not seen in organizations. Everyone is on a first-name basis (Howes, 1989); in fact, when I met with John Yearick, he introduced himself to me as an outside visitor using only his first name. Out on the shop floor, it's difficult to distinguish operations associates from leadership. The typical distinction in dress (more formal dress for leadership, such as ties) does not exist. When I toured the shop floor, no one appeared to change their behavior or try to look busy because someone from leadership was present. In fact, several people were joking about something unrelated to work and were not working directly on a machine or building product. However, as you might expect in a traditional plant, they did not stop what they were talking about to try to look busy. Their responsibilities were being met, so they weren't worried about someone looking over their shoulder. The culture is one in which people are treated like adults and professionals and consequently behave like professionals.

1.2.6. Past and Present Improvement Initiatives

Since the Blacksburg plant is a new design plant, many leading edge management and leadership techniques and practices were designed into the plant, in addition to the team environment. For example, the Corning corporation has for years been putting into use the concepts of total quality. These quality concepts and tools have been designed into the practices of the plant from the very beginning, for instance, the use of Statistical Process Control. OAs have received training on constructing and interpreting control charts, which are used on the main processes.

Another example of a common improvement initiative designed into the Blacksburg plan is Just-in-Time. Many of the plant's customers operate under JIT, which requires that suppliers do as well. While not really called JIT, the plant uses a pull system rather than a push system. What this means is that product is 'pulled' through the plant with the forcing function being a customer order. In a push system, product is pushed through the plant to build up inventory with the forcing function being production itself. Consistent with JIT philosophy, the plant maintains very little inventory. There are 8-10 days of raw material inventory, two and a half to three weeks of finished goods inventory, and work in process inventory is about 70 hours worth of work. It should be noted that product takes about 64 hours in the kiln, so almost all of the WIP is in the kiln, with the rest of the product in other places throughout the process. Product spends a minimum of time waiting to be worked on.

The Blacksburg plant has been in operation just over two years, so it is still relatively young. There may be improvement initiatives initiated in the future as specific improvement needs arise.

1.2.7. External Organizational Environment

The external organizational environment of the Blacksburg plant is a function of its industry, its market and its product. There are three significant external issues the plant must address. The plant's major competitor is NGK Insulators, LTD of Japan. NGK produces the same product Corning does under a license from Corning, primarily selling in Japan. NGK has built a plant in North Carolina in the early 1990s about the same time CELCOR's patents expire (Burlingame, 1989; Howes, 1989). When the plant in North Carolina is completed, Corning will have additional competition in the U.S. it did not have previously. This provides additional reason to continually improve quality and lower the cost of CELCOR to Corning's customers.

In addition to the potential future problem of increased competition from NGK, Corning also faces the problem of decline in car sales and scale backs by U.S. auto manufacturers (Burlingame, 1989). Decline in car sales translates to less demand for Corning's product, CELCOR, and could mean a decline in production at the Blacksburg plant. To address this external issue, Corning is trying to find alternative uses for CELCOR. In addition, the Design Team addressed this potential problem by instituting a job security policy to minimize layoffs if sales fell off (Burlingame, 1989).

There is an additional potential threat to the Blacksburg plant's business. An alternative to the CELCOR product that is being researched is a metal part which has the advantage over CELCOR of having very thin walls. Bob Hoover states that he is more worried about the metal part competition than the competition in the ceramic part from his Japanese competitor (Hoover, 1991).

1.2.8. Performance of the Blacksburg Plant

The performance of the Blacksburg plant is evaluated by Corning corporation as performing up to par on the expected levels of productivity, quality, and sales that have been forecast - in fact the Blacksburg plant is one of the most profitable plants within Corning, even though it's one of the smallest (Hoover, 1991). The plant's cost per unit is below the 1990 objective. The plant has met the customers' requested delivery date 98.5% of the time. Note that delivery date is when the customer requested it at their dock (in

Korea or Japan) and not when the plant said it would be delivered. Almost 100% of the shipments were delivered when the plant said they could deliver a shipment. Another key performance measure for the plant is outgoing quality - parts per million (ppm) defective. Bob Hoover states that their ppm is better than most Japanese companies (Hoover, 1991).

Two surrogate measures of quality of work life - turnover and absenteeism - have been unusually high. John Yearick estimates that about 75% of employees who do leave, leave within the first six months. This has been attributed to the pressures on the teams to learn and perform, pressures of home life, and lack of manufacturing experience. There is currently a cross-functional team addressing the issue of absenteeism.

1.2.9 Sharing Successes

The Blacksburg plant, like many other organizations using self-managing teams, has a mechanism for sharing successes with those outside the plant. About once a month, the plant has a visitors day. Plant leadership (usually the plant manager or employee relations manager) first gives an overview of the plant and the team-based environment. Then operations associates give visitors a tour of the plant and split up into groups to answer their questions. About ninety-nine percent of the visitors coming into Blacksburg so far have been internal to the Corning corporation; leadership has not yet opened it up to anyone who is interested. They feel they would be deluged with requests for tours and information, which they just don't have time for.

Eventually, leadership would like to get to the point where they are not involved in the visitors' day and OAs coordinate everything. In other words, OAs have all the information necessary to talk to visitors, but at this time, leadership recognizes that outside visitors are not familiar with the lack of status symbols and distinctions between leadership and operations associates in this team-based environment. It's possible they would feel slighted by being hosted by operations associates rather than their counterparts at the plant.

1.3. Self-Managing Teams

1.3.1. Evolution of Self-Managing Teams

Because the Corning Blacksburg plant is a new design plant, the history and evolution of self-managing teams in the plant has already been described in the History of the Organization. To summarize briefly, a Design Team was formed with team members from corporate as well as the plant manager for Blacksburg, the employee relations manager for Blacksburg, several of the key leadership personnel for the plant, and two union representatives. The team designed the structure of the plant and the structure of the teams (including coordinator roles and leadership of teams). The plant opened in October 1988, starting with only one line and one shift team. Now, there are two lines and a total of eight shift teams, with approximately 150 operations associates. Some teams have been working together for a little over two years, while others have been more recently formed.

1.3.2. Team Structure

There is only one job classification for everyone on the eight production shift teams - operations associate. There is another job classification for the support maintenance department - maintenance engineer. The ultimate goal is to have everyone on the shift teams trained in all skill modules for the team. The shift teams work twelve and a half hour shifts (decided upon by employees), so there is a thirty minute overlap at the beginning and end of each shift. There are two lines which are mirror images of each other. Line I is made up of the four shift teams A, B, C, and D. Between these four shift teams, all shifts are covered - twenty-four hours a day, seven days a week. The same two teams on Line I always hand off shifts to each other. For example, teams A and B always hand off to one another. Line II also has four shift teams - E, F, G, and H, and teams E and F always hand off to one another. The same two teams on the two lines also always work at the same time. For example, teams A and E always work at the same time (A on Line I and E on Line II).

There are five skill modules in the plant which are also part of the pay for skills system - forming, piece processing, kiln, support services, and measurements. Forming is batch mixing through the extrusion process and then sending product on to the dryer. Piece processing is finishing and inspection of the parts while they're still green, as well as inspection of fired parts and packaging. These first two represent the core of the processes in the plant, require the most time and people devoted to them at one time, and therefore, represent the core of the teams. There are about 14 people doing forming and piece processing on each shift team. The last three skill modules - kiln, support services and measurements - are really "support" skill modules. The kiln is the firing process. Support services is shipping, receiving, material handling, and clean-up. Measurements is physical properties lab, quality auditing, and gauge room. People performing these functions serve as a support to the rest of the core teams (forming and piece processing) and are a 'satellite team.' New employees coming in typically begin training and working in piece processing. Then they learn piece processing and serve a rotation period learning the kiln, support services, and measurements. When someone serves a rotation period in one of the three support skill modules, they'll still maintain a close "kinship" with the core shift team they just came from. They might also have to work one day a week or every two weeks back in the core team (forming and piece processing). However, they are not really part of the core team when they are performing one of the three support skill modules - they sometimes attend the regular team meetings but not always. Each team decides how often people in the core team (piece processing and forming) will rotate between work stations performing different skills. In most teams, people rotate every four hours and in others, it's after half a shift (six hours).

There are four people total required in the whole plant to perform the kiln function at any one time, which means one person on each shift (there are four shifts - four people total). Therefore, the kiln is called a one person per shift module. Support services is also a one person per shift module (so there are four people total). Measurements is a two per person per shift module (so there are eight people total). There are relatively few people needed to perform the three support skill modules at any one time (sixteen in the whole plant) as compared to forming and piece processing which require many people. Because of this difference in people required, there is a bottleneck getting people who are currently working in forming and piece processing trained in the kiln, support services, and measurements.

1.3.2.1. Coordinator Roles

Coordinator roles are performed by team members to take on vertical business-type responsibilities typically performed by a supervisor. These responsibilities are 'owned' by the teams in this type of environment. There are five coordinator roles in the plant: scheduling, production, site maintenance/safety, quality, and training. There is one person on each of the eight shift teams in the plant filling each of these five coordinator roles. Leadership is looking at creating a role for human resources. People performing these coordinator roles currently receive no additional pay. The person who has the responsibility for a given role will take care of that responsibility (for example, the scheduler decides how a certain batch of product will be scheduled throughout the shop) for six months. There is both a coordinator and co-coordinator for back-up on each shift team, and they don't rotate at the same time so there is some overlap. One 'team' of a coordinator and co-coordinator is together for three months, and the co-coordinator becomes the coordinator for the next rotation.

1.3.2.2. Internal Team Leadership

There is no one person who is designated as an internal team leader (sometimes called a facilitator) at the plant. In many organizations, there is some sort of internal team leader, in addition to the people filling coordinator roles. Leadership recognizes that this makes them different from many of the other organizations using a team environment. Rather than a designated person as a team leader, teams rely on emergent leadership at meetings. In meetings, there is always someone who takes charge in facilitating setting the team's daily goals - "they'll say 'Okay, what are we going to set as our goal today?'" - but it is not always the same person. There are also other roles in the teams in which leadership emerges, for example, being a listener, a cheerleader, etc. The person who emerges as a leader is not always the same person.

1.3.2.3. Liaison With Support Departments in Organization

Each of the coordinator roles has a link back to a functional department in the plant. There is "dotted line matrix" from the training coordinator role to the training coordinator in the Employee Relations function. There is a link from the maintenance/safety coordinator role to the Maintenance/Facilities function and to Employee Relations function for safety. There is a link from the quality coordinator to the Quality/Technology function. There is also a link from production and scheduling coordinator roles to the Administrative/Logistics function. This liaison from the coordinator roles back to the functional support departments is in the form of communication and passing along information. The coordinators receive necessary information and other support from these functional departments.

1.3.3. Role of Leadership/Supervisor

Currently, the line leaders, the external leadership for the teams, are somewhere in between traditional managers/supervisors and the ideal for self-managing teams. Because not all team members have acquired all the necessary technical and social skills, line leaders are in a coaching, guiding mode. Some of the things they are responsible for are making sure people understand and know the technology, "pushing productivity, quality, training," facilitation, and helping to bring people up to speed on technical and interpersonal skills. The assistant line leader is there primarily for administrative reasons, and is not part of the "chain of command." For example, if an OA wanted to talk to a line leader, they go directly to him/her and not through the assistant line leader first.

As the teams develop technically, e.g. more people acquire all the necessary technical skills, the line leaders will emphasize people development more. For example, one of the guidance/coaching roles of line leaders is helping people through their reluctance to make decisions without someone else's approval. Line leaders used to set daily production goals for the teams in the team meetings but they no longer do. Now, the line leaders are often not even present during those meetings. Eventually, once teams have developed and can respond to the internal environment, leadership will be freed up to deal with and respond to the external environment and think strategically (Burlingame, 1989).

1.3.4. Performance of Teams

I collected no specific information on performance of the teams. However, because the plant is a new design plant, this section is not as important since I assume that the collective performance of the teams will determine the performance of the plant, which I have already discussed. One thing to note about team performance is that teams that are struggling (i.e., performance is weaker than other teams) have been teams where leadership has not emerged with regard to certain issues (Hoover, 1991).

1.3.5. Decisions and Responsibilities of Teams

The responsibilities of the teams have grown since the first teams were formed over two years ago. When people were first hired, teams were not trained in the technical and social skills required, hence, line leaders were performing many of the responsibilities which teams now do. As teams develop further, their responsibilities and the decisions they make are expected to change even more. Some of the current responsibilities of the teams include:

- setting daily production goals (production coordinator role);
- decide upon the schedule for the day (scheduler coordinator role);
- decide who is going to work where;
- make mid-shift corrections if necessary (move people around) based on performance figures;
- coordinate training for the team (training coordinator role);
- measure and post the quality of the product (quality coordinator role);

- coordinate maintenance for equipment (safety/maintenance coordinator role);
- enter jobs on the computer system so they're tracked throughout the shop;
- decide to try new things in the process (to a certain extent)
- evaluate team members' performance;

Many of these decisions are made at the daily shift exchange meeting (discussed below). There are also decisions and responsibilities for the team which do not occur on a daily basis. For example, teams have the power to implement process improvements to a certain extent. This is a growing process, and as teams develop more, they are beginning to challenge leadership more on how things get done. Another example of what OAs decide on without approval is finalizing a safety videotape being made during my visit there. Two OAs wanted John Yearick to view the tape (which was to be viewed by all employees in the plant) to give it final approval, but he would not. Instead, he told the people to go ahead with the tape and that he was sure it was fine.

Another example of the teams' power is the decision to move to twelve hour shifts. This decision was made by OAs, not leadership. OAs also evaluate the performance of their peers - other team members - on demonstrating technical and social skills (discussed later in Peer Evaluation and Feedback). Eventually, teams will be fully responsible to respond to and deal with the internal organizational environment, while leadership will have the time to respond to the external organizational environment.

1.3.6. Team Meetings

Twice a day, teams meet - at the end and beginning of each shift. These meetings are called pre and post shift exchange meetings. The shift exchange consists of fifteen minutes of the on-coming shift reviewing the results of the off-going shift, problems, schedule, and setting goals, and fifteen minutes of the off-going shift reviewing their performance and discussing any issues for a total overlap of thirty minutes. Each team is in the team room for fifteen minutes with a hand-off relief in the middle. For example, team A meets with on-coming shift team B to pass on information such as production problems and changes in schedules, review team A's performance that shift and team B will set production goals for that shift. Than at the end of the shift team B is the off-going shift and meets with the on-coming shift team A to pass on information, review team B's performance and team A will set production goals for that shift. The teams use a basic format (a 2-3 page report) to store daily information, such as daily goals and actual performance (performance measures used are select, pieces handled per hour, parts loaded and unloaded, and problems with equipment). Each day's report is stored in a large binder notebook kept in the team room. Each team views the other as a customer in these meetings. Sometimes leadership (line leaders) are present at the shift exchange meetings but not always.

1.3.7. Team Facilities

Each of the two lines has a 'team' room teams use for their daily shift exchange meetings. The team room has a large table with comfortable chairs (furniture that is "nicer than the plant manager's" - Howes, 1989), flipcharts, whiteboards, a 'Remarkable' board, and a computer terminal. Team members keep the team room very clean and organized.

There are also a large number of flipcharts and bulletin boards used by teams to generate and portray information, in the plant lobby area and out on the shop floor. These flipcharts and bulletin boards are clearly used by the teams - information on them is up to date and relevant, including things like performance of teams and action items from team meetings.

1.3.8. Selection and Placement Process

The selection and placement process was first begun in August 1988 to get ready for the plant to open in October 1988. In the initial process, former Corning employees were not expressly sought out. People were referred to Corning through the Virginia Employment Commission. For the initial 85 positions, there were 5,000 applications (Howes, 1989). The same process is used to hire groups of new employees as they are needed. The first round of people hired now participate in the selection and interviewing process for new employees. The detailed, rigorous screening and interviewing process applicants go through is one month long; in other words, the elapsed time from initial interview to potential hire is one month. The process is designed to select people with traits and characteristics (cooperation, problem-solving and openness to a group environment) deemed important to the team environment. At any time throughout the process, an applicant can de-select him/herself. The General Aptitude Test Battery reduces the applicants to a pool of candidates. Then a group orientation session is held to explain the team-based environment before any interviews are conducted. Additional elements of the selection and placement process are: group interviews, work simulations, a tour of the plant, and another group orientation session with spouses or significant others. The total investment per candidate is 15 hours (Burlingame, 1989; Howes, 1989).

In the initial orientation session, the autonomy and competitive pay described by leadership may sound desirable to many people, but the pressure to learn and to perform may outweigh the advantages for other people. OAs have given feedback to leadership that they get overly enthusiastic about the team environment such that candidates don't see the whole picture, in other words, the disadvantages of the team environment. Subsequently, leadership has tried to be even more up front and clearly communicate both the upside and downside of working at the plant.

1.3.9. Rewards and Recognition

OAs do not punch time clocks but are paid on a salary basis. They are salaried non-exempt employees, which means they are paid a salary but are paid hourly overtime for hours worked over forty hours in one week. If someone calls in sick for the day, they still get paid. OAs initially are paid about $330 a week and should be making at least $405 a week within two years (Howes, 1989). Corning's pay is competitive as compared to other companies in the area, but of course, more is expected.

1.3.9.1. Pay for Skills System

Operations associates are on a pay for skills system. Above the starting salary, OAs are paid an additional amount for up to four of the five skill modules (forming, piece processing, kiln, support services, and measurements) they could master. There is an initial condition of employment that each OA will learn at least three skill modules within two years. However, leadership recognizes the 'bottlenecking' problem discussed earlier and that two years may not be enough time to master three skill modules. The ultimate aim is for all OAs to be trained in a minimum of three skill modules with some mastering more.

The five technical skills are the 'breadth' - the horizontal skills of the pay for skills system. To try to address the future problem of 'topping out', leadership is planning several changes to the system. They are looking at adding a dimension for 'vertical business skills' to the system. These skills would represent what are now the unpaid coordinator roles. In other words, at least five more skills (corresponding to the present five coordinator roles) would be added to the pay for skills system. Additionally, leadership is considering adding a third dimension to the system - 'depth.' This dimension would represent employees learning the technology and engineering skills. A few people would be identified on each team to go this route, and it would take perhaps two to four years to become a 'technologist.' The purpose in creating this dimension is in the future to have less engineers, since the depth dimension represents engineering skills.

By adding on the vertical business skills and the depth dimension, leadership is trying to address the problem of topping out, where operations associates in a few years, would have no more skills to learn.

1.3.9.2. Goal-Sharing System

There is a goal sharing program instituted at the plant which was part of the initial design, to be implemented in the second year of operation. When the plant as a whole meets the plant-wide goals, employees share in the financial rewards. Depending on what percentage of the goals are met, each employee receives anywhere from 0 to 10 percent of their annual wages. A goal sharing committee sets the goals, using data from the previous year's performance. There are four key goals by which the plant's performance is evaluated: process loss, customer service (on-time delivery), cost per cubic inch, and quality (parts per million defective). To share in any rewards, the plant must at least beat last year's performance. Above that, financial rewards are shared depending on what percentage of the goals are met. For example, if 94% of the goals are met, rewards will be shared, but not as much as if 100% of the goals were met. Information on whether or not the plant has met its goals is reviewed at the plant review meetings and also is published in the plant newsletter. For 1990, the plant performed well against its goals. Later this month, each employee in the plant will receive a check representing 8.3% of annual wages, approximately $2500 for most operations associates. Bob Hoover has said in the future, he would like to see the goal sharing represent anywhere from 0 to 20% of employees' annual wages.

1.3.10 Peer Evaluation and Feedback

Team members determine when another OA has sufficiently mastered a skill in order to be paid the higher level in the pay for skills system. The certification process includes demonstrating skills ("show me") and answering questions (both written and oral). An OA who has been determined by their peers to have mastered a skill module (of the five skill modules) will receive the additional pay. The certification process also includes feedback on social skills, such as communication, work ethic, and team skills. A team can put someone on a "developmental level" (meaning they need to work more on a particular social skill) for skills and therefore withhold pay increases until the person is off developmental. This peer appraisal process is done once a year.

1.3.11. Training and Skill Development

Operations associates have spent about 14% of their time in training over the past two years the plant has been open (Hoover, 1991). In the first year alone, OAs spent 25% of all hours worked in training (Hoerr, 1991). Bob Hoover's goal for 1991 is for people to spend 8.2% of their time in training (Hoover, 1991). As more and more people have become trained in the skill modules, the need to spend a lot of time training is expected to decrease.

There are four areas that operations associates receive training in: technical training, administrative training, interpersonal training, and group process training The technical training is in the five skill modules - forming, piece processing, kiln, support services, and measurements. Administrative training is received to be able to perform the coordinator roles - scheduling, production, quality control, training, safety/maintenance, and as well as constructing and interpreting control charts. Interpersonal training is received in dealing with peers, conflict resolution, and reaching consensus. In group process training, operations associates learn about group dynamics and what groups are all about. Currently, operations associates are in all different stages of these skills. The training coordinator helps to determine training needs for the team with the Training Development Coordinator in the Employee Relations function.

1.3.12. Information System

1.3.12.1. Information Teams Receive

Table 1.2 summarizes what information teams receive, how the information is provided, how often, and the provider of the information. The specific types of information teams receive are:

- Performance of the team
- Team production information
- Team issues
- Technical product/process information
- Performance of other teams
- Performance of plant

- Plant-wide issues
- Performance of Corning corporation
- Corning corporate issues

The pre and post shift exchange meetings are a major source of information for teams. This is the mechanism for a team to get information from the off-going shift team on *production information* - problems experienced, production changes, equipment problems, and any other related information. The off-going shift team also reviews their own *team performance* as compared to the goals they set for the shift. The on-coming shift team sets production goals for the shift based on production information (how many units are needed) from the off-going team. Therefore, the pre and post shift exchange meetings are a source of information for reviewing *performance of the team, team production information, team issues, and performance of other teams.* All information about team performance for the shift and other production information are recorded on a standard report format several pages long, which is kept in a binder in the team meeting room. Each line has its own team meeting room, so this binder is the place where all relevant production information for the line is stored.

A bi-weekly "town meeting" is another source for information on team issues. The purpose of the town meeting is to bring together teams to talk about issues that are somewhat more longer term than day to day issues discussed at the pre and post shift exchange meeting.

Technical information about changes to the processes or products is provided to teams through a process documentation control (PDC) system. This information is posted on bulletin boards and communicated to all teams so operations associates know what changes engineering has made.

Monthly plant review meetings are held to share information on the *performance of the plant, plant-wide issues, performance of the Corning corporation, and corporate issues.* Several review meetings are held so as to cover all shifts. The meetings are usually conducted by plant leadership, either the plant manager or the Employee Relations Manager. Plant leadership reviews the performance of the plant as compared to the goals. This information is also important because the plant is on a goal sharing system in which bonuses are tied to whether or not the plant meets its goals on process loss, customer service, cost per cubic inch, and outgoing quality (parts per million defective). Goals for the plant for the upcoming period are also reviewed at the meetings. Any other issues

Table 1.2. Information Inputs Provided to Corning Blacksburg Self-Managing Teams

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Feedback on team performance (performance measures are: select, pieces handled per hour, parts loaded and unloaded)	Pre and post shift exchange meetings; information is posted on whiteboards, bulletin boards, Remarkable boards; a standard report format is used to record daily performance information and is kept in the team meeting room; teams can also pull up information on the computer system	Performance information posted on the shop floor on bulletin boards is updated every 2-3 hours; daily performance is reviewed at meeting	Team (team measures own performance)
Team production information (production goals, equipment problems, production changes)	Pre and post shift exchange meetings; at shift exchange meeting, the on-coming team sets production goals for the shift with the help of off-going team; goals are posted on whiteboards and bulletin boards on the shop floor; review any problems, changes, etc.	Daily	Team (team generates own goals)
Team Issues (concerns, activities, action items, changes, interpersonal problems or activities, etc.)	Teams exchange information on problems, concerns, and other related daily team activities at the pre and post shift exchange meetings	Daily	Other teams
	Biweekly town meeting for shift teams that work together to discuss issues which need to be communicated to other teams; held in team meeting room	Every two weeks two shift teams meet	Other teams, leadership, engineering

Table 1.2. Information Inputs Provided to Corning Blacksburg Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Technical Product/Process Information	PDC - process documentation - system; technical information about changes to products or processes is posted on bulletin boards and communicated to all teams	As needed	Engineering, other teams
Performance of Other Teams	Teams learn about how other teams performed at the pre and post shift exchange meetings when the off-going team reviews its performance	Daily - review performance of other shift team	Teams
Performance of Blacksburg Plant (state of the plant, plant-wide goals, performance to goals, profitability of plant)	Plant review meetings conducted by plant leadership; several meetings are held to cover all operations associates; review the performance against goals	Monthly	Leadership
	Biannual manufacturing review	Two times per year	Corporate (division senior vice-president of manufacturing)
	Plant newsletter	Bi-monthly	Newsletter team and leadership
	Quarterly Vision Review team meeting	Quarterly	Team of leadership and OAs

Table 1.2. Information Inputs Provided to Corning Blacksburg Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Company Issues (activities, changes, problems, social/QWL issues, etc.)	Plant review meetings; discuss issues and activities affecting all teams	Monthly	Leadership
	Plant newsletter includes information on plant activities, social events, updates, etc.	Bi-monthly	Newsletter team and leadership
	Quarterly Vision Review team meeting	Quarterly	Team of leadership and OAs
	Social QIT addresses social/QWL issues and posts relevant information on bulletin boards	As needed	Social QIT team
Performance of Corning Corporation	Plant review meetings	Quarterly (receive corporate financial results quarterly)	Corning Corporation
Corporate Issues (problems, activities, concerns, etc.)	Corning Live Videotape	Monthly	Corning Corporation

pertaining to the plant as a whole are discussed at the meeting. These meetings are a source of information at the corporate level as well. Corporate performance and issues are reviewed when results come out.

Other sources of information for plant performance and plant-wide issues are the newsletter published for the Blacksburg plant, results from a Quarterly Vision Review Team made up of leadership and operations associates, and results from a social quality improvement team (QIT) which addresses social and quality of work life issues, such as absenteeism policy.

1.3.12.2. Information Teams Provide

Table 1.3 summarizes the information teams provide to other groups or individuals in the plant. There are five types of information outputs:

- General information about the team
- Performance of the team
- Team issues
- Plant activities and issues
- Requests for approval

Teams provide *general information about the team* environment to external visitors (external to the plant, internal to Corning) on Visitors' Day, held about once a month. Operations associates are responsible for giving tours of the shop floor to visitors and answering questions about their jobs and the team environment.

Information about the *performance of the team* is exchanged at the pre and post shift exchange meetings. As mentioned in the previous section, the off-going team reviews their performance against the production goals for that shift, so they are providing information to the on-coming team about their performance. The off-going team also passes along information to the on-coming team on production problems, changes, equipment problems, etc. (*team issues*) at the meetings.

Recently, operations associates have had the opportunity to make presentations on the *plant activities and issues* pertaining to the team environment for one of the Biannual Review meetings conducted by the Corning senior vice president of manufacturing. Many of the presentations on projects were made by operations associates, including one on the newly created social QIT.

Table 1.3. Information Outputs Provided by Corning Blacksburg Self-Managing Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
General Information About Team	Visitors' Day; group question and answer session with operations associates	Once a month	Internal Corning visitors
Performance of Team	Team performance is reviewed at pre and post shift exchange meeting; leadership sometimes attends meetings	Meetings are held daily; leadership sometimes attends meetings	Other teams and leadership
Team Issues (problems, concerns, activities)	Pre and post shift exchange meeting; leadership sometimes attends meetings	Daily	Other teams and leadership
	Coffee klatch	Periodically	Leadership
Plant Issues and Activities	Biannual Review meeting conducted by senior VP of manufacturing and staff; many presentations in meeting to be made by operations associates	Twice a year	Corning corporation (division senior VP of manufacturing)
Requests for approval to make process improvements	PDC experiment plan	As needed	Leadership, technology manager, engineering

Teams *request approval* for making changes to improve the process through the PDC experiment plan. If an operations associate wants to make a process improvement, they fill out an experiment plan which must be approved by engineering and the technology manager. The reason for requiring approval is so that something won't be tried that was perhaps tried several years before and known to have failed, or to prevent a costly mistake.

1.3.12.3. Influence Over Information Received

Operations associates have influence over the information they receive in several ways. First, they can access any information that the plant manager has access to, through the computer system containing all the production figures for the plant. Secondly, plant leadership shares all numbers with everyone during the monthly plant review meetings. There are no production or financial figures that are hidden from employees or the union.

1.3.13. Intergroup Relations

1.3.13.1. Communication, Information Sharing, Interaction Among Teams

There is a meeting once every two weeks (bi-weekly) for the two shift teams that always hand off to each other - A and B, C and D, E and F, and G and H. These meetings are called town meetings. The purpose of these meetings is to exchange information between teams and discuss issues that are more broad than the daily issues of the shift exchange meetings. For example, teams might discuss the results of implementing process improvements, or a recurring problem that needs to be solved.

The communication and information sharing among teams works well between the two teams that always hand off to each other because they hold their shift exchange meetings together and the biweekly town meeting. The explicit purpose of these meetings is for the two teams to share information. The interaction between teams seems to be positive - teams view each other as customers and suppliers - an off-going shift team is a supplier to the oncoming shift team, and then vice versa at the next change of shifts. Communication and information sharing is also good between the teams that work Lines I and II at the same time, because they always see each other.

According to John Yearick, it has been a challenge to coordinate communication between teams that never see each other. To facilitate sharing technical information between shift teams, there is a PDC - process documentation - mechanism to disseminate information about technical changes in processes. This information is posted on bulletin boards out on the shop floor and is also passed on to shift teams by each team's quality coordinator. The PDC process has an experiment plan that is filled out by the person initiating a process improvement which must be approved by a line leader or technology manager before anything is done. The reason for this approval is because something may have been tried before and known to be unsuccessful by someone in leadership or engineering.

The plant newsletter and bulletin boards in the lobby area and out on the floor are communication tools for teams to share information with each other, as well as for leadership to share information with teams.

Inter-team competition exists in the plant - people have the attitude of 'my team' and 'my team is the best team out there.' This competition arises because each team is measured with the same performance measures, so it's easy for teams to see how they're performing as compared to other teams. Plant leadership views the team competition as "healthy, in most cases."

1.3.13.2. Perception of Teams Within Organization

This section is not relevant for Corning, because it is a new design plant.

1.3.14. Problems Experienced With Teams

There have been several problems that have arisen related to the use of teams. Some problems are unique to the Blacksburg plant, while others are common to any organization using self-managing teams. One problem is a "bottleneck" in getting people trained in the five skill modules. This problem is due to fact that there are so few people needed to perform the three support skill modules at any one time. There is a 'wait list' for people in forming and piece processing to be trained in the other three skill modules. A second problem or challenge already mentioned is the challenge of making sure all teams communicate and share information, and lessons learned.

The rest of the problems experienced by Corning are common to other organizations using self-managing teams:

- The dilemma of letting teams make decisions that might not be the best decision, or may even be a mistake. As John Yearick puts it - "Do you let a person make that move technically when you have some ceramic engineers who have been working with that process for fifteen years and know that it was tried three years ago, ... do you let them make the mistake and do it anyway and cost you ten thousand dollars?" Leadership doesn't want to stifle change and innovation by overturning a team's decision; sharing power and then taking it away could lead to frustration and loss of motivation to exercise authority.

- "Fighting the battle of bringing people up to speed in training." Training is something that is easy to fall by the wayside in the face of day to day pressures. It's a long-term investment and easy to cut short.
- Overcoming preconceived ideas that even young adults come in with, in particular, reluctance to make decisions without approval and ideas of union-management adversarial relationships. John Yearick spends much of his time out on the shop floor, coaching people to put their training to use and make the decisions they own and are qualified to make.
- Higher than expected absenteeism, which has been attributed to the pressures of the job and the ease of calling in sick and the novelty of still getting paid (Burlingame, 1989).
- High initial turnover - John Yearick estimates that about 75% of the people who leave, leave in the first six months. Again, this is attributed to the pressures of the job and of the group - the expectation to learn and perform. The expectation to learn in this environment is made very explicit through the initial condition of employment that OAs will learn three skill modules within two years. OAs must demonstrate to their peers they have acquired skills in order to be paid for them. There is also pressure by leadership to put to use training received - to exercise authority and make decisions typically made by management. These pressures can result in more job stress than many people have experienced in other jobs.
- People who are high achievers and like to receive individual recognition and praise may not like the team environment (Hoover, 1991). The focus is on the team not on the individual, and high performers may be accustomed to being rewarded with either financial rewards or recognition.
- In this type of environment, many people feel as if they should be involved in every decision. Bob Hoover states that decision-making and who should be involved is much less clear in the team environment than in traditional plants - there will be always be "second-guessing."
- There are some people who are not as committed as others. In the screening process, "you can't look for attitude" (Hoover, 1991).
- "Dilemma of encouraging creativity and ownership without everyone doing it differently" (Hoover, 1991). Leadership wants teams to be creative and feel as if they

own the process, but there is a need to have consistent production and inspection methods.

- The customer sensitivity is still very low in the plant. The teams are buffered from the customer, in other words, team members still don't have much interaction with external customers.
- There is still 100% inspection in the plant (as opposed to process control) which Bob Hoover thinks is too much.

The problems and disadvantages to the team environment listed above are things plant leadership continues to try to address.

1.3.15. Disseminating Teams to Other Parts of the Organization

Since the Blacksburg plant is new design plant, this section is not relevant; teams are used throughout the plant.

1.4. Summary

The Blacksburg plant is still a young plant (just over two years old), and as Bob Hoover says - "we're at the beginning of the journey." The plant is performing very well, but there are still problems with the team environment to deal with and iron out, as discussed in the previous section. Leadership is still in the process of getting everyone trained, which is a long process and doesn't happen overnight. Ultimately, teams will be responsible for operations, business management, and continual improvement. For the most part, teams are handling operations now, but they are not "there yet" as far as business management - an area which will be worked on. Now that the teams have been established and operations associates are accustomed to working together as a team, leadership is starting to get people out of the teams somewhat and participating on broad plant-wide teams, such as the social and technical QITs.

Overall, the Blacksburg plant is viewed as a success story within Corning corporation; there are many people coming from Corning sites to visit the Blacksburg plant and there are plans to use socio-technical systems theory to redesign Corning's other 31 plants (Howes, 1989). Of the 300-500 estimated new design plants in the country (Lawler, 1990b), the plant's consultants put them in the top 50 as far as success in implementing self-managing teams. One of the operations associates at the plant articulates well the attitude of people at the plant and their commitment to continuing to make it a success - "Everybody that works here is competitive. We're willing to work long hours. We want to be multi-skilled and learn how we can make the product better so we can be the best in quality and service to the customer. And if we do all that, this plant will be around a long time" (Hoerr, 1990).

2. CASE DESCRIPTION FOR SHENANDOAH LIFE INSURANCE COMPANY

2.1 Overview

Shenandoah Life Insurance Company is a mutual life insurance firm that has been using self-managing teams in their Individual Insurance Services Department (one of six departments) for over six years. An experimental self-managing team was formed in 1983, and the remaining employees in the department were formed into four self-managing customer service teams in late 1984. Results show that teams have successfully improved their work volume, productivity, and quality of service to customers over the six years.

The company has had over 30 articles or papers written about their experiences with self-managing teams. Based on what has been published about Shenandoah Life, which includes tangible results, over 35 companies have come to visit to talk with managers and team members about the use of teams. Shenandoah Life is one of the pioneer companies in the service sector experimenting with self-managing teams; most applications of teams are in manufacturing organizations. Many organizations coming to visit are service companies, in particular, insurance firms.

Largely due to the successes experienced with self-managing teams (results are discussed in a later section), Shenandoah Life was the recipient of the Senate Productivity Award for Virginia in 1988. The company is considering applying for the Award for Continuing Excellence when eligible based on its continued success with the teams.

The sources of information for this case description were : many of the articles and papers published about Shenandoah Life; a case study I conducted on Shenandoah Life for a graduate class in 1989 (which included an interview with Mr. Jack Cochran); and a site visit and interview with Jack Cochran in early 1991. This case description was reviewed by Mr. Jack Cochran and Mr. Dick Wagner.

2.2 Background of Organization

2.2.1. General Information and History of Organization

Shenandoah Life Insurance Company is a mutual life insurance company founded in 1916. There are approximately 220 employees occupying the three story home office building in Roanoke, Virginia. The home office is the 'headquarters' for 240 general agency offices and a field agency force of 1200 which serve twenty states and the District of Columbia. Shenandoah Life is not part of a superordinate organization. Assets are in excess of $450 million and insurance in force exceeds $10 billion. A.M. Best (which provides ratings to insurance companies) has consistently give Shenandoah Life a rating of A+ (superior) since 1976.

Shenandoah Life offers insurance products in both individual (life, disability income, and annuities) and group insurance (life, disability income, health, and dental). A new product that has been developed and offered relatively recently is called universal life - a new base-life product with greater interest-earning potential than whole life insurance (Myers, 1985). Currently universal life accounts for 85% of the company's new individual policy business. Because of the wide range of insurance products Shenandoah Life offers, there is no specific market niche the company occupies. Their competitors are the over 2,000 insurance companies in existence.

In sum, Shenandoah Life is a service industry insurance company in the private sector. SLIC is a 'redesign site' because self-managing teams are used in only one department - Individual Insurance Services Department.

2.2.2 About Organized Labor

This section is not relevant for Shenandoah Life because none of the workforce is unionized.

2.2.3 Organization Structure

2.2.3.1. Formal Organizational Structure

The home office is organized into six departments: Marketing, Insurance Systems and Services (data processing), Investment, Planning and Control, Individual Insurance Services, and Group Insurance Services. The two product-oriented departments (Individual and Group Insurance Services) each offer a set of insurance products to customers.

The company president and CEO is Mr. Joe Stephenson, who has been in this position since August 1989. There are vice-presidents who head each of the six departments and report to the president. These vice-presidents are also called 'officers.' In the Individual Insurance Services (IIS) Department, the vice president is Mr. Dick Wagner and the assistant vice president is Mr. Jack Cochran, to whom the self-managing teams and their previous supervisors report. Prior to the move to self-managing teams, the IIS Department was organized into three functional areas: policyholder services, policy issue, and premium accounting, each with a manager (supervisor) and clerks. Now, the department consists of four self-managing customer service teams responsible for policyholder services, policy issue, and premium accounting.

2.2.3.2. Infrastructure to Support Improvement

The company's infrastructure to support improvement is composed of ad-hoc teams or committees to address specific issues. One cross-functional team is an employee involvement committee, which is trying to increase communication between all levels of the company and trying to get more feedback from employees to upper management (Forbes, 1988). Another company-wide team is a product implementation team. Typically new untested insurance products are full of problems that need to be worked out. This team helps coordinate new products throughout the various departments, seeing how the test transactions work and what changes have to be made (Forbes, 1988). Other company-wide task forces which came out of the company's strategic planning efforts addressed the issue of customer satisfaction, while another dealt with ways to differentiate the company's service from that of its competitors (Forbes, 1988).

2.2.4. Organizational Communications

2.2.4.1. Nature of organizational communication

According to Jack Cochran, Shenandoah Life has an "open door policy" and anyone in the department can talk to him or Dick Wagner, or even the president, Joe Stephenson, at any time. At the company-wide meetings (described in the next section), the president addresses any questions that are asked from any employee; the president \ is described as an "open communicator."

Information is quickly disseminated throughout the company through a series of regular weekly meetings. On Monday mornings, the president and all the vice presidents have a meeting to discuss problems, and issues. On Monday afternoons, the vice president of IIS Department, Dick Wagner holds a meeting with all the managers and supervisors in the department. Part of that meeting is devoted to briefing everyone on what went on at the Monday morning meeting. All vice presidents are supposed to brief their departments in a similar fashion, although it may not always occur because of time constraints. Then on Tuesday afternoons, Jack Cochran holds a meeting with all the managers and the team representative from the four self-managing customer service teams (these meetings will be discussed in further detail in a later section). Part of this Tuesday meeting (called a 'Team Rep meeting') is also devoted to briefing people on what went on at the Monday afternoon meeting with Dick Wagner. Information from the Team Rep meeting is passed on to all team members later that day through the minutes.

In this way, information is quickly disseminated from top management all the way down to members of the customer service teams. Although not every department and not every area in each department may receive information from top management in the same way, there is a commitment to sharing information from the top management meetings to keep everyone in the company informed on important issues.

2.2.4.2. Organization-wide Information Sharing Meetings

There are company-wide meetings on a quarterly basis primarily to review the performance of the company. At the meetings, the president summarizes the results as compared to the company goals. At the first meeting after the year's end, the company's yearly performance is reviewed. Examples of other things reviewed at the meetings are: announcement of an attendance bonus program; an exercise program where employees can accumulate credits; and an announcement that the company was moving from a four and a half day to a five day work week to provide service throughout the week. After presenting information about the company's performance and discussing any relevant issues, the president answers any questions from employees.

2.2.5. Culture

In the late seventies, before Shenandoah Life undertook efforts in socio-technical systems design, Dick Wagner described the company - "Neither morale nor communication were good...supervision was poor. We had a bureaucracy and rules and regulations that permitted no deviation. The culture around here could have been described as rote thinking" (Forbes, 1988). Since that time, the culture has changed to one of "challenge, growth, learning, and trying new things" where people are treated as mature functioning adults (Conversano, 1988) - definitely a change from the old culture that required following strict rules and regulations. According to John Myers, previously the Human Resources Manager, the culture must be prepared to accept the concept of self-managing teams (Conversano, 1988). The concept is radically different from the bureaucracy the company used to be, with formal job descriptions, strict organizational boundaries, and close supervision (Myers, 1985). Management established a culture that would support change and the concept of self-managing teams through awareness and training on socio-technical systems (STS) theory. Managers attended two-day seminars on

STS theory, and clerical employees attended one-day seminars on the same topic. In addition, the company president at the time publicly stated at a meeting attended by all employees that no one would lose their job as a result of any productivity improvement that would come from the use of teams. Eliminating the threat of losing a job due to improvements in operations enables people to feel secure in suggesting and trying new things, creating a culture supportive of change.

2.2.6. Past and Present Improvement Initiatives

Because Shenandoah Life is a redesign site, past improvement initiatives are discussed in a later section, Evolution of Self-Managing Teams. For instance, the evolution of quality circles to self-managing teams will be discussed. Present improvement initiatives are being carried out by the cross-functional teams described in Organizational Structure - such as the employee involvement committee and the new product development team.

2.2.7. External Environment

Beginning in the late seventies, Shenandoah Life faced the following external pressures with which the company had not dealt in the past (Myers, 1985):

- rapidly rising interest rates forcing policyholders to go to other sources
- increasing demand for improvement in the paper processing service provided to policyholders and agents
- competition from life insurance companies as well as from non-traditional sources such as full-service financial institutions
- pressure to control costs relative to sales
- more difficult regulatory environment

These factors have contributed to creating an external environment that is extremely competitive with an ever increasing need for Shenandoah Life to differentiate itself in the marketplace. Because Shenandoah Life hasn't carved a specific niche for its insurance products and because competitors can easily examine the company's products and develop competing ones (Conversano, 1988), it must distinguish itself other than through its products. The way the company has pursued this throughout the eighties and into the nineties is through high quality service to policyholders and agents in the field.

Due to the pressures of the external environment, Shenandoah Life has had to face some significant issues in its internal environment. The internal environment includes the home office and the agents in the field. For the first time in the company's seventy-seven year history, employees were laid off. Even through the Depression in the 1930s, no one lost their job. But because of the competitive environment and regulations, the company had to reduce staff by approximately thirty employees in late 1989. This downsizing was accomplished through an early retirement offer, a voluntary package, and some terminations. Because of the downsizing, some managers had to assume additional responsibilities. For example, Jack Cochran took on two additional work areas, which left less time to advise and coach the teams. For this reason, the Directors of Customer Service (previously the supervisors) have become more involved in helping the teams than they have been in the past several years.

Another consequence of the external environment was a revamping of the agents' contracts. The field agents no longer qualify for fringe benefits and have to provide their own. This was a "traumatic period" according to Jack Cochran for the home office and the agents. Since the company had an excellent year in 1990, perhaps the internal environment will be less affected by the pressures from the external environment.

2.2.8. Performance of the Organization

Largely due to the success experienced with self-managing customer service teams in Individual Insurance Services Department, Shenandoah Life was a recipient of the 1988 Senate Productivity Award for Virginia in the private sector service category. Due to continued success, top management is considering applying for the Award for Continuing Excellence when eligible. In addition, the company has been written up in approximately 30 journal and newspaper articles ranging from the Wall Street Journal to Business Week to National Productivity Review.

It would seem that the performance of the company might not be excellent in light of the downsizing in late 1989. However, the downsizing was primarily due to an external environment which managers have no control. In addition, Shenandoah Life has recently experienced very promising results. At the most recent quarterly company-wide meeting, the president reviewed the preliminary performance figures for 1990. From the preliminary figures, 1990 was an excellent year in terms of profitability, sales, etc. Additionally, throughout the 'rough' period in 1989, the Individual Insurance Services Department continued to operate as before, maintaining it's quality of service to agents and policyholders.

The effect of word-of-mouth recognition, publicity, and winning awards on Shenandoah Life's performance is immeasurable. As Dr. Deming (1986) states, some of the most important figures (in evaluating performance) are unknown and unknowable. Shenandoah Life may never know the full benefit of their efforts with self-managing teams, but it is clear that the teams give the company a competitive advantage. Given that they are so small and can't compete with larger insurance firms in developing new products, for example, customer satisfaction is the only arena where they *can* compete.

2.2.9. Sharing Successes

Shenandoah Life has hosted over 35 visiting companies interested in learning about the customer service teams. A few examples of companies visiting are: AT&T, Celanese, Corning, Aetna Insurance, Allstate Insurance, Defense Logistics Agency, Aid Association for Lutherans, General Electric, Mutual of New York Insurance, and Proctor & Gamble. The visiting companies represent other insurance companies, other service companies, and manufacturing companies. Clearly, these companies believe the concepts as they have been applied at Shenandoah Life are applicable to any organization. The University of California at Berkeley has even sent some people to Shenandoah Life to interview and observe, in an attempt to determine what kind of college curriculum would be necessary to prepare graduates for the organization of the future, which they believe Shenandoah Life represents (Micossi, 1990).

The company received so many requests for on-site visits, they had to begin to ask visiting companies for $1200 per day for the time they spend with them. During the visit, Dick Wagner and Jack Cochran give an overview of the self-managing teams, going through the entire process, what they did, why they did it, and how they did it. Then visitors receive a tour of the work area, and afterwards have a few hours to talk with several team members as well as directors to ask questions.

2.3 Self-Managing Teams

2.3.1. Evolution of Self-Managing Teams

In 1977, operations at Shenandoah Life were manual and mechanized. In order to improve the technology, the company invested two million dollars in new computer software and hardware, along with computer training. No significant improvements in service were realized from these computer upgrades. For example, after the investment in the computerized system, a policy still required 27 days to process, could pass through 32 hands, across nine sections and three departments (Myers, 1985). The reason the significant gains in processing time were not achieved was because work was still performed in an assembly line approach.

In 1979, the president began to question whether Shenandoah Life was doing the *right* things (effectiveness), in the *right* way (efficiency), and he questioned whether the company's productivity was up to par. An employee attitude survey was administered in 1979 to identify areas for improvement from employees' perspective. The results indicated that people were dissatisfied with the poor supervision, job duties, work group climate, communication, training, and the low morale. In addition to increasing employee dissatisfaction, Shenandoah Life faced unfavorable market and economic conditions, as discussed in <u>External Environment</u>. To address the questions posed and search for ways to respond to the internal and external factors, the president appointed a Productivity Committee to perform a "situation analysis." As a direct result of the recommendations of the Committee, a Quality Circle program was initiated in 1981. In a meeting of all employees, the president stated that no one would lose their job as a result of productivity improvement based on suggestions from QCs.

There was 86% voluntary participation in QCs. One key suggestion, which set the stage for self-managing teams, was the proposal that everyone in the Policy Issue section of the IIS Department be cross-trained in all the skills (this proposed change was called Total Issue Processing Service, or TIPS). Cross-training is one characteristic of a self-managing team, where the team is more flexible and adaptable to changes in workload (Manz and Sims, 1986). About the same time QCs were started, Shenandoah Life hired John Myers, who had experience with self-managing teams at a pharmaceutical company. Based on the success of TIPS and Myers' influence, management decided to form an experimental self-managing team in 1983. The reasons for developing the team were:

- to be more productive and provide faster, more effective and better quality service to customers
- to make the company more flexible and responsive to the competitive, ever-changing work environment
- to continue and expand, as part of the productivity program, the participative management practices initiated by the QC program in 1981

- to provide an opportunity for employees to increase their skills, knowledge, earnings, and value to the company without stagnating in a narrowly defined job

Myers conducted a two-day seminar on socio-technical concepts for upper management, including the president, vice presidents, company officers, and managers/supervisors. He also conducted a one-day seminar for clerical employees who would eventually be affected by self-managing teams. The first experimental team was formed from two members each from Policy Issue, Premium Accounting, and Policyholder Service sections (these three sections make up the IIS Department - see Figure 2.1 for organizational structure before and after teams). Members were elected by their peers to participate in the experimental self-managing team. Team members received training in communicating, how to train others, how to give feedback, stress management, and conflict management. Other training was conducted as needed. The directors (previously called supervisors) of the three sections, together with Jack Cochran and other key personnel, served as an Advisory Team to the pilot team. The Advisory Team had two main missions: to help the pilot team become self-managing as quickly as possible, and to serve as a role model for self-management (Myers, 1985). In addition to the processing responsibilities of premium accounting, policy issue, and policyholder services, the pilot team was responsible for designing their office layout (they designed an "open" office layout to facilitate the face-to-face communication and interaction important in learning new skills), allocating equipment, cross-training other team members, and helping to design a pay-for-learning compensation system. The team performed tasks traditionally performed by supervisors (the team had no direct supervision), such as scheduling the work, scheduling vacations so as to minimize disruption, providing feedback and taking disciplinary action when necessary, interviewing applicants and making final selection of new team members, and reviewing and signing off on peer skill evaluations.

Management viewed the experimental team as a success and decided to form self-managing customer service teams with the remaining employees in the Policy Issue section. There were brainstorming sessions with top management, human resources, the Advisory Team, and the internal auditor to map out a strategy for transitioning everyone to self-managing teams. The auditor was involved to gain commitment; according to Jack Cochran, a self-managing team is an "auditor's nightmare" because of the difficulty of

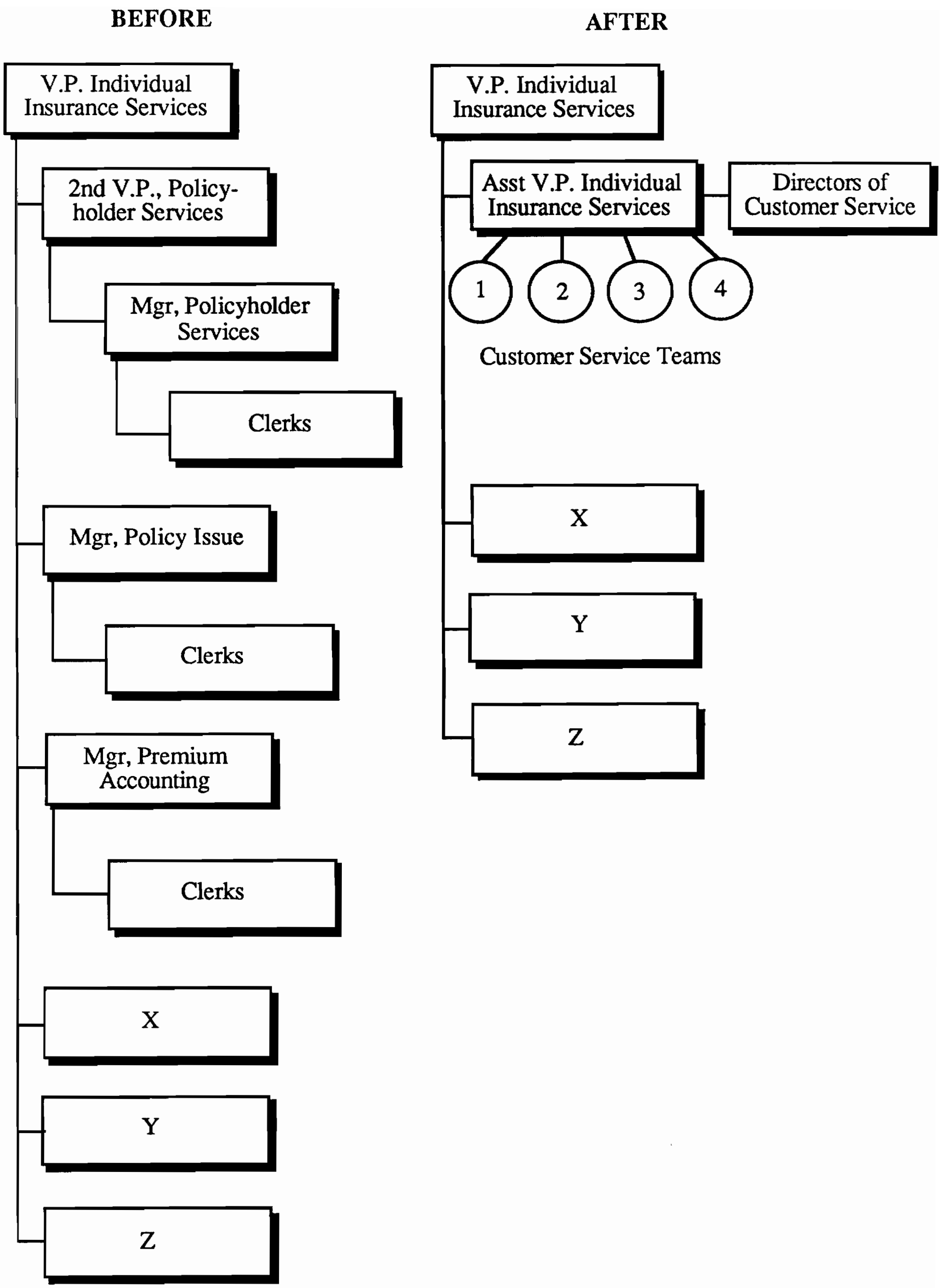

Figure 2.1. Individual Insurance Services Department Structure

tracking accountabilities for a particular job. Each employee completed a skills inventory and ranked themselves on all skills; these results were used to match high skill with low skill people so that all high skilled employees weren't on the same team. The four teams were distinguished by the geographic location (the states) which the team served. Otherwise, the teams are the same (everyone learns the same skills and performs the same functions).

2.3.2. Team Structure

Employees (clerks) in the IIS Department were re-organized into four self-managing 'customer service' teams in late 1984, based on the success of an experimental team formed in 1983. The teams have taken over the responsibilities of three sections: policyholder services, premium accounting, and policy issue. The seventeen job classifications in these three sections have been replaced with one job classification - customer service team member. Team are responsible for all technical tasks involved in performing these three functions, as well as other administrative tasks (discussed in Decisions and Responsibilities of Teams). There are currently a total of 22 people in the four customer service teams, so there are five to seven people on each team. This number has been reduced from the original five teams through the company-wide downsizing and attrition.

There are also three other teams in the IIS Department - a disability income, special markets, and underwriting services team, which account for an additional 15 people. These teams are natural work teams in that they are organized to be responsible as a team for a product/service. However, the teams are not on a pay for learning compensation system, nor are they fully cross-trained. The focus of this case study description is on the four customer service teams.

The customer service teams are organized by geographical market, to handle all aspects of issuing, accounting, and servicing all types of policies (Peters, 1988). Other than the market each teams serve, the teams are the same in every other respect. They all perform the same tasks and collectively have the same sets of skills. Within each team, the work is divided according to the last digit on new policies coming in or service requests. For example, one person on Team A is responsible for all incoming policies and service requests whose policy number ends in 0 and 4. The team's customers are the "agents in the field, the policyholders, and their peers within the company" (Jack Cochran). If a policyholder has a request, they may either call their agent or their team at the Roanoke home office. One of the benefits of this team structure, from the customers' viewpoint is that they only have to deal with one team of people, rather than being shuffled around between three sections depending on the nature of their request. Team members work the same schedule as the rest of the company. Until recently, the company was on a four and a half day work week, however, the president has decided to move to a five day work week to provide service on Friday afternoons.

The teams are supported by an Advisory Team comprised of Jack Cochran, and supervisors, whose titles were changed to 'directors' when the teams were created. The role of the directors is clearly very different than a supervisors' role (see Role of Leadership/Supervisors). Until recently, none of the directors were directly 'assigned' to any one team; the Advisory Team as a whole was responsible for helping the teams whenever they needed and requested assistance. A recent change has been made in the role of the directors on the Advisory Team. Two directors have been 'assigned' to each of two teams, where the director works more closely with the teams. Two directors cover the four teams. The teams had requested more "hands-on help" with difficult issues such as disciplining team members. The titles of directors have now been changed to managers. Now, teams report to a manager, and the managers report to Jack Cochran. This change was made to provide more direct assistance to the teams as well as to free up some of Jack Cochran's time from advising teams so he can deal with added responsibilities as a result of the company downsizing.

2.3.2.1. Coordinator Roles

There are no formal coordinator roles in the customer service teams, as there are in other organizations using self-managing teams. For example, some companies have a role for safety, maintenance, and scheduler. Some of the typical coordinator roles may not be applicable to service companies, such as the first two examples given - safety and maintenance. Others may be applicable, but they are not in this case. The teams don't need a scheduler (someone who decides how the work is divided and how it is processed throughout the team's area) because the decision of how to divide the work is a one-time decision. In addition, the teams decide their vacation schedule as a team. Because the teams at Shenandoah Life are smaller than most self-managing teams and there are only four of them, the formality of coordinator roles is not necessary.

2.3.2.2. Internal Team Leadership

There is an internal team leader for each team, called a 'team rep.' The team rep is a member of the team, and the position rotates on a monthly basis. The team rep has several functions. They represent their team at the weekly Team Rep meetings, held with Jack Cochran, managers, and the rest of the team reps on Tuesday afternoons. They poll their team prior to the meeting for any issues, problems, or concerns that need to be brought up at the meeting. The four team reps also take turns writing and distributing the minutes from the Team Rep meetings. Team reps represent their team at any other type of meeting or training sessions. Whenever visitors come in, Jack Cochran asks two of the four team reps to set aside several hours to talk with visitors and answer their questions about the team environment.

Some self-managing teams have an internal team leader that changes only every year or so and might even be paid more than other team members. Sometimes this position is called a 'facilitator' because the person also facilitates team meetings. Shenandoah Life purposely did not want to create a more formal internal team leader that held the position for a relatively long time for several reasons. First, since the team is on a pay for learning system, if the internal team leader has to spend a lot of time at meetings and sessions, it takes time away from learning new skills, which translates to having less opportunity to increase their pay. It did not seem fair to take away that opportunity from one person. Secondly, management wanted everyone to have a chance to be the team rep, on a somewhat regular basis (e.g., every fourth or fifth month). Thirdly, rotating the team rep position monthly lets leadership emerge in different situations. In other words, as John Myers put it, "leadership changes as the situation changes" and it's "leadership by expertise, not appointed position" (Forbes, 1988). It also "takes pressure off people who are natural leaders" - i.e., they don't always have to be the leader - and it gives "everyone an opportunity to grow and expand in that function" (Jack Cochran).

2.3.2.3. Liaison With Support Departments in Organization

Most of the interaction with people outside the teams is with other teams within the IIS Department. For instance, the customer service teams have a lot of interaction with the three other teams in the department - special markets, disability income, and underwriting services. This is true because these teams are either internal suppliers or customers to the customer service teams. The underwriting services team provides applications with all the necessary information, in essence, a policy ready to be issued, to customer service teams.

An area outside the IIS Department teams interact with is the Marketing Department. One of the customer service teams' responsibilities is to test new products when they are developed. The actuaries in the Marketing Department's Product Development section develop the products and work with the teams in ironing out any processing problems. The actuary who developed the product typically gives an overview on the new product to each team, goes over the process, and answers any questions.

Teams may also interact with the Marketing Department if an agent calls in with a question that pertains to Marketing. The team member can transfer the agent to Marketing or call Marketing themselves to get the information the agent needs.

Other areas with the company which teams interact with are the Mailroom and Data Processing. These two areas are internal suppliers in that they provide mail and computer output to the teams very frequently (usually on a daily basis).

2.3.3. Role of Leadership/Supervisor

In the transition to self-managing teams, the role of the people who previously filled the supervisors' positions changed from that of "policeman" and "deciding what folks can or should do" to "discovering what people can do" according to John Myers (Peters, 1988). The role of external leadership has undergone a change relatively recently, as briefly described earlier. When the four customer service teams were created, the supervisors from the three sections of policyholder services, premium accounting, and policy issue formed an Advisory Team (called Directors of Customer Service), along with Jack Cochran and several other managers. The mission of the team was to "get the teams to become self-managing as quickly as possible and serve as a role model for the teams" (Myers, 1985). The directors had two sets of responsibilities - line and staff responsibilities. Line responsibilities include working with the teams to help them resolve their management-type problems, while staff responsibilities include serving as a coach, advisor, technician, and a 'getter of things.' No directors were assigned to any one team.

The recent change that was made in the role of directors was that two of the directors (now called 'managers') have been assigned two teams each as a direct report. This change was initiated because of requests from the teams for more direct assistance and to free up some of Jack Cochran's time for new added responsibilities. The role of the managers has not changed very much with this change; the only difference is that two of the managers now work more closely with the teams and are more involved with the problems that occur with the teams.

The role of manager is as a coach, providing guidance, training, and support to the teams when necessary. The activities of managers with the teams include helping the teams with particularly difficult policyholder or agent requests, serving as a "test driver" for new products, system enhancements, tax law revisions, and personal computer changes (Forbes, 1988). Managers "analyze these situations, determine how they will affect the work flow in the area, and develop the process and training necessary to incorporate any corresponding changes into team procedures" (Forbes, 1988).

In addition to the coaching and support to teams, managers are involved in more higher value-adding activities, rather than being policemen (Conversano, 1988). Their role has been broadened to include challenging projects and company-wide task forces or teams. Managers at first were doubtful and were worried about giving up prerogatives they worked hard to achieve (such as the status of the position of supervisor) (Forbes, 1988). However, as they became involved in some of these projects and teams, they found their new duties both "more rewarding and more intellectually challenging;" they are "technical professional-level gurus working autonomously on their own projects" (Forbes, 1988).

One manager is a member of a product development committee to test new products. She provides input based on her expertise (Conversano, 1988). Another works with Data Processing to enhance the department's systems, while another is now the 'personal computer guru.' Yet another is involved with a project involving IRS oversight of the company's reporting procedures. Other committees managers are involved with are an employee involvement committee and a task force that deals with customer satisfaction.

2.3.4. Performance of Teams

The performance of the teams has significantly improved since they were formed in late 1984. Their performance work volume (number of transactions) and productivity (average transaction per person) is measured and distributed on a weekly basis. Performance for average transaction time for policies is compiled on an annual basis and formal customer feedback from agents is collected and analyzed on an annual basis. Customer surveys were performed in 1986, 1987, 1988, and 1990. A survey was not conducted in 1989 because of the "traumatic period" with the agency contract changes mentioned earlier. Informal customer feedback is received throughout the year in the form of cards sent with praise and commendation, as well as small gifts for teams around Christmas.

Table 2.1 summarizes improvement in performance on efficiency (number of employees in teams), average skill level, work volume, productivity, average service time, and percent of overtime from 1985 to 1989. These figures were collected in late 1989, therefore, the last two months of 1989 were projected based on the earlier part of the year. Table 2.2 summarizes the data from the 1988 and 1990 customer survey. As mentioned, a survey was not performed in 1989. Jack Cochran reported that the results from the 1990 customer survey are the best overall results yet since the survey was first conducted in 1986.

The improvement in performance is clearly significant. Although there is no comparison of customer survey results from previous years, the initial comparison from 1990 figures to 1988 appear to show an improvement. Even though it is important to measure customer satisfaction, as well as work volume and productivity, as Dr. Deming (1986) says, the most important figures are unknown and unknowable. It is impossible to measure the bottom-line impact from a customer that brags about the service received from a team, or conversely, the negative affect of a dissatisfied customer spreading the bad news.

2.3.5. Decisions and Responsibilities of Teams

The technical tasks for which teams are responsible are the three functions of policyholder services, premium accounting, and policy issue. These are the three sections which existed before teams were created. The teams are responsible for all the tasks necessary to perform these three functions, which represent a total of 68 distinct skills. In addition to the technical tasks, teams are responsible for the following administrative decisions/tasks:

- dividing the work between team members
- formulating a vacation schedule to minimize negative impact on production
- interviewing and making final decision on hiring new team members
- designing the office layout (the experimental team)
- training one another or arranging for training
- determining the basics of the salary system (the experimental team)
- managing the interface with other units and their managers
- reviewing and signing off on peer skill evaluations and initiating salary increment requests
- organizing themselves to shift the load when someone is sick or on vacation
- deciding when to work overtime

Table 2.1. Comparison of Shenandoah Life Customer Service Team Performance from 1985 to 1989

Performance Measure	1985	1989	Percent Change
Number of Employees	30	22	- 26.7%
Average Skill Level on the Pay for Skills System	47%	75%	+ 59.6%
Total Customer Service Requests	101,570	140,398	+ 38.2%
Average Number Requests per Person	3,386	5,592	+ 65.2%
Average Service Time	4.97 days	3.15 days (1988 data)	- 36.6%
Budgeted Overtime	10%	6%	- 40%

Table 2.2. Results of 1988 and 1990 Shenandoah Life Customer (Agent) Survey

Survey Question	1988 results	1990 results
1. Timeliness - Team response time is:		
• Very Good	85%	81%
• Satisfactory	12	15
• Needs Improvement	3	4
2. Accuracy - Team Error Ratio is:		
• Very Good	79%	83%
• Satisfactory	19	17
• Needs Improvement	2	0
3. Courtesy - My Team is Helpful and Courteous:		
• Always	88%	92%
• Frequently	12	8
• Occasionally	0	0
4. Overall - Service Provided by My Team is:		
• Very Good	88%	90%
• Satisfactory	11	8
• Needs Improvement	1	2

- filling out absenteeism reports
- providing feedback, constructive criticism or discipline to teammates when necessary
- assisting other teams that are having work flow problems due to a heavy workload, vacation, or illness.
- participating in the decision to fire a team member if necessary
- working with actuaries in Product Development section to test new products

In addition to technical and administrative tasks, teams also have the freedom to experiment somewhat if they wish, on trying to improve the way things are processed. However, before an improvement is implemented throughout the area, team members must review it with a manager to ensure that the improvement or shortcut is not illegal, which is a possibility with the dynamic tax laws and other regulations.

2.3.6. Team Meetings

There are no formal regular team meetings for just the team to meet. In many manufacturing organizations, a self-managing team meets briefly at the beginning of each day to discuss what is to be done that day and any problems or issues. However, because members of each team work in close proximity, whenever one person has a problem or needs help, they will ask another team member or have an ad-hoc team meeting to address the problem. They often meet right in their work area, or if the subject is somewhat "volatile" or "touchy," they'll go into the team meeting room behind closed doors.

This is not to say that teams do not meet at all; they do in fact often have ad-hoc meetings. However, there is not a set time, such as every morning before work starts, that the team gets together. For example, the team reps, after the Team Rep meeting (discussed below) will call everyone together to let them know what happened at the meeting. If someone is having a problem with a difficult policy, they will either ask another team member, a manager, or initiate a team meeting to solve the problem. Sometimes a manager is present when a team meets and sometimes not. Usually, a manager will only attend a team meeting if specifically asked. Generally the person who initiated the meeting and brought the problem to the attention of the team will facilitate the meeting.

The meeting serving as a major source of information for teams is the weekly Team Rep meeting on Tuesday afternoons. These meetings are not attended by all team members, but just the team reps, managers and Jack Cochran. The purpose of the meeting is to share information from Jack Cochran and managers (information which may have come down from top management) and for teams to share information with managers and Jack Cochran. Team reps go around and ask members of their team before the meeting if they have anything that needs to be brought up at the meeting, such as problems that need to be addressed or information to pass along to management or other team reps. Jack Cochran describes these meetings as "two-way communication" and a "give and take exchange" of information to make sure that "everyone is on the same wavelength and getting all the same information." Some of the types of information passed along from managers or Jack Cochran to team reps (and hence to teams) is the introduction of a new product, new function, or new screen on the computer system, as well as general information such as visitors coming in. One specific example is informing the teams that people from Virginia Tech coming in and asking teams to complete a questionnaire about their job and doing a job description. Some of the types of information team reps bring to the meeting are problems that someone might be having with a particular function on the computer. Other team reps or managers might contribute potential solutions or their experience with that particular problem.

The meeting has a somewhat standard format. Normally, Jack Cochran kicks off the meeting, and then they simply go around the room and everyone makes whatever contributions they have. Part of each meeting is devoted to briefing people on what went on at the Monday afternoon meeting with Dick Wagner and all the managers in the IIS Department. Any other information filtered down from the Monday morning meeting with the president and all officers (see Nature of Organizational Communication section) is also reviewed. The four team reps rotate the responsibility of taking minutes at the meetings, typing them up and distributing them to all teams. Normally, after the minutes are ready to distribute, the team rep will call an ad-hoc meeting with their team in their work area to brief everyone on what went on the meeting.

There is a third type of team meeting teams attend which happens approximately once a month. The manager assigned to a team meets just with the team. The purpose of these meetings is to share information from management that should be shared with all team members (instead of through the team rep meetings) or to address any problems with the manager.

A fourth type of meeting customer service teams attend is an IIS Department meeting conducted by Dick Wagner on a quarterly basis to review the department performance. He goes over the budget for the department, the goals and objectives for the present year, performance against the goals and objectives (which objectives were met, which were not met and why), and goals and objectives for the coming year. He also reviews performance to budget. The purpose of this quarterly meeting is to keep everyone in the department informed on where they stand on goals and objectives.

2.3.7. Team Facilities

Each of the four customer service teams has its own work area, with desks arranged such that people can face each other in "conference style and can communicate informally and rapidly" (Myers, 1985). The experimental team was involved in designing the office layout to be conducive to informal and frequent communication. Each team member has on their desk a computer and two team members share a laser printer. Teams also have access to a meeting room near their work area to meet when necessary. They share the meeting room among the four teams. All they need to do is sign up for the room when they want it.

2.3.8. Selection and Placement Process

When an opening is available on one of the teams, the job is posted throughout the company. Both internal and external applicants can apply for the positions. So far, only internal applicants have been selected for job openings. Jack Cochran and the managers do an initial screening on candidates and select people who are acceptable to them. Once applicants have passed this initial screening, team members conduct group interviews and then make the final decision on who to hire. To assist them, teams have received training on interviewing techniques and EEO guidelines.

2.3.9. Rewards and Recognition

2.3.9.1. Pay for Skills System

Team members have been on a pay for skills compensation system since they have been part of the customer service teams. The experimental team participated in identifying all the skills necessary to perform the functions of policyholder services, premium accounting, and policy issue - the three sections which existed prior to the teams. A total of 68 individual skills were identified in addition to five 'team' skills (each skill has sub-skills as well). The individual skills (things performed as individuals) include all the technical skills necessary to perform any task for which the team is responsible as well as several administrative skills. Individual technical skills include all the tasks for processing and issuing policies, as well as using the calculator and being able to perform mathematical calculations. Individual administrative skills include filling out personnel reports (vacation, absentee), word processing, using electronic mail, and using the computer system.

The team skills are the tasks teams decide or do as a group. The five broad team skills are: 1) coordinate scheduling of work (includes redistributing work if necessary and scheduling overtime); 2) development and positive disciplining of team members (includes training, giving feedback, communicating); 3) interviewing skills; 4) ability to negotiate "win-win" situations (includes conflict resolution); and 5) other departmental responsibilities (includes reviewing peer evaluations and helping other department employees if necessary).

People are paid a base salary and they are paid in increments for each additional skill they learn. Their total pay is determined by the percentage of the 73 skills they have mastered. Twice a year, every team member goes through a peer evaluation process (discussed in Peer Evaluation and Feedback) on the skills they have been developing, and their salary is adjusted to reflect their increased skill level. The 68 technical and 5 team skills represent a total time frame of 321 weeks, or a little over six years, to master. In other words, it takes approximately six years for someone with none of the skills to become proficient at all of them. These estimates of the time it takes to learn a certain skill were developed jointly between experimental team members and managers. When people were initially placed in the pay for skills system, they were given credit for the skills they already had. For example, one person started at 79% of the necessary skills. The average skill level of team members when the teams were first created was 47%. In 1989 it was 75%. IIS is the highest-paying clerical department in the company.

A common problem with a pay-for-learning compensation system is 'topping out,' where people have learned all the skills. Some organizations add new skills on to the list, so people who are close to topping out have more skills to learn and therefore opportunity to earn more pay. Management considered adding a block of skills which would add an additional two years to the six years necessary to acquire all skills. However, they decided not to add any more skills because they did not want a clerical job that required eight years to become 100% proficient. Although turnover is low in the customer service teams, there is still some turnover, and with new people coming in, there would be a significant amount of time spent in training. Even adding more skills to the pay for skills system would only prolong the problem of people topping out. Jack Cochran developed a proposal for a new compensation system for the customer service teams. The system would be a variable compensation system, where team members are primarily compensated based on customer feedback received from the customer surveys of the agents. In a sense, this would be a pay for performance compensation system because teams would be compensated based on how they performed with respect to satisfying their agent customers. The proposal was submitted to Human Resources but Jack Cochran has not received a response as yet.

When he became president in August 1989, the new president of Shenandoah Life made a commitment to have everyone in the company in the same compensation system. When he became president, team members in the IIS department were on pay for skills, while the rest of the employees were on a different compensation system. To begin to establish a consistent system, the pay for skills system for the customer service teams was eliminated. Each person's pay was kept where it currently was. The two major reasons for doing away with the pay for skills system is to have everyone in the company on the same system and to eliminate the topping out problem management would have had to deal with. Team members (and new team members) will still be expected to learn the skills necessary for the team to be cross-trained, however, they will not be paid more for learning those skills. Updates on skill assessments will probably be done only once a year rather than twice a year now as well. The updates will not be done, not as part of the compensation system, but to help team members develop and learn skills. It has not yet been decided what sort of compensation system will be developed for the entire company, or how customer service team members will compensated for learning and using all the skills they are expected to.

2.3.9.2. Other Reward Sharing

There has been an executive bonus program in place for all the vice presidents for several years now. This year, the president has included all of the officers (which includes people like Jack Cochran who is an assistant vice president). Next year he is proposing to t Board of Directors that all managers and supervisors (anyone with a direct report) be ided in the bonus program. Ultimately, the plan is to include all staff employees and al employees. The bonus is determined by the overall performance of the company - p bility, sales, expenses, performance to budget, etc. If everyone in the company w luded, it would become a sort of profit sharing or goal sharing system. It is not kn now each person's pay would be calculated, i.e., what would be their base salary or what percentage of their salary would come from a bonus. This bonus program, if filtered down throughout the company, is also a type of pay for performance compensation system, albeit based on the performance of the entire company and not individual or group performance. It is possible that this compensation system, or something similar, would be instituted throughout the company, including the customer service teams, which would mean that Jack Cochran's proposal to Human Resources would not be implemented.

2.3.10. Peer Evaluation and Feedback

Under the pay for skills system, peer evaluation is the mechanism by which salary increments are determined. Once a year (changed from twice a year), teams perform what is called a skills assessment update. Each team member individually performs a self-assessment on the skills they have developed since the last update. Then the team gets together to review each person's assessment. After a team review, discussion, and any changes, the team members initial each skill evaluation, indicating their agreement with the assessment. Jack Cochran and managers review the team's decision on the skills assessment update.

Now that the teams are not on pay for skills system, they will only perform a skills assessment once a year. The reason it was done twice a year was to begin to pay people the additional salary for those skills they have learned in a six month period. Because people will still be expected to learn the skills, they will still be evaluated by their peers. They will need to know what skills they are still not 100% on so they can be included in their objectives for the next period.

Another form of peer evaluation and feedback, which is the teams' responsibility is disciplining team members who are not contributing their fair share to the team's performance. If the need arises, teams develop a 'counseling statement' for an individual listing expectations, changes desired, and the consequences of failure to change (for example, dismissal). The person reviews the counseling statement and decides whether or not to agree to the desired changes. If they do, they sign the statement and are put on probation until the desired changes occur. If not, they are either fired or they leave on their own initiative. There have been two instances where counseling statements were used. In the first case, the individual refused to sign the statement and resigned. In the second case, the problem was resolved when the employee being disciplined reacted well to the criticism and agreed to be put on probation. Jack Cochran works closely with the teams to ensure all legal guidelines are met when the teams are resolving a discipline issue.

2.3.11. Training and Skill Development

The training team members have received directly support the tasks they must perform in the teams. The technical training team members receive is in the technical individual skills identified (most of the 68 individual skills are technical skills). Team members and/or managers provide the technical training. A second type of training teams receive is administrative training to perform the tasks the supervisor used to. Examples of this kind of training includes interviewing techniques and EEO guidelines, filling out absenteeism reports, and how to plan and schedule work. Teams receive administrative training in all of the administrative skills listed in the section on Pay for Skills. Interpersonal skills is the third type of training given to team members, which includes things such as communication, how to teach, how to be a good learner, conflict resolution, negotiation, disciplining team members, and stress management. Group dynamics training includes brainstorming, decision-making, and team functioning.

2.3.12. Information System

2.3.12.1. Information Teams Receive

Table 2.3 summarizes the information provided to the customer service teams: the type of information, how it's provided, how often, and the provider of the information. The types of information provided to customer service teams are:

- Feedback on team performance
- Skill level of team members
- Team issues
- Technical product/process information
- External customer feedback
- Performance of other teams
- IIS Department performance
- IIS Department goals
- IIS Department issues
- Performance of company
- Company goals
- Company issues

Teams receive *feedback on team performance* on a weekly basis on an "IIS Team Production Summary" which is distributed to all teams. The Production Summary contains each team's work volume (number of transactions per team) and the average transaction per person for each team. The teams provide the data on their work volume to Jack Cochran, and he compiles the summary on a weekly basis. Teams receive feedback once a year on several other performance measures: accuracy of transactions and average processing time. Twenty-five transactions are selected every week (a total of 1300 per year) for an internal audit on accuracy. Managers randomly select the transactions and give them to team members who are fully trained on the skills needed to process the transaction selected (but not the team member who initially performed the transaction). The resulting accuracy of the transactions and the average time it took to process a transaction are calculated at the end of the year and shared with teams.

A Skills Analysis matrix is updated twice a year and distributed to team members so every person knows the *skill levels of other team members* and which team members are one hundred percent trained on which skills. The matrix lists every skill for the teams' tasks down the rows and all team members names are entered across the columns. For each team member, those skills which s/he is fully trained is indicated on the matrix.

The Team Rep meeting held every week is attended by the four team reps, managers, and Jack Cochran. The purpose of the meetings are for the four teams to exchange information on *team issues* through their team reps. Another purpose of the meetings is for managers to provide information to teams and for teams to provide information to management. The team issues exchanged are any problems one team may be having with the computer equipment, any relevant team activities, lessons learned, any interpersonal problems, etc. The meeting is a forum to resolve any issues pertaining to all four teams.

Managers give teams any *technical information* they may need, for example, they inform teams of any new insurance products which will be coming their way in the near future. They also provide assistance on technical problems at these meetings and informally as needed throughout the week. Technical information on new products also comes from the actuaries in the Marketing Department who have developed new products. They usually give presentations on the new product to review anything teams need to know about processing the product.

Another form of feedback teams receive is *external customer feedback*, which comes in several ways. Once a year, the department sends out a customer survey to all the agents in the field who are the teams' customers (both agents in the field and policyholders are

Table 2.3. Information Inputs Provided to Shenandoah Life Customer Service Teams

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Feedback on team performance	Form called "IIS Team Production Summary" is distributed to all teams, with feedback on work volume (no. transactions per team) and average transaction per person on each team	Summary is compiled weekly, monthly, quarterly, semi-annually, and annually	Teams provide data to Cochran (management) who then compiles summary
	25 transactions are selected weekly (1300 per year) for internal audit to check accuracy; managers randomly select transactions and give them to people who are 100% skilled in processing those transactions to check accuracy; results (accuracy and average processing time) are compiled and distributed to teams	Transactions are selected weekly, and results on average processing time are calculated once a year, at the end of the year	Management and internal auditors
Team Production Information	Informal communication among team members, between teams, and between teams and managers as necessary	As necessary	Other teams, managers
	Team Rep meetings (attended by team reps, managers, and Cochran) get information on action items, changes, etc.	Weekly, every Tuesday	Managers, Cochran, and other team reps

Table 2.3. Information Inputs Provided to Shenandoah Life Customer Service Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Skill Level of Team Members	Skills Analysis matrix is distributed to teams after each skills analysis update; each skill is across the top and each person who is 100% in a skills is marked as such in the matrix.	Updated twice a year	Cochran compiles and distributes data
Team Issues	Team Rep meeting - information on problems, concerns, activities, etc.	Weekly	Managers, Cochran, and other team reps
	Informal communication among team members	As necessary	Other teams, managers
Technical Product/Process Information	At Team Rep meetings team members get information on new products coming in, technical assistance in resolving problems, etc.	Information is provided as necessary at weekly meetings	Cochran, managers
	Presentation/discussion with teams to give product overview on new products	As necessary when new products are developed	Actuaries in marketing department
	Informally; one on one communication to solve problems	As necessary	Managers, other team members, other teams
External Customer Feedback	Customer survey asks agents to evaluate accuracy, timeliness, courtesy, and overall service provided by teams; Cochran compiles, distributes, and discusses results with each team	Once a year (from 1986 to 1990, excluding 1989)	Agents fill out survey and Cochran summarizes data for all four teams overall and also for each team

Table 2.3. Information Inputs Provided to Shenandoah Life Customer Service Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
External Customer Feedback (cont'd)	Written feedback, praise, commendations, from agents are posted on bulletin board in team meeting room	Irregular	Agents
	Team members conducted ten field trips to meet with 5 agents each trip to gain better awareness of agents' problems and issues and how to improve service to agents.	Once a year conduct field trips (first ones were conducted in 1990)	Agents
Performance of Other Teams	IIS Team Production Summary form includes performance for each team so teams know how their "work volume is stacking up" and they know "whether they're high or low among the other teams"	Summary is compiled weekly, monthly, quarterly, semi-annually, and annually	Teams provide data to Cochran who then compiles summary
Department Performance	IIS Department Meeting conducted by Vice President for IIS Department	Quarterly	IIS Department Vice President, Dick Wagner
Department Issues (includes departmental goals, departmental activities, changes, etc.)	IIS Department Meeting	Quarterly	IIS Vice President
Performance of Company	Company-wide Meeting led by President to review company's performance	Quarterly	Company president, Joe Stephenson

Table 2.3. Information Inputs Provided to Shenandoah Life Customer Service Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Performance of Company (cont'd)	Report with comparison of company's performance to "peer" companies selected by Marketing	Irregular; IIS Department doesn't consistently receive information	Cochran passes on information to teams when he receives it from Marketing Department
Company Issues	Company-wide Meeting; issues and activities such as exercise program, attendance bonus program, moving to five day work week, company-wide goals, etc.	Quarterly	Company president

customers to the teams). The customer survey solicits feedback on accuracy, timeliness, courtesy, and overall service provided by teams to the agents. The results are summarized for the four teams overall and for each team individually. The teams also periodically receive customer feedback from agents in the form of written praise and commendations which are posted on the bulletin board in the team meeting room. A third way teams receive feedback from agents is through field trips to visit agents and talk with them about how to improve the teams' service. The first field trips were conducted in 1990. Team members went on ten field trips to talk with five agents on each trip about what they could do to improve their service.

Teams receive information about the *performance of other teams* through the Production Summary mentioned earlier. The performance of all four teams is summarized so a team can see how they compare to other teams.

An IIS Department Meeting is held quarterly with all employees in the department (and not just customer service team members). At the meeting, the Vice President of the IIS department reviews *department performance, department goals, and department issues.* Company-wide meetings are also held quarterly and are conducted by the company president. *Company performance, company goals, and company issues* are discussed at these meetings. Examples of company issues are a new exercise program, attendance bonus program, and moving from a four and a half day work week to a five day work week.

2.3.12.2. Information Teams Receive

Table 2.4 summarizes the information teams provide to other groups or individuals in the company, as well as how the information is provided, how often, and to whom. The types of information teams provide as outputs to others in the company are:

- General information about team
- Performance of team
- Team issues
- Requests for assistance
- Requests for approval

When visits are coordinated with external companies, several team reps spend a few hours as part of the visit answering questions and providing other *general information* *about the team environment* at Shenandoah Life. These visits occur periodically. Teams provide weekly production information about *team performance* to Jack Cochran so he can compile the IIS Team Production Summary.

Prior to the weekly Team Rep meetings, the team reps poll the other members of their team for *team issues* to bring up at the meeting. These issues may be problems the team is having with a screen on the computer, or with a policy. Or the issue may be something new someone has tried that has worked well, such as a shortcut. Team reps communicate the change to other team members and to management to make sure that no legal procedures are violated. Team issues are also communicated to other teams and to managers informally as needed. For example, if one team member is having a problem with a policy, and they need assistance from a manager or from another team, they don't wait for the Team Rep meeting, but bring it to someone's attention right then.

Teams *request assistance* on technical or interpersonal problems as needed from managers or from Jack Cochran. Sometimes, the team is struggling with a touchy interpersonal problem, such as disciplining one team member, and they need help from a manager to resolve the problem.

Requests for approval are necessary to purchase additional equipment or to receive additional training which was not planned. Teams also request approval to deviate from established procedures in order to respond to an unusual request from an agent or policyholder. Some agents request team members circumvent established procedures to provide better service to a policyholder. These shortcuts may cause problems later. Depending on which agent it is, a team member may grant the request if the agent has been with the company a long time and is reliable.

2.3.12.3. Influence Over Information Received

According to Jack Cochran, teams "can get anything that they want to know." If a team member believed they needed some information they didn't currently have, they would be able to get it, by asking Jack Cochran, a manager, or even upper management. The company has an open door policy, and anyone can get to see Jack Cochran, the Vice President of the department, or even the company president if they wish. One of the managers' roles is as a "getter of things" which includes information. Although there are always things that fall through the cracks, Cochran believes that teams have all the necessary information to do their jobs.

Table 2.4. Information Outputs Provided by Shenandoah Life Customer Service Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
General Information About Team	Question and answer sessions set up with visiting companies	Irregular	External visitors, from outside companies
Performance of Team	Teams provide weekly production information for compilation	Weekly	Cochran
Team Issues	All team members are polled informally by team rep before Team Rep meeting to bring up any problems, concerns, activities at the meeting	Weekly	Managers, Cochran, other team reps, and hence, other teams
	Team issues or problems are also shared on an informal basis as needed in the work area	As needed	Managers, other teams
Requests for Assistance	Teams ask for assistance with a specific issue or task as needed	As needed	Managers, Cochran
Requests for Approval	Informally request approval from management for equipment, additional training, etc.	As needed	Managers, Cochran
	Informally request approval to deviate from established guidelines in order to respond to unusual request from agent or policyholder	As needed	Managers, Cochran
Suggestions for improvement	Team members informally provide suggested improvements to other teams and managers	As needed	Other teams, managers, Cochran

2.3.13. Intergroup Relations

2.3.13.1. Communication, Information Sharing, Interaction Among Teams

The formal mechanism for teams to communicate and share information is the team rep meeting. One of the purposes of the meeting is to exchange information about problems or issues between teams with the team reps being the communication link at the Team Rep meetings. Team reps poll the rest of their team prior to the meeting each Tuesday afternoon in order to address any problems at the meeting that need to be solved by that group of people. The teams are also working on a procedures manual for all teams that will be an information source to all teams, particularly newer team members, so everyone is following correct and consistent procedures.

Informal interaction between teams is frequent. All four teams are physically located in the same work area, with each team having its own designated area. If one person is having a problem and none of their team members can contribute any information or resolve it, teams are "very comfortable" going to someone on another team and asking for help. Teams also pitch in to help each other and relieve some of the workload for another team if someone is sick or on vacation. In fact, assisting other teams in this manner is an explicit expectation of every team (see Decisions and Responsibilities of Teams).

2.3.13.2. Perception of Teams Within Organization

When the customer service teams were first created, there was initially some jealousy and resentment from people in other parts of the company. Most of the negative feelings arose due to the fact that customer service team members received salary increases twice a year instead of only once a year like everyone else. A team of people in another department even went to John Myers, then in Human Resources, to propose they be organized into a team like the customer service teams. They were already cross-trained on each others' jobs; when asked what the benefit would be, they replied that they would be able to get pay raises twice a year. Over the years the teams have been in place, the initial jealousy and resentment appear to have significantly decreased, and possibly disappeared. According to Dick Wagner, once people understood that with the higher salaries, customer service teams were expected to learn much more and perform many more responsibilities, it did not seem quite as appealing.

The perception of the teams and their performance by top management is "very positive" and they have been "very well pleased with the teams" according to Jack Cochran. There are several contributing factors to the positive perception which now seems to exist throughout the company. First, the fact that the company won the Senate Productivity Award for Virginia, largely due to the results achieved with the customer service teams is a positive point. However, as Jack Cochran points out, Shenandoah Life won the award and not Individual Insurance Services Department. In other words, if the company were not an excellent one overall, they would not have won the award. Secondly, the very positive feedback that agents in the field provide gets disseminated throughout the company. So others have a chance to hear first or second hand the benefits to Shenandoah Life of the customer service teams. In sum, the fact that some characteristics of self-managing teams have been adopted in several other parts of the company (more in a later section) is evidence that the teams are perceived well throughout Shenandoah Life.

2.3.14. Problems Experienced With Teams

Even with all the benefits of a team environment, problems are inevitable. Some problems experienced by Shenandoah Life are common to any organization using self-managing teams. There are also problems unique to the company's situation and environment. One such problem centers around the role of directors (now called managers) and team members. Because managers have been less involved in teams' day to day activities and there is no close supervision, they are not required to learn all the intricacies of every type of transaction and master all the skills that team members are expected to master. So team members "struggling to master a very detailed system don't always appreciate the [managers] doing long-range theoretical work and not being able to come up with a solution to a problem." In addition, managers are paid more for what they do (Forbes, 1988). This lack of comprehensive technical expertise on the part of managers has created situation in which managers have not totally won the respect of all team members. It also creates a situation where team members feel managers "don't know what we do and we have no idea of what they do" (Forbes, 1988).

The other problems Shenandoah Life has experienced with the customer service teams are common to other companies using self-managing teams. First of all, not everybody likes the team environment. There is a lot of added stress, frustration, anxiety and ambiguity in this type of environment. People are expected to learn a lot more and put their training to use, which adds a lot of pressure to people's jobs. Secondly, a pay for skills system brings with it the problem of topping out. This problem needs to be addressed before it occurs in any organization using a pay for skills system. Shenandoah Life dealt with this problem by replacing the pay for skills system with an as yet to be determined compensation system. This solution came about because of the company's unique situation (not everybody being on the same pay system and the reluctance to add to the already significant amount of time required to master all skills). Other organizations may use different solutions to the problem of topping out. A third problem also related to a pay for skills system is that pay for skills does not address such issues as absenteeism and excellent service (performance) by a team member. For example, if one team member is absent frequently and also does not contribute as much to the team's performance when they are present at work, they are still paid the same as another team member having the same skill level. This problem is common to all pay for skills systems.

A fourth problem, which may really be a 'flaw' in the design of self-managing teams is its reliance on people who have similar characteristics to Jack Cochran - being "laid back" in their personal management style (Forbes, 1988). It is well-documented how many supervisors and managers have difficulty adjusting to the team environment because they are asked to let go of decisions and responsibilities they may have had for years. The ability for middle managers and supervisors to support the self-managing teams by coaching them and letting them make decisions is critical to the teams' success.

2.3.15. Disseminating Teams to Other Parts of Organization

Certain characteristics of the self-managing customer service teams have been disseminated to other parts of the company. No other department has undertaken a transition from traditional work groups to self-managing teams, however, several areas have formed employees into teams (natural work teams) and people are cross-trained and somewhat more autonomous than previously. There are three other teams in the IIS Department, mentioned earlier - disability income team, special markets team, and underwriting services team. These teams are not on pay for skills compensation system. The disability income team includes both professional and clerical people - actuary, underwriter, marking director and administrative personnel.

Several other departments have begun some type of team processing based on the success in IIS department. There is a marketing services team in the Marketing department, as well as one in Human Resources. These teams are natural work teams and people in the teams are cross-trained in each other's jobs. Jack Cochran estimates that there are approximately 75 people of the 220 in the home office who are organized into some form of teams.

2.4 Summary

Although some specifics of the immediate future of the customer service teams is uncertain (e.g., the compensation system they will be in, the closer involvement of managers in teams activities), one thing is clear: no one wants to return to the old way of doing things. In one study conducted on the teams, everyone interviewed "stated in no uncertain terms that a return to the old system would be an unpleasant prospect" (Forbes, 1988). People felt it would be boring to go back to the old system. They also stated that "there were two years of rough times; we paid our dues... it's a lot better now" (Forbes, 1988).

There are always going to be problems and disadvantages of this type of team environment, as there will be with any type of approach to organizing and managing people. As Jack Cochran puts it - "you have to determine the set of problems which which you prefer to deal. At Shenandoah Life, we chose to deal with the problems associated with total processing teams rather than the traditional structure, because we felt that from the standpoint of both the employee and the company, this was the best option" (Forbes, 1988). Although the concept of self-managing teams is not being widely disseminated throughout the company, certain characteristics are, for example forming teams, cross-training, and more autonomy for the teams. These characteristics are taking Shenandoah Life where it wants to head - according to Jack Cochran, to "push more of the decisions down to a lower level [throughout the company] and that's where we're headed."

3. CASE DESCRIPTION FOR TENNESSEE EASTMAN COMPANY

3.1. Overview

Tennessee Eastman Company (TEC), one of several manufacturing plants in Eastman Chemicals Company (ECC), is located in Kingsport, Tennessee. As part of its overall quality management efforts, TEC has initiated work redesign efforts to move to what they call the New Work System (NWS) in several divisions within the plant. The NWS is based on socio-technical systems theory and uses self-managing teams. Three of the seven manufacturing divisions are in various stages of design or implementation with self-managing teams. It is expected that approximately fifteen percent of the workforce at TEC will be functioning in self-managing teams by the end of 1991.

Redesign efforts with the NWS and self-managing teams have evolved over the years and represent the next phase of TEC's quality management efforts. All improvement efforts at TEC are under the umbrella of quality management, for example, focused problem-solving teams, natural unit teams, and now, the New Work System (more details of this progression of effort will be discussed in Evolution of Self-Managing Teams). Efforts in applying socio-technical systems theory and self-managing team concepts began in late 1987, with investigating and exploring concepts in how to evolve TEC's current natural unit teams to the next phase. The first department to begin the transition to the NWS was the Kodel Department in the Textile Fibers Division in late 1988. FT1 Department, in the Filter Products Division was the second department to begin the transition, in early 1990. Several other departments in these two divisions and a department in a third division, Organic Chemicals Division, are in different stages of design and implementation. The focus of this research is on the FT1 Department and what they have done to make the transition to the NWS. I have focused on only one department because studying two departments would be like studying two different companies. Each department involved in redesign has a design team that applies STS concepts to their unique department. Therefore, each department is different in how they have set up self-managing teams. I chose to focus on FT1 because it was the second department to begin the transition and was able to learn from Kodel.

This case description was based on two site visits to TEC. In the first site visit, I participated in a visit by an external company, RR Donnelly. RR Donnelly is in the beginning stages of the transition to self-managing teams and visited TEC to learn from their experiences. It was a one day visit that included presentations by the team of internal consultants (called the NWS Resource Team), panel discussions with team members, and a tour of the FT1 Department as well as presentations by FT1 employees. The second site visit was also one day and included interviews with Mr. Ed Reynolds, a member of the Resource Team; Karen Rowell, FT1 Department Manager; a group interview with three FT1 team members; a group interview with two FT1 team coaches (supervisors); observing three team meetings, and a tour of the FT1 manufacturing area. This case description was reviewed by Ed Reynolds and Karen Rowell.

3.2. Background of Organization

3.2.1. General Information and History of Organization

The focus of this case study is Tennessee Eastman Company (TEC), which is one manufacturing facility in Eastman Chemical Company (ECC), a wholly owned subsidiary of Eastman Kodak Company. ECC is considered the 'Chemicals' division of Eastman Kodak. Other divisions of Kodak are Imaging, Information, and Health. ECC, headquartered in Kingsport, Tennessee, is a leading international supplier of chemicals, fibers and plastics. ECC has manufacturing facilities in Kingsport, Tennessee; Longview, Texas; Batesville, Arkansas; Columbia, South Carolina; Toronto, Ontario; Workington, England; and Rochester, New York. TEC accounts for approximately 70% of ECC business. ECC products do not go directly to the consumer but instead are used by manufacturers who produce end-use items.

Tennessee Eastman Company (TEC) was begun in 1920, marking the beginning of ECC as well. TEC provided needed chemicals to Eastman Kodak as a supplier in their photographic film business. Beginning in the 1940s, ECC experienced new areas of growth and entered new markets, and hence, began to build other manufacturing facilities. ECC now produces 400 industrial chemicals, fibers, and plastics for 85 distinct markets, and accounts for 20% of Eastman Kodak sales worldwide.

TEC in Kingsport is the largest Eastman Kodak manufacturing plant outside of Rochester, New York. There are approximately 12,200 employees working in the plant to produce over 300 industrial chemicals, 2 basic fibers, and 3 basic types of plastics. The plant facilities take up almost 400 buildings on 360 acres of land.

Management at the ECC level has developed an Eastman Chemicals Company Quality Policy which includes their goal, the process for achieving the quality goal (the Quality Management Process), the operational policy, and the principles which support and enables achievement of the quality goal. This policy applies to all ECC operations, which includes TEC. The quality policy is framed and posted in all company meeting rooms and is published in a formal document. Table 3.1 contains the Eastman quality policy. All improvement efforts at TEC are under the umbrella of Quality Management - Total Productive Maintenance, the New Work System, and the application of Statistical Process Control are a few examples. Quality Management is a focusing concept for all improvement efforts. The quality policy represents the company's 'vision' for quality management. The "Eastman Way" is similarly a vision for the company's culture. The Eastman Way, shown in Table 3.2, represents the values and beliefs of all ECC employees. The development of the ECC Quality Policy and the Eastman Way are discussed in more detail in Evolution to Self-Managing Teams.

3.2.2. About Organized Labor

The work force at TEC is not unionized, so this section is not relevant.

3.2.3. Organization Structure

3.2.3.1. Formal Organizational Structure

TEC is organized into seven product-oriented manufacturing divisions with four support divisions. The manufacturing divisions are: Acid, Filter Products, Cellulose Esters, Textile Fibers, Polymers, Organic Chemicals, and Tenite Plastics. The support divisions are: Plant Maintenance, Shops and Services, Engineering and Construction, and Power and Services (TEC's utility company). Functions such as Marketing, Accounting, Research and Development, and Purchasing, are also located in Kingsport but are at the corporate ECC level. There are plans to begin to decentralize some of these corporate functions to the manufacturing plant level, for instance, have marketing and accounting at the TEC level as opposed to ECC corporate level.

Until recently, there was a TEC Steering Team, comprised of the TEC president, Mr. Bill Garwood, several division heads (but not all), and representatives from ECC (corporate level), such as Marketing, R&D, etc. There is also a TEC Manufacturing

Table 3.1. Eastman Chemicals Company Quality Policy

Quality Goal

To be the leader in quality and value of products and services.

Quality Management Process

- Establish mission, vision, and indicators of performance.
- Understand, standardize, stabilize, and maintain processes.
- Plan, do and reinforce continual improvement and innovation.

Operational Policy

- Achieve process stability and reliability.
- Control every process to the desired target.
- Improve process capability.

Principles Which Support and Enable Achievement of the Quality Goal

Customer Focus	Emphasize understanding, meeting, and anticipating customer needs.
Continual Improvement	Current level of performance can be improved.
Innovation	Everyone searching for creative process, product, and service alternatives.
Process Emphasis	Focus on processes as the means to prevent defects and improve results.
Management Leadership	Create an inspiring vision, maintain constancy of purpose, and establish a supportive environment.
Employee Involvement	Every employee participates in decision making and problem solving, along with teamwork among all functional areas and organizational levels.
Statistical Methods	All employees understand the concept of variation and apply appropriate statistical methods to continual improvement and innovation.
Performance Management	Take pride in work through clear accountabilities, feedback, reinforcement, and removing barriers.
Education and Training	Encourage learning and personal growth for everyone throughout their careers.
Customer and Supplier Relations	Build long-term partnerships with customers and suppliers.
Assessment	Benchmark against world best and assess performance against the Quality Policy for improvement planning and reinforcement.

Table 3.2. The Eastman Way

Honesty and Integrity in All Relationships
We're honest with ourselves and others. Our integrity is exhibited through relationships with co-workers, customers, suppliers, and neighbors. Stated simply, our goal at Eastman is truth in all relationships.

Trust Throughout the Organization
We respect and trust each other. Fair treatment, honesty in our relationships, and confidence in each other create trust. We seek systems and practices which continue to build trust.

Teamwork Involving All Employees in Problem-Solving and Decision-Making
Everyone is encouraged to be a manager within his or her area of responsibility. Open communication is essential to fully utilize collective experience of all Eastman men and women. Involvement of people closest to the process or system in problem-solving and decision-making provides individuals direct involvement in the company's success.

Employee Well-Being
Employee safety is of paramount importance. Stability of employment is given high priority. Growth in employee skills is essential. We will promote job satisfaction through assignments which better utilize employee skills and capabilities.

Continual Quality Improvement
Every level of performance can be improved. It is our goal to satisfy customer needs by providing products and services which are the leaders in quality and value. We work to continually improve the quality of our services, and the use of time, money, and materials.

Creativity and Innovation
Creativity and innovation in all that we do are required for continual improvement. Employees are urged to seek creative solutions and accept intelligent risks in business decisions.

Flexibility in Management Systems
There is no one right way to manage. There is no one best organization structure. Systems which have been productive may be altered to make them even more productive. We will adapt to meet business needs.

Winning Attitude
A winning attitude drives continual improvement. Pride and confidence associated with being the best leads to superior performance. Employees who demonstrate a can-do attitude will be encouraged and supported.

The Eastman Way at Work
Honesty. Trust. Teamwork. Employee well-being. Continual improvement. Creativity. Flexibility. Winning attitude.

Team which includes all division heads, TEC vice presidents and Mr. Garwood. Recently, the Steering Team has been dissolved and its purpose and activities have been absorbed into the Manufacturing Team. The corporate representatives on the TEC Steering Team are now ad-hoc members of the TEC Manufacturing Team. The reason for combining the two teams was to eliminate role ambiguity and conflict of the teams. This team meets every Monday afternoon and Tuesday morning. The role of the TEC Manufacturing Team in the context of the NWS is to lead the TEC NWS change, provide principles with which to operate, and review proposals for NWS design. Each division also has a leadership team which manages the division.

Because of global competition TEC faces, there are plans underway to reorganize the organizational structure to be more conducive to competing in a global market. The new structure will be more of a "business-based organization" and will include strategic business units.

3.2.3.2. Infrastructure to Support Improvement

The infrastructure of TEC exists to support improvement efforts. One of the company's major improvement efforts, which is the focus of this research, is transforming the company to the New Work System, using self-managing teams. There are several teams and groups of people which make up the infrastructure to support the move to the NWS. The NWS Resource Team is a team of primarily engineers begun about four years ago, which serves as a resource to the divisions making the transition. Being a member of the Resource Team is a full-time job for the people on the team. The role of this team, according to Ed Reynolds, is to "research, investigate, and explore innovative approaches to work redesign" and then "come back and teach others about that and integrate it into what [TEC] is doing." Reynolds believes that the team has done this, but not enough of it. The Resource team has instead been more directly involved with helping the various departments in their redesign efforts.

There are currently three divisions with redesign efforts underway. In those divisions, there are eight departments (out of a possible thirteen) that are in various stages of design and implementation. Each of the eight departments has a Design Team, responsible for the design of the department under the NWS. The role of the Design Teams is to obtain design input from peers; communicate the design process to others; redesign the work system and plan the transition to the NWS; build understanding and commitment for the design proposal; and identify issues requiring ad hoc study teams. Generally, Design Team members have other jobs and their role on the Design Team is not their full-time job. Once the design is finalized and approved, a Transition Team usually takes over and decides how the plan will be implemented, perhaps making revisions to the design as necessary. In departments finished with design and in the transition stage to the NWS, the Design Team is dissolved, and the Transition Team remains responsible for continually making adjustments and fine tuning how the design is implemented. The Resource Team works closely with the Design Teams, helping, guiding, and advising them. The bulk of the work, however, is done by the Design Teams, not the Resource Team. The Resource Team teaches the Design Teams 'how to fish,' rather than fishing for them.

The various departmental Design Teams also work closely with their Division Steering Team. Each of the three divisions involved in the NWS has a Division Steering Team, which is a "vertical slice" of the division, created to guide the Design Teams' efforts in the NWS. In other words, they contain a representative team of people from various levels and functions throughout the division. The role of the Division Steering Teams in the NWS is to manage change; provide resources; advise the Design Teams; remove barriers; communicate with the TEC Manufacturing Team; and ensure integration, thoroughness, understanding, and commitment to the design. The Division Steering Teams work closely with the division leadership team to communicate the design. The Division Steering Team and/or the TEC Manufacturing Team gives the final approval on the designs.

To summarize, the Resource Team, the Design Teams, and the Division Steering Teams make up the infrastructure for change focusing on the move to the NWS. The Design Teams and the Division Steering Teams work closely with the TEC Manufacturing Team, which are part of the formal organizational structure, to ensure commitment and necessary resources.

In addition to these 'standing teams,' there are also many ad-hoc teams created to solve specific problems or to address specific issues as needed. Many of these ad-hoc teams are concentrated within a division or even in a department. An example of a short-term ad-hoc team is a team to manage the United Fund drive within a division.

3.2.4. Organization Communications

3.2.4.1. Nature of Organizational Communication

Employees view TEC management as "great at sharing information" and managers "don't hide any numbers" from employees. Management shares "dollar figures, pounds produced...things employees never heard about" before. There appears to be a commitment on the part of management to keep people informed to allow them to effectively perform their jobs. There are several tools that facilitate the open exchange of information. There are closed circuit TV monitors in every building of TEC facilities. These monitors display a wide variety of information around the clock - safety information, financial results of the company, company issues and activities, and even news coverage during the Gulf War. Another element facilitating information exchange is the "PROFS" computer system throughout the plant. Recently, all team coordinators in the NWS departments have been put on PROFS. They can and often do communicate with each other through electronic mail across shifts. Coordinators can access financial results on this system, as well as any other type of information. Previously, only managers and supervisors were on PROFS.

3.2.4.2. Organization-wide Information Sharing

Because of the size of TEC, there are no formal organization-wide meetings to share information about the company's performance, corporate (ECC) performance, or company issues. Instead, the closed circuit TV monitors are used to disseminate information that people need, in addition to the PROFS system. Information also gets filtered down to the appropriate person through managers passing it along to people in their division or department. For example, the FT1 department manager, Karen Rowell, passes along any necessary information to the coordinators on the teams. The coordinators in turn, pass along the information to the rest of the team, as necessary.

Some of the divisions have quarterly business meetings where employees are invited to attend to learn about how the division, the company, and the corporation (ECC) is performing. For the department level, monthly cost data is calculated and sometimes shared with employees. Not all departments are consistent in making this information available to employees.

3.2.5. Culture

The culture of TEC is described as generally resistant to change, for several reasons. TEC is a relatively old company (it has been in existence since the 1920s), and paternalistic in nature. It has been a challenge to move from a "parent-child" relationship to an "adult-adult" relationship. TEC has also been relatively successful, which has allowed management to avoid laying off people, even during tough times. Because of this, people generally are not motivated to change to improve, because they know they will not be laid off even if tough times come. According to Ed Reynolds, "when we have shut down businesses, we move people to other...divisions...so their view is 'you'll just find me another job'... the message is 'that isn't so anymore' and they don't hear it." The problem in communicating the message is that TEC is a "victim of [their] own success." The attitude of not perceiving a need for change is so pervasive that some external consultants have even advised top management to lay off some people to get their attention, and make people realize they are serious about improvement.

On the other hand, TEC has come a long way in attempting to change the culture to be more conducive to change. There are areas within the company, particularly those in the NWS, which are doing very innovative things and changing all the time. The company has spent a great deal of time and money on workshops and seminars in trying to educate people about the need for change in every aspect of the business. They have brought in employees from Digital Equipment Corporation (a pioneer in the area of self-managing teams) to talk to TEC employees about being on self-managing teams and how even with the additional responsibility and accountability, they would never go back to the "old way." Employees have attended workshops and conferences on the team environment and other related topics, and made visits to other companies. People going on these trips usually become "enlightened," however, there still is not a critical mass of people who have bought in, and so the culture is still not receptive to the changes brought on by the NWS.

Another aspect of the culture which management is trying to change is the perception by employees that leadership for continual improvement efforts resides with management. For instance, there are many project teams and efforts underway in all areas to improve performance, however, if the project team leader were taken away, the effort would most likely stop. Management is trying to change to shared leadership and responsibility for continual improvement, such that it becomes institutionalized into the organization, and a change in leadership would not affect improvement efforts.

A culture study was undertaken in 1985 to identify principles, values, beliefs, and norms that comprise ECC culture (this was done throughout ECC). From that study, a culture statement was developed - the Eastman Way, which was shown in Table 3.2. This culture statement is like a vision for the culture at ECC and TEC. It is posted in every meeting room to increase awareness of the culture and of the importance of Employee Involvement and teamwork. The company has clearly come a long way in trying to create a culture which will accept and embrace change, and they are doing many new things and changing some areas radically. However, people recognize there is still a long way to go.

3.2.6. Past and Present Improvement Initiatives

In addition to the redesign efforts with the NWS, there are also many other improvement initiatives throughout TEC. For example, TEC has a major initiative in Total Productive Maintenance, and they are a "world leader" in TPM, according to Ed Reynolds. They have even licensed their approach to TPM to an outside consultant and are selling it. Throughout the shop, joint teams of mechanics and operators are formed, and the team decides what types of maintenance jobs operators can do, and conversely, what things mechanics can do to help operators. The TPM efforts have mechanics and operators sharing some job responsibilities. Clearly, TPM efforts are very compatible with the NWS, because a support function is being absorbed into production team responsibilities.

Another major initiative is TEC's version of Statistical Process Control, which they call Process Evaluation, Control, and Improvement (PECI). Teams, including the teams in the NWS, select a PECI project; a process to improve, within the team's responsibility. Either the entire team works on the project, or a sub-team is established. Each PECI team has a facilitator trained in process improvement (the facilitator is a team member), and everyone in the company has been trained in statistical techniques and process improvement.

All of these are attempts to make the company better for all stakeholders - customers, employees, etc. These efforts all fall under the umbrella of Quality Management and this has been the case since 1983. A management style was initiated in 1983 that emphasized three elements: process control, performance management, and teamwork. An ECC Quality Policy was issued (shown in Table 3.1) that stated the principles of the Quality Management philosophy. The NWS also falls under the Quality Management umbrella.

Although all improvement efforts are linked to Quality Management, it is still not clear to all employees. To make the link stronger, top management decided to combine all internal consultants in TEC (including the members of the NWS Resource Team) to form an "Integration Team." This team includes people from the Resource Team, SPC/PECI internal consultants, people working on Total Productive Maintenance, and any others involved in continual improvement efforts. The name of the New Work System will also be changed to 'Empowerment', so people more clearly see the link to Quality Management. The superordinate goal is still Quality Management and achieving the quality policy, with Empowerment being a "key leg of the Quality Management effort," according to Ed Reynolds. The link to Quality Management that will be communicated is that all continual improvement efforts fit together to ultimately improve the quality of products and services and better satisfy the customer.

Although the Resource Team is being combined with other internal consultants to form the Integration Team, and the name of the NWS is being changed to Empowerment, I will continue to use the terms Resource Team and the NWS throughout the rest of this case description. These changes are very recent and have not been adopted fully yet in the language of TEC employees.

3.2.7. External Organizational Environment

The competition TEC faces in its industry is "intense." TEC competes with any major chemical company, such as DuPont and Monsanto. However, since TEC offers such a diverse set of products (chemicals, fibers, and plastics), it is hard to find one company that is exactly the same. In fact, the diversity of products is a strategic competitive advantage for the company. The competitive market has forced the company to shut down some departments throughout the plant in Kingsport and at other locations (people are not laid off but are moved to other areas). According to Ed Reynolds, the company is experiencing "growing pains" in learning how to function in a global market and achieve a global perspective. TEC has reorganized the structure so as to more effectively compete globally (see earlier section on Formal Organizational Structure).

Another issue TEC has to deal with in its external environment is federal regulation. Because of the nature of the industry (chemicals), there is a great deal of federal regulation to which the company must adhere. There is so much regulation that must be communicated to all employees that each team in the NWS has an environmental coordinator to oversee compliance with regulations and communicate the regulations to the rest of the team.

3.2.8. Performance of the Organization

Although I gathered no specific information on the performance of TEC or ECC, the company has been and is successful in its industry. It is the 15th largest chemical producer in the U.S. and 1990 sales were approximately 3.5 billion dollars. As mentioned earlier, the company in a sense has been a victim of its own success because success breeds complacency and an attitude of 'we're already good, we don't need to change.' However, according to Ed Reynolds, change is no longer considered an option. In other words, it's not a question of whether or not to change, it's a question of when and how and who will be involved.

An aspect of performance in which the company excels is social responsibility. TEC is viewed as a community contributor, donating money to many charities and educational institutions. ECC makes contributions to surrounding communities amounting to two million dollars annually. In Kingsport alone, ECC has contributed almost one million dollars to education, health and human services, culture and arts, and the civic and community.

3.2.9. Sharing Successes

TEC, over the past year or so, has averaged about one outside company visit per month. When a company calls and requests to come into TEC to learn about what they have done with socio-technical systems theory and self-managing teams, the Resource Team sets up an entire day to spend with the visitors. Generally, companies find out about who to visit from their outside consultants; these consultants serve as an information source to direct those who are just beginning to other companies to learn from. The amount of time TEC spends with visitors demonstrates their commitment to sharing what they have learned with others. Their philosophy is that they went through the learning stage also and visited many companies (and still are), so this is a way for them to 'pay forward' by spending time with companies just getting started.

I was able to participate in a one day visit set up for RR Donnelly Company, as a way for me to learn background information about TEC and its redesign efforts. The agenda was: history and background of TEC with a videotape about the company; presentations by Resource Team members on the history of Employee Involvement at TEC; presentation on the 'organization for change' - the infrastructure to support redesign efforts; significant issues the company has had to deal with; two panel discussions with various team members and coaches in the NWS; a tour of the FT1 Department; presentations by members of the FT1 Department on what they have done in their design; and then a wrap-up question and answer session at the end of the day. Everyone who participated in the visit (team members, coaches, the Resource Team members) were open and honest about both the advantages and disadvantages of the NWS. Upcoming visitors include Corning and Litton Polyscientific.

3.3 Self-Managing Teams

3.3.1. Evolution of Self-Managing Teams

The history of Employee Involvement at TEC and the evolution toward self-managing teams began in 1982, beginning with a program to make all employees more customer sensitive and more aware of meeting customers' needs. In 1983, a corporation-wide Quality Management effort was initiated, and a quality policy was developed at the ECC level, which was shown in Table 3.1. From that point on, all improvement and Employee Involvement efforts were under the umbrella of Quality Management. All efforts to improve performance ultimately improve the quality of products and services provided to customers. The progression from this Quality Management 'umbrella' to the New Work System and using self-managing teams is described in Table 3.3.

The company's improvement efforts can be classified into three phases, shown in Figure 3.1. The first phase, in the 1982 time frame, was characterized by 'special teams' - focused problem-solving teams. Activities in this phase included workshops, SPC teams, problem-solving teams, and shift supervisor teams. These teams are part of what is called the "parallel" organization structure. The teams are parallel to and do not replace the formal organizational structure.

The second phase of TEC's Quality Management process, in the 1985-1986 time frame, was characterized by 'natural unit teams.' All employees throughout the company were organized into teams to work on problems and issues for some amount

Table 3.3. History of Employee Involvement at TEC

Time Frame	Activity
1982	Customer Emphasis - A program to sensitize all employees to the importance of customers and meeting their needs.
1983	Quality Management - A management style was initiated that emphasized three elements: Statistical Process Control, performance management, and teamwork. All employees were given training in SPC, participative management, and problem-solving skills. An ECC Quality Policy was issued that stated the principles to be followed. Quality Management has been the umbrella for all efforts since 1983.
1985	Culture Study - A study was commissioned to identify those principles, values, beliefs, and norms that comprise ECC culture. From that study came a culture statement, "The Eastman Way," and an increased awareness of the importance of Employee Involvement and teamwork.
1986	Team Management Pilot - Textile Fibers Division (about 1,000 employees) implemented team management in 1986. The process is based on the natural team concept (the work group as members and their supervisors as team leader). Each team identifies its mission and key result area measures, sets goals, and problem-solves to improve its performance. Team Management was expanded to all other TEC manufacturing divisions.
1987	New Work System Concept Team - A team was appointed to develop a recommended approach for a beachhead effort using a New Work System (self-regulating teams). Work redesign using the open socio-technical system process was initiated in the Polyester Staple (Kodel) Department.
1988	Started work redesign in Filter Products Department No. 1 (FT1) and planning for redesign in Intermediates Department and B-255 area.
1989	A. Implementation Kodel Department New Work System began. B. Design proposal completed in FT1; pre-transition training began. C. Started work redesign in B-255 Polymers. D. Started work redesign in Intermediates. E. Began redesign of management and business systems for Kodel Dept. F. Design of Pay for Applied Skills and Knowledge System started.
1990 (through October)	A. Started implementation in FT1 Department B. Started redesign efforts in 4 more departments (FT2, Dope, Acetate Yarn, Development and Quality Services) C. Completed redesigns in B-255 area and Organic Intermediates. D. Approved first Pay for Applied Skills and Knowledge plan. E. Developed Social Skills training.

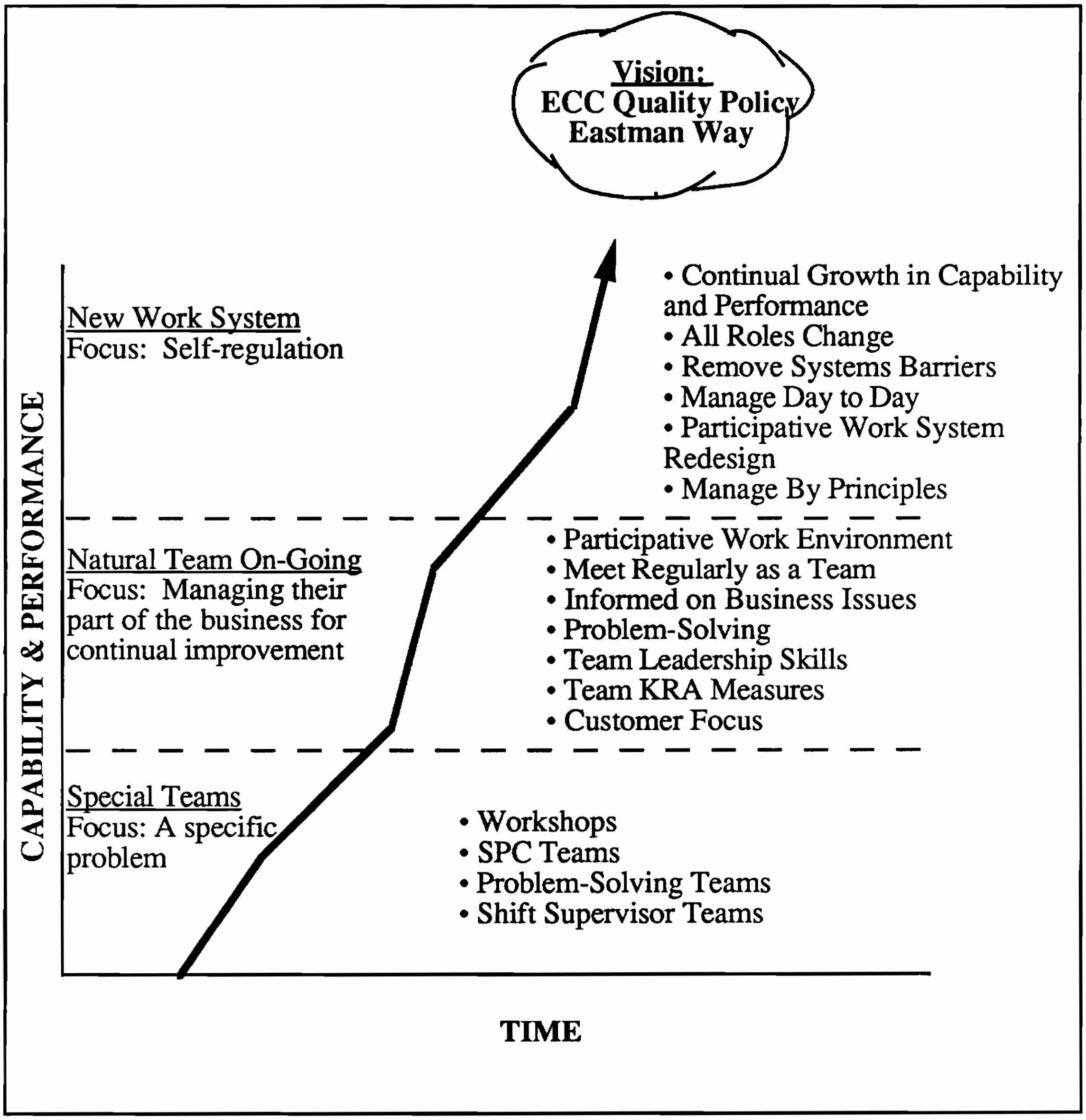

Figure 3.1. Quality Management at TEC
Continued Growth in Capability and Performance

of time each week, but they still did not work in teams on a day to day basis. Concepts or activities characterizing this phase are a participative work environment, meeting regularly as a team, employees being informed on business issues, problem-solving, developing team leadership skills, identifying team Key Results Area (KRA) measures, and being customer focused. Although this phase gave TEC employees experience working in teams, the teams still weren't truly empowered and were still an "add-on" to the organization structure - still part of the parallel structure - according to Ed Reynolds. TEC employees not involved in the NWS are still in this phase of natural unit teams, although some areas have more mature natural unit teams than others. All employees received training in problem-solving during this phase to help them in working and solving problems in teams.

The third phase is the New Work System. Currently, there are approximately 500 people in the transition to the NWS, with many more in the design stage. Concepts or activities characterizing this stage are:

- participative redesign - jointly consider technical and social system needs
- product focus vs. functional focus
- emphasis on variance control
- mini businesses - make large small
- open sharing of information
- continual improvement - continual redesign
- sharing and rotating tasks (including administrative tasks)
- multi-skills
- emphasis on task assignments as opposed to job assignments
- new manager roles - coach, advise, allocate resources, and manage boundaries
- managers manage teams, teams manage team members
- teams manage day to day
- manage by principles
- support systems are congruent (enabling) - remove systems barriers
- open systems planning and design
- continual growth in capability and performance

In their redesign efforts to the NWS, TEC has used outside consultants in addition to their internal consultants, the Resource Team. The external consultants are primarily the Davis Group, as well as Jack Sherwood, John Cotter, and David Richey.

All three phases of the Quality Management process, illustrated in Figure 3.1, move TEC towards the vision - achieving the ECC Quality Policy and the Eastman Way (a 'vision' for culture). Figure 3.1 applies to all of TEC; it describes phases of Quality Management company-wide and how improvement efforts have evolved toward the NWS. The areas involved in redesign to the NWS progress from the second phase in Figure 3.1 (natural unit teams) to the third phase, the NWS and self-managing teams.

The Kodel Department, in the Textile Fibers Division was the first department to begin redesign efforts, as described in Table 3.3. Kodel was also the first department to begin implementation. Textile Fibers Division has made a commitment to redesigning the entire division, as has Filter Products Division, which includes FT1 Department, the second department to begin redesign efforts and begin the transition to the NWS.

The progression to the NWS from natural unit teams has four general stages, which generally describe what each department has progressed through. The first is Education and Preparation. This includes communicating to the workforce what the transition will entail and why the need for it. A department then goes into the second stage, Participative Redesign. In this stage, a Design Team is formed; the redesign of the department is performed (using socio-technical systems theory with an environmental scan, business analysis, and social analysis); workshops are held to communicate the preliminary plan to the rest of the department; and workshops are held with supervisors. When the design is approved by the Division Steering Team, and the TEC Manufacturing Team if necessary, the department enters into the next stage.

The third stage is the Transitional Start-up stage, where teams actually start up and the pay for applied skills and knowledge system is designed (teams are not on pay for skills in this stage). In this stage, teams have to meet certain requirements before they enter the next stage. These requirements, called the 'rites of passage' are: having all the coordinator roles filled and functioning; team capabilities meet the minimum skill profile; developing a skill profile for each team (a matrix of all team members with skills each member has filled in); developing citizenship standards; team members give and receive feedback for continually improving the team's effectiveness; the team has performance measures that support the business (each team develops Key Results

Indicators); and the pay for applied skills and knowledge plan is approved. Once they have met these requirements, teams enter into the fourth stage - Fully Functioning Teams. In this stage, they are in the pay for applied skills and knowledge system. Other characteristics of this last stage are continual growth and improvement, continual renewal, and publicity. This four stage progression to the NWS is generally followed by departments involved in redesign. Specific activities in each stage may be unique to each department. There are currently no teams yet in this fourth stage of fully functioning teams, although several teams in Kodel and in FT1 are close.

3.3.2. FT1 Department and Team Structure

The FT1 Department is one of four departments in the Filter Products Division (the structure of the division is shown in Figure 3.2). FT1 and FT2 departments are continuous process operations to produce filter tow (the products are very similar - they are 'sister' departments) and the Dope department is an internal supplier to FT1 and FT2. Development and Quality Services is a support department to the division and includes functions such as labs, process improvement (development) engineering, customer service, and quality assurance. All four departments are in some stage of redesign, including the support department, and FT1 has been involved the longest (it was the second department in TEC to begin redesign). The FT1 Design Team began working on the design in the spring of 1988, the design was approved by the Filter Products Division Steering Team in late summer of 1989, and the department began transition in February 1990. So the department has been in Transition Start-up and working in self-managing teams for a little over a year. Benefits of the NWS, from FT1's perspective are: teams are aligned to better control variances in processes; variances are controlled at the source; better business focus by all; multi-skilling provides more opportunities; and there is improved teamwork across shifts.

FT1 customers are external cigarette manufacturers, such as RJ Reynolds and Philip Morris. The department mission, principles, and citizenship factors are shown in Table 3.4. The citizenship factors are what team members expect of each other for the team system to work. Each team must develop these broad factors into specific statements, called citizenship standards. For example, housekeeping would become "everyone is expected to keep their work area clean and organized."

FT1 is in the Transitional Start-up stage described earlier. No teams have yet gone through the rites of passage to become fully functioning teams, although some teams in

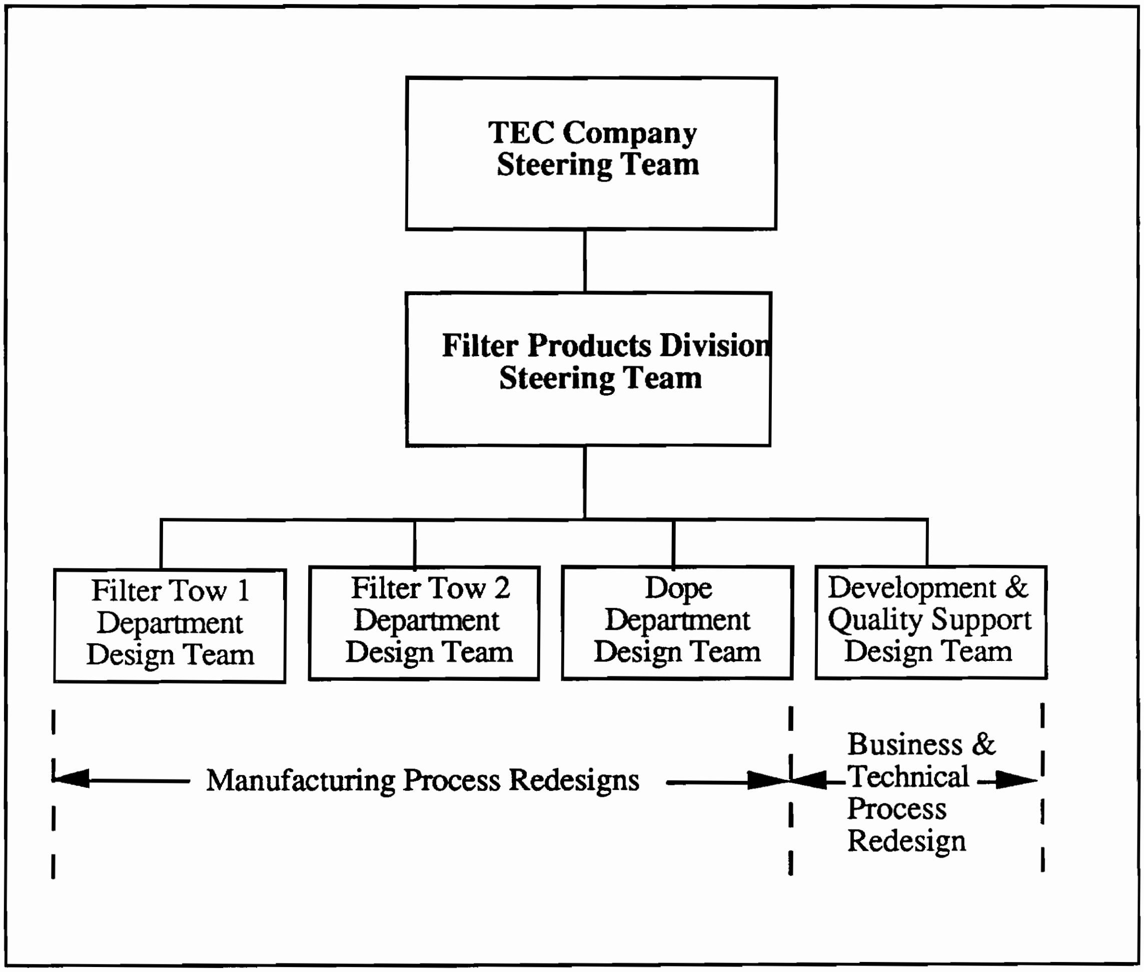

Figure 3.2. Filter Products Division Structure

Table 3.4. FT1 Department Information

FT1 Mission

We supply Filter Tow for the Tobacco Industry worldwide and for specialty tow applications. Our reputation with our customers is high because of our quality, value, service, and reliability. We are successful because we meet or exceed customers' needs.

We measure the success of our business by:

- long-term business relations with our customers and suppliers
- customer satisfaction in all we do
- stakeholder satisfaction (employees, support people, suppliers)
- environmental protection
- earnings from operations
- return on assets

FT1 Principles

For the success of the business we will:

- satisfy our customers
- value people
- cooperate, participate
- tell it like it is
- build trust
- accept ownership
- make decisions that are good for the business and good for the people
- continually learn
- seek understanding
- improve processes
- be flexible
- share information
- invite creativity, innovation, and diversity
- cherish the quality of life

Citizenship Factors

Citizenship factors are "reasonable rules for reasonable people" - they are what team members expect of each other for the team system to work: safety, housekeeping, security, cooperation through teamwork, economics, quality, attendance, conduct, overall contribution, business awareness, and feedback and development.

Teams are responsible for recognizing and resolving citizenship problems.

FT1 are getting very close. One team at a time goes through the rites of passage, and they go through together as a team. They are asked questions as a team, by the Policy Advisory Team (discussed later in this section) to determine whether they have met the requirements described earlier. Once a team goes through the rites of passage and formally enters into the NWS, they are eligible to enter the pay for applied skills and knowledge system (currently team members are not being paid for learning additional skills). Other benefits of going through the rites of passage include a reduced level of coaching; increased opportunities in the form of being able to train for and perform higher level skills; and business cards for when team members interact with customers. Although no teams have gone through the rites of passage, the department manager, Karen Rowell, predicts that one will within six months, while some teams may be as far as two years away.

The FT1 department structure is shown in Figure 3.3. The department is divided into three overall teams - A, B, and C Team. Team members are called "technicians," and they are salaried employees (they do not punch time clocks) and are paid for overtime. Each team provides the same basic products to the same external customers and is essentially the same. There are three sets of equipment and machinery (and therefore three work areas). Each set of equipment produces filter tow with different performance features, depending on what the customer wants. Teams are not assigned to any one set of equipment, so they do not make product for any one particular customer, although if possible, the design would have included this. Because of FT1's particular product mix and because some machines are more desirable to operate, teams rotate on the three sets of equipment every four months. Other departments, such as Kodel, have teams (called business units) which each produce different types of products and for different customers. In FT1, this was not possible, so each team essentially performs the same functions.

All production employees in TEC work twelve hour shifts, so the plant operates twenty-four hours a day, seven days a week. To keep the three work areas in FT1 running all the time, there are four groups, or crews, in each team. So teams A, B, and C each have crews 1, 2, 3, and 4, for a total of twelve production teams. Each crew in FT1 has 18 members. (Note: even though the group of employees who work together day to day is called a crew, or group, I will use the word team in this case description. Within FT1, the word team is used to refer to the group of 18 people, even though the word team is also used to describe Teams A, B, and C. I will specify Team A, Team

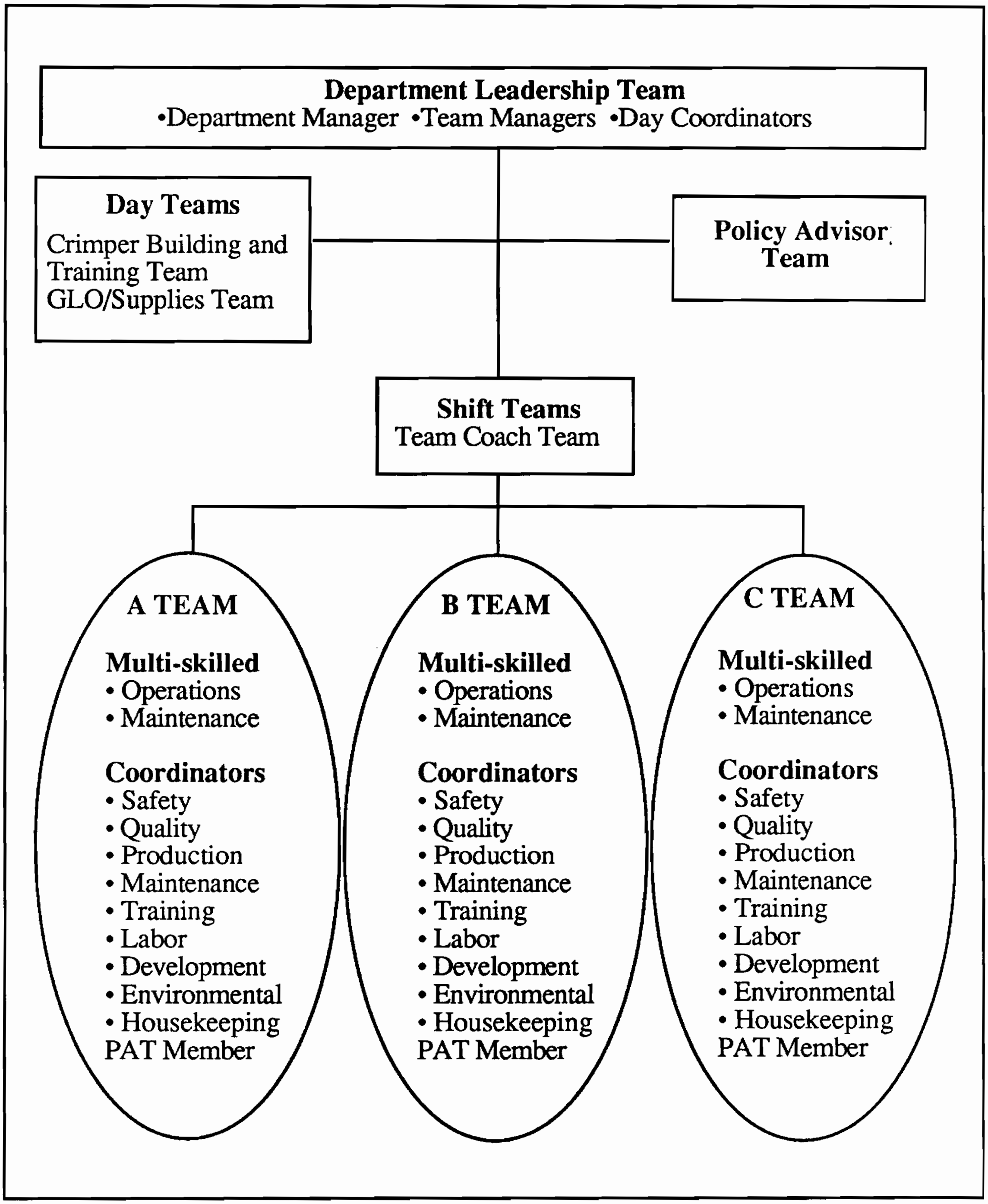

Figure 3.3. FT1 Department Structure

B, etc. if I am referring to the overall team. Otherwise, the word team refers to the group of 18 people who work together day to day.) Right now, teams are working on getting team members trained and proficient in the four core skills (baling, top deck, bottom deck, and spinning). Team members trained in these skills try to rotate performing these tasks on a daily basis.

Two support "day" teams which work days only support the twelve production teams. The two support teams are General Labor Organization (GLO)/Supplies Team and the Crimper Building/Training Team. All new department employees come into the GLO Team first for a period of "orientation" and are then moved onto one of the teams. The day teams are also in transition to the NWS, however, the focus of this research is limited to the twelve production teams. Ideally, the functions of these day support teams would have been absorbed into the production teams, but the department has been unsuccessful in doing this. It will be an issue to address in future refinements of the design.

A department leadership team leads and manages the department and includes a department manager, three area managers, and day coordinators. Area managers oversee the three overall teams in the department. Day coordinators work as support to the teams and are primarily people who were shift supervisors. They currently work on projects to help improve the department (this will be discussed in more detail in <u>Role of Leadership</u>). A Policy Advisory Team (PAT) continually refines the design for the NWS as necessary. This team develops and communicates policy for the department. Each of the twelve production teams and two day teams have a representative on the PAT. The department manager and three area managers are also on the PAT. The PAT meets for about eight hours every five weeks.

The shift supervisors are called coaches in the NWS, and there were initially sixteen supervisors for the twelve crews. This number has been reduced to eight. The extra eight supervisors are now working on other projects (see <u>Role of Leadership</u>). There are a total of eight coaches, so there are two coaches who work each of the four shifts. Two coaches support the three teams who work each shift. Because there are only two coaches for each shift, no coaches are assigned to any one team. The coaches make up what is called the 'Team Coach Team.'

Before redesign, the department was divided into four functional areas: spinning, processing (baling), packaging, and the laboratory. Each functional area was a separate team, or unit, with their own supervisor. These skills were combined into three vertical teams, so each of the three teams (Teams A, B, and C) includes all four functions. The skills involved in the four functions have been incorporated into FT1's pay for applied skills and knowledge (PASK) system, and team members are being cross-trained in the core technical skills in these areas.

There are no formal job classifications that prevent team members from performing any task for the team. The only restriction on any person performing a task is that they be skilled in that area, and it meets the business needs of the team. The teams have absorbed the function of maintenance, and mechanics' skills are incorporated in the PASK system.

3.3.2.1. Coordinator Roles

Each crew has nine coordinator roles in addition to a PAT representative. The nine coordinators are: safety, quality, production, maintenance, training, labor, development, environmental, and housekeeping. Most coordinator positions are rotated twelve or eighteen months, and one, the developmental coordinator is rotated after twenty-four months. Some roles require more time to master so the role is rotated less frequently. Every coordinator has received at least eight hours of training (some have received more) to be able to perform their role. The responsibilities of the key coordinator roles are shown in Table 3.5. The person who will be a coordinator the following time period usually serves as a back-up coordinator, in case the coordinator is out sick or on vacation. People who have served as coordinators in the past are expected to maintain their skills in those areas should the team need them to perform the role.

The production, maintenance, and labor coordinators come in for a shift hand-off meeting with the previous shift's production, maintenance, and labor coordinators from 6:00 to 6:12 (a.m. or p.m., depending on whether the crew is working days or nights). Then the three coordinators for each team goes to their own team meeting room, where the rest of the team is waiting for them, and there is a meeting with the whole team from 6:12 to 6:25. At this meeting, everyone on the teams finds out where they will be working that day and any other necessary information (more will be discussed in <u>Team Meetings</u>). The teams begin working production at 6:30.

Coordinators are not paid anything additional for performing their roles, however, in the design of the PASK system, a team member won't be able to advance beyond a certain level without having held one or more coordinator roles. So the roles are built

Table 3.5. Coordinator Responsibilities

Labor Coordinator
• record and approve time worked for team • approve vacation • work with production coordinator to schedule labor required for changes and upsets • keep measures on team's labor utilization, absenteeism, and vacation
Quality Coordinator
• help problem-solve customer complaints • help problem-solve internal quality problems • help develop and manage FT1 Quality Plan • recognize and reinforce quality improvements • ensure compliance with ISO 9002
Production Coordinator
• order supplies for team • coordinate production changes (labor, supplies for change, manage change to minimize downtime and maximize quality) • monitor process conditions to keep process on target • coordinate shift hand-off meeting
Training Coordinator
• prepare and manage team's training plan • ensure standardization of training • manage Employee Development System (EDS) process for the team • supports pay system certification requirements

into the PASK system and coordinators indirectly receive additional pay. Coordinators are paid for the extra time they must put in as part of performing the role.

Coordinators serve as a major link to the team's external environment which consists of management, other teams, and other departments and divisions. In this sense, they are 'boundary spanners.' They are a "point person...an information focal point to carry out the decisions the team has agreed to" according to Ed Reynolds. Information that teams need is typically filtered down to the appropriate coordinator from the department manager, or coach, and the coordinator in turn, takes information back to the team. For example, when the department manager receives a customer complaint, she passes it on to the quality coordinator through the PROFS computer system or one on one communication. The quality coordinator will address the problem, and also pass the information along to the team as necessary.

All of the coordinators except for the production and labor coordinators are members of a 'Standing Team' in the department. For example, there is a quality Standing Team, a training Standing Team, etc. The Standing Team consists of all fourteen coordinators (one from each of the twelve production teams and the two day teams). Standing Teams meet approximately every five weeks. Every five weeks, the Standing Teams meet to talk over issues, exchange any information that all coordinators need to have to bring back to their team, and set policy for their particular area. For example, the quality Standing Team sets departmental quality policy and works on the departmental quality plan. The purpose of the Standing Teams is to ensure standardization, consistency among all coordinators of one type, continually improve the coordinator role, and communicate any necessary information about lessons learned, new things that have been tried, what works, and what doesn't work.

The coordinators in each of the twelve production teams and the Standing Teams perform the administrative functions for the department. These administrative functions were previously performed by supervisors. According to Karen Rowell, "it's sort of like you took all the stuff that you had to do to run a department, and you broke it out amongst all these coordinators... and these Standing Teams manage that." Coordinators are not, however, "mini-foremen." Coordinators do not make final decisions on issues pertaining to the team. The team makes a decision and the coordinators do the "leg work" to carry it out. For example, if the team volunteers to work overtime, the labor coordinator works with everyone on the team to coordinate the schedule for who will work overtime when.

3.3.2.2. Internal Team Leadership

Teams do not have a designated 'internal team leader,' or facilitator, as many teams do in other organizations. Instead, teams rely on shared leadership. The way leadership responsibilities are viewed is that everyone on the team shares the responsibility. The coordinators also play a leadership role when appropriate. For example, the production coordinator facilitates, or runs, the shift hand-off meeting for their team, because they have the most information to share. Other coordinators emerge as leaders when an issue arises for which they are responsible, such as the quality coordinator for a quality problem. Another leadership role is played by the PAT member, who is a representative on a policy-setting leadership team for the department.

3.3.2.3. Liaison With Support Departments in Organization

In some organizations using self-managing teams, the coordinators have a 'dotted-line' relationship or link, to centralized support departments. The purpose of this type of link is for coordinators to gain information they need to have to perform their role. For example, the training coordinator might work closely with people in the Training, or Human Resources, department. This type of information exchange is accomplished through the Standing Teams described earlier. Appropriate people from centralized support functions attend Standing Team meetings. For instance, a Quality Assurance representative, which is part of Development and Quality Services Department in Filter Products Division, is a member of the quality Standing Team. The Division environmental coordinator is on the environmental Standing Team. Other standing teams also have Division coordinators as representatives on the team. The development Standing Team also meets regularly with the development group in the division. These representatives from support functions (e.g., development, Quality Assurance, Division environmental coordinator) bring any relevant information to the meetings to disseminate to all coordinators, and hence, to all team members.

In addition, each Standing Team has a department leadership representative on the team. The purpose of this representative is to make sure the Standing Team has the resources it needs. If the team needs outside resources, the departmental leadership representative will help the team get those outside resources, whether that be information, expertise, or other resources.

3.3.3. Role of Leadership/Supervisor

Before the transition to the NWS, there were sixteen supervisors for the twelve production teams. Now there are eight. Four of the supervisors have been moved to the Development and Quality Services Department to work on development engineering projects. They were individually asked by the Development Department to work with them on projects. According to Karen Rowell, this has turned out to be "win-win solution" because they bring something to Development that wasn't there before. For example, in FT1, if the Development group wants to run an experiment, they have to use production equipment, which the department may sometimes be reluctant to have them do. But "if one of those former supervisors comes ...and says I want to do this, this, and this, I (the department manager) don't have as much hesitancy to turn that over to them" because they understand the equipment, the people, and the possible impact on the customer.

The other four supervisors are still working in the FT1 Department, and are working on process improvement projects within the department. The supervisors decided among themselves who would work on process improvement projects and who would remain working as coaches with the teams. The types of projects the previous supervisors working in FT1 are involved with is maintenance coordination, a project with personal computers, in the laboratory, and a large environmental improvement project.

In the old system, supervisors did a lot of checking up on people and played a more "demanding" type of role. Their role was to supervise, direct, make work assignments, appraise performance, and manage day to day. If something needed to be done or fixed, the supervisor usually either told someone what to do or went and made the adjustment him/herself.

In the NWS, the coaches role is to empower, coach teams to meet citizenship requirements, and develop teams' capability to manage day to day. They are a teacher/trainer and serve as a coach to help people. The purpose of the coaching process now is to: help improve individual and team performance on citizenship factors and operations (technical) skills; recognize people for what they do right; replace the merit rating system with a positive approach to developing people; improve business results by continually improving individual and team effectiveness; and enable the team to meet the rites of passage requirement "give and receive feedback."

In order to perform these different roles and achieve the objectives of the coaching process, there are principles, or underlying assumptions, in defining the coach's role:

- people want to do a good job
- every team member is responsible for the effectiveness of the team
- every team member is responsible for giving and receiving positive and constructive feedback
- individual is responsible for taking actions to use strengths and make improvements in his/her effectiveness
- team members hare responsibility to help each other continually improve

According to coaches, "it's about twice as hard" now in the NWS. It's easier to tell people what to do or do it yourself, but hard to get people to see what to do and teach them what to do. To help them through the transition in role, supervisors received training on how to be a team manager and coach. They also received the training in interpersonal skills and group skills that all team members received (see Training and Skill Development section). For many people, the transition was very difficult because they did not understand their new role. For others, giving up the status and power associated with being a supervisor was difficult.

Some of the specific activities coaches perform is teaching and helping people perform coordinator roles, such as the labor coordinator who has to decide where to put each person every day. Coaches also help the team in their PECI projects described earlier. For many team members, filling out the Individual Development Planner (IDP) which is part of the peer evaluation and feedback, is difficult. Coaches help people be precise in what they want to improve, for example, instead of just writing they will work on safety, they will wear their safety glasses at all times. In the old system, when an operator made a mistake, many supervisors viewed it as a "punishment opportunity." In the NWS, coaches view a mistake as an "improvement opportunity."

TEC recognizes that first-line supervisors are the key to any improvement effort and to achieving the quality policy. As Karen Rowell puts it, "you needs those folks...it's critical they don't check out on you." According to Ed Reynolds, "we told them what their jobs aren't, but we haven't told them what their jobs are, and therefore, we have paralyzed them." However, they are now doing a better job of linking them in and helping them clarify what their jobs are. They have brought in an additional consultant to help them define the role of the supervisor as coach. Even with increased efforts in defining the role of the coach, there are still problems once in awhile. Some team members believe that there are coaches who interfere too much, particularly when teams are starting lines up. But they also recognize that coaches have come a long way.

As teams mature and develop and coordinators are up to par on their roles, the role of the coach will continue to change. Currently, their biggest role is teaching and training team members their previous administrative duties. But as team members and coordinators become more proficient, they will no longer need this type of teaching and training (although team members will always continue to learn and develop). In the future, then, coaches' time spent on teaching and training administrative duties will be reduced. This will free up their time to learn new technical and interpersonal skills, such as skills to become an engineering assistant, a SPC expert, and interpersonal skills to intervene on touchy personnel issues for their team. They will then transfer new skills acquired to teams. For now, coaches are an essential part of the NWS and critical in helping the teams develop.

3.3.4. Performance of FT1

As a result of moving to the NWS, there have been some significant improvements in several areas. One thing that is measured very closely is what's called the "sigma s, sigma c" ratio. This measure is an indication of how well the tow line processes are being controlled, as compared to the process capability. The goal for the ratio is 1.0 (this means that the process is operating at capability as far as variability is concerned). For several key processes, the ratio has come down closer to 1.0.

Another area of improvement is with plant shutdowns. Sometimes, the entire building must be shut down and then restarted due to utility interruptions. When a shutdown happens, it is a huge effort to shut down all the lines and then re-start them. Since the transition to the NWS, there have been a number of shutdowns. It used to take FT1 4-6 hours to shut down, and now it takes thirty minutes. Starting up used to take a week, and now it takes only four days. According to Ed Reynolds,.this improvement is probably a result of increased technical training, cross-training, and commitment.

Karen Rowell also stated that there has been evidence that the department's maintenance costs have decreased about ten percent. When asked about improvement in quality, such as decreased defects, Karen Rowell said number of defects and customer complaints are so low for FT1 anyway that it's hard to say there has been an improvement in that area.

In addition to quantitative benefits which are easily converted to dollars and cents, there are qualitative benefits as well. One such benefit is that team members are more quality conscious. One team member says the attitude is "this is my product" instead of "I don't care what happens to this product after it leaves my hands."

Teams have only been in transition for a little over a year, so it is still somewhat early to judge whether the NWS has paid off with significant improvements in all areas. Ed Reynolds said they knew it would take three to five years perhaps for significant results. It also may be difficult to trace any improvement in bottom-line results (costs, quality, profitability, etc.) to the NWS, because of other factors, such as changes in the market. For example, in the Kodel Department, it will be difficult to "identify a direct cause and effect relationship" because the market has changed so drastically.

3.3.5. Decisions and Responsibilities of Teams

In the NWS, team members make "more daily decisions" and have "a lot more responsibility" than in the old system. This increased responsibility results in increased ownership for the job, according to team members - "we've got a little more concern for the job because you realize how you can make a difference...you can impact it." Instead of being told what to do by the supervisor, teams make daily decisions and manage day to day with the help of coaches. Specific decisions and responsibilities of teams are listed below:

- give and receive feedback on individual team members' performance
- promotions for team members in moving through the PASK system
- decide who works where on daily basis
- determine and address training needs
- decide when to work overtime for team meetings
- manage the supplies the team uses
- handle disciplinary problems if necessary
- find and address causes of quality problems
- handle administrative tasks through coordinator roles
- address maintenance problems
- approve and schedule vacation for team members

- shut down the production line if there are problems

There are other responsibilities, not necessarily taken care of on a daily basis, which teams have acquired in the NWS. These responsibilities are in addition to the coordinator roles. As mentioned in an earlier section, each of the twelve production teams chooses a PECI project, which is a process the team focuses on to control and/or improve. Team members have received training in PECI. Each team may work on improving the process as a whole team, or a sub-team may do it. Another project which the teams have been given by FT1 Department management is to address the issue of competition between Teams A, B, and C. Competition between crews 1, 2, 3, and 4 (the four shift crews) is not really an issue, because crews in FT1 are each part of an overall Team. The teams will identify the problem (if they think there is one) and determine a solution to minimize competition between teams.

An indirect responsibility teams have is to continually improve the design of the work system for FT1. Because each team has a representative on the PAT, which handles redesign issues and departmental policies, teams can influence the design and policies through the PAT representative. If an element of the design is not working out, the PAT representatives will bring it up at the PAT meetings and the issue will be addressed.

3.3.6. Team Meetings

3.3.6.1. Daily Team Meetings

Each team meets at the beginning of each shift, in what is called a 'shift hand-off' meeting. The hand-off meeting has two parts. The first part, from 6:00 to 6:12, is for the production, labor, and maintenance coordinators from the three oncoming teams (from Teams A, B, and C) to meet with the production, labor, and maintenance coordinators from the three off-going teams to meet and pass on any necessary information. There are a total of 18 coordinators at the meeting. The production coordinator keeps a notebook with production information. All the production information from one shift is contained on a one page "report" which the production coordinator fills out after the shift. S/he then places the one page report in the notebook and hands it over to the oncoming production coordinator at the hand-off meeting. The production coordinator reports any production changes, how are the machines running, and any interruptions in the lines. At this first part of the hand-off meeting, the labor coordinator also finalizes who is going to work where that shift. The labor coordinators from the three teams on one shift draft the daily labor plan before the hand-off meeting (usually near the end of the previous shift) but can't finalize it until the hand-off meeting because they don't know until then who from the entire team is there that day. For instance, someone may have called in sick. The maintenance coordinator also finds out if there were any problems with equipment that need maintenance. The labor coordinator also uses this information to finalize the labor plan. If a machine is down, there is no need to schedule someone to work on it that day.

The exchange of information at this first part of the meeting primarily happens between the same overall Team. For example, suppose crew 1 were the off-going crew and crew 2 the oncoming one. At the meeting then, the off-going coordinators are from Team A crew 1, Team B crew 1, and Team C crew 1, and the oncoming coordinators are from Team A crew 2, Team B crew 2, and Team C crew 2. The most information exchange occurs between the production coordinators on Team A crew 1 to Team A crew 2, and from Team B crew 1 to Team B crew 2, etc. This is true because the production coordinator has the most information to share (from the notebook). At the next shift, it may be that crew 2 hands off to crew 4. It works out that each crew hands off to each of the three other crews throughout the four week cycle of the rotating shifts.

Although the primary information exchange is between coordinators on the same overall Team, the coordinators as a group (all 18 of them) also need to decide a few things. If one team has several people who are either out sick, on vacation, or in training, that team may need to 'borrow' some people from another team. This swapping of team members is decided at this meeting.

During this twelve minute meeting with just the coordinators, other team members from the three oncoming teams are waiting in their team meeting room (there are three team meeting rooms, one each for A, B, and C) for the coordinators to come in and start the second half of the hand-off meeting which runs from 6:12 to 6:25. This second part of the hand-off meeting is done just with each team alone. When the coordinators come into the team meeting room where the rest of the team is waiting, the production coordinator primarily runs the meeting. Team members find out what's going on, what they need to do, how many people the team is short that day, any maintenance or production problems, how many production changes there are, how the previous shift team did on production, any quality problems, and customer feedback that came in. The labor coordinator tells everyone else on the team where they will be working that day - what machine, or if they will be helping out another team that day. Any coordinators that have something to report or contribute do so at this meeting. In the team meeting I observed, the training coordinator reminded several people that they were scheduled for some training the next week. The quality coordinator reminded the team about a quality issue.

Coaches are not always present at these team hand-off meetings, although one coach is usually present for some part of the meeting. They do not play a leadership role in these meetings; the production coordinator runs the meeting. Since there are only two coaches covering each shift, which has three teams, they cannot attend all three meetings for the whole time. They usually come and go from the meetings so that at least one of them hits all three meetings. The coaches have their own informal hand-off meeting with the coaches from the off-going shift to find out any necessary information from the previous shift.

Sometimes teams try to accomplish some 'team business' at their hand-off meetings. For instance, there are certain requirements of the teams - things they must do as a team to go through the rites of passage and enter into the pay for applied skills and knowledge system. They must develop their citizenship standards, go through the peer evaluation and feedback process twice a year, work on their skill profiles, to name a few. Some teams try to work on these things at the hand-off meetings, but the meetings are short and these things they need to work on as a team take time. So most teams work on these requirements at their monthly team meetings.

3.3.6.2. Monthly Team Meetings

Each team is required by the design for the department to meet every four weeks for at least four hours to work on things like citizenship standards, going through the Employee Development process, and other things. Teams also use these meetings to talk about problems, team concerns, personality conflicts, review the PASK plan and certification process, etc. Basically, the meetings are for any team business which cannot be addressed in the daily hand-off meetings. Some teams choose to stay after their twelve hour shift for these meetings, while other teams come in on their day off to meet. The meetings usually run more than four hours because teams have too much to do to be able to accomplish it all in four hours. Team members rotate the responsibility for developing an agenda for the meeting. There is a format for the agenda (a blank form is filled in by the person who 'owns' the agenda for that meeting), shown in Table 3.6. This agenda format is used not only for all teams in FT1, but the Filter Products Division as well. Each team may have a different agenda for each meeting; it just depends on what stage the team is at and what they need to work on.

Since the teams have been working together for a little over a year, they have met in these monthly meetings twelve or thirteen times. About half of them have been devoted to things the team is required to do, which includes two meetings going through the Employee Development process. Briefly, the process involves each team member evaluating themselves on the citizenship standards that have been developed for the team (each of the twelve production teams has their own unique set of standards). Then each person presents their self-evaluation to the team in these monthly team meetings and the team gives the individual feedback on the self-evaluation, i.e., whether they agree with it or not. More will be discussed on the Employee Development process in Peer Evaluation and Feedback section. Other monthly team meetings have been devoted to working on citizenship standards, as well as other things. Generally, the coordinators share information on their Key Results Indicators for the team at these meetings. Since the hand-off meetings are so short, there isn't always time to go over team action items (called the Action Register) and their status, sharing new things tried, new procedures, etc.

The monthly team meeting I observed was not a typical meeting. Instead of working on team action items or requirements for rites of passage, the team spent the meeting completing the Organizational Culture Index (an instrument to diagnose gaps between the way people think the culture should be vs. what the culture actually is) and the Myers-Briggs Type Indicator personality test. Internal FT1 trainers ran the meeting and gave instructions to teams. They were going to take the surveys and analyze the results, then share the results with the team members and explain how to interpret them. The MBTI was administered to enhance understanding of personality differences in team members and improve interpersonal relations, a critical element of self-managing teams.

Although it was not a typical team meeting I observed (team members were even apologizing to me for it not being a typical meeting!), I still was able to get a sense for how the team worked together by observing the hand-off meeting and this monthly team meeting. The atmosphere of the meeting was good-natured, yet sufficiently task-oriented to accomplish what needed to be done.

Table 3.6. Filter Products Division Team Meeting Agenda

Team Name: ____________________ **Date:** ____________ **Place:** ______
Team Leader: ___________________ **Time:** ________________________
Participants: ____
____
____
News and Information (Successes, New Procedures, etc.)
Data Review & Current Register
Problem Solve (Measures and other Problems)
Team Concerns (Follow-up and New)
Review New Action Register Items and Minutes (Critique Meeting Optional)

3.3.6.3. Daily Production Meetings

There is another type of meeting which involves team members. All production coordinators and coaches for the department attend a daily 8:30 a.m. meeting to review the previous day's performance. The meetings are held in the mornings, so it is not always the same production coordinator and coach who attend the meeting; it depends on what crew is working days. The production coordinator brings their production notebook with them to the meeting to bring up any relevant information that needs to be provided at the department level. At the meeting, they review status of items on a "hit list," which is any problems that need to be addressed. On a daily basis, an analysis of each tow line is performed to check for waste, and any other problems. Any repeating problems are entered on the hit list and are kept on the list until they are resolved. After the hit list is reviewed at the production meeting, the production coordinator brings back information on tow lines which experienced a large percentage of waste the previous shift. The technician currently working on the problem line(s) tries to address the problem, with the help of any appropriate coordinators and/or coaches.

3.3.7. Team Facilities

Each of the three overall Teams (A, B, and C) has their own team meeting room to use for their daily and monthly team meetings. The three meeting rooms are connected and can be opened up to make one big meeting room if teams need to meet together. Teams use their meeting rooms at the beginning of the shift in their hand-off meetings. Each meeting room is equipped with an overhead projector, a screen, flipchart, and "remarkable" boards. Each room also has framed posters on the walls for the ECC Quality Policy, the Eastman Way, the FT1 Department Mission and Principles, a seven step problem-solving process, guidelines for brainstorming, guidelines for reaching consensus, and a list of questions to ask when collecting data. These guidelines are a useful reminder to teams on group process techniques.

3.3.8. Selection and Placement Process

Of the twelve production teams, only one so far has had an opening. For that position, the teams decided whether or not to hire a certain person (from inside TEC). Karen Rowell states that she would like to have teams make the final decision on hiring team members, but there are ECC personnel policies within which the department operates. Karen Rowell would like to set up a departmental interviewing body, which will review candidates referred to them by personnel (personnel will do an initial screening). The departmental interviewing body will do the final interview and move people who pass the final interview into a pool of people available to move onto teams.

As far as firing, or terminating, a team member, there has been one instance where a team member was recommended to be terminated by the team. There is a standard disciplinary process in TEC where a team can take a person through the process and can make a formal recommendation that a person be terminated. Management is generally supportive of a team's decision. This process applies to all of TEC, and not just teams in the NWS. Getting teams to use the process when necessary, however, is difficult.

3.3.9. Rewards and Recognition

3.3.9.1. Pay for Skills System

The FT1 PASK team has completed the design for the PASK system, and a certification team is almost finished determining the certification process. The certification process includes how people will be certified when they first enter PASK and how they will continue to be certified as they learn new skills in the future. A team does not enter PASK until the team goes through the rites of passage described earlier, and no teams have yet done this. Some, however, are getting close. Currently, team members have been focusing on acquiring the set of four technical skills so the team is moderately cross-trained and flexible, however, they have not been paid for learning the skills. Team members who have many of the skills identified in the PASK system will still have to re-certify on those skills, even if they have been performing them for years. Karen Rowell anticipates that this re-certification will bring a big pay-off for the department, because it will ensure consistency and standardization in operating procedures. There might be people who have been performing skills for years but are not using correct procedures or who don't fully understand the process or machine they're operating. Re-certification will significantly reduce this variation in operating procedures.

The PASK is basically divided into technical skills and what FT1 calls business/management skills. Many organizations call the second category social skills because it represents every skill that is not technical in nature (relating to producing product). FT1, however, decided that business/management was a more appropriate name for the second category of skills. There are six levels identified in the PASK system, with most levels consisting of a set of technical and business/management skills. Levels 1 through 3 represent breadth of knowledge in the department and contain a relatively diverse set of technical skills, and the business/management skills are designed to "encourage that breadth...to understand the whole business, and understand how the business fits together." The minimum requirement for every team member in FT1 will be to eventually make it through Level 3. Both technical and business/management skills are identified for Levels 1 through 3, shown in Figure 3.4. Beginning in Level 3, coordinator roles and PAT representative are included in the system.

Beginning in Level 4 and up to 6, team members begin to specialize and develop expertise in a particular area. These levels represent depth of knowledge, where team members make a choice of career path. For example, in Level 4, someone can become a 'crimper/dryer specialist,' an operations specialist, a computer specialist, an environmental specialist, a mechanical specialist, a lab specialist, or a team consultant. The PASK team anticipates that it will take someone eight to ten years to progress from Level 1 to 3, and a total of fifteen to twenty years to progress from Level 1 through Level 6.

There are five categories of business/management skills: safety, teamwork, quality, computer skills, and FT1 business skills. There are skills identified for each of these five categories for Levels 1 through 3. In Level 4, the only business/management skill is a teamwork skill, and in Levels 5 and 6, there are only technical skills, representing specialization. Beginning in Level 2, the business/management skills also begin to include what is called "team support skills" (shown in Table 3. 7). Team support skills are skills the team has identified which do not directly support FT1 business, but would be desirable for one or more team members to have.

Team support skills are of three types - team activities, computer skills, and quality improvement skills. Some of the team activity skills are very unique - narrator, CPR, stress management, managing change, giving tours and presentations, etc. During the outside company visit I participated in, the team members who gave parts of the presentations were earning "credits" for the team support skill giving tours and presentations.

The PASK system was designed to support the FT1 NWS design by encouraging multi-skilling, mastery, coordinator roles, PAT representatives, and attaining and maintaining rites of passage. The design also encourages people to make a career in

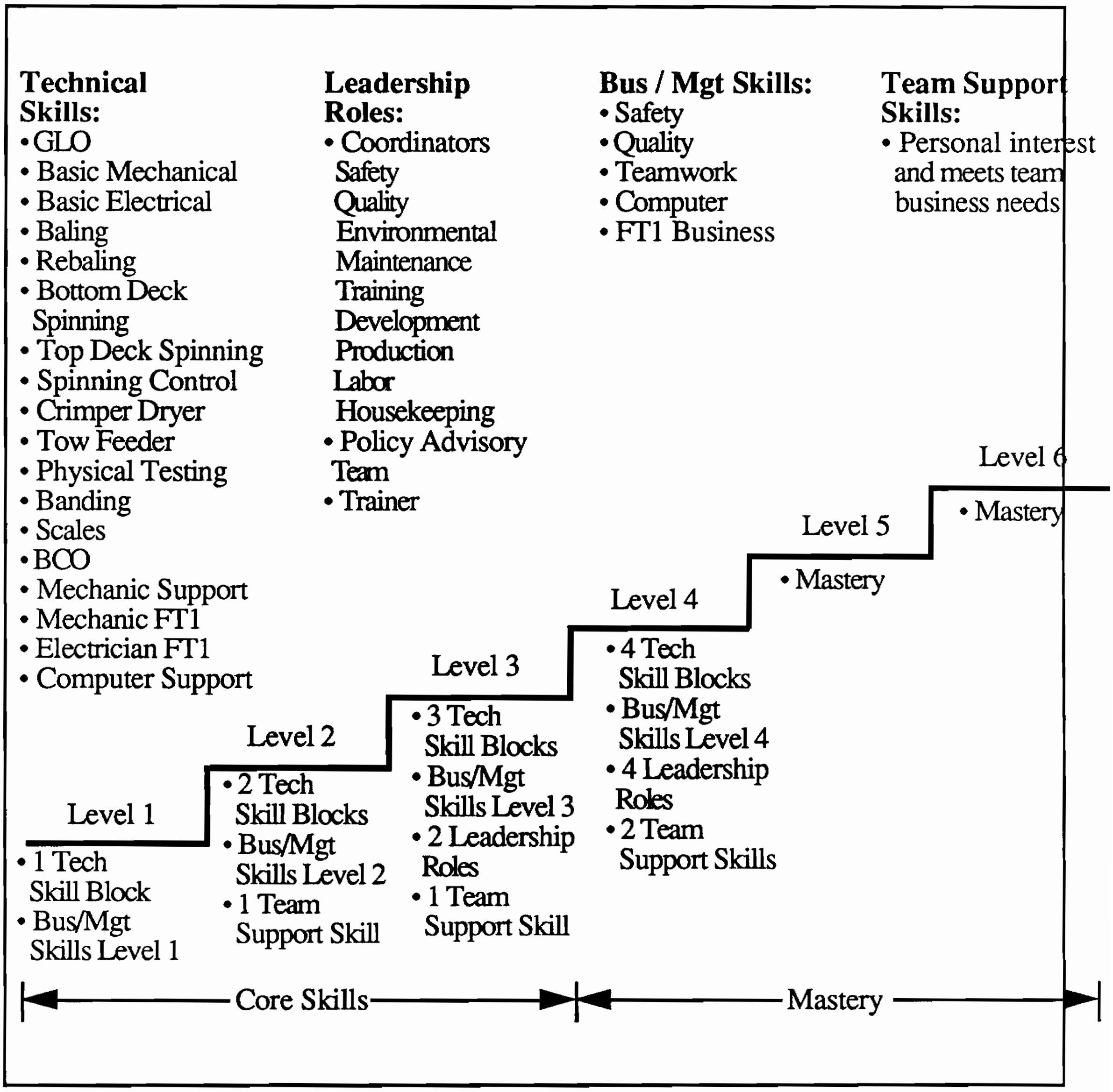

Figure 3.4. FT1 Pay for Applied Skills and Knowledge System

Table 3.7. FT1 Team Support Skills

Team Activities:		Computer Skills:	Quality Improvement Skills:
• word processing • team facilitator/ team consultant • team record keeping • tour guide • presentation support: writing/AV, printing services • photographer • artist • cost system	• ergonomics • team personnel representative • EEO • harassment • first aid (CPR) • stress management • physical fitness • narrator • managing change	• spreadsheet • use of RSI • Ramis • Harvard Graphics	• PECI Specialist • QMP • design of experiments • auditing skills • project management skills

Filter Products, by specifying skills which can be learned at higher levels and developing expertise in certain areas. The design requires certification of all skills (technical and business/management), although it is not yet determined exactly how each skill will be certified. The PASK system was designed to be consistent with the TEC compensation principles and the FT1 NWS design. If a team member wants to progress through the system rapidly and earn a lot of money, they can do so. Another person, who may not be as motivated to learn so many new skills can progress more slowly through the levels. Progression through the system "is controlled by the employee within the constraints of the business needs." Team members will be expected to maintain the skills (by using them frequently enough to remain proficient) they have been certified in.

The advantage of having waited so long to put the PASK system in place is that the FT1 NWS had a chance to stabilize and people became more comfortable working in teams before their compensation and reward system is changed. The disadvantage is that they have been working in teams so long without seeing any additional money, some team members have begun to feel somewhat resentful of all their added responsibilities without extra pay. Some view the NWS as just like the "old work system with a lot more to do." According to Ed Reynolds, there is a misconception by some people in the company that the PASK system is a "get rich quick scheme." In other words, team members may be expecting to progress up through higher levels and earn more pay very quickly. In reality, the training and certification may take longer than expected. An issue the Resource Team must deal with is other departments or divisions not in the NWS wanting to go to pay for skills. Other areas will hear about the additional pay possible with PASK and want their department or division to move to this type of compensation system.

FT1's design for PASK seems to be comprehensive and innovative. It is designed to try to avoid some of the common problems with pay for skills, such as topping out. The system is designed to take up to fifteen to twenty years to progress through all six levels. It is also designed with breadth *and* depth of skills, to avoid the problems of team members having nowhere else to progress after only a few years.

3.3.9.2. Other Reward Sharing

There is profit-sharing for all ECC employees, based on the return on assets for the company. Return on assets determines the pool of money to be distributed, and employees' salaries the previous year determines how much money each individual receives. The bonus is distributed at the end of the year. This profit-sharing program has been in place for two years. It is seen as a good example of a congruent support system.

3.3.10. Peer Evaluation and Feedback

The twelve production teams have gone through an Employee Development process twice since they have been working together as teams. As mentioned earlier, two of the monthly four hour team meetings have been devoted to giving peer feedback. The process includes several steps. The first step is for each individual team member to fill an Individual Development Planner (IDP) on themselves. They evaluate themselves on the citizenship factors, job knowledge, and skills. The objectives of the IDP are: personal growth; realize personal strengths and weaknesses; team growth; determine training opportunity; maintain citizenship; and replace performance evaluation system. The specific areas on the IDP which individuals evaluate themselves on are: job knowledge, economics, housekeeping, overall contribution, business awareness, feedback and development, attendance, safety, security, cooperation through teamwork, quality, and conduct.

The second step occurs at the monthly team meeting. Each of the eighteen team members gets up in front of their team and presents their self-evaluation. The rest of the team gives that team member feedback on the self-evaluation - whether they agree with it or not, areas where they disagree and why, etc. This step is one of the most difficult for people to do. As one team member put it, "it's been one of the hardest standards to live up to...I can take it better than I can give it...it's hard to give feedback."

The next step of the Employee Development process is for each team member to take the feedback from their team and determine what they need to work on to improve. A Development and Coaching Plan is used to do this. This plan takes three of the most important 'development opportunities' from the development discussion at the team meeting, and the team member describes specific action plans for development. They consider coaching, training, assignments, projects, and planned follow-up dates. Many team members have difficulty filling out this plan (in being specific enough about action plans), so coaches help them fill the plan out. Team members then work on what they said they would, and receive feedback on how they have done the next time the team goes through the process. Teams will go through this Employee Development process twice a year.

The development process is for developmental purposes only and it can only indirectly affect pay. For instance, a team can withhold one member's training if they are not living up to the citizenship standards set by the team. Withholding training means the team member cannot receive pay increases. So the development process is only indirectly linked to pay. According to Karen Rowell, it is critical that development and feedback be separated from pay if people are expected to improve. If a team member who is having a problem, for example, with attendance, receives honest feedback from their entire team, it can be much more effective than hearing it from only person. Some team members feel the development process has not been as effective as it could be, but they admit that it is because they are not yet comfortable giving feedback to their peers. As teams become more skilled at giving and receiving feedback, the process will most likely become much more effective. Next year, Karen Rowell hopes to include in the process the teams evaluating her as department manager.

3.3.11. Training and Skill Development

Because TEC has been using natural unit teams throughout the company for some time, everyone in the company has received training in certain areas to help function as teams. Everyone has received training in team problem-solving and has gone through team skills training, which included things like brainstorming, listening, communication skills, etc. Everyone has also received training in statistical techniques and TEC's version of SPC - Process Evaluation, Control, and Improvement (PECI). PECI training includes how to calculate and interpret control charts, reject limits, and set targets. PECI training also includes explaining the technical variance matrix to FT1 team members. The variance matrix has all the processes in FT1 and sources of variations in the processes, and how they all interact.

FT1 team members have received additional training because of being in the NWS. During the design phase, the Design Team held sessions to explain the NWS and the FT1 design to the rest of the department. These sessions were held to educate people on the NWS and to obtain commitment. Team members went through four days of what is called LIFT training (Leadership, Involvement, Facilitating, and Training). LIFT training includes interpersonal skills, conflict resolution, understanding different leadership styles, giving and receiving feedback, and communication skills. Every

TEC department in the NWS has gone through or is scheduled to go through LIFT training. In addition, FT1 team members have taken the MBTI personality instrument and will receive training on how to interpret the test results and on individual personality differences.

Team members have received technical training on the core skills in the department so the team is more flexible. Coordinators have received training on how to perform their coordinator roles, and coaches have received training from area managers on how to be a good team coach.

In the PASK system, team members will receive technical training to acquire technical skills blocks and progress through the system. Training is given by departmental trainers. There are approximately 40-50 trainers in FT1, and they are also team members. The training process is called analytical training development, which includes a very rigid standardized training format with "classroom training combined with lots and lots of on the job training." Analytical training developers who work in FT1, develop the conceptual level of training, and do certification testing. They are the "keepers of the training process." Trainers have received training in how to train others and have manuals to help them. In the certification process, training will not be considered complete until a person certifies on a particular skill. The training process will involve training on the technical skill, the employee practicing the skill for a period of time, and then certifying on the skill when they are ready. The amount of time budgeted for training is 9% for each individual. If someone has a better than average attendance record, they have more time to spend in training, and hence, opportunity for more pay.

3.3.12. Information System

3.3.12.1. Information Teams Receive

Table 3.8 summarizes the information teams receive. The specific types of information the twelve production teams receive are:

- Feedback on team performance
- Feedback on team production information
- Skill level of team members
- Team issues
- Technical product/process information

- External customer feedback
- Performance of other teams
- FT1 Department performance
- FT1 Department issues
- Performance of Filter Products Division
- Performance of company/plant (TEC) and corporation (ECC)
- Company (TEC) and corporate (ECC) issues

The major and most frequent types of information the twelve production teams receive are *feedback on team performance, feedback on team production information, internal team issues, and the department's performance.* The main source for these four types of information is the daily hand-off meeting, both the first part with just the coordinators from the three off-going and three on-coming shift team, and the second part just with each team. These meetings occur from 6:00 to 6:25 (a.m. or p.m., depending on whether the team is working days or nights). Feedback on the previous shift *teams' performance* is reviewed at the first part of the hand-off meeting with just the coordinators. The measures used are safety (accidents and/or inspections), roll breaks (breaks in the line), specific quality problems, number of bales approved (number of 'good' bales), number of bales held and rejected (number of 'bad' bales), waste in pounds, and number of interruptions in the line. Goals are not set for production measures, such as the numbers of bales produced, because as one team member put it, "everybody knows what their job is...you go out and do your job and hope for the most tow produced." *Department performance* on percent approved (the percentage of bales produced which is approved for shipment) is reviewed at the first part of the hand-off meeting. *Feedback on team performance* is also received at the monthly team meeting. Each coordinator has responsibility for one Key Results Indicator (KRI) and collects data and shares information with their team on their KRI at the monthly team meeting. Each team then, has a set of KRIs. Some KRIs are the same measures reviewed at the daily hand-off meetings, e.g., bales produced and held bales. The only difference is that the KRI is measured for the entire month and then shared at the monthly team meeting. Other KRIs are *only* measured on a monthly basis and reviewed at the monthly team meeting, for example, absenteeism and average time to resolve a roll break.

Table 3.8. Information Inputs Provided to Tennessee Eastman Crew Teams

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Feedback on team performance: safety (accidents, inspections), roll breaks, specific quality problems, bales held and rejected, waste in pounds, number of interruptions	Production coordinator's notebook contains all team performance information; reviewed at first part of hand-off meeting	Daily, from 6:00 to 6:12	Production, labor, and maintenance coordinators from other teams
	Key Results Indicators for team are reviewed at monthly team meetings	Monthly	Each coordinator collects data and shares information on their KRI(s) for the team
Feedback on team production information: production changes, baler switches, crimper changes, equipment problems, team members unexpectedly out sick	Production coordinator's notebook contains production information; reviewed at first part of hand-off meeting	Daily, from 6:00 to 6:12	Production, labor, and maintenance coordinators from other teams
Skill level of team members	Skill profile - a matrix of team members and team skills which is filled in to show which team members have which skills; portrayed on remarkable boards	Updated as necessary (as team members acquire skills)	Individual team members
Team Issues (problems, concerns, personality conflicts, action items, changes in procedures)	Reviewed when time is available at second part of team hand-off meeting	Daily, from 6:12 to 6:25	Individual team members, other teams, coaches, management
	Reviewed at four hour monthly team meetings	Monthly	Individual team members, other teams, coaches, management

Table 3.8. Information Inputs Provided to Tennessee Eastman Crew Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Technical Product/Process Information - changes to procedures, processes	Standing Team meetings (quality, safety, maintenance, training, development, environmental and housekeeping Standing Teams)	Every five weeks	Other team coordinators, management, division coordinators and representatives
	Policy Advisory Team meetings	PAT meets every five weeks	Management, coaches
	Informally; one on one communication to solve problems	As necessary	Team members, other teams, coaches
External Customer Feedback (problems, complaints, defects)	Customer feedback is filtered to team through the quality coordinator, using PROFS computer system or one on one communication	As needed	External customer provides feedback to department manager
	Customer visits; some team members participate in customer visits to TEC and some go to visit customers	Irregular	External customers (Philip Morris, RJR)
Performance of Other Teams	Team performance is subjectively assessed at first part of hand-off meeting when production coordinators from off-going shift report on the previous shift teams' performance	Daily, from 6:00 to 6:12	Production, labor, and maintenance coordinators from other teams

Table 3.8. Information Inputs Provided to Tennessee Eastman Crew Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
FT1 Department Performance (percent approved)	Percent approved for department is reviewed at hand-off meeting	Daily, from 6:00 to 6:25	Management provides information to production coordinator who shares with other coordinators and their team at the hand-off meeting
FT1 Department Issues (problems, concerns, changes, etc.)	PAT meeting	Every five weeks	Management, coaches, other teams
	Daily Production meetings, review "Hit list" of problems needing to be addressed	Daily at 8:30	Attended by coaches, managers, and production coordinators
	Coordinators receive electronic messages on the PROFS system on any relevant department issues from other coordinators, coaches, management	As needed	Other team coordinators, management, coaches
Performance of Filter Products Division	Meetings with presentation by division head on cost information for division and other financial information	As requested by teams	Division management
	TV monitors	Continuous information is displayed on monitors	Top management

Table 3.8. Information Inputs Provided to Tennessee Eastman Crew Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Performance of Company (TEC) and Corporation (ECC)	TV monitors contain safety information, customer survey information, financial performance, etc. of company	Continuous information is displayed on monitors	Top management
	Company newsletter includes performance information on company	Bi-weekly	Top management
	Coordinators receive messages on PROFS system on safety performance, etc.	As needed	Top management
	Charts and graphs on company performance	Monthly	Top management
Company (TEC) and Corporation (ECC) Issues (procedural changes, activities, social information)	Company newsletter includes information on retirements, company anniversaries, TEC activities, new things going on such as the NWS, financial performance of company	Bi-weekly	Top management
	PAT meetings; company issues which have been filtered down to FT1 department management are communicated to teams through their PAT representative at PAT meetings	Every five weeks	Top management
	TV monitors includes information on TEC and ECC issues	Continuous information is displayed on monitors	Top management

Feedback on team production information (any other general information about how the previous shift went which is not directly related to the team's performance) includes production changes, baler switches, crimper changes, and equipment problems. This production information is needed by the on-coming shift teams so they can make any necessary adjustments in production plans and scheduling the labor (who works where). *Feedback on team performance* and *feedback on team production information* is reviewed from 6:00 to 6:12 and is contained in a production coordinators' notebook which one overall team (Team A, for instance) shares and is simply passed on from one shift to another.

Team issues are also discussed at the hand-off meeting, in the second part from 6:12 to 6:25 if time permits. Team issues include many different types of things: problems, concerns, team activities, personality conflicts, etc. Team issues are reviewed at the daily meeting if there is time. Issues requiring more time for discussion are saved for the monthly team meeting.

Other types of information teams receive about the team or about the department are things like updates on the *team's skill profile* (what team members are trained in what skills), *technical product/process information, external customer feedback, performance of other teams, and department issues.* Much of the information comes directly from coaches or managers informally in one on one communication, particularly the technical product/process information (for example, changes to the process, how to correctly operate a machine, how to schedule people effectively, etc.). Another main source of this kind of information, especially department issues, comes from the Standing Team meetings and the PAT meetings which each occur about every five weeks. There meetings are forums for representatives from each team to share information, lessons learned, things that work well for their team, things that don't work well, common problems, and issues needing to be addressed for the entire department. The coordinators/PAT representative bring necessary information to the Standing Team meetings and PAT meetings, and bring back any appropriate information to their teams.

Teams do not receive quantitative information on how their team performance compares to *performance of other teams.* In other words, charts or graphs are not posted for each team. Comparison between teams is not encouraged; management believes providing information so teams could easily compare themselves to other teams would encourage destructive competition between teams. Instead, teams are encouraged to compare their performance to their own past performance.

Teams also receive external information (external meaning that it pertains to things outside FT1 Department): *division performance, company (TEC) and corporate (ECC) performance, and company/corporate issues.* The main sources for this information is the PROFS system (for team coordinators), the TV monitors which display information continuously, and the company newsletter. The PAT meetings are also a source of information from the division, company, and corporation. Information which has been filtered down from top management or from other areas in the company are passed on at the PAT meeting. In traditional organizations, the "rumor mill" is generally a source of information for things going on in the company, changes coming in the company structure, personnel changes, etc. Because management has been so open with sharing information, the rumor mill at TEC in general is not considered a source of accurate information about what's going on in the company.

3.3.12.2. Information Teams Provide

The types of information teams provide to other groups or individuals outside their team (this could mean to other teams inside FT1 or outside the department) are (see Table 3.9):

- General information about the teams and the department
- Team issues
- Requests for assistance on technical, administrative, and personnel problems
- Requests for help from other teams
- Requests for approval

When visitors come into FT1 (whether they are internal or external to FT1), team members give presentations, tours, and/or hold panel discussions to share *general information on the teams and the FT1 Department. Team issues* are provided to other teams, coaches, and managers at the first part of the hand-off meeting with coordinators, and at Standing Team meetings. *Requests for assistance with technical, administrative, and personnel problems* are generally handled informally as help is needed, and the requests go to coaches, managers, and members from other teams. *Requests for help* from other teams for support if someone is out sick or on vacation are handled at the first part of the hand-off meeting. This is when the daily labor plan is

Table 3.9. Information Outputs Provided by Tennessee Eastman Crew Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
General Information About Teams and FT1 Department	Presentations, tours, and question and answer panel sessions set up with both internal 'visitors' (other departments) and external visitors (other companies)	On average, about once a month	Other departments in TEC, and external visitors, from outside companies
Team performance	Coordinators exchange information on their team's performance at first part of hand-off meeting; also in production coordinator's notebook	Daily, from 6:00 to 6:12	Coordinators on other teams
Team Issues	First part of hand-off meeting, coordinators bring up any issues from their team as necessary	Daily, from 6:00 to 6:12	Coordinators on other teams
	Coordinators send electronic messages on PROFS to other team coordinators on team issues	As necessary	Coordinators on other teams
	Standing Team Meetings; coordinators bring up any issues from their team as necessary and that are related to that Standing Team	Every five weeks	Coordinators from other teams on Standing Team
Requests for assistance on technical, administrative, and personnel problems	Informally request assistance one on one	As needed	Coaches, managers

Table 3.9. Information Outputs Provided by Tennessee Eastman Crew Teams

Information Output Provided by Team	How Information is Provided	Frequency	Customer of Information
Requests for help from other teams	At first part of hand-off meeting, coordinators decide to borrow or lend team members to help out other teams in need	Help is provided as needed, but reviewed on a daily basis	Other teams
Requests for approval to try new things	Standing Team meetings; review ideas for changes and develop policy	Every five weeks	Coordinators from other teams on Standing Team
Suggestions for improvement	Teams informally provide suggestions for process improvements	As necessary	Coaches, managers

finalized for all three on-coming teams, so if one team is short of people, other teams "loan out" some of their team members. If a team has an idea for something new, or a change to a process, they ***request approval*** to initiate the change at the Standing Team meetings.

3.3.12.3. Other Issues Pertaining to the Information System

There are several important elements to the information system supporting the teams in FT1. Having the necessary tools, or materials, such as flipcharts, remarkable boards, and a team meeting room to meet in, having all team coordinators on the PROFS computer system, and TV monitors are important so teams receive the information they need to perform their job. According to several coaches and team members, coordinators can get any kind of financial figures from PROFS and bring back that information to their team. This was not available to teams until relatively recently. The open sharing of information as far as dollars and hard production numbers which were never provided to production employees in the past, is important in building trust between management and employees. According to a team coach, "the information is out there" in the forms of charts and graphs on company performance and "there are no secrets." The next step is to make sure that everybody understands what the charts and graphs say about company performance, which is not true yet. Whenever the teams request it, the Filter Products Division head will come in and give a presentation on the company performance and break down and explain the figures so people can see the division's performance.

Teams still come up against obstacles in getting the information they want or need. An example illustrates this point. FT1 wanted to install an 800 number on the shop floor so customers could directly contact the teams if there were questions or concerns. But marketing people objected, because they are the "customer contact." This is an example of having support functions which are not yet congruent with, or supportive of, self-managing teams.

One issue the department is dealing with now is the redesign of the accounting information system to provide the necessary information to teams. TEC in general is striving for a line of business focus. Each department in each division will be, or is, divided into business units. The goal is to manage each business unit as an autonomous mini-business. To get the focus on those business units, management recognizes that a key ingredient is providing line of business information. In other words, each business unit will need financial information (costs and revenues). The current accounting information system is very old and difficult to change. It is difficult to change the format in which information is provided. There are efforts underway to overhaul the information system. This redesign of the system was needed anyway, but it is spurred by the departments in the NWS, like FT1, who need information in a certain way and can't get it. FT1 needs to have separate business information for not only the department, but for each overall team (i.e., Teams A, B, and C). Each of the three overall teams are mini-business units and will be managed as such. The aim is to have the system provide information (not only on costs but on production numbers and quality level) on a monthly basis and eventually move to providing this information on a daily basis.

Currently, teams in FT1 (and in other departments in the NWS) have the production figures, e.g., number of bales produced, they need, but the manufacturing information system had to be changed to give the information the way teams need it. Other departments may have set up "bootleg information systems" as a quick fix to give teams the information they need. According to Ed Reynolds, one of their lessons learned in implementing the NWS, is that "the information system will lag the requirements of the teams [in the NWS] and need to be driven by teams' needs." But the information system at TEC lags more than is desirable, and hence, "bootleg systems may be started to give teams what they need." TEC is currently working on aligning the information system with teams' needs and integrating all the needs and requirements into one system. However, information system people and accounting people have been "compliant" but are not leading the change. To illustrate the reluctance to change the information system to match NWS needs, information systems people resisted putting all team members on PROFS because they were concerned about a loss of control (e.g., computer viruses or personal use). However, according to Ed Reynolds, if team members really wanted to, they could do those things without even formally being on the system.

3.3.12.4. Influence Over Information Received

If teams find they do not have some information they need, it is generally thought that they could get it, either through their coordinator from PROFS system or from coaches or managers. FT1 department management and coaches pass along any information they have which they think teams need. According to a team coach, teams "have all the information they need...but they don't fully use it yet because this is new to them." Some team members may also be involved in the redesign of the information system and may therefore influence the design of the system and what information will be provided to teams and how.

3.3.13. Intergroup Relations

3.3.13.1. Communication, Information Sharing, Interaction Among Teams

There are several mechanisms for teams in FT1 to communicate with each other and exchange information. The first part of the hand-off meeting every day is just the production, labor, and maintenance coordinators from the on-coming and off-going shifts. At this meeting, coordinators can briefly discuss common problems to the department, and any other team or department issues. Teams exchange information on how the previous shift went and let the on-coming shift teams know anything they need to. The Standing Team meetings are also for teams to exchange information with other teams, through their coordinators. The Standing Team meetings are an opportunity for coordinators from all teams to get together at one time (at the hand-off meeting, it is only two shift crew teams that meet at any one time). The purpose of these meetings, in addition to ensuring consistency and standardization, is for teams to share lessons learned, what has been working, what is not working, and bring up any issues related to the Standing Team. In addition to the hand-off and Standing Team meetings, team coordinators can also communicate through the PROFS computer system.

Teams share information with teams in other departments in the NWS, however, according to Ed Reynolds, not sharing enough information with other teams is a weakness at TEC. Rather than just sharing the "good news" and the successes about the NWS, Reynolds believes teams should spend more time exchanging information on what didn't work well and what they learned from mistakes. For instance, because Kodel was the first department to go through the transition to the NWS, there should have been more communication between Kodel and FT1 teams so FT1 could learn from Kodel.

A team relations issue which FT1 is struggling with now is competition between teams. There is cooperation among team members within a team, but there is competition between the three overall Teams (A, B, and C). Because the three Teams are essentially the same and provide the same product, the problem is intensified. If

Teams A, B, and C each produced a different set of products (like in Kodel Department), the competition might not exist to such an extent.

According to Karen Rowell, there is more competition than is healthy, even though management purposely does not compare teams using quantitative results. For instance, team performance for all twelve teams is not posted up on bulletin boards, and management emphasizes the bottom-line performance on percent approved (percent of bales of filter tow passing inspection) for the entire department. Team members agree that there is competition between teams but that some competition is good. The competition is more of a subjective nature. Since performance is not formally compared, teams compare other things, like seeing how many breaks in the line one team has on a particular shift. Team members feel that most of the teams generally do well at helping out other teams when they need it, although there are some problems. According to a team coach, "everybody's wanting their team to look the best." Coaches on the other hand, are more of a mind that as long as the department performs well and TEC makes money, they don't care which team did the best. Teams have been given the assignment by management to look at the problem and determine how to minimize competition between teams.

3.3.13.2. Perception of Teams Within Organization

The perception of other employees in TEC of the NWS is, as it generally is with anything new, not always positive. According to Ed Reynolds, "bad news travel fast...anything that goes bad, they hear about, anything that goes good they don't." The issue is one of being resistant to any kind of change and not just the NWS in particular. People outside the NWS "feel resentment toward the Design Teams and the people in the NWS." Team members may be ridiculed by people in other divisions who know little about the NWS. They may be made to feel as if they have "sold out to management" when they project a positive attitude about the NWS. This negative perception by other TEC employees will probably slowly change as more and more people are involved in the NWS and as they learn more about it and the associated benefits.

3.3.14. Problems Experienced With Teams

Along with all the advantages and benefits of the NWS, there are also some problems and significant issues that the Design Teams and the Resource Team have had to deal with. The major problems experienced are listed below:

- Having two cultures within TEC - TEC has found "you can't have two cultures existing... a traditional [culture] and a high performance work system...side by side." Either the culture of the entire organization must change to that of the NWS, or the organization will "gravitate back to the traditional" culture. This problem is a "higher order problem" than the ones listed below, and it appears in several ways. Support systems which are not supportive of self-managing teams, such as information systems (manufacturing and accounting), personnel, and marketing, are symptoms of this problem. These systems are simply not designed to support teams. The problem of incongruent support systems is the most common problem of organizations transitioning to self-managing teams (Katz and Laughlin, 1990). Additional evidence of the problem of having two cultures is the fact that employees in other areas often make fun of team members in the NWS, particularly when they hear "bad news" or problems with the NWS. The perception of NWS team members may be that they have sold out to management, and this perception is reflected in behaviors toward team members.
- Role of the first line supervisor - TEC has struggled with defining the new role of the supervisor as a coach. As Ed Reynolds put it, they told supervisors what their jobs aren't (what not to do) but they didn't go a good job early on telling them what their role is. The transition to the role as coach can be very difficult for many supervisors. This role clarification for supervisors is still one of the weakest links, according to Ed Reynolds. TEC has brought in consultants specifically to help them define the new role of supervisors to help them through this problem.
- Cost and length of the design process - The length of time it has taken Design Teams to complete the design for a department and get it approved by the TEC Manufacturing Team (previously the TEC Steering Team) has proven to be exorbitant. FT1 in particular took eighteen months to get their design approved. The length of time (and hence the cost) required for the design process is a big concern to top management and to the Resource Team. Since they plan to disseminate the NWS throughout the rest of TEC (see next section), they are trying

to find ways to reduce the amount of time required. For departments going through the transition to the NWS, the Design Teams no longer have to get approval from TEC Manufacturing Team, but just the Division Steering Team which should shorten the overall time for the design process. Additionally, as subsequent departments transition to the NWS, they will be able to learn from previous departments and continually improve the process. For departments and divisions who are evolving their natural unit teams, the Resource Team has determined what elements from the design process were valuable and important to do versus what was just an exercise to go through. The Resource Team has developed what they call an Empowerment template for departments not in the NWS, so these departments can move toward the important characteristics of the NWS without going through the lengthy design process.

- Resistance to multi-skilling - There are still people in TEC who do not want to share skills they have acquired over the years with other team members. Generally, people are resistant to sharing skills because being the only person on a team with a certain skill gives someone power, which they are being asked to give up in the NWS. Another source of resistance to multi-skilling in FT1 is because of the nature of one of the jobs in the department. The baling job is one of the most difficult and physically demanding jobs in the company. In the old system, people performed the baling job for a period of time, then graduated on to other jobs and never went back to the baler. Many people are very resistant to going back now, after perhaps years of not working on the baler, and perform that job as part of the regular rotation of team tasks. Even newer team members feel they would rather put their time in on the baler and never have to do it again. For flexibility, the design requires rotation of tasks and multi-skilling. To alleviate the problem, the baler job has been made less difficult by adding more people to work on the baler and by reducing the daily production requirement. Now, team members say the job is much better, however, there is still resistance to perform the job, possibly because of the status associated with the previously defined entry level jobs.
- Training resource requirements - Training is an absolute essential for self-managing teams to work, but is one of the easiest things to let slide because it is a longer-term investment. Even though it is widely known that training is critical, many organizations still don't put enough resources into it. Kodel team members and

coaches say they didn't get enough training and if they had it to do over again, they would make sure they got more.

- Understanding the need to change - Because of TEC's culture (i.e., no layoffs, victim of success), there has been a lot of difficulty communicating the need for change and why things are different now than they were five, ten, or twenty years ago. The company has expended a great deal of resources in trying to change the awareness for the need to change through internal workshops, seminars, and bringing in outside companies and team members to talk to TEC employees about working in self-managing teams and the need to change. Team members have attended conferences, seminars, and visited other companies to see what they are doing. These people come back "enlightened," however, they quickly become frustrated because things change so slowly back in their department. However, as more and more people do things like this, a critical mass of enlightened people will be developed and gradually change the collective awareness of TEC employees for the need to change. But they are not there yet.
- Resentment to people in the NWS by those outside the NWS - As with any change and anything new, people feel resentment toward those involved in the change. Even within a department going through the transition, there is resentment to the Design Team during the design phase, before anyone is actually working in the NWS. To try to eliminate the resistance and resentment, Design Team members "keep communication lines open with people on the floor" as much as possible. The problem becomes particularly acute if production employees begin to think that other production employees on the Design Team have sold them out and are "a member of management." To alleviate this problem, Design Team members spend time talking with employees still working production, explaining what they are doing and how the design will work.
- Team members being unwilling to make decisions and take responsibility - It is difficult for people who have rarely or never been asked to make decisions, to begin making decisions and trust those decisions. Coaches play a big role in helping team members through this reluctance. The way one coach put it is "you answer a question with a question." In other words, if someone asks a coach what to do about something, they answer the question with a question about what they think.
- People have begun to feel somewhat resentful of all the added responsibilities they have in the NWS without any additional pay yet. Teams have been working

together and functioning as teams for over a year without being on PASK. Once teams begin to go through the rites of passage and enter the PASK system, the negative feelings should dissipate.

3.3.15. Disseminating Teams to Other Parts of Organization

As mentioned earlier in Evolution to Self-Managing Teams, the transition to the NWS is being made in three divisions at TEC - Textile Fibers, Filter Products, and Organic Chemicals Divisions. Textile Fibers and Filter Products have made a commitment to redesign the entire division, including the support departments - Development and Control (or Development and Quality Services as it's called in Filter Products). Textile Fibers currently has approximately 90% (there are four departments in the division) of the people involved in various stages in the transition to the NWS right now, with plans in place to transition the rest of the people soon. Filter Products has one department in the transition (FT1), with another department (FT2) ready to begin the transition, and the other two departments (the Dope Department and Development and Quality Services) in the design stage. The Organic Chemicals Division does not have as many people involved in redesign as the other two divisions; there is only one department involved, and they are beginning implementation of their design (they are beginning the transition to NWS). For the departments following the STS approach and redesign, the process used will be somewhat different each time. As they learn more with each department that goes through the transition, the Resource Team continually improves the design and implementation process.

There are other divisions which are evolving toward self-managing teams using another approach than socio-technical systems theory to redesign the work system. These divisions are Shops and Services, Maintenance, and Power and Services Divisions - all support divisions. The approach is described by Ed Reynolds as more "evolutionary," as opposed to "accelerated" as STS redesign is. Basically, they are maturing and evolving their natural unit teams to be more autonomous and gradually to become self-managing. The Resource Team has developed what they call an "Empowerment" template that lists criteria for when departments have truly empowered their workforce. This list represents stepping back and taking a look at what was "really valuable" in the design process versus what was "just an exercise to go through." Developing this list of criteria is an attempt to communicate the "vital few" important things in the design and implementation process to the NWS. Things that are not as important and were just an exercise to go through are not emphasized, in order to minimize the stress and change on people. They are changing the name from the New Work System to Empowerment because there are other divisions that are evolving their teams but not using STS to redesign the work. According to Ed Reynolds, the template will be used as somewhat of a checklist to say "are we there yet?" The philosophy of the Resource Team is that it's not critical what approach is used to empower the workforce; they don't want to 'force' everyone to use STS theory, but to use what works best for them and what has been working. What is important is that their department meets all the criteria for an empowered workforce. The criteria are shown in Table 3.10.

Developing this Empowerment Template demonstrates that the Resource Team is thinking ahead to getting the entire plant operating as self-managing teams. They realize that it would be unwise to try to get every department in every division to use the STS approach, for several reasons. First, other areas may be evolving their teams their own way and it may be working for them, for example, the three support divisions which are evolving their natural unit teams. It might at first seem that the inconsistency between divisions in the plant and how they 'get there' might be a problem; in other words, they might not do it right. However, the Empowerment Template is the mechanism which will build consistency between different divisions. As long as everyone is aiming toward the same goal (the requirements listed in the template), how they get there is unimportant.

Secondly, the STS approach in redesigning the work system has proven to take an exorbitant amount of time, particularly in the design stage. It has taken departments anywhere from one year to eighteen months to get designs approved by the Steering Team, and that's even before implementation and making the transition to the NWS. The Resource Team recognized that something would have to change in the approach because of the amount of time required and that it would be impossible to have every department use this approach. Hence, they developed the Empowerment Template to help everyone see the goal to work towards, and then let each area decide how to get there, using the Resource Team if they need them.

The company president, Mr. Bill Garwood, has set as a goal to have the entire company transformed within a five to eight year time frame. Now that the Empowerment Template has been developed and will be used as a checklist by other

Table 3.10. Required Key Features for an Empowered Organization.

1. Product/external customer focus:
- A. Structure and job design for product variance control
- B. Supplier and customer input to managing the business

2. Rapid continual improvement and innovation:
- A. Organization and supporting systems requires everyone improve products, processes, teams, and themselves
- B. Continual learning is part of job
- C. Stretch improvement goals
- D. Risk taking is encouraged
- E. System for organization renewal
- F. Coaching and development systems for all teams

3. Self-regulating team concept including these features:
- A. Ability to control variances at source (multi-skills, authority to act, needed information, tools and technology)
- B. Shared team leadership - coordinators
- C. Team behavioral norms
- D. Peer feedback
- E. Team has and uses business and performance measures
- F. Pay for Applied Skills and Knowledge for technicians (PASK)

4. Manage principles (rather than control/rules)
- A. All actions and decisions based on a stated philosophy (mission, values, principles)

5. Shared leadership and new roles for all managers:
- A. New roles include:
  1. Coach and develop teams and individuals (normally more than one team per coach/manager)
  2. Clarify business expectations
  3. Manage interface between teams and their environment
  4. Resource allocation between teams
- B. Provision for everyone's input to decisions affecting larger organization (e.g., Standing Committees)

6. Support systems which enable an empowered organization such as:
- A. Pay - reward desired skills and behaviors
- B. Business information - systems which allow decision making at the lowest level
- C. Personnel systems - which allow input from teams about their needs
- D. Accounting - systems which allow decision-making at the lowest level
- E. Training - which supports learning and individual growth

departments, Ed Reynolds believes that this goal is attainable. One point to make about TEC is that they are not only transforming all production teams, but they are also working on redesigning support departments and functions. In addition, they will be redesigning management, which has not been done by very many organizations. In fact, they have been working on a management redesign (the department leadership team) for the Kodel Department for the past two years. In the redesign, there are people from production, production planning, and marketing (from corporate), to manage the Kodel business. The Design Team has, however, encountered some predictable resistance and are working to overcome it.

3.4 Summary

Organization-wide change can be extremely difficult, particularly in an organization as large as TEC. However, TEC has come a long way in changing the company, with their transition to the NWS and integrating the NWS with other improvement efforts toward the ultimate goal of Quality Management. Many of the improvement efforts at TEC are leading edge management principles and techniques. For instance, TEC is licensing their TPM approach to outside consultants. Additionally, they have hosted many outside companies wanting to come in and see what they have done with their design of the NWS.

Although not every department will end up using the same approach to the NWS, the goal is to have the entire company incorporate the "vital few" characteristics of the NWS listed in Table 3.10 into their department. There are currently two departments (Kodel and FT1) in transition to the NWS, with six other departments in design stages or about to begin transition. The change to Empowerment will gradually pervade the entire company, but will take a long time. The benefits, however, will be immeasurable. Even though quantitative results have not been achieved to a large extent yet in FT1, the subjective benefits are significant. Karen Rowell states that she has "seen people doing things that were beyond my wildest imagination." One team member said that "a year ago, you never would have thought we'd be where we are today." Clearly, FT1 has come a long way.

One area the Resource Team is looking to take Empowerment and the NWS are management redesign. This does not mean redesigning support functions such as accounting, marketing, etc., because they are still support to production. TEC is experimenting with redesigning the management team for a department. The Resource

Team knows this is the appropriate next step and is in the process of learning what other companies have done in this area. The evolution of the stages of Quality Management efforts (evolving from natural unit teams) and the work in redesigning production departments has given TEC an "excellent foundation upon which to build" for the future.

4. CASE DESCRIPTION FOR VIRGINIA FIBRE CORPORATION

4.1 Overview

Virginia Fibre Corporation (VFC), located in central Virginia, is an independent paper mill which manufactures semi-chemical corrugating medium - the wavy, center-ply found between the walls of corrugated boxes. For a little over year, VFC has operated an Old Corrugated Container plant, called the OCC plant, in a small separate building, which uses recycled boxes to produce pulp for VFC's papermaking operation. Since the OCC plant started up in December 1989, VFC has used what they call self-directed work teams to operate the plant. The plant operates twelve hours a day (one shift) and two teams rotate working days and nights to cover seven days a week.

This case description on the self-managing teams in the OCC plant was based on several sources: an article written about VFC published in *Quality and Productivity Management*; a one day site visit to VFC, which included interviews with Mr. Stew Thomas, Vice President of Mill Operations, Mr. Bill Cooper, Vice President of Employee & Public Relations, and Mr. Marion McDearmon, a member of B shift, as well as discussions with several other members of the B shift; a phone interview with Mr. Ron Waters, OCC plant superintendent; and organizational documentation, including the VFC 1990 Annual Report. This case description was reviewed by Stew Thomas and Ron Waters.

4.2 Background of Organization

4.2.1 General Information and History of Organization

In 1973, Robert Macauley, VFC's founder and Chairman, joined with Charles Chandler, the current VFC president, to create an independent mill producing semi-chemical corrugating medium. Macauley's vision was to begin a company with the following characteristics: a state-of-the-art facility; a union-free environment, "unencumbered by traditional labor relations attitudes" (Coleman, 1990); no specific job descriptions; staffed leanly; where everyone shared equally in the performance of the company; and where the company is a "partnership enterprise" between all stakeholders - managers, production employees, and customers.

The mill began operations in August 1975 on a 1200 acre site on the James River near Riverville, Virginia, with an average daily rate of 450 tons per day. The mill has grown to

270 employees, 120 of which are operating employees, and the rest are support staff, maintenance, and management. VFC competes against any organization which makes corrugated medium, including companies like Weyerhauser and International Papers. VFC ranks eighth among U.S. producers of corrugating medium and is the largest independent producer in the world. Markets served include the Northeast, Southeast and the Midwest, as well as some international markets via nearby East Coast ports. VFC's mission and vision for the future are shown in Table 4.1. According to one employee, compared to its competitors, VFC is a "new kid on the block" because the company has not been around very long.

The mill has been continuously upgraded and expanded since 1975 and now averages 725 tons per day. VFC is currently in the midst of a modernization and expansion project in excess of $100 million to expand the capacity of the mill to 1,100 tons per day. The first phase was to install the OCC plant which allows VFC to "utilize the more abundant source of recycled fiber" (Coleman, 1990). The OCC plant is the focus of this case description because of the self-managing teams operating it. Additional improvements are being made to the mill through action teams addressing specific improvement projects to implement state-of-the-art technology.

As a member of the surrounding (and world) community, VFC is committed to sharing its success with those in need. The company's success since its beginning has enabled Macauley to form AmeriCares, a worldwide relief organization that provides food, medicines, and other aid to the world's poorest countries. Beginning in 1988, VFC pledged to give ten percent of pre-tax profits to charity each year. Ninety percent of the charitable contribution goes to benefit AmeriCares and ten percent goes to worthy causes in Central Virginia.

4.2.2 About Organized Labor

The workforce at VFC is not unionized, so this section is not relevant. Mr. Ron Waters, OCC superintendent, likes the union-free environment as compared to two other union mills he has worked in. The "friction among management and hourly ranks" typically seen in a union environment does not exist.

Table 4.1. **Mission and Vision of Virginia Fibre Corporation**

Mission

To position Virginia Fiber Corporation as the most desired supplier of semi-chemical corrugating medium in the containerboard industry.

Vision - Year 2000

We intend to be an industry leader that:

1. Continually improves product quality and customer service to anticipate and to meet the ever-changing needs of the market.
2. Continues to improve and modernize plant, equipment and facilities.
3. Pursues growth opportunities for itself and for its employees.
4. Employs a process of strategic planning that provides an opportunity for every employee to participate in the ongoing improvement of individual and company performance.
5. Provides training that meets the needs of the company and its employees.
6. Provides financial security for its employees both during and after their work years.
7. Abides by its guiding principles, the "Principles of the Partnership," in conducting its internal and external business.

4.2.3. Organization Structure

4.2.3.1. Formal Organizational Structure

There are five vice presidents under the company president, Charles Chandler. They are Vice President of Employee and Public Relations, which includes Employee Relations, Public Relations, Safety and Training; Vice President of Finance and Treasurer, which includes the controller functions, data processing and the woodlands; Vice President of Mill Operations, which includes all the production departments; an Executive Vice President of Sales, which includes sales, marketing, and sales service; and a Vice President of Marketing, reporting to the Executive Vice President of Sales. The production departments are: paper machine, transportation and shipping, and pulp & power (includes the OCC plant). The V.P. of Mill Operations, Stew Thomas, also has environmental, engineering, maintenance, and purchasing.

Charles Chandler views his job quite differently than many company presidents. He looks at the organization as upside-down, with himself and other management there to support production employees. The president is "at the bottom, and up at the top you have a broad base of individuals that are out there in the trenches making the decisions...I don't want to get in their way; I just want to support them" and provide "the capital, so to speak for them to get the job done" (Coleman, 1990).

4.2.3.2. Infrastructure to Support Improvement

The infrastructure of VFC consists primarily of action teams working on specific focused projects which may be part of the mill expansion project or may be part of other improvement efforts. The action teams are cross-functional in nature, and are comprised of production and maintenance, employees, supervisors, and engineers working together to solve a problem or address an issue. These focused action teams are created for the purpose of improving the organization.

In the next few years, Chandler envisions having everyone in the company regarding performance improvement as part of their regular job responsibilities. Right now, there are many people involved in improvement (through action teams mentioned above) but not everybody. Over the next couple of years, "working on an action team will be a routine part of everyone's job...that's where we're headed" (Coleman, 1990).

4.2.4. Organization Communications

4.2.4.1. Nature of Organizational Communication

One of the secrets of VFC's success, according to Chandler is that "there *are* no secrets in this company...anything that anybody wants to know that is not already published they can ask and get an answer" (Coleman, 1990). VFC is committed to sharing information and has been since they started; sharing information and answering questions "have always been the rule." They have always shared financial information and wanted employees to know "the way it is" and that there are not two "sets of books," according to Bill Cooper.

The way information is disseminated is through a Weekly Operations Report. Someone in each department writes a summary of the previous week's operations, including activities, problems, a production report, safety issues, etc. These summaries are published in the weekly operations report sent to all departments and posted on bulletin boards so "every employee has the opportunity to read the reports and stay up to date on what's taking place in our world." Additionally, all employees can access anything on the computer system. Any question they have, they can look up in the system. If they can't find it there, they can ask any supervisor or manager, even the president. Because of the wealth of information available to all employees, the rumor mill is not a source of accurate information. In an information-rich environment (a deluge according to some) like at VFC, people do not have to resort to the rumor mill to find out what's going on in the company. According to Waters who has worked at two other mills, VFC is very open and is "the best one as far as sharing information with hourly people."

4.2.4.2. Organization-wide Information Sharing Meetings

VFC has semi-annual "Communications" meetings in September and March with all employees to keep them informed on how the company is performing and what is coming up in the future. The meetings used to be quarterly, but were cut back to twice a year because people thought they happened too often. There are several meetings each time so all employees can attend (VFC employees work rotating twelve hour shifts). There is a typical agenda for each meeting:

1. Comments from Charles Chandler - perception of overall business climate, update on the strategic planning process, and any other relevant topics
2. Sales/Marketing Report - VFC's marketplace, strength of customer orders, pricing situation, new and lost opportunities

3. Financial Report - review of financial performance of the company
4. Operations Report by Stew Thomas - review of the status of operations at VFC and relevant production information
5. Miscellaneous - announcement of major maintenance shut down for the summer, safety, training, and/or environmental issues
6. Questions/Concerns - management tries to address any questions or concerns employees have; if the answer is not immediately available, a group or individual is assigned to look into the question

One of the semi-annual meetings is referred to as an annual address to all employees. It is held in September, at the end of the fiscal year. At the September annual address, Chandler goes into much more detail about financial results, the annual pay raise is announced, and many other things are discussed. The VFC Annual Report is a summary of the annual address. The Annual Report is a comprehensive, detailed compilation of how VFC performed on many dimensions the previous year. The major sections of the report are: *Strategic Planning* (review of Tactical Objectives); *Performance* (significant accomplishments, net income, return on assets, cost comparison to other mills, daily production and lost time, monthly average production, and paper machine lost time); *The Market* (net selling price); *Safety* (safety performance, accidents broken down by category); *Attendance* (percent absenteeism and associated cost, employees with perfect attendance); *Wages* (cost of pay and benefits, typical earnings, comparison to other mills); *Benefits* (medical benefits and comparison to other mills, incentive plan performance); *Training*; *Charitable Contributions*; *Guiding Principles* (mission, vision, and principles of the partnership) and *Service Anniversaries.*

This Annual Report is an extraordinary source of information to employees on every aspect of the company's performance. The report demonstrates VFC's commitment to getting information to everyone.

4.2.5. Culture

One of the key elements that Macauley envisioned for VFC was to create a culture where everyone would feel equal and where employees would feel no need for a union. All employees have the same benefits package and are under the same incentive plan. The culture is characterized by teamwork and everyone working toward a common goal. According to Chandler, "we wanted a culture to be one where we'd say 'help your fellow workers whether it's your job or not, or part of your responsibility'" (Coleman, 1990). Words used to describe the atmosphere in the mill are kinship and fraternalism, with no intimidation by top management, as in other mills. It is not uncommon to see Chandler or Thomas out in the mill, going around and talking to people.

When the mill was first started up, management knew they wanted it to be different and be more like a partnership than a traditional organization. To guide the actions and behaviors of all employees, management developed the "principles of the partnership," shown in Table 4.2. These are the guiding principles for VFC. Chandler believes that without the culture and principles of the partnership that have been developed, implementing strategic planning would not work as smoothly as it has. The culture has also laid a strong foundation for the introduction of self-managing teams. Many of the elements necessary for successful teams are already present throughout VFC and have been for some time.

4.2.6. Past and Present Improvement Initiatives

The mechanism used by VFC to plan for and implement improvement initiatives is the VPC's strategic planning process. VFC began formal planning efforts using this process in 1988 and is now in the third cycle. Tactical objectives are identified and are implemented using cross-functional action teams. One improvement initiative very large in scope which was developed through strategic planning is a mill modernization program to modernize and expand the capabilities of each department. Each department has production employees, maintenance, and engineers from the area involved in action teams to address modernization.

One of the tactical objectives identified this year was to decide how to deploy the planning process throughout VFC. In other words, the objective is to determine the best way for each of the departments to go through the planning process and identify their own set of goals and objectives, which all tie into and move VFC toward the common vision. By disseminating the process throughout the organization, more and more employees will be involved in strategic planning and how to improve the company.

Another improvement initiative which VFC may undertake in the near future is Statistical Process Control (SPC). Thomas believes the OCC plant in particular is conducive to SPC. Another issue currently being addressed is getting all forty first-line supervisors in the mill to apply the company policy consistently. All the supervisors meet

Table 4.2. VFC Principles of the Partnership

Principles of the Partnership

Virginia Fibre regards itself as a partnership enterprise which offers it members opportunity, incentive, recognition and security. With this in mind, corporation guidelines, entitled "Principles of the Partnership", have been established to express how this Partnership should function, and how its members should act.

The Partnership is committed to:

- Promote the dignity and worth of each member of the Partnership.
- Provide competent leadership which instills confidence in the members.
- Encourage the members to maximize their potential by providing the opportunities, training, and rewards for so doing.
- Promote from within based upon experience and performance whenever possible.
- Provide a fair and equitable compensation package which includes benefits that provide financial security for all members.
- Operate the mill in a safe and environmentally responsible manner, protective of employees and of the community.
- Encourage open communication and active participation of members to improve the enterprise and minimize conflicts.
- Develop and implement an ongoing planning process that ensures the Partnership maintains a competitive position in the marketplace.
- Produce a product of high quality and performance which continually meets the changing needs of our customers and which is backed by the best service and reliability in the containerboard industry.
- Provide equal employment opportunity, without regard to race, color, sex, national origin, or age.

together every five weeks with Thomas to discuss problems and concerns. One common problem among employees was having one supervisor tell them to do something one way and another tell them to do it differently.

4.2.7. External Organizational Environment

The past year for VFC was one of declining price for corrugated medium, which affected the company's profits and plans for modernization (VFC 1990 Annual Report). Because of the economy and increased containerboard capacity, prices are expected to continue to decrease throughout 1991. However, unlike many of its competitors, VFC is better postured to withstand lower prices and lower profits, because the company is debt-free. Many VFC competitors have incurred a great deal of debt throughout the last decade to expand and modernize.

VFC not only faces a market with declining prices, but also a market whose customers are more and more demanding. Customers demand "maximum container performance." VFC is learning to participate in a world economy and facing "tremendous competition from other countries" (Coleman, 1990). According to Chandler, VFC's key to successfully dealing with their external environment is the use of their participative strategic planning process. The process has enabled them to be prepared for declining prices. Some objectives became necessary because of the business environment and were identified and are being worked on because of the planning process. The process enables VFC to utilize the potential of employees' creativity and ideas for improvement. Management realizes they cannot operate with everything "coming from the top" to succeed in a global environment.

4.2.8. Performance of the Organization

VFC publishes an Annual Report every year (mentioned in an earlier section) which provides details on the company's financial performance over the past fiscal year, as well as performance on other dimensions, such as safety, accomplishing objectives from the planning process, social responsibility, absenteeism, etc. The report is a comprehensive look at total performance of the company. The report also compares VFC along certain dimensions to competitors. VFC ranks second among six other mills in hourly labor cost, fourth in man hours per ton produced, and sixth on labor cost per ton produced. On many other performance dimensions, VFC performance is compared to its own past performance and in general, significant improvement is evident.

4.2.9. Sharing Successes

I collected no specific information on whether VFC regularly receives visitors interested in the self-managing teams at the OCC plant or in the company in general. However, everyone I met during my visit was very willing to spend time to talk with me and share what they have learned.

4.3 Self-Managing Teams

4.3.1. Evolution of Self-Managing Teams

At a business meeting, the mill president heard about the self-managing team concept and decided to explore the concept for VFC. Dick Ward, Operations Manager over the OCC plant and Waters, OCC plant superintendent, visited a mill in Monticello, Mississippi using self-managing teams to see what it was like. Based on what they learned, they decided to try self-managing teams in the OCC plant, which had not yet been built. The OCC plant was considered a good area for teams since it was new and somewhat stand-alone by being in a different building.

The eight people on the two teams came together in October of 1989. They were selected based on a series of skills tests (see Selection and Placement). From October through December, team members went through a training period to learn how to operate the OCC plant. During this time period, all eight team members and Waters also visited another OCC plant in South Carolina. This plant did not use self-managing teams. They also visited a local recycling center so people could see what happens to the recycled materials before VFC gets them. More is discussed on this training period in Training and Skill Development.

The plant started up in December 1989, and according to Dick Ward, it was a very smooth start-up. The two teams have been working together since that time. There has been one person who has left to enter a maintenance program, and he has been replaced with a new team member.

Although the OCC plant was VFC's first experience with self-managing teams, the company has had some participative initiatives in the past to involve employees, such as moving to twelve hour shifts. That was decided by employees. In addition, the strategic planning process is a participative one and allows employees the opportunity to become involved in problem-solving and decision-making. Management would like an even greater extent of involvement in the coming years.

4.3.2. Team Structure

The OCC plant runs on one twelve hour shift per day, seven days a week, so two teams are necessary to cover seven days a week. Teams work either three or four shifts in a week (it varies from one week to another). The plant at capacity (operating twenty-four hours a day) can produce 500 tons per day of pulp to feed the paper machine, however, since the plant runs on the average about ten hours a day, production is about 200-250 tons per day. The main suppliers to the OCC plant are external to VFC. Recycled boxes in the form of bales, come on trucks and rail throughout the day and night. The OCC plant's customer is the paper machine in the mill. All of the OCC plant's pulp produced goes to the paper machine. Other operations also feed the paper machine. The woodyard feeds the pulp mill, which in turn also feeds the paper machine. The OCC plant accounts for approximately 30% of the pulp going into the paper machine.

Everyone on a team has the same job classification and can perform all the team's tasks. There are a total of four members on each of the two teams. Three of the team members work days from 6:30 a.m. to 6:30 p.m., while one team member works overnight to do preventive maintenance, lubrication, unload trucks that come in overnight, inventory control, and fire watch. The job of working nights is rotated among the four team members. The three team members working days rotate working the following jobs: control room, out on the floor, and feeding bales. The three team members working days rotate performing these jobs about every three to four hours.

The person in the control room continuously monitors how each piece of equipment and each process in the plant is performing. In addition to the computer terminal tied in to VFC's computer system, there is another computer to control the equipment in the OCC plant. The two systems are not linked. The person in the control room monitors the processes, makes sure no problems happen (sometimes the equipment that re-pulps the bales gets something stuck in it), and checks the process parameters to make sure they are set where they should be. If something isn't quite right, they make adjustments to the parameters. According to Marion McDearmon on B shift, they don't have to adjust parameters very often. When they do, "everybody does it differently" since they are still learning about the processes through trial and error. If one adjustment doesn't seem to work, they try something different. This job is the most difficult on the team and requires the most judgement to be used. In the other OCC plant the team visited, this job received the most pay.

The person in the control room has a few other responsibilities besides monitoring processes and making necessary adjustments. When a load of bales come in, the person unloading them fills out a quality sheet on the load. Any defects with the bales, the amount of material in the load, etc., are recorded on the sheet. The person in the control room has to enter the information from all the sheets for that day into the VFC computer system. This information is kept to manage suppliers. If one supplier continues to ship bales that are defective, they will receive a letter asking them to address the problem(s). One more responsibility the person in the control room has is to enter in the VFC computer system what all the process parameters in the OCC plant were set at that day. This keeps an on-going record of equipment performance every day. This record is particularly important since the teams are still learning what is the optimum set point for process parameters. If they wanted to go back and look up what something was set at a month ago, the information is there.

The person working out on the floor has to constantly "make rounds," and perform a visual check on each piece of equipment to make sure everything is operating as it should. The person feeding bales unloads the bales as they come in on trucks and places them on a conveyor to take them up to the first operation. This person also fills out the quality sheets mentioned earlier. Sometimes it is necessary to have two people feeding bales if a big load comes in. In that case, the person in the control room covers both the controls and makes rounds on the floor and the other two team members feed bales. Both McDearmon and Waters believed that the teams may need another person each. As it is, they are "stretched pretty thin" and are not able to pay attention to things like housekeeping as close as they would like.

According to McDearmon, some people do certain jobs better than others, because of their background at VFC. For example, one team member is best at mechanical tasks, so he is the "expert" when minor mechanical problems come up. Another person knows the most about operating the control room. Even though some team members know more than others on certain tasks, they still rotate the jobs several times a day, so the team is flexible.

If one team member is out sick or on vacation, the team uses someone from the VFC "extra board," as a labor pool. The extra board has about eighteen people who substitute for vacancies either on a daily or weekly basis. When a team member is out, the team will use someone from the extra board usually to feed bales, since it is the least skilled job in the team. Then the other two will cover the floor and the control room. The day I visited

VFC, the superintendent, Ron Waters was on vacation, so Marion McDearmon was covering for his job, and someone from the extra board was feeding bales.

The team has no set goals each day as far as tons produced. However, they do have one goal, which is really more of a minimum requirement. The "high density storage chest" is the last operation in the OCC plant, and is what the paper machine "pulls from." The team must have the high density storage chest filled up to 45% before they leave for the night, so the paper machine has enough material to last throughout the night. If some problem happens during the day and the OCC plant is shut down (thus losing time to fill up the head chest), the team must stay overtime to get the storage chest filled to 45%.

Some day, the OCC plant will go to a twenty-four hour a day operation. When it does, two more teams will have to be added. Another possible change for the future is to eventually phase out the superintendent. If that happens, it is another reason why teams may need one additional person so they can perform the administrative functions Waters currently does.

4.3.2.1. Coordinator Roles

Teams do not have coordinator roles, so this section is not relevant. Responsibilities performed by coordinators on self-managing teams are built into the four basic jobs of the teams. For example, the person feeding bales fills out quality sheets on the incoming bales. The person working nights does inventory control and performs preventive maintenance.

4.3.2.2. Internal Team Leadership

Teams have no designated internal team leader or facilitator, as some other self-managing teams do. However, according to Thomas, there is one team member who is a "natural leader" to whom team members may "defer important decisions because of his expertise." And as mentioned earlier, some team members know more about certain things than others, and emerge as leaders in those situations where their expertise is needed.

4.3.2.3. Liaison With Support Departments in Organization

The support department with which the OCC plant teams interact most frequently is maintenance. According to McDearmon, they have maintenance people in the OCC plant about once a day. That doesn't necessarily mean there is a maintenance problem every day, but the mechanics may be in there just to check to see how things are going. If the plant has to be shut down, team members help mechanics do their work to help them get the equipment back up and running. This gives the teams even more training on specific equipment.

Another support department teams interact with is engineering. During start-up, there was a lot of interaction and communication with engineering to get the plant started up and to program the computer terminal. Now, teams only call engineering in if there are problems. Engineering does not come in to the plant to change things very often. They do, however, ask team members fairly often for their input on what changes they think should be made. According to Waters, employees have a lot of good suggestions and ideas for how to improve operations, and the majority of the changes made have come from their ideas.

4.3.3. Role of Leadership/Supervisor

There is one superintendent, Ron Waters, over both teams in the OCC plant, and he works daylight hours during the week, so when a team works on the weekend, they "supervise themselves." The kinds of thing the superintendent is responsible for is paperwork, keeping track of information on equipment, ordering spare parts, giving tours, filling out work orders, and submitting summaries for the Weekly Operations Report. If there is a personnel problem, Waters prefers that the teams work it out themselves, but he acts as referee if necessary. Another role Waters sees himself as responsible for is to bring back any information he believes the teams need to do their jobs so they "can make the best decisions they can." According to Thomas, the role of the superintendent is "long-range planning and coordination with maintenance." Team members believe the difference between working in the OCC plant and other areas in VFC is there is "no one breathing down your neck wondering what you're doing or where you are." When asked whether the differences were attributed to the structure of the self-managing teams in the OCC plant or to Waters' personal management style, a team member responded that "it's the way Ron is."

Waters says he plays a more active role in the OCC plant at VFC than the superintendent did in the plant using self-managing teams in Mississippi, because he handles some of the administrative functions that teams do in other organizations. He believes, however, that "these fellows could do that, but [it would be]....tougher for these fellows to handle that type of paperwork swinging shifts."

When Waters is not present in the building (which is about one third of the time), teams supervise themselves and the day to day operation. As times goes on, Waters spends less and less time in the OCC plant. He is involved in helping out with several action teams in other areas of VFC. Having been a supervisor in pulp and power, he can contribute expertise to teams working on modernization in other areas. Eventually, the superintendent may be phased out and the teams may be responsible for handling all the paperwork and administrative functions associated with the OCC plant.

4.3.4. Performance of Teams

The performance of the two teams is not really measured objectively. Their performance is more subjectively assessed by Waters and by upper management. So far, management "has been very well pleased" with the teams. Since the teams do a lot of their own maintenance (preventive maintenance and minor maintenance), it "cuts down on down time in the plant and increases production," according to Waters. He also believes the OCC plant is a "more efficient operation" because people "have knowledge of every job." One area of performance which Thomas was particularly complimentary of, was the job the teams have done in keeping the plant clean and taking care of the equipment.

Teams receive feedback on their performance when they find out if the paper machine has gone down. They don't always know whether it is from material from the OCC plant or the pulp mill, but as far as the paper machine is concerned, "no news is good news." Waters also gives the teams positive feedback when they have done a particularly good job. Other managers throughout VFC occasionally send written praise to the teams when they have done an exceptional job to keep the paper machine running.

4.3.5. Decisions and Responsibilities of Team

The teams are generally responsible for the day to day operation of the OCC plant. Some of the specific decisions and responsibilities they have are:

- scheduling work and the rotation of jobs on the team
- keep their own time cards (rest of employees in VFC don't do this)
- entering quality information on incoming bales
- monitoring and adjusting process parameters
- perform most (70-80%) of minor maintenance
- shut down the plant if necessary

- call in maintenance if necessary to fix a problem
- decide whether to work overtime (if the OCC plant has to be shut down, it "pretty much dictates" working overtime)
- receive information on shipments coming in
- decide to bring in someone from the labor pool if necessary
- manage inventory
- order things, up to a certain point
- determine and address training needs
- cover for the superintendent if he is out
- respond to questions from managers/superintendents from other parts of VFC
- talk to outside people about the plant who call with technical questions
- try new things, provide ideas to engineering for changes, new process parameters
- informally evaluate new team member

One thing teams are not responsible for is scheduling vacation, which is something that needs Waters' signature because of company policy. However, to a certain extent, they check their schedules and informally do it, then just get Waters to sign off on it. They also need approval for big purchases; a big purchase would even have to go above Waters. They do not use a formal process for disciplining team members if one person is not putting forth a fair contribution to the team, but peer pressure is used instead.

The day I visited the plant, there was a problem which required the team to shut down the OCC plant and call in maintenance. The superintendent was out that day and one team member was covering his job, and said that if "Ron had been there, he would have left the decision to shut down to us." When asked if anyone in the mill pressured them when they shut down operations, team members responded no, because others know that it only means overtime and more work for teams if they do shut down.

In general, VFC is trying to foster a participative environment throughout the company, and not just in the OCC plant. There have been some participative initiatives in the past (such as moving to twelve hour shifts, decided by employees), and with the participative strategic planning process, even more employees will have opportunities for increased decision-making responsibility.

4.3.6. Team Meetings

The teams do not have any formal meetings each day to start off the shift. However, they get together informally to discuss anything if necessary, before they begin the shift. Waters usually comes in early to talk to the man coming off nights to find out if there's anything to report. Waters believes that having team meetings may be "one area we should do" in the future. Team members do attend safety meetings which are held for each department.

Waters attends an 8:15 meeting every morning for all VFC department managers to review the previous day's operations, problem areas, and what the plans are for the upcoming day. There are also weekly operations meetings on Friday mornings, conducted by Thomas. Information from these meetings is disseminated through the Weekly Operations Report.

4.3.7. Team Facilities

There is no team meeting room for the OCC plant, which they don't really need anyway, because they don't have formal team meetings. When an informal meeting is needed, the teams use the control room. The control has a bulletin board where relevant company information is posted. The OCC plant procedures manual is also kept there.

4.3.8. Selection and Placement Process

The process used to select the initial eight team members is the same process used to select a new team member when one person left the OCC plant. Anyone in the company could bid for the available positions in the OCC plant and everyone who signed up took a series of skills test. Their mechanical abilities, basic math, and ability to read charts and graphs were tested. There was a series of six or seven tests. From everyone who passed the test, seniority was used as a basis to select the initial eight team members. The new team member who replaced a person entering a maintenance program took the same skills test everyone else did. New team members work for six months in a training period Other team members informally evaluate the new team member and let Waters know when he is ready to do the job. The evaluation by other team members is the "determining factor when that man is ready."

4.3.9. Rewards and Recognition

All production employees at VFC, including team members in the OCC plant, are paid on wages, while management and administrative staff are salaried. Everyone receives the same benefits and medical package. The philosophy for the benefits package is that it should protect employees and their families from major peril. VFC has the "best medical plan in Central Virginia" - the VFC benefits are compared to other mills in the Annual Report and it is clear that VFC provides the most protection to its employees.

Because all team members in the OCC plant perform the same job responsibilities, no one receives higher pay because of the job they do.

4.3.9.1. Pay for Skills System

Team members are not on a pay for skills compensation system, so this section is not relevant.

4.3.9.2. Other Reward Sharing

Everyone at VFC is on the same incentive program. Everyone receives a base pay, and an incentive is paid in addition to that based on the number of tons produced for the entire mill. A certain number of tons produced is set as an average base, and for every ten ton increment above that base, everybody receives an incentive bonus of one percent of their paycheck. So if VFC exceeded the daily average base by ten tons for the month, everyone gets a one percent bonus that month. The bonus is calculated each month, although the tons produced are measured and posted on a daily basis. The company has been averaging between fifteen to seventeen percent incentive bonus and has had up to twenty-one percent bonuses for several months in a row. Everybody participates in the incentive bonus program from the chairman to the most recently hired employee.

The reason this measure was selected as the basis of the incentive plan was to keep the calculations simple, so that everyone could easily understand where their bonus was coming from. Everything in the company revolves around the production of paper, and everyone can understand how the incentive plan works and they "believe in the formula that's used to determine their incentive pay" (Coleman, 1990). A production scoreboard is placed right where everybody walks by when they come in to work. The previous day's production is posted every morning, along with the month-to-date average so people can get an indication of what their incentive pay will be that month, particularly near the end of the month.

4.3.10. Peer Evaluation and Feedback

There is no formal peer evaluation process the teams use to give each other developmental feedback. According to Waters, teams do not evaluate or discipline each other, other than using "peer pressure" on someone who is not contributing their fair share to the team. One team, however, did informally evaluate a new team member to determine when they were ready to do the job.

4.3.11. Training and Skill Development

When the team members were initially put together as teams, they spent from late October to December (about seven or eight weeks) in a training period to prepare to operate the plant. The training they received was all technical training. They did not receive any interpersonal skills training, or group process training, such as problem-solving, communications skills, etc. The technical training had several elements:

- eight team members and Ron Waters visited another recycle plant operation in South Carolina so people "would have a feel for what they'd be doing"
- teams also visited a local recycling center to "get an idea of how the material was handled and baled before it was sent to VFC"
- classroom training from the equipment vendor; seminars on each different part of the plant, how to run the equipment, and how to shut down and start up the plant
- other vendor training on the computer equipment

There was also a great deal of self-training. Each team member had a flow diagram of the OCC plant and had to go through the entire flow and learn where every valve and pipe was located. They flushed the lines in the plant and ran it with water to teach themselves how to operate it. Each team member also has an operating training manual. A mill in Alabama using the same equipment sent them their training manuals, which they used to help them write their own manuals.

As far as ongoing training, team members receive additional training on specific pieces of equipment when they help maintenance get the equipment back up and running.

4.3.12. Information System

4.3.12.1. Information Teams Receive

Table 4.3 contains details on what information teams receive, how the information is received, how often, and who provides it. The types of information teams receive are:

- Feedback on team performance
- Feedback on team production information
- Team issues
- Technical information
- Internal customer feedback
- Performance of other team
- VFC issues
- VFC performance

The *feedback on performance* teams receive is subjective in nature and not on a regular basis. Waters verbally praises them when they have done a good job on something, and other managers in VFC write memos praising the teams' efforts.

Production information comes from three basic sources. The first is a log book which the teams use to record any problems they had with the equipment and what they did to solve it, any changes or new information they need to know from the other team. The information in the log book then, comes from the other team in the OCC plant. Teams can also get production information they need from the computer monitoring the OCC equipment. This computer is not tied into the VFC computer system. From the displays, the person working in the control room can pull up any of the process parameters and adjust them if necessary. The computer also shows a visual display of some of the equipment, so team members make sure everything is running as it should. Production information may also come from the VFC computer system. There are almost twenty different screens available on the computer system. Each department tailors their screens to the department's unique information needs. The OCC plant, for example, has screens for entering and storing the quality information on each load of bales that comes in. Teams can also pull up how much material the paper machine is pulling from them so they can keep up with it.

Whenever the need arises, a team will meet informally in the control room to talk about *team issues* - any problems that have occurred, or concerns about potential problems.

These meetings are not formal nor are they held regularly. The day I visited VFC, some of the equipment had some problems, and the entire team stopped production and met together in the control room along with several people from maintenance. They decided to shut down the OCC plant until maintenance could fix the problem.

Whenever the teams need *technical information* to assist with equipment problems, they call on engineering to answer their questions. They call engineering if they have a question or they don't know how to do something. Engineering worked more closely with the teams during start-up because they were still learning how to operate the plant. Teams receive *internal customer feedback* from the paper machine only when there is a problem. According to Waters, "no news is good news." The bottom line for the OCC plant is to keep the paper machine running.

Teams find out about *company issues* and the *performance of the company* from several sources. First, the superintendent brings back any information he feels is relevant for the teams. The Daily Operations Report contains primarily production performance for the previous day rather than VFC issues (as the Weekly Operations Report does). In the daily report, there is about a page on each department, with measures such as lost time, tons per hour (for the paper machine), a safety scoreboard, a sales report (orders received), shipments made to customers, etc. There are also comments for each department, such as "good run." On a daily basis, everyone in the company can see how VFC performed the previous day because the tons produced is posted where everyone can see it coming in for the morning.

The Weekly Operations Report emphasizes company issues more than strictly production performance. There is a section on each department (written by department managers) which contains information on activities in the department, status of improvement projects, engineering and environmental projects, training scheduled, etc. A company newsletter put out by Human Resources every other month also contains issues such as human interest stories and other employee relations information.

The semi-annual Communications meeting described earlier are a major source of information on the comprehensive performance of the company and any company issues, such as the annual pay raise and benefits information. The meetings are a chance for top management to share information with employees and to address any questions or concerns they might have. The September meeting at the end of the fiscal year provides more detailed information on the financial performance of VFC. The Annual Report is a written version of the information shared at the annual address.

Table 4.3. Information Inputs Provided to Virginia Fibre Self-Directed Teams

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Feedback on team performance	Informal one on one praise/recognition when the team has done a good job	As needed	Supervisor
	Written memos to praise teams when they have performed well to keep the paper machine running	As needed	Other VFC managers, top management
Feedback on team production information (problems from other shift, changes, etc.)	Log book filled out by other team provides any information the team needs	Daily	Other team
	Team members use the computer displays (on the computer for just the OCC plant equipment) to monitor process parameters and make necessary adjustments; they also use the computer for visual checks on some equipment	As needed; can be every few minutes	Computer for the OCC mill (not the VFC computer system)
	Team members can use the VFC computer system to get production information they need, such as how much material the paper machine (internal customer) has "pulled" from them the last hour; incoming bale shipments from rail and truck; safety information on how to dispose of chemicals	As needed; can be as frequently as every hour	People operating paper machine update the VFC computer system on what they pull from the OCC on an hourly basis

Table 4.3. Information Inputs Provided to Virginia Fibre Self-Directed Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Team Issues (problems, concerns, changes in procedures, other new information)	Each team informally meets together as a team as needed in the control room to solve equipment problems, decide who will work where, get relevant information from supervisor, etc.	As needed	Supervisor, other team members
Technical Product/Process Information	Engineering lets teams know if there any changes in operating procedures	Infrequently	Engineering
	Operations Manual is a source of information for operations procedures; each team member has a manual	Manuals are used as needed	Equipment manufacturer
Internal Customer Feedback (problems, complaints, defects)	Teams are notified if there is a problem with the paper machine which they might have caused	As needed	Paper machine process
Performance of Other Team	Subjective assessment of other team's performance through information in log book	Daily	Other team
Company Issues (procedural changes, activities, improvement efforts, concerns, social information)	Supervisor brings back information to teams as needed	As needed	Supervisor
	VFC Newsletter including "human interest stories, new things going on in the mill, purchase of major piece of equipment, a major shutdown"	About every two months	Human Resources (Bill Cooper)

Table 4.3. Information Inputs Provided to Virginia Fibre Self-Directed Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Company Issues (cont'd)	Weekly Operations Report ("major source of information") sent to all departments; employees call it a "newsletter"; includes a report from each department; includes problems in the mill, activities, status of improvement projects, status of engineering and environmental projects, visitors, production forecast for upcoming month, employee relations information, and training scheduled.	Weekly	Each department submits a weekly summary of operations
	Communications Meeting held for all employees; the agenda is: comments from the president, sales/marketing report, financial report, operations report, miscellaneous issues, and questions/concerns.	Semi-annually, in March and September	Top management (President and Vice-Presidents)
	VFC Annual Report; this report is a summary of the September annual address; includes information on strategic planning efforts, accomplishments, benefits plan, pay issues	Annually; report usually is published in December	Top management

Table 4.3. Information Inputs Provided to Virginia Fibre Self-Directed Teams (cont'd)

Information Inputs to Teams	How Information is Provided	Frequency	Provider of Information
Performance of VFC (includes other departments and VFC overall)	Daily Operations Report is sent to all departments and posted on all bulletin boards; report includes specific measures for each department, some are common to various departments (such as lost time) and others are unique to some departments (such as machine speed, porosity, and moisture for the paper machine); includes a "safety scoreboard" with accidents, injuries.	Daily	Each department contributes to report by entering information into VFC computer system
	The tons produced the previous day and month-to-date daily average is posted every day on huge bulletin boards for employees to see as they walk into work	Daily	The computer calculates tons produced
	Weekly Operations Report; contains some performance information such as customer complaints, defects, safety report (accidents, injuries)	Weekly	Each department writes a weekly summary of operations
	Communications Meeting	Semi-annually, in March and September	Top management (President and Vice-Presidents)
	VFC Annual Report	Annually; report usually is published in December	Top management

4.3.12.2. Information Teams Provide

Teams are responsible for providing several types of information to other groups or individuals in VFC (see Table 4.4 for details):

- Team issues
- Team performance
- Requests for information
- Suggestions for improvement
- Requests for approval
- Responses to questions

Any relevant *team issues, production information,* and information on the *team performance* for the shift is passed along in several ways. First, each team enters any production problems they had and what they did, anything that is new or changed, or any other information which the other shift team needs to know in a log book each day. General production information is also entered daily into the VFC computer system, for example, what the process parameters were set at for that shift, quality information, and qualitative information on how the shift went. The OCC plant also submits a weekly report of operations (which includes the type of information just listed in addition to status updates on projects and other general activities). It is usually written by Waters. This report becomes part of the Weekly Operations Report distributed to all departments and posted on bulletin boards. The Weekly Operations Report is almost more of a newsletter than just a production report (see Table 4.3 for more details).

Any *requests for information* teams have to assist with technical problems are directed to engineering or maintenance. During start-up, engineering worked closely with the teams to iron out problems, but now there is less need for their technical assistance. They call maintenance when something has broken down or isn't operating as it should. They sometimes help the mechanic(s) fix the equipment and in this way, learn even more. Team members direct any questions for general information to the superintendent, or any other VFC manager. Teams provide *suggestions for improvement* to engineering periodically. Since the plant is still relatively new, teams are constantly coming up with ideas to make things run better. As mentioned earlier, most of the changes made have been their ideas. For any large purchases for supplies or parts, teams *request approval*. Depending on how big the purchase is, the request may have to go to top management, instead of just the superintendent.

Responses to questions from other managers in VFC are usually given informally over the phone. The questions may have to do with production on a previous day or month, and the teams try to look up the information and respond to the request as best they can. They also receive questions about the OCC plant from people outside VFC. They call in with questions about how the plant operates, about the recycled materials, etc. Any team member is capable of answering these questions, according to Waters. At many other mills, only a few team members might be able to answer them.

4.3.12.3. Influence Over Information Received

If a team member needs some information they don't have, they have several options, all of which will result in getting the information they need. If it is not already published in a report somewhere (weekly operations report or the Annual Report), they can look in the computer system and access anything they want. If it's not in the computer, they can ask their superintendent, or any member of management, including Stew Thomas, Bill Cooper, or even Charles Chandler to get their question answered.

4.3.13. Intergroup Relations

4.3.13.1. Communication, Information Sharing, Interaction Among Teams

This section refers to the communication and information sharing between the two self-managing teams in the OCC plant. Because the two teams work different days (they don't 'hand-off' to each other in changing shifts), there is very little opportunity to talk with anyone on the other team. However, the teams do keep a log book mentioned earlier. Every day, the team writes any relevant production information in the log book.

4.3.13.2. Perception of Teams Within Organization

The perception of the teams in the OCC plant by management has been very positive; management has "been very well pleased with it," according to Waters. Waters also views the teams positively. He feels the team members are "so versatile....with their time, they just get so much more done." The teams have a good relationship with other departments as well. Initially, there was apparently some resentment and "hard feelings" toward the OCC plant, having something to do with start-up issues and creating some problems for others in VFC. However, these hard feelings are no longer there. The teams work very closely with the people operating the paper machine because they are an internal supplier to the paper machine. According to Waters, they have good communication with their internal customer.

4.3.14. Problems Experienced With Teams

The only problem that anyone at VFC identified about the two teams was that if Waters left, it could be a problem. As mentioned earlier, team members attribute the differences in the OCC plant environment and the rest of the mill mainly to Waters' personal management style. If he did leave, another superintendent might not have the same style and might try to supervise the teams more closely. However, Thomas indicated that VFC is committed to "keeping those teams self-directing." If the problem did come up, management would do what was necessary to maintain the environment as it is.

4.3.15. Disseminating Teams to Other Parts of Organization

The general perception among managers in VFC is that there may be other areas in the company where the team concept can be applied, such as the woodyard if it is re-built, perhaps shipping, the power house, and the pulp mill. The general agreement about the paper machine, the core operation in VFC, is that self-managing teams would not work. The reason given is that the paper machine requires five or six different jobs, whereas the OCC plant only has three different jobs and is easier to cross-train team members. The paper machine operation would be difficult to cross-train everyone because it would take a long time to progress through all the jobs. Additionally, the top jobs (machine tender and back tender) on the paper machine are very difficult and require quite a bit of judgment and discretion on the part of the operator. The feeling is that not everyone would be able to handle these difficult jobs.

Although the concepts of self-managing teams may not be used in other areas in the company, employees in other areas generally already work in teams. Some teams are also somewhat cross-trained. Hence, some of the characteristics of self-managing teams (working as natural unit teams, cross-training) are already in use in other areas.

4.4 Summary

VFC has an excellent foundation on which to build even further success. The Principles of the Partnership and the open exchange of information, among other things, serve to build the trust between management and employees which is critical to long-term success. These elements have built a healthy culture conducive to change. And VFC will change and grow, but as Cooper puts it, "we'll grow some, but keep one eye on not having one more body than needed, and the other on optimizing." If self-managing teams are introduced in other areas, they are likely to succeed as well as they have in the OCC plant because of the groundwork that has been done over the past sixteen years.

5. CASE DESCRIPTION FOR BOEING CORINTH PLANT

5.1 Overview

Boeing Aerospace and Electronics - Corinth is a wholly owned subsidiary of the Boeing Company. The Boeing Corinth plant is located in Corinth, Texas and was begun as a new design plant in December 1987. A Strategic Planning Team (SPT) was first formed in the summer of 1987 and began designing the plant, which opened in December. Boeing Corinth produces electronic assemblies which go only to support other segments of Boeing. There are approximately 400 employees at the plant, 250 of which are production employees, while the rest are classified as support personnel (finance, engineering, administration, etc.).

This case description is based on notes from presentation given by the plant manager, Mr. Tom O'Fallon, at a conference on self-managed work teams, and a one and a half day site visit to the Corinth plant . During the site visit, I collected organizational documentation and conducted interviews with: Mr. Ron Shenberger, a pay for knowledge facilitator in Human Resources; Mr. Les Killingsworth, an area team leader in Human Resources; Ms. Linda Capauno, in Human Resources; Mr. Tim Holland and Mr. Jeff Devine, area team leaders in production; Mr. Robert Martin and Ms. Robin Miller, area team coordinators in production; Ms. Michelle Fletcher, a team facilitator; Ms. Debbie Fauley, the military liaison; a small group of industrial engineers; a support team (production control) member; and informal interviews with approximately four other team members. I also observed one area team stand-up meeting in the commercial shop (lasting about fifteen minutes), two area team leader meetings (lasting about one half hour), and two individual team meetings (each lasting approximately one hour). This case description was reviewed by Mr. Ron Shenberger and Mr. Les Killingsworth.

5.2 Background of Organization

5.2.1 General Information and History of Organization

Boeing Corinth's Strategic Planning Team (SPT) met in a retreat in Oklahoma to begin designing the plant in the summer of 1987. They developed the mission and philosophy (shown in Table 5.1) as well as organizational design objectives. The plant opened its doors in December of 1987, began production in March 1988, and shipped its first product in May 1988, ahead of schedule.

The Boeing Company is both a customer and a supplier to the Corinth plant, in that it supplies the designs for the electronic assemblies produced at Corinth and receives the end products from the Corinth plant. The plant began primarily as a defense production facility, to supply Boeing's military business. However, because of declining defense business, the plant now produces electronics assemblies for commercial use as well. In fact, approximately 80% of the plant's production personnel is in the commercial side, while the remaining 20% support the military business. Generally, some of the more experienced groups in Seattle take on the newer, more complex work and Boeing off-loads some of the more mature product lines to the Corinth plant.

Employees work ten hours a day, four days a week. Most employees are not long-term Boeing employees but are from local communities. About 250 employees are classified as production employees, called production associates, quality control associates, material associates, fabrication technicians, or electronics technicians. The rest of the employees are classified as support payroll, which includes engineering, technical, administrative, systems, and finance people.

5.2.2 About Organized Labor

The Boeing Corinth plant is unionized; the local union is the International Association of Machinists and Aerospace Workers (IAM). The relationship between plant leadership and the union is described by employees as a partnership agreement rather than an adversarial relationship. Union representatives are involved in important activities and groups; for example, the union was represented on the pay for knowledge advisory team created to make recommendations to improve the pay for knowledge system.

5.2.3. Organization Structure

5.2.3.1. Formal Organizational Structure

The structure of the plant is described as "nested teams." The SPT, which meets weekly, is composed of the plant manager and six Functional Team Leaders (FTLs). The six functions in the plant are Finance, Materiel, Human Resources, Manufacturing/production, Engineering, and Quality. The role of the FTL is to think strategically - a year out - for their function. Each function is divided into various areas, each with an Area Team Leader (ATL). See Figure 5.1, which depicts the organization structure. There are a total of twenty-four areas, and hence, ATLs, in the plant. Two of the twenty-four are production ATLs, i.e., in manufacturing areas. The rest of the twenty-

Table 5.1. Boeing-Corinth Mission and Philosophy

Mission
Create a customer oriented company which produces defense electronics products that satisfy customer requirements for quality, schedule, and cost while producing an acceptable return to our stockholders. Establish an environment characterized by high ethical standards and highly committed, team-oriented, well trained and enthusiastic employees with common goals dedicated to continuous improvement.
Philosophy
Our way of working together to accomplish goals and our mission is based on the following set of beliefs that we share about people and work: People work best when they are in, and feel part of a team where they can be trusted, and trust each other, to do their jobs; share leadership and make decisions; be accepted and respected; resolve issues with sensitivity and understanding; have the opportunity to accomplish challenging goals and contribute to continuing improvement. People are committed to and work best in an environment which provides for creativity; involvement; self-motivation; adequate resources and training; open communications; clear, realistic goals and tasks; feedback on their performance; recognition and praise; honesty, integrity, and high ethical standards. People work best when there is a spirit of freedom, equality, dignity, mutual respect and trust.

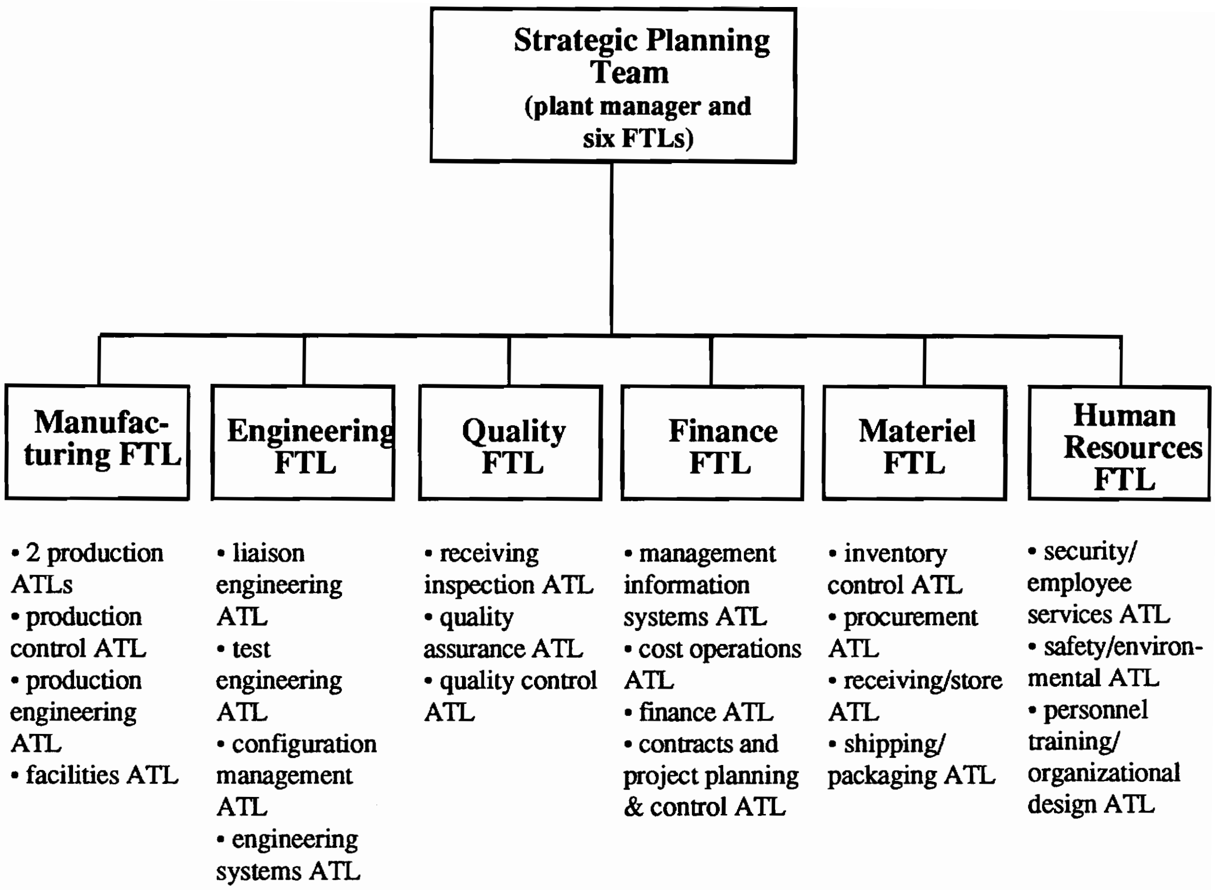

Figure 5.1. Organization Structure of Boeing-Corinth Plant.

four are ATLs for support functions such as engineering, quality, production control, and human resources.

The two production ATLs each have a manufacturing shop area. One ATL has responsibility for the military work in the plant. The other production ATL has responsibility for the shop which performs all the plant's commercial work. Each of the two production shops is divided into several teams. Approximately 80% of the production personnel (about 200 people) are in the commercial shop and 20% (about 50 people) are in the military shop. There are approximately sixteen to twenty production associates (PAs) on a team. To assist them in coaching and advising the teams, the ATLs have Area Team Coordinators (ATCs). The ATCs work more closely with the teams and provide coaching and guidance, however, they are *not* supervisors. Teams are responsible for managing themselves. ATCs are not assigned to any one team but share responsibility for coaching all teams in each shop (more on this in <u>Role of Leadership</u>).

5.2.3.2. Infrastructure to Support Improvement

The formal organization structure is augmented by an infrastructure to support improvement at the plant. There are numerous ad-hoc teams created to solve specific issues or problems, which are dissolved once they serve their purpose. These teams are generally cross-functional in nature. Some examples are: teams to coordinate social activities such as the Christmas party, teams to address changing the leadership roles, fund-raising drives, etc. There are also teams which are more longer-term in nature, such as the pay for knowledge advisory team. The purpose of this team is to learn about what is going on in the area of pay for knowledge and make recommendations to improve the plant's pay for knowledge system. This team spent a lot of time studying and visiting other plants.

<u>5.2.4. Organization Communications</u>

5.2.4.1. Nature of Organizational Communication

The nature of communication and information sharing at the Corinth plant is described as very "open" and "informal." There is a great deal of information exchange, vertically and horizontally, throughout the organization. Information is passed along through a series of mechanisms. For example, all the ATLs in the plant, as well as various other support people as needed, meet daily at 8:30. The purpose of the ATL meetings is to review key measures in each of the three shops (commercial, PWA, and EA) for the previous day, go over any announcements (visitors, major events, etc.), and review the "hit list" (unresolved problems or issues). In addition to the two production ATLs, team facilitators attend this meeting. The team facilitators and the ATLs pass along any necessary information from these meetings back to the individual teams. In other words, information shared at these "management-type" meetings is not held from the teams; on the contrary, ATLs, ATCs, and facilitators view the information exchange to the teams as part of their job. It also works the other way around. Teams inform their ATCs, ATLs, and/or facilitators of issues or problems, which are brought to the ATL meeting and addressed.

Another illustration of the openness of communications at the plant is the fact that every PA has access to the computerized manufacturing system, called the Total Manufacturing System (TMS). TMS contains all information necessary to run a manufacturing shop - payroll, production schedules, training teams need, etc. An example of the open exchange of information with those outside the plant is "loaning" out engineers in the plant to help other companies with specific problems, even if the company is in the same industry. According to the military liaison at Boeing Corinth, this is "very different."

5.2.4.2. Organization-wide Information Sharing Meetings

The mechanism for sharing information throughout the plant is the monthly "town meeting." Everyone in the plant attends town meetings, which are held in the cafeteria. Since the plant operates on only one shift, only one meeting is necessary. Meetings used to be held every week and then every two weeks, before moving to the current schedule of every month. As things became more stable, the need for holding the meetings so frequently decreased. According to employees, the town meetings are good for finding out what's going on in the company, finding out the status of operations, reviewing plant performance, and meeting new employees.

The meetings are conducted by the plant manager, Tom O'Fallon. He generally reviews plant performance against the goals. The plant has goals for key performance measures of quality, schedule, and cost, and performance is portrayed on charts, displayed in the cafeteria. Other important plant-wide issues are covered at the meetings, such as the United Way campaign. At one meeting, one of the teams gave a presentation on their TQM project, and the FTLs gave a status review on each of their functions. At the end of each meeting, the plant manager addresses questions and/or suggestions placed in the suggestion box from the previous month. The SPT reviews the questions from the box prior to the meeting and responds to them at the meeting. According to one team facilitator, some of the questions can be quite sensitive in nature, yet the SPT and particularly Tom O'Fallon are very open and honest in answering them.

5.2.5. Culture

As an outside observer during my site visit, it was clear to me that the culture of Boeing Corinth is very consistent with that reported by other greenfield sites. The characteristics of the culture, as described by team members and as observed, are openness, mutual trust between team members and leaders, cooperation, respect, and a commitment to the team-based environment and all that it requires. When asked to describe what the team environment was like and how she felt about it, one team member replied that "no one looks over my shoulder"; another replied that she was able to feel pride and ownership in what she did. In addition, this team member said that there are always people ready "to drop their work to help" her, if necessary.

There are small yet significant pieces of evidence throughout the shop illustrating the culture which are easily observed. For example, a new type of team that was started, called the LCF Cell team, had written out their mission on a flipchart and each team member had signed it at the bottom. This illustrated the ability for team members to have pride and ownership in their team. A short story told by the plant manager in a speech at a self-managing work team conference, is indicative of the relationship between team members and leaders. The plant manager had been away from his job for some time due to an illness. At the same time, the plant was readying itself for a TQM initiative to improve quality. The day he returned, there was a huge sign hung in the plant which appeared to read "TOM IS COMING." In his speech to conference attendees, Mr. O'Fallon said this welcome back sign brought tears to his eyes. Amusingly, it turned out he was mistaken - the sign actually read "TQM IS COMING." In addition to eliciting some laughs from the audience, the story demonstrated the respect and caring between all employees at Boeing Corinth. One ATL phrased the culture this way - "my viewpoint is that the celebration....social things....is part of the teambuilding process,...really trusting and caring about people...we have that on the [laminated] cards...there's a lot to that...people know each other a lot better [in this environment] than in other plants."

Due to the external environment, over which Boeing Corinth has no control, there is one aspect of the culture which is negative. Declining military business has made it difficult for teams in the military shop to keep busy. According to one ATC, the morale isn't what it could be. People come in to work and don't know what they're going to do that day, which can be very frustrating and contribute to low morale. A discussion at one team meeting I attended became very heated and tense at times; one team resented the fact they had to move off their equipment so another team could use it for some of their work. In other words, they did not like being moved and have nothing to do, while another team, who was borrowing the equipment, had work to do. Everyone on the team and the representatives from the other team, recognized, however, that there would not be a problem if it weren't for the low military work volume.

5.2.6. Past and Present Improvement Initiatives

As with other greenfield sites, Boeing-Corinth was designed to have many of the leading edge continuous improvement techniques and practices in place from the very beginning. For example, SPC is used throughout the shop to ensure the electronics assemblies meet customer requirements and specifications. On the other hand, there are also some improvement initiatives which have begun since the plant opened. As mentioned earlier, a TQM initiative was begun. Each team in the plant has chosen a TQM project - a project to improve the quality of the team's output.

Another initiative is organizing the teams around whole products, rather than organizing teams around the major processes in the shop. For example, in one shop, there is a first assembly team and a second assembly team (organized around the processes). The LCF Cell team mentioned earlier, is a first attempt at creating a team organized around a whole product, similar to a "cell." One of the benefits of organizing teams in this manner is to reduce the flow time of products through the shop. The LCF team was able to reduce the flow for their team from 30-35 days to 4 days. According to the ATL, the plant will be re-configuring as much as possible into "cell" teams.

5.2.7. External Organizational Environment

Because the Boeing-Corinth plant only provides its electronics assemblies to other Boeing facilities, it does not experience external competition, as other electronics facilities would, to compete for business. Therefore, the plant is, in a sense "buffered" from the external environment. According to one ATC, employees "don't think [of ourselves] as being in competition with other [organizations]....because we're a subsidiary of Boeing; the only interface we have is Seattle....we're not out on the streets trying to win a big deal...we're totally regulated by our mother company." This does not mean that the plant's performance is not compared to other Boeing facilities. According to ATLs, the plant's performance is closely compared to another Boeing plant's performance at similar stages in growth and development.

Although the plant is buffered somewhat from the environment, external factors do impact the plant. The decline in military business has had a significant impact on the plant - in that the military shop does not have enough work to go around and must struggle to keep busy. Production associates from various teams are being moved over to the commercial shop because fewer people are needed to support the military side. This shuffling around of people has been difficult; teams have become accustomed to working together for several years and do not want to be split up. Boeing-Corinth has been told there will be no layoffs, because Boeing Company wants to keep a military shop there.

5.2.8. Performance of the Organization

The plant has three sets of goals it will successively strive to meet, corresponding to phases of change as the plant matures. The first phase of change is Start-up - "learning how to put in place the plans we have." The next phase is Steady State I - "predictable level of performance." Meeting Steady State I goals results in predictable but still unacceptable performance. This is equivalent to Dr. Edwards Deming's concept of having a process in control, but not yet meeting customer requirements. Meeting Steady State I goals is defined as meeting stated numerical goals for quality, schedule, cost, and safety for three consecutive months. The third phase is Steady State II. Meeting this set of goals results in performance which is predictable and desirable. To achieve Steady State II goals, the plant must reach more difficult goals for quality, schedule, cost, and safety for three consecutive months. At the time of the site visit, the plant was striving to achieve Steady State II goals. The next phase is Maturity - "where do we go from here?"

At the corporate level, Boeing is reported to be "very satisfied" with how the plant manages its priorities. The plant focused on getting a quality product out the door first, and then focused on meeting schedule. Predictably, there have been some quality problems during start-up because PAs began with little to no technical experience.

In addition to quantitative evaluation of performance, plant leadership assesses qualitative benefits of an organization using self-managing teams. Not all benefits have yet been achieved, but it is anticipated that they will be realized in the near future. Below are listed the expected benefits of a high involvement organization (from a presentation on the plant's pay for knowledge system):

- improved flexibility
- leaner staff
- fewer job classifications
- improved efficiency
- lower absences - (absenteeism is at an acceptable level of less than 3%)
- lower turnover rate - (turnover rate has been about 10 %)
- higher quality output
- higher job satisfaction/variety - (overall morale of employees is higher than the corporation as a whole and other comparable facilities, based on a company wide climate survey)

5.2.9. Sharing Successes

The Boeing Corinth plant is very open to sharing information with external visitors. They have hosted a large number of visitors; there appear to be very frequent tours of the plant. One engineer at the plant said he had never seen so many tours. In fact, during my site visit, announcements were made at the ATL meeting about upcoming visitors, and there were visitors from other companies almost every day that week. Whenever there are visitors coming in, announcements are made at the daily ATL meetings, the commercial and military shop meetings (called area team stand-up meetings), and individual team meetings. One way or another, word gets around when visitors are coming through. There is a complete system set up for taking visitors through the shop.

The plant manager gives an overview of the plant, the culture, how the plant got started, and how things operate. Then there is a network of PAs throughout the shop ready to take the visitors on tours. Each team has what is called a customer relations coordinator, whose job is to give visitors tours through their team's area. Visitors are then handed off to the next team's customer relations coordinator, and so on. This network is very easily executed and very efficient. It also gives PAs the opportunity to meet and talk to outside visitors. During my site visit, because I was collecting data for research purposes, I was permitted access to the production area. This is very unusual for any manufacturing plant, particularly one doing military work, however, it illustrates Boeing's commitment to sharing information on their successes with others - managers and researchers alike.

According to one ATL, many of the visitors are from outside companies - not just Boeing employees from other Boeing sites. There are several things which have attracted other managers to visit the plant. Several members of plant leadership, including Tom

O'Fallon, are participants in a manager's network coordinated by Dr. Barry Macy of the Texas Center for Quality of Work Life and Productivity at Texas Tech. In addition, the pay for knowledge advisory team (mentioned earlier) has made visits to other organizations using self-managing teams in their study of pay for knowledge systems. Through this networking, other managers have learned about the plant and subsequently, paid visits.

5.3 Self-Managing Teams

5.3.1. Evolution of Self-Managing Teams

Because Boeing Corinth is a greenfield site, the background and evolution of self-managing teams was described in the Background section of the plant in the beginning of this case description.

5.3.2. Team Structure

There are five job classifications for production employees at the plant: production associates (PAs), quality associates, electronics technicians, fabrication technicians, and material associates. The focus of this research was on the production associates, because they form the teams which directly work on product - the other four job classifications can be viewed as "support" to the teams. The teams I refer to throughout this case description consist only of PAs.

As mentioned earlier, there is an ATL for each of the two major shops, commercial and military. In the commercial shop, there are two ATCs who support the teams - ATCs are not assigned to any one team but instead spread their time across several teams. The military shop has only one ATC. ATCs have cubicles located out on the shop floor, so they can easily be reached if a team needs them. In fact, one ATC reported that he spends about 90-95% of his time out on the shop floor during the day. Support team members, such as engineering, production control, and planning personnel, are also located out on the shop floor in cubicles, which facilitates communication back and forth with teams.

There is a pay for knowledge plan for each of the five job classifications mentioned above. The plan for PAs includes eleven leadership roles team members fill. These leadership roles are responsibilities typically performed by supervisors, and are managed by individual team members (more on this in the next section). Over the past year or so, team members have spent approximately 70% of their time directly working on building product, 20% on the leadership roles, and 10% in training. A plant-wide goal for time spent on direct labor is 75%.

5.3.2.1. Coordinator Roles

The concept of "leaderships" was introduced in the previous section - these are what is often called coordinator roles. PAs allocate about 20% of their time to performing these roles. The purpose of the leaderships is to expand the business and technical knowledge of PAs. Each pay for knowledge plan has a unique set of leaderships. Because the focus of this research is on production teams and PAs, I will only discuss the leaderships for PAs. They are shown in Table 5.2, in addition to the responsibilities of each leadership and the liaison to a support function in the organization. Some teams have fewer than eleven people; in this situation, PAs double up on those leaderships which take less time than others. They also have a back-up person identified for the more critical leaderships, which are administrative, scheduler, and material/parts supply coordinators.

Leaderships are rotated on a yearly basis - a consensus process is used to determine the next person to fill a leadership role. The new person is trained at the end of the year, and then takes over at the beginning of the next year. Training is provided by the support team function acting as liaison for a particular role and the current holder of that role. Team members who have previously filled the role are also available as a back-up for that role. Team members are not paid any additional money directly for leadership roles, however, performing these roles is necessary to advance in the pay for knowledge system.

The leaderships represent a link between work teams and the various support teams, such as engineering, human resources, etc. Coordinators work closely with members of the support team to perform their roles; support team members even participate in training PAs in the leadership roles. The training for leaderships ranges from 6 to 60 hours. Because leaderships represent another step in maturity and development of PAs and the teams, newly hired PAs do not take on leadership responsibilities during the first six months. Instead, they concentrate on learning the technical skills of the job and the company's culture during this initial time period. To share information among PAs performing the same leadership responsibilities on different teams, coordinators of one type have meetings together with support team members. For example, someone from safety will meet with all the safety coordinators to share information regarding that role.

PAs enjoy the responsibility of the leadership roles and take them seriously. In one team meeting, the productivity coordinator jokingly said he "got yelled at" the day before because he wasn't doing a good job on his productivity charts.

Table 5.2. Leadership Roles for Production Associates

Leadership	Responsibilities	Liaison with Support Function
safety	housekeeping tasks; makes sure safety and housekeeping standards are met; addresses any safety problems; fills out paperwork if there are any injuries	human resources, safety
materiel/parts supply	parts/supply replenishment; scrap control; takes care of coordinating parts for team; returns parts to stores if necessary; sends parts to discrepant control parts processing area; replenishes common use items that are kept in bulk out in the work areas	materiel function, inventory control, procurement
quality	Statistical Process Control; nonconforming material handling; leads problem-solving on quality issues; yield problem identification and resolution; updates quality charts for team on a daily basis	quality function
tooling/equipment	coordinates preventive maintenance; facilities maintenance; tooling/fixture control; test equipment control; calibration monitoring and recall; coordinates getting tools calibrated on time; coordinates repairs for non-calibrated tools	calibration laboratories
administrative	overtime tracking; keeps attendance for team; certification tracking; fills out manning report; cost tracking; makes daily labor corrections to the automated entry system; interfaces with payroll; responsibility for payroll inputs	ATL, ATC, finance, human resources
productivity	standards development; efficiency analysis; updates productivity charts for team on a daily basis	ATL, ATC
methods	methods analysis; planning analysis; workstation layout; works with IE methods improvements in work area	IE
planning	change incorporation; problem identification and resolution; makes sure instructions are clear; makes sure any methods improvements are incorporated into planning instructions	planning, IE

Table 5.2. Leadership Roles for Production Associates (cont'd)

Leadership	Responsibilities	Liaison with Support Function
scheduler	scheduling; work order movement and status tracking; overtime distribution; work assignment; inter-team coordination; makes sure work moves through work area; interfaces with production control on scheduling problems; makes sure that schedules are met; hands out work to team members	ATL, ATC, production control
customer relations	manages internal customer/supplier relationships (technical and/or cultural/social issues); receives customer team feedback; provides supplier team feedback; supplier team problems; supplier team rating; gives tours through work area to visitors	plant leadership - SPT
training	makes sure everyone gets their training in the PFK system; interfaces with human resources; works the on-line training record system; responsible for team's training	human resources (training), production engineering

5.3.2.2. Internal Team Leadership

In the original design for teams, there was no team leader, or facilitator, for teams. Leadership quickly realized they had a missing link - there was no one to lead team meetings, coordinate team problem-solving, and make sure all necessary people are present for solving a problem (such as support team members). To fill this missing link, the role of facilitator was created. At the time, there was no ATC role - this was also added later (see next section). Besides, the ATCs do not act as team leaders, because they are not assigned to any one team. They coach and guide the teams, but do not actively participate in team problem-solving and decision-making.

The facilitator is a six month elected position and paid a ten percent premium. The role of the facilitator is to lead team meetings, set the agenda for team meetings, initiate and lead problem-solving, coordinate completion of team action items, and serve as an information source by bringing back necessary information to teams. The facilitators for all the teams in each shop take turns attending the daily ATL meeting to report out on key performance measures for the shop. Facilitators receive one week of training to prepare for the role. The facilitator works closely with the ATCs and ATLs, and support team members if there is a problem which requires their knowledge.

In adding the facilitator role, Boeing-Corinth wanted to avoid the potential problem of having the internal team leader become just like a supervisor, become more dominant in team meetings, and build a network in the organization, accumulating power. To avoid this problem, the facilitator only serves a six month term and then must wait out one year before being elected again.

All of the facilitators in the entire shop meet with someone from human resources once a month to share information on plant-wide issues and address problems. In addition, the ATLs in each shop meet with all the facilitators in their area about every two weeks to share information. The facilitators bring back the information they receive in meetings like these to their teams.

5.3.2.3. Liaison With Support Departments in Organization

As mentioned in the earlier section on leadership roles, the PAs performing the leaderships work closely with support team members. The liaison for each leadership was listed in Table 5.2. According to one ATC, "a lot of information comes from that support group to that leadership role." Support team members act as "mentors" for PAs performing leadership roles. According to one ATL, Boeing has struggled with this area. They have made some modifications to how support team members work with leaderships and now better understand the relationship and how it should work.

5.3.3. Role of Leadership/Supervisor

In the initial design of the plant, no supervisors or team coaches were included. The role of the ATL is not that of a supervisor, but to think longer-term for the shop areas, such as planning for several months out. However, after about a year of operation, as the plant grew, there appeared to be a span of control problem. The ATLs were spread too thin to work closely with the teams and help coach and guide them. Therefore, the position of ATC was created to spend a lot of time with teams, to plan for and think week to week, and help the team work the day to day issues and problems. ATCs are not assigned to any one team, but work with several teams. One ATC described how she performs her role - giving teams the "opportunity to try and work their issues, even if it becomes a shouting match [at team meetings]." The challenge is "knowing when to step in." In the long run, the goal is to phase out the ATC position, which ATCs understand and accept. It was created due to start-up issues, such as teams not yet being fully mature. When asked if she was concerned about what she would do when the position was phased out, one ATC replied that she has enough "trust and faith that they are not going to send [her] out on the streets."

Some of the responsibilities of ATLs are: help "fine-tune" the budget for the area, determine staffing needs, determine production start-up rates for new products, decide how to organize the teams, develop an initial layout for the work area, keep teams informed on management issues, coordinate cross-functional teams in the area, and act as a resource person for the teams, one of the main resources being information. In addition to bringing back information to the teams, the ATL brings people in from other functions in the plant to share information. For example, one ATL has brought in someone from finance to explain one of the key measures for the plant, and how it is calculated. Another way to describe the ATL role is the analogy of "teaching people how to drive." One ATL says he tries to make sure that no teams "drive off the road." The two production ATLs work closely together to compare notes on how they handle similar issues and problems, to ensure consistency across the two shops.

5.3.4. Performance of Teams

Because Boeing-Corinth is a greenfield site and self-managing teams are used throughout the plant, the collective performance of the teams is equivalent to the performance of the plant, which was discussed in an earlier section. In general, the Boeing Company has been satisfied with the plant's performance in improving quality first, and then focusing on improving schedule performance, and things like efficiency and productivity.

Another dimension of team performance, rather than performance of the teams' output, is how the team is performing with regard to being self-managing. An ATC defined a self-managing team as one "that understands what the business needs are and understands how to make decisions based off those business needs." She believed that there was some progress yet to be made as far as helping teams understand the business needs and seeing the big picture. As an outside observer, my assessment of the maturity of the teams I observed in meetings was that they were very mature in their group process and managing conflict. Since teams meet very frequently, this is a very important area to perform well in, that is, managing meetings. During the meeting, team members effectively addressed and resolved conflict, stuck to their agenda, and maintained a positive atmosphere throughout, which can be a difficult task.

5.3.5. Decisions and Responsibilities of Team

Many of the decisions and responsibilities of teams in this type of environment are part of performing leadership roles, so in a sense, this section overlaps somewhat with the section on leadership roles. Listed below are some typical decisions and responsibilities of teams:

- administer the training system - scheduling people for training
- investigate and solve (quality) problems
- keep charts on key measurements for quality, cost, and schedule
- address and resolve social/cultural problems
- hold a team meeting if necessary
- order and manage parts and tools
- determine work schedule - who works on what and when
- conduct meetings
- counsel team members having problems, for example, attendance problems

- give tours to visitors
- address internal customer/supplier issues and problems
- identify and resolve action items for teams
- obtain necessary resources from support team members
- report out on key performance measures for the shop at ATL meetings (facilitators do this)
- stop production if there is a problem
- make minor process or method improvements (major changes must be coordinated with leadership and/or engineering)

As teams have matured, they have taken on more and more responsibility as a result of training and experience. For example, one facilitator said that before, they used to have to go through a lot of red tape to order something as simple as a screwdriver. Now, teams take care of that themselves, through the tool/equipment leadership role.

5.3.6. Team Meetings

There are several different types of meetings which team members attend on a regular basis, several of which have already been mentioned. The first type of meeting is the area team stand-up meeting conducted by the ATL and/or the ATC, which is held "standing up" out on the shop floor for five to fifteen minutes. The commercial shop stand-up meeting is held daily at 7:00 a.m. with everyone in the shop present. Topics covered are: review key measurements from the previous day, make any announcements (visitors, special events, etc.), and share any problems or issues affecting the entire shop. The military shop has stand-up meetings twice a week and they are held only with the ATL, ATC, facilitators, and support team members for the area. The facilitators then bring back information to their team in individual team meetings. The typical agenda for the military shop stand-up meetings is: review key measurements for quality, schedule, and cost; make any announcements (examples are visitors, safety issues, housekeeping issues, special requirements); and review the "action board" which is a "running set of problems and concerns taken on by support people." The purpose of the stand-up meeting is primarily to share information, not to problem solve. According to one ATC, they don't get into technical issues to solve problems at the stand-up meetings. Another purpose of the stand-up meeting, is to keep homogeneity among the teams in the shop. The ATL gives teams subtle reminders that they are all one team and must work together to reinforce cooperation and prevent sub-optimization.

The second type of team meeting is individual team meetings. Each team in the shop decides how often they want to meet. Some teams meet on a daily basis, while other teams whose work flow and performance is less dynamic, meet once a week, or once every two weeks. Each team has somewhat of a standard agenda for the meeting with reports from the coordinators (schedule, productivity, quality, safety, administrative, and any others as necessary), as well as status of action items, and announcements. The facilitator leads the team meetings and brings up any issues and reports any necessary information for the team. Primarily problem-solving is done at these meetings, as well as information sharing. Team meetings last about an hour or so, and they usually go down to the cafeteria to meet. One of the ATCs in the area typically attends the meetings, but does not play an active role. They try to let teams work out problems themselves. Team members can also call an ad-hoc meeting out in the shop if a problem arises. Generally, the person noticing the problem will initiate a meeting, or go to the team facilitator who will coordinate and lead the meeting.

The third type of meeting is meetings held by the ATL with the entire shop (commercial or military). The ATL may bring everyone down to the cafeteria, about every four to six weeks, and share general information about the shop (performance and other issues) and/or about the company. These meetings are to keep everyone in the shop informed on important issues in the plant. It's an opportunity to explain things in more detail than the stand-up meetings allow.

In addition to meetings which team members are directly involved with, there are several other types of meetings addressing plant-wide issues which only representatives (facilitators) of the teams attend. The daily ATL meeting, held at 8:30 a.m. is an example. Each of the twenty-four ATLs in the plant, facilitators from commercial and military shops, and various others, attend the meeting. The typical agenda for the meetings is: review daily shop measurements (reports from the team facilitators), review weekly shop measurements on Mondays, announcements (visitors, audits, meetings), product concerns, and review the "hit list" - unresolved issues or problems. The facilitators and the production ATLs bring back information from these meetings to their teams.

An overtime meeting is held every Wednesday, with production control, schedule coordinators in each area, ATLs, and ATCs for about ten to fifteen minutes to determine overtime needs for each shop area. A third example of these plant-wide meetings is a daily

9:00 a.m. meeting between production control, schedule coordinators, and ATCs to determine if there are any problems with meeting deadlines for shop orders.

5.3.7. Team Facilities

Teams appear to have all the facilities they need to do their job. Every PA has access to the on-line computer system, TMS. Each person must log on and off when they begin and complete work on a particular shop order. In addition, PAs having leadership roles need to access particular parts of the system, for example, the administrative coordinator accesses payroll information on the computer, and the training coordinator accesses the training record system.

Although teams do not have their own team meeting room as teams in other organizations do, they can use the cafeteria to meet when they need to. All the teams must share the cafeteria, however, so they work around other teams' schedules. Other resources teams have at their disposal include tools to help them communicate with each other and with other teams, such as flipcharts, whiteboards, bulletin boards, etc. Teams use these tools extensively to share information.

5.3.8. Selection and Placement Process

Candidates for positions at Boeing-Corinth are screened by an external temporary agency. The agency does pre-screening for Boeing using criteria such as reading ability and mechanical abilities. Candidates who make it through this screening are referred to plant leadership. When new positions are needed, candidates are brought in to work for a ninety day period. They are paid through the agency something similar to minimum wage. During this trial period, they are receive an orientation on the culture at Boeing and are trained in the basic technical skills needed to perform the job. This period provides an opportunity for Boeing to assess candidates' group problem-solving skills and ability to learn technical skills. Boeing doesn't necessarily look to hire people with electronics assembly experience, but those with basic mechanical and literacy skills who "possess qualities which allow them to be successful" in the organization's culture.

Candidates who successfully complete the ninety day trial period are invited to become full-time employees of Boeing. Once new PAs are hired, they become part of a team and continue to learn technical skills. In addition, they learn group problem-solving skills through working with their team to solve problems.

5.3.9. Rewards and Recognition

All PAs at Boeing Corinth are paid on a salary and not hourly. PAs do not punch time clocks. Although they record their hours spent on particular shop orders in the computer, this is for accounting purposes only - not to pay people. PAs are paid for accumulating skills in the pay for knowledge plan, described below.

5.3.9.1. Pay for Knowledge System

As mentioned earlier, there are five pay for knowledge (PFK) plans, one for each job classification (production associate, electronics technician, fabrication technician, quality associate, and material associate). The focus of this case study is on PAs, therefore, this section only pertains to the pay for knowledge plan for them.

The model for the PFK plan is a six step sequential progression over an expected three year period. The plan has a dimension for depth of skills (increasing levels of knowledge of particular skills), horizontal breadth of skills (variety of different skills), and a vertical dimension (the leadership roles discussed earlier). Once the initial design of the PFK plan was completed, it was the responsibility of each functional area to design, develop, and implement the training to support PFK. The training coordinator uses an on-line training records system to execute the training plan - schedule team members for training and coordinate team members attending the training.

In March 1988, the SPT created a PFK Advisory Team, a cross-functional team with representatives from each function, team leaders, support staff, and the union. The advisory team's mission was to learn about PFK as a system, study how it is used in other organizations, read what was in the literature, and then make recommendations for changes in Boeing's PFK system. As a consequence of the team's efforts, a major redesign began in July of 1989. Some of the resulting changes were to make training more directly relevant to PAs' current assignments and adding the training leadership role. The training leadership works closely with a PFK facilitator in human resources. The PFK facilitator's role is to take the information (training needs) entered into the training records system by the training coordinator and put together a plan to offer the requested training during the next six months. PAs receive an increment in their salaries for additional skills learned every six months.

5.3.9.2. Other Reward Sharing

The last step of progression in the PFK plan (the top rate) is what's called a "team rate." At the time of the site visit, the SPT was considering adding a gainsharing system on top of pay for knowledge. Fairly soon, PAs would be reaching the team rate and have nowhere else to go in the system; in other words, they would top out. Gainsharing is a popular and generally successful element to add on top of pay for knowledge in organizations using self-managing teams.

5.3.10. Peer Evaluation and Feedback

PAs do not go through a formal feedback and evaluation process with their team members as some other organizations do. They may, however, be evaluated by their peers when they are assessed in the pay for knowledge plan. Every six months, PAs go through an evaluation process where they must demonstrate the skills they have learned. The evaluators can include instructors, on the job trainers (OJTs), and a PA who has been evaluated to be performing that particular skill at a sufficient level of competence. Any other type of feedback necessary to change behaviors (such as poor attendance) is expected to be given by team members as needed. For example, if a PA were having irregular or poor attendance, someone on the team might discuss it with him/her individually. If the situation did not change, then the entire team may bring up the issue at a team meeting. If the PA still does not change, then the problem may be brought up to the ATC or ATL to help resolve.

PAs do participate in the appraisal process for support team members, such as engineers. The appraisal and compensation system for support team members is called "TOGM." Twice a year, every support team member identifies individuals with whom they have customer/supplier relationships. Those individuals then rate the support team member as tops, outstanding, good, or marginal and provide specific feedback as well on how the person can improve. This feedback is entered into the computer. Feedback can be given by other support team members as well as PAs. An example of where PAs would be involved is if there is an engineer who works closely with a team (i.e., they are an important supplier to the team). In this case, the team may even get together as a group and decide what rating to give the engineer. Once a year, support team members receive a compensation adjustment based on their rating in the TOGM system.

5.3.11. Training and Skill Development

As mentioned in the earlier section on Selection and Placement process, candidates go through an initial ninety day period where they receive training in technical skills needed to do the job, as well as training in the basics of the business, and the team culture. Once new PAs come up to speed, they spend approximately 10% of their time in training, learning additional technical skills to do the job and skills to perform the leadership roles. The training needs for each team are entered into the training records system by the training coordinator. The PFK facilitator then develops a plan to provide the necessary training. Training is provided by instructors from human resources, support team members (for leadership roles), and by OJTs. Each shop area has one or more OJTs whose job is to train PAs in technical skills while on the job; they do not build product. In addition to training from these sources, Boeing is planning to include more peer tutoring as a strategy for team members to transfer knowledge to other team members. Because of the need to increase the percentage of time spent on directly building product, the time spent on training is expected to decrease toward the end of this year.

5.3.12. Information System

5.3.12.1. Information Teams Receive

Table 5.3 summarizes the information teams receive. The specific types of information teams receive are:

- Feedback on team performance
- Team production information
- Team issues
- Technical product/process information
- Internal customer feedback
- Performance of other teams
- Plant-wide issues
- Performance of the plant
- Corporate issues
- Performance of the corporation

Teams receive *feedback on team performance* several ways. At individual team meetings, they review the team's performance for the previous day, or previous week if it is a Monday. The key measures for each team are quality, schedule, and cost. There are specific sub-measures for each of these three. At the area team stand-up meeting, key measurements (quality, schedule, and cost) are reviewed for the entire area. Measurements are reviewed for the previous day and for the previous week on Mondays. As previously mentioned, these meetings are held first thing in the morning when everyone comes in and usually last about fifteen minutes. This meeting is an important source of information for feedback on how individual teams and the entire area team performed. Additionally, part of the meetings held every four to six weeks with each area is devoted to reviewing team performance.

There are detailed charts and graphs portraying key measurements for each team posted on bulletin boards out on the shop floor. Charts and graphs are posted in very visible places. They have directional indicators on them, such as down is good or up is good, and they also have goals clearly indicated on them. Charts are updated on a daily basis by the appropriate coordinator. For example, the quality coordinator "owns" the charts for first pass yield, and the productivity coordinator owns the charts for realization rate (similar to labor productivity) and BFL (budgeted factory labor, or direct labor). Charts are also compiled on a weekly basis by industrial engineering for each of the two shops as well as every other cost center in the plant. The productivity coordinators, ATLs, and ATCs receive the report on Monday mornings. A monthly performance report is compiled by the planning group and engineering for the two shops and other cost centers.

Team production information includes such things as problems, status of jobs through the shop, production changes, production goals, customer requirements, changes in procedures, new products coming soon, and overtime needs. This information is anything the teams need to know to directly support performing their job responsibilities. The individual team meetings cover production information such as goals for the teams, problems which have been resolved, or need to be resolved, any changes in the production requirements, etc. Another main source for team production information is the stand-up meeting. The ATL reminds everyone of the production goals for the week, as well as any other necessary information.

The schedule coordinator receives a report, the SOCZ20, which is their "bible" and is a major source of production information for him/her, and hence, for the team. The report shows each job (part number) in the shop and what process it is at. It also shows when the job was released and when it is due to the customer. The scheduler uses this report to decide how work moves through the shop, whether to switch jobs around, who works on

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Feedback on Individual Team and Area Team Performance; key measures for team are quality, schedule, and cost	Individual team meetings out on the shop floor or in cafeteria led by team facilitator; each team meeting has somewhat standard agenda with reports from coordinators (schedule, productivity, quality, safety, administrative, and any others as necessary), as well as status of action items, and announcements. Facilitator brings up any issues that need to be addressed and coordinators bring information to team as necessary.	Varies from team to team; anywhere from daily to every other week	Team measures own performance (production and quality coordinators)

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Feedback on Team Performance (cont'd)	Area team stand-up meeting out on the shop floor led by ATL or ATC; review key measurements (quality, schedule, cost) for previous day and week (on Mondays). The standard agenda for one of the areas (PWA shop) is: Announcements; Material Concerns; Summary of Measurements; Identify actions; Review all key measurements (on Mondays); Review past actions. ATL relays relevant information to teams from the ATL meeting at 8:30. Each area also has meetings every 4 - 6 weeks in the cafeteria to discuss longer-term performance issues.	One area has daily meetings and the other has meetings twice a week	ATL, ATC other teams in Area

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Feedback on Team Performance (cont'd)	Charts and graphs posted for each individual team in each area on bulletin boards out on the shop; updated daily by appropriate coordinator: quality (1st pass yield), schedule (output/backlog, behind schedule hours, flow time), and cost (realization rate - labor productivity, scrap, percent of BFL hours - direct labor); bulletin board is "very important...everyone watches it"; all charts have directional indications on them, i.e., up is good or down is good; all charts have goals.	Daily	Teams measure performance and update charts/graphs
	Weekly Performance charts compiled for two areas and every other cost center; report includes BFL, realization rate; ATLs, ATCs, and productivity coordinators get report.	Weekly, on Monday mornings	Generated by Industrial Engineering
	Monthly performance report for two areas and every other cost center.	Monthly	Generated by Industrial Engineering, production and planning

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Team Production Information (problems, status of jobs through the shop, production changes, production goals, customer requirements, changes in procedures, new products hitting the floor, overtime needs)	Individual team meetings cover status of team action items, goals, problems, etc.	Varies from daily or to every other week, depending on the team	Coordinators and facilitator bring back necessary information to team; ATC sometimes attends meetings
	Area team stand-up meeting; ATL or ATC reviews production goals for the current week, any other relevant production information; ATL brings back relevant information for teams from the ATL meeting at 8:30.	Daily or twice weekly, depending on which area	ATL, ATC, other teams
	SOCZ20 report broken down by cost center with part numbers by priority; received by schedule coordinator, ATLs, ATCs, and anyone else who wants to pull it up; is the scheduler's "bible"; gives information on each job in the shop and what process it is at; comes from TMS.	New print out is obtained several times a day	Planning group

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Team Production Information (cont'd)	TMS (total manufacturing system) has finance, accounting, payroll, production, planning information; each coordinator on each team pulls up information they need to perform their role, e.g., scheduler uses production information, admin coordinator uses payroll information, etc.	As needed	TMS system
	Messages and relevant production information is written on whiteboards and flipcharts, e.g., one message was "Test operation is trying to get another tester from Seattle, or renting one - theirs is broke"	As needed; could be as frequently as daily or more often	Primarily other teams
	Teams informally receive necessary production information one on one with ATC, ATL, or facilitator; ATC often goes around the shop floor talking to teams	As needed	ATL, ATC

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Team Issues (team problems, concerns, tours coming through, changes in personnel, social issues, status of action items, other new information)	Individual team meetings to discuss team issues.	Varies from team to team; daily or at least every other week	Coordinators and facilitator bring back necessary information to team
	Ad-hoc informal team meetings called by facilitator or any team member as needed to resolve problems, issues; "a lot of informal meetings"	As needed	Coordinators and facilitator bring any necessary information to meeting
	Informal communication between team members as necessary without a formal meeting.	As needed	Other members of team
	Area team Stand-up meeting; review announcements - "tours, items of general interest" social issues, personnel issues, problems common to all teams such as safety, housekeeping, customer requirements, but "no problem-solving" done at these meetings.	Daily for one area and twice weekly for the other	ATL, ATC, Other teams
	Messages are written on flipcharts and whiteboards; problems, social information, etc.	As needed	Other teams

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Team Issues (cont'd)	Facilitators meeting for all facilitators in each area to exchange information, new things tried, lessons learned	Weekly	Facilitators from other teams
Technical Product/Process Information	Engineering provides teams with suggested changes to processes and technical assistance through face to face verbal communication; "teams can choose not to implement an engineering change."	As needed	Engineering
	Operations Manual is a source of information for operations procedures; manuals are kept out on the floor.	Manuals are used as needed	Engineering updates manuals if necessary
	Government liaison who has oversight function; "if process problem, product deficiencies, better way to do something, making teams understand what document they need and why" "helping them understand the mil std and specs."	As needed	Government liaison person
Internal Customer Feedback (problems, complaints, defects)	Customer relations coordinator is notified if there is a problem downstream.	As needed	Other teams

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Performance of Other Teams	Teams can see performance of other teams from all the charts and graphs posted	Updated daily	Other team coordinators update their charts
Plant-wide Issues (plant-wide procedural changes, activities, improvement efforts, new contracts for the plant, social information)	ATLs bring information to teams from ATL meeting for all ATLs in plant to discuss plant issues. Daily agenda: Daily measurements, Hit list, Weekly measurements, Visitors/audits/meetings, Product concerns, Area functional review, Staffing, Steady state II goals, and General discussion; facilitators attend meeting to give performance report and bring back information to team.	Daily at 8:30 a.m.	Other ATLs, people from other areas
	Plant Review ("town") meeting in cafeteria mandatory for everyone run by plant manager, Tom O'Fallon; opportunity to "tell what's going on with the company", meet new PAs, status of operations, problems, status review by FTLs, presentations by TQM project teams, review suggestions from suggestion box, and answer questions. Also review things like United Way Campaign.	Monthly (used to be every week, then every two weeks, now every month)	Plant manager

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Plant-wide Issues (cont'd)	Facilitator brings back information to teams from Facilitator meeting for all team facilitators in the plant to share information and resolve issues.	Monthly	Facilitators in other areas
Performance of the Plant (includes other areas and the plant overall, includes external customer feedback)	ATL meeting for all ATLs; facilitators from each shop give a performance report from the previous day and update charts in meeting room.	Daily	Other ATLs and people in other areas
	Charts for each of the two shops and other areas (Receiving, Stores, Rec/Insp) in the ATL meeting room; facilitators who attend ATL meeting update charts at the meeting; charts for plant wide performance measures such as shipping status, labor distribution, FOB performance, safety, are also updated.	Updated daily	Other areas
	Town meeting in cafeteria; "usually review plant performance charts", review "health of the company."	Monthly	Plant manager
	Performance charts hung up in cafeteria show performance compared to goals.	Updated monthly	Strategic Planning Team

Table 5.3. Information Inputs Provided to Boeing Corinth Self-Managing Teams (cont'd)

Information Inputs to Teams	How Information is Shared	Frequency	Provider of Information
Corporate Issues (Boeing)	Boeing newsletter	Monthly	Corporate
	Town meeting; plant manager brings in information about corporate as necessary.	Monthly	Plant manager
Performance of Boeing corporation	Boeing newsletter	Monthly	Corporate
	Town meeting; plant manager reviews Boeing Company performance.	Monthly	Plant manager

what, etc. They receive a fresh report first thing in the morning and usually print out at least one updated version throughout the day. The report is generated by the planning group from the TMS.

Other coordinators and team members use the TMS to pull up whatever information they need throughout the day to do their jobs. TMS contains finance, accounting, payroll, production, and planning information, all in one system. For example, the scheduler uses it for production information, the administrative coordinator uses it for payroll information, and the training coordinator uses it to schedule team members in training classes. In addition to using TMS to get relevant production information, teams also rely on their ATCs and ATL to provide them with information they need. The ATCs in particular spend a great deal of time out on the floor talking with teams.

There are many whiteboards and flipcharts all around the shop, which are used frequently by team members to write messages to each other and to other teams. One flipchart had a message to all teams about a tester being broken down and the team was trying to rent another one or get one from Boeing headquarters in Seattle. Other teams needed to know this information to plan for work being slowed down at this operation. There is a great deal of informal communication within a team and between teams. Team members work close to one another, and if a problem arises, it is easy to talk to another team member about it. ATCs spend a lot of time on the shop floor, so team members can easily access their time and get information from them.

Teams learn about *team issues* mainly from individual team meetings and stand-up meetings. The types of issues teams discuss at individual and stand-up meetings are problems common to all teams, concerns, tours coming through, changes in personnel, social issues, team relations, status of action items, and any new information on products or processes. At the individual team meetings I attended, team members discussed relations with a new team, the LCF cell team, which was formed as an experiment. The LCF team had to use this team's equipment for some work, and the team resented being "kicked off" their own equipment so the LCF team could keep busy. The issue did not get resolved, but it was brought into the open which appeared to make team members feel better about the situation.

In addition to regular team meetings, teams often meet informally on an ad-hoc basis when necessary. For example, if a quality problem occurs, the facilitator and quality coordinator will call the team together to identify the root cause of the problem and decide what to do about it.

The individual team meetings emphasize more those issues and problems which are unique just to the team, while the stand-up meetings cover issues which affect all teams in the area. Problem-solving is done at individual team meetings, but not during stand-up meetings. Some of the issues covered at the stand-up meeting I observed were housekeeping of the entire commercial shop, cautioning against using "quick fixes" in the shop, and someone thanking everyone in the area for sending a card when she was ill.

Team issues are also communicated by writing messages on flipcharts, whiteboards, and bulletin boards throughout the shop. Information on social events, vacation schedules, and any other issues, even slogans, are written. One flipchart had the following message - "don't aspire to being average - average is as close to the bottom as it is to the top." Another flipchart had the mission of the new LCF team written on it to communicate to other teams, and each LCF team member had signed it.

Teams receive *technical product/process information* from several sources. Any technical information they need to help with the equipment, the processes, or the products comes from either the ATC or engineering. Since engineers' desks are right out on the shop floor, communication between the shop and engineering is made simple. Generally, teams receive technical information in an informal way, with face to face verbal communication. Engineering makes suggestions to teams on process improvements and other changes. One interesting thing to note is that teams can refuse to implement an engineering suggestion. It is the job of the engineer to convince the teams of the benefits of a proposed change.

A government liaison for the military shop is located at the plant full-time, and she often goes out to the shop to talk with teams to help them understand "the military standard and specs." There are complete Operations Manuals developed by engineering out on the shop floor. Any team member can look up information about any product in the shop in the manuals. They received training from the engineers on how to use the manuals.

Teams receive *internal customer feedback* from the next process through the customer relations coordinator. As mentioned earlier, the customer relations coordinator is responsible for relations with upstream and downstream teams. In addition to giving visitors tours of their work area, the customer relations coordinator works with internal customers or suppliers if there is any technical or quality problem, or even a cultural/social problem.

Because of all the charts and graphs posted on each team's performance, teams can easily see the *performance of other teams*. Coordinators from each team are responsible for updating their team's charts. The same specific measures are used for all teams in an area. For example, first pass yield is an important measure of quality for a team. There are charts for first pass yield for each of the five teams in the commercial shop. Although the information is readily accessible, comparing the performance of individual teams is discouraged at the plant. The philosophy is that if one team fails, i.e., doesn't perform, all teams fail.

Plant-wide issues are communicated to teams first hand through the monthly town meetings discussed earlier. To reiterate, the purpose of the meetings is to find out "what's going on in the company", meet new PAs, and keep informed on plant-wide issues. Some typical agenda items are: status of operations, status review by each of the FTLs, presentations on TQM projects, read and address suggestions/questions from suggestion box, going over the United Way campaign, and goals for the plant.

Teams also receive information on plant-wide issues second hand, from their ATLs, ATCs, and facilitators. The ATLs bring back information from the daily ATL meeting at 8:30. The purpose of this meeting is to review production and performance for the previous day and cover issues for the upcoming day and week. The agenda for the ATL meetings was discussed under Team Meetings. Any issues that might affect the team or that the ATL just wants to share with the teams are communicated at the next stand-up meeting. Facilitators also bring back information from the ATL meeting, in addition to the monthly facilitators' meeting for all facilitators in the plant.

ATLs and facilitators bring back information to the teams on the *plant's performance* from the ATL meetings. The facilitators from each shop give a performance review at the ATL meetings and also update the charts on their shop in the ATL meeting room. There are charts having plant-wide performance measures posted in the ATL meeting room, such as shipping performance, safety, and labor distribution for the plant.

All employees learn first hand about the performance of the plant at the town meetings, when the plant manager reviews plant-wide key measurements for the month. He gives an overview on the health of the company. There are charts showing monthly performance on the key measurements posted in the cafeteria where the town meetings are held, so people can see them throughout the month.

Corporate issues and *performance of the corporation* are are shared at the town meetings when the information is available. The Boeing Company newsletter which comes out each month also contains information about Boeing.

5.3.12.2. Information Teams Provide

Table 5.4 summarizes the types of informations teams provide to other groups or individuals in the plant:

- General information about teams and about the plant
- Team issues
- Team performance
- Requests for assistance
- Suggestions for improvement
- Requests for approval
- Responses to questions or problems

When outside visitors (internal and external to Boeing) come in to visit the plant, the customer relations coordinators provide *general information about the teams and the plant.* They give a tour of their team's work area and answer any questions the visitors have. Visitors are then "passed on" to the next team's customer relations coordinator to receive a tour. PAs are requested to provide this type of general and background information about the plant and about the team-based culture to newly hired PAs.

Teams provide information on *team issues* to other teams and to the ATC and ATL at the stand-up meetings. If it is an issue which affects other teams, such as a quality problem or housekeeping in the area, the stand-up meeting is the appropriate forum to raise the issue. Team issues are communicated through other types of team meetings throughout the plant as well. For instance, team issues may be discussed at the ATL meeting if appropriate, or they may be communicated to other cross-functional teams as necessary.

Teams are responsible for providing information on *team performance* by updating the charts on performance of teams which are posted out on the shop floor. Coordinators are responsible for collecting data on key measures and updating the charts on a daily basis. The same charts (measures) are used for each team in an area. Coordinators and other team members also enter information on production for the day into the TMS. For example, they enter discrepancies (defects), number of units produced, and how many hours they spent working on each job in the shop.

Requests for assistance are generally handled informally, by talking one on one with the ATC, ATL, or engineering depending on the nature of the problem. For technical assistance on the equipment or on procedures, they may go to their ATC or directly to an

Table 5.4. Information Outputs Provided by Boeing Corinth Self-Managing Teams

Information Output Provided by Team	How Information is Shared	Frequency	Customer of Information
General Information About Teams and About Plant	Customer relations coordinators answer questions and give tours to external visitors.	As needed	External visitors from outside companies
Team Issues	Area team stand-up meeting; teams bring issues to meeting.	Daily or twice weekly	Other teams, ATC, ATL
	ATL meeting; ATLs and facilitators bring team issues to meeting if necessary.	Daily at 8:30	Other ATLs, people in other areas
	Other meetings throughout the plant, e.g., weekly and monthly facilitators' meeting, pay for knowledge team meeting, etc.	Varies from weekly to monthly	Other areas and teams
Team performance	Coordinators update performance charts on quality, schedule, and cost.	Daily	Other teams
	Coordinators and team members enter relevant production and performance information into TMS.	Daily, or more often	Other areas
Requests for assistance	Teams informally request assistance with technical problems, about equipment, products.	As needed	ATC, ATL, Engineering
	Informally request any assistance with interpersonal problems, such as discipline. Facilitator and other appropriate coordinators will bring problem to attention of ATC/ATL.	As needed	ATC, ATL

Table 5.4. Information Outputs Provided by Boeing Corinth Self-Managing Teams (cont'd)

Information Outputs Provided by Teams	How Information is Shared	Frequency	Customer of Information
Suggestions for improvement	Informally provide suggestions for process improvements and work with process engineering	As needed	Process engineering
	Provide suggestions in suggestion box which is reviewed at Town meeting.	As needed	Strategic Planning Team
Requests for approval	Teams informally request approval from ATL, ATC, or write proposals to request whatever they need, e.g., painting their work area.	As needed	ATL, ATC, Strategic Planning Team
Responses to questions or problems	Solve problems, investigate a measure which doesn't look right; may require an informal variance analysis; performed by coordinator(s).	As needed	ATC, ATL, other teams
	If exceed a target for a month, need to fill out a formal variance analysis by productivity coordinator.	As needed	ATC, ATL, other teams

engineer. They request help with interpersonal problems from the ATC or ATL. The teams try to address the problem by themselves first. If they are unable to solve the problem, then they bring in an ATC or the ATL. An example of an interpersonal problem is a disciplinary problem with a team member who frequently misses work.

Teams provide *suggestions for improvement* informally to engineering, if the suggestion is of a technical nature. If it is related to things like pay, company policies, etc., then it would be written out as a suggestion and put it in the suggestion box. The SPT reads over and formulates responses to the suggestions collected throughout the month, and then reads the suggestion and their response to it at the town meetings.

If a team wanted to do something which would require funds, such as painting their work area, they *request approval* starting first with the ATC and/or ATL. Depending on the nature of the request, it may go to the SPT, a different function in the plant, or the ATL may be able to grant the request.

When something on the production report doesn't look right, or a measure doesn't come out as expected, the ATC or ATL may ask a coordinator to investigate the problem and provide a response. The investigation may require what is called a "variance analysis" to determine the cause of the variance from what was expected. The analysis may require detailed calculations and the use of problem-solving skills. If the shop exceeds a target for a month, they must fill out a formal variance analysis. Measures are closely monitored throughout the month so that if something doesn't look right, a coordinator may perform an informal variance analysis for the week.

5.3.12.3. Influence Over Information Received

According to team members and ATCs, any PA could get any "information if [it was] needed." One ATC who was previously a schedule coordinator on a team, stated that she believes teams have all the technical information they need to do their job. The "openness and freedom of information" in the plant is much different than traditionally-managed plants. Any PA can get any information they want from TMS. There are no hidden figures. The SPT is "very open with the plant performance and what it costs to do an hour of rework and what it costs to do an hour of work from an overall standpoint."

There are many meetings held - regular team meetings, informal team meetings, ATL meetings, and meetings for ad-hoc and cross-functional teams in the plant. These teams include members from all areas in the plant, including engineering, PAs, ATCs, ATLs, facilitators, and people from other support areas. Information from these meetings is shared liberally with anyone who is interested. The ATC, ATL, and particularly the team facilitator play a major role in the bringing back information to teams from other meetings in the plant.

5.3.13. Intergroup Relations

5.3.13.1. Communication, Information Sharing, Interaction Among Teams

There is a great deal of communication between teams in each shop area. Teams are located in fairly close proximity to one another - some PAs work almost alongside of PAs from other teams. This physical proximity facilitates communication and information sharing among teams. The stand-up meeting in the commercial shop is a forum for teams to share information as well (since all team members attend this meeting in the commercial shop). The role of the customer relations leadership was created to facilitate communication and interaction between teams to resolve issues and problems. According to one ATC, this is an area where progress has been made, and there is still room for improvement. At first, bringing up problems to internal customers/suppliers was an "offensive process" but teams have learned not to "take it too much personally."

Information is readily available for teams to compare performance - the same key measures and charts are used for teams within a shop, so teams can easily see how they performed as compared to another team. However, comparing performance, and hence competition between teams, is very strongly discouraged at the plant. In fact, several of the people I interviewed made the comment that the culture and philosophy is that if one team fails, all teams fail. One ATL's viewpoint was that "each team is only as good as the team that is struggling like heck because they all ship to the same customer."

5.3.13.2. Perception of Teams Within Organization

Because Boeing-Corinth is a greenfield site and teams are used throughout the plant, this section is not relevant.

5.3.14. Problems Experienced With Teams

Along with the benefits and advantages to self-managing teams come disadvantages and problems with implementing teams. The problems and difficulties Boeing-Corinth has experienced are listed below (adapted from a presentation given by a PFK facilitator in the plant):

- the team environment and pay for knowledge system is very expensive to develop, in terms of time, money, and dedication.
- the pay for knowledge system is complex to administer; scheduling is a real challenge in trying to match business needs with training needs to schedule instructors, trainees, and classroom facilities.
- large amounts of resources to training are required; it is a challenge to balance the needs of the organization to produce a product with the need to provide the training necessary not only for team members to get their pay raise on time but also to be able to do their job.
- people are always in a learning mode, which can be chaotic and stressful.
- some support members feel insecure in their job - some of the tasks performed by teams have traditionally been performed by supervisors and technical support people; some support people are reluctant to share too much of their knowledge and expertise because they are afraid of reducing their value to the company.
- some PAs are uncomfortable with leadership roles and are reluctant to assume them; they learn technical tasks, but do not want leadership responsibilities, which is unacceptable to plant leadership and sometimes requires an intervention.
- topping out - some of the original team members from when the plant first opened will be reaching top out on the scale soon; the compensation increases have been about 57% from base to top out over three years; there is some concern about what they can expect after they have achieved team rate (the highest rate in the PFK system); one alternative strategy is a gainsharing system.
- as originally designed, there were too many job tasks to learn - it became apparent that it was unrealistic to expect PAs to learn all the tasks in production; the system has since been redefined into smaller parts representing different segments of the business.

Other disadvantages as described by people interviewed during the site visit:

- some criticism that there are too many committees and meetings in this environment.
- some PAs have had "ambiguous attendance"; a cross-functional team has been chartered with looking at how to administer a fair attendance policy and trying to put together some norms.
- leaders often get into a directive mode; they ask a team to make a decision and when the team comes back with a decision which is not the best in the leader's viewpoint, they fall back into an autocratic mode.

- PAs who are committed and dedicated to this environment and the added responsibilities resent those who aren't and who do not carry their weight; however, the team is reluctant to discipline those who do not contribute their fair share.
- some teams may get isolationist and tend to sub-optimize; there may be too much team identity and cohesiveness with some teams. Plant leadership tries to overcome this with reminders about everyone being part of one overall team (the plant).
- there have been problems with some teams not becoming self-managing as quickly as others; they needed more direction and leadership than other teams.
- the need to balance reinforcing team identity and cohesiveness vs. individual identity and recognition is a challenge; some believe Boeing has erred on the side of not enough individual recognition, yet when when leaders tried to recognize some PAs by giving them a small Boeing pin, teams did not like it.
- staffing is "very traumatic right now," having to shift people around, out of one shop into another to adjust to declining military business; teams do not want to split up because they have been together for years, like a family.

5.3.15. Disseminating Teams to Other Parts of Organization

This section is not relevant for Boeing-Corinth because it is a greenfield site.

5.4 Summary

Boeing-Corinth has had it share of problems and difficulties, as any greenfield site has. Most, if not all, of them are predictable based on problems faced by other greenfield sites. Boeing appears to be successfully addressing these challenges by putting in place mechanisms, to feed back information on design problems and institute changes to solve the problems. The pay for knowledge advisory team is an example of one such mechanism. It was created specifically to learn more about pay for knowledge, analyze the current system, and make recommendations to improve it. Effectively using other mechanisms to truly make Boeing a "learning organization" will be the deciding factor in its long-term success. Opening the plant up to outside visitors and freely exchanging information not only helps Boeing because they can also learn from visitors, but it also greatly assists other organizations who choose to make the transition to a high involvement organization.

APPENDIX H Data Displays for Types of Information from Cross Case Analysis

This appendix contains the data displays from the Cross Case Analysis, looking at all the case data together. The data from Within Case Analysis (which was presented in Chapter 5 and also in the case descriptions on Appendix G) was combined into one display, and summarized and condensed to facilitate comparison between sites. Types of information from individual sites which were related were combined into one type in Cross Case Analysis. As mentioned earlier, these displays became the foundation for developing the definitions and examples of the types of information received and provided by teams in Chapter 6 Conclusions and Interpretations.

Table H.1a. Types of Information Teams Receive Across Sites

Type of Information Received	Corning Blacksburg Plant	Shenandoah Life Insurance Company	Tennessee Eastman Company
Feedback on team performance	• daily shift exchange meetings • teams can access information on computer • recorded daily in a production notebook in team meeting room	• Teams receive Production Summary (weekly performance report) • receive feedback on accuracy of transactions and average processing time once a year • annual customer survey of agents on accuracy, timeliness, courtesy and overall service • written praise from customers • once a year, team members conduct field trips to customers	• daily shift hand-off meeting • recorded daily in production coordinators' notebook • performance on Key Results Indicators is shared on KRIs at monthly team meetings • external customer feedback is filtered down to team through department manager and quality coordinator • some teams participate in external customer visits and site visits to customers
Team production information	• daily shift exchange meetings • production goals are posted on bulletin boards in the shop	• informal communication one on one with team and managers • weekly Team Rep meetings • skills analysis matrix is distributed to teams	• production coordinator's notebook • daily shift hand-off meeting • team skill profile is posted in team meeting room
Team issues	• daily shift exchange meetings • biweekly meeting for shift teams handing off to each other	• weekly Team Rep meeting • informal communication	• daily shift hand-off meeting • monthly team meetings

Table H.1a. Types of Information Teams Receive Across Sites (cont'd)

Type of Information Received	Corning Blacksburg Plant	Shenandoah Life Insurance Company	Tennessee Eastman Company
Technical product/ process information	• process documentation process (PDC) provides formal documentation • process changes are posted in shop	• weekly Team Rep meetings • presentation by developer of new products to review processing information • informal communication with teams and managers	• Standing Team meetings with coordinators • Policy Advisory Team (PAT) meeting • informal one on one communication with team members, coaches to solve problems
Performance of other teams	• daily shift exchange meetings	• Production Summary shows objective performance for all teams	• teams see how other teams performed at daily shift hand-off meeting
Performance of department, division, company/ plant, corporation	Plant: • monthly plant review meeting conducted by plant leadership • biannual manufacturing review by corporate VP • bi-monthly plant newsletter • results from quarterly vision review team meetings Corporation: • plant review meeting	Department: • quarterly department meeting conducted by department VP Company: • quarterly company-wide meetings conducted by president	Department: • key department performance measures is reviewed daily at shift hand-off meetings Division: • presentation by division head on cost and other financial information for division, as requested Company/Corporation: • TV monitors • bi-weekly company newsletter • information is sent through PROFS computer system to coordinators • charts and graphs on company performance are posted out in shop areas

Table H.1a. Types of Information Teams Receive Across Sites (cont'd)

Type of Information Received	Corning Blacksburg Plant	Shenandoah Life Insurance Company	Tennessee Eastman Company
Issues for department, division, company/ plant, corporation	Company: • monthly plant review meeting • plant newsletter • results from quarterly vision review team meetings • results from social QIT meetings • information is posted on bulletin boards all over the plant Corporation: • corporate videotape is shown at monthly plant review meetings	Department: • quarterly department meetings Company: • quarterly company-wide meetings	Department: • PAT representatives bring back information Policy Advisory Team meetings • coaches and coordinators bring back information from daily production meetings for all coaches • information is sent through PROFS to coordinators Company/Corporation: • bi-weekly company newsletter • information is filtered down to PAT meetings and back to teams from there • TV monitors

Table H.1b. Types of Information Teams Receive Across Sites

Type of Information Received	Virginia Fibre Corporation	Boeing Corinth Plant
Feedback on team performance	• informal feedback from supervisor • written memos praising team performance • internal customer feedback from the next process is received informally if there is a problem	• individual team meetings (daily or weekly) • area team stand-up meetings • extensive charts and graphs are updated daily and posted in shop • weekly performance charts are compiled for all areas • monthly performance report is compiled for all areas • internal customer feedback from downstream teams is handled one on one communication between customer relations coordinators
Team production information	• log book from other team • teams use computer to access necessary production information throughout the shift	• individual team meetings • area team stand-up meeting • production report received several times a day by scheduler • teams access information on TMS as needed • messages are written on whiteboards and flipcharts throughout the shop • informally receive information from ATC, ATL, facilitator
Team issues	• teams meet informally if necessary at beginning of shift	• individual team meetings • ad-hoc informal team meetings • informal communication among and between teams • area team stand-up meeting • messages written on whiteboards and flipcharts in the shop • facilitator brings back information on team issues from other teams and meetings

Table H.1b. Types of Information Teams Receive Across Sites (cont'd)

Type of Information Received	Virginia Fibre Corporation	Boeing Corinth Plant
Technical product/ process information	• engineering informally communicates with teams on changes in operating procedures • Operations Manual in team meeting room	• engineering provides teams with suggested changes • Operations Manual on the shop floor • government liaison for military shop assists teams in interpreting military standard and specs
Performance of other teams	• team can subjectively assess other team's performance from log book (what problems they had)	• objective performance of all teams is posted on charts and graphs throughout the shop
Performance of department, division, company/ plant, corporation	Company: • daily operations report sent to all departments; reports specific measures for each department as well as company overall • key bottom line company measure is posted daily on huge bulletin board where employees walk in • weekly operations report • semi-annual Communications meetings led by top management • annual address to all employees • annual report which is a written version of annual address	Plant: • ATLs and facilitators bring back information to teams from daily ATL meeting which all ATLs in the plant attend to review performance • charts and graphs on each area in the plant are updated daily in ATL meeting room • charts for plant performance measures are updated in ATL meeting room • monthly town meeting • monthly performance charts in cafeteria on plant performance Corporation: • monthly town meeting • corporation newsletter published every month
Issues for department, division, company/plant, corporation	Company: • supervisor brings back any relevant information to teams • company newsletter comes out every two months • weekly operations report sent to all departments • semi-annual Communications meetings • annual address • annual report	Plant: • ATLs and facilitators bring back information from daily ATL meeting and from other meetings • monthly town meetings Corporation: • monthly town meetings • monthly corporation newsletter

Table H.2a. Types of Information Teams Provide Across Sites

Type of Information Provided	Corning Blacksburg Plant	Shenandoah Life Insurance Company	Tennessee Eastman Company
General information about team environment	• team members give tours and answer questions from visitors during Visitors Day about once a month	• one agenda item for visiting companies is to spend time with several team reps and ask questions	• team members participate in presentations, tours, and question and answer panel sessions with internal plant visitors and external visiting companies
Team performance	• teams provide performance information to other teams at daily shift exchange meetings	• teams provide weekly production data for compilation into Weekly Production Summary	• coordinators pass on performance information for their shift to on-coming coordinators at shift hand-off meeting
Team issues	• team communicates issues to other team at daily shift exchange meetings • team members communicate issues to leadership at coffee klatch	• team reps poll other team members for team issues before weekly Team Rep meeting • team issues are communicated informally with other teams and with managers	• daily shift hand-off meeting • coordinators communicate issues on PROFS • issues relating to all teams are raised in Standing Team meetings
Requests for approval	• teams fill out a PDC experiment plan to request approval for a change	• teams informally request approval from management for equipment, additional training, etc. • informally request approval to deviate from established procedures • teams informally suggest changes to other teams and managers	• coordinators request approval from other team coordinators at Standing Team meetings to try new things • PAT representatives bring suggestions for improvement to PAT meetings

Table H.2a. Types of Information Teams Provide Across Sites (cont'd)

Type of Information Provided	Corning Blacksburg Plant	Shenandoah Life Insurance Company	Tennessee Eastman Company
Requests for assistance	• no data	• teams ask managers for assistance with technical and interpersonal problems as needed	• teams informally request assistance with technical, administrative, and personnel problems from coaches as necessary • teams request help from other teams as needed when other team members are out
Responses to questions/ problems	• no data	• no data	• no data

Table H.2b. Types of Information Teams Provide Across Sites

Type of Information Provided	Virginia Fibre Corporation	Boeing Corinth Plant
General information about team environment	• no structured visits set up for visitors interested in the teams; team members answer questions informally	• customer relations coordinator gives tours of their work area and answers visitors' questions
Team performance	• teams enter subjective performance information into computer daily • submit weekly summary of operations and activities to contribute to weekly operations report • each team writes subjective comments on their performance in log book to other team	• coordinators updated charts on key performance measures daily • coordinators and team members enter information on performance into TMS computer system
Team issues	• each team writes relevant issues in log book for other team • teams enter problems, activities, etc. in computer system which is compiled for the daily operations report • weekly summary of activities and production is submitted and compiled for the weekly operations report • teams informally raise issues with supervisor as needed	• issues pertaining to all teams are discussed at area team stand-up meeting • facilitators and ATLs bring relevant issues to daily ATL meeting • facilitators and coordinators raise relevant team issues at other team meetings they are involved with
Requests for approval	• teams request approval from supervisor or top management for purchases • teams provide ideas and suggestions for improvement to engineering	• teams informally request approval for purchases or changes from ATC, or ATL or write proposal to appropriate support function • teams informally request approval to make process improvements and work with process engineering • team members write out suggestions to put in suggestion box and addressed at town meeting

Table H.2b. Types of Information Teams Provide Across Sites (cont'd)

Type of Information Provided	Virginia Fibre Corporation	Boeing Corinth Plant
Requests for assistance	• teams request technical information from supervisor, maintenance, or engineering to answer questions about equipment as needed	• teams informally request assistance with technical problems, about equipment, products from ATC, ATL, or engineering • facilitators informally request any assistance from ATC, ATL with interpersonal problems
Responses to questions/ problems	• other managers call with questions about the teams' production and teams look up information and respond • people from other companies call with technical questions about mill and any team member can respond	• coordinators investigate and solve problems at the request of ATC, ATL, and perform informal variance analysis as necessary • if a target is exceeded for a month, coordinators fill out formal variance analysis

VITA
Eileen Morton Van Aken

I. PERSONAL INFORMATION

PERSONAL: Birthdate: June 26, 1965
United States Citizen

HOME ADDRESS: 203 E. Turner St. Apt. 4
Blacksburg, VA 24060
703/951-7535

OFFICE ADDRESS: Virginia Productivity Center
Industrial and Systems Engineering
567 Whittemore Hall
Blacksburg, VA 24060
703/231-6397

II. EDUCATION

1991 - Master of Science, Industrial and Systems Engineering, Management Systems Engineering Option, Virginia Polytechnic and State University, Blacksburg, Virginia.

1988 - Bachelor of Science, Industrial Engineering and Operations Research, Virginia Polytechnic and State University, Blacksburg, Virginia.

III. EXPERIENCE

January 1989-Present - Graduate Research Associate, Virginia Productivity Center, ISE Department, Virginia Tech, Blacksburg, VA.

- Served as project manager for Puget Sound Naval Shipyard and Naval Ship Systems Engineering Station projects.
- Coordinated and developed course materials for numerous seminars and presentations on quality and productivity management and performance measurement.
- Served as co-presenter and project manager of three day short course "Becoming a Change Master in Quality and Productivity Management," presented twice a year through the Institute of Industrial Engineers.
- Served as VPC Strategic Management Team member and participated in interviewing, hiring, and training new associates.
- Management Systems Engineering Program Coordinator - coordinated seminars, created MSE newsletter, and developed MSE manual.

August 1988-December 1988 - Graduate Teaching Assistant, ISE Department, Virginia Tech, Blacksburg, VA.

- Tutored and assisted students in problem solving in Operations Research graduate course.
- Taught classes on PERT and CPM.

March 1985-August 1988 Industrial Engineer (CO-OP and Summer Student), AT&T Microelectronics, Richmond, VA (worked a total of 21 months over this time period)

- Participated in new product start-up team for a ceramic computer chip where team's efforts resulted in a tenfold yield improvement: provided technical support to operations, wrote machine operating and product inspection instructions.
- Served on project team to implement pilot Just-in-Time line: created and implemented system for tool and fixture organization and assisted in design of work flow and operating team structure.
- Designed and conducted engineering studies for quantifying and improving product parameters, and designed and developed production visual aids.
- Participated on project teams to implement Total Employee Involvement and Total Quality Control.

IV. SERVICE AND INTERESTED AREAS

- Actively involved in the student chapter of the Institute of Industrial Engineers and Alpha Pi Mu IE Honor Society, Student Engineers Council.
- Interested in these research areas:
  - Employee Involvement
  - Self-Managing (Self-Directed) Work Teams
  - Quality and Productivity Management
  - Management of Change
- Participated in the following conferences and seminars:
  - Kepner-Tregoe Problem Solving and Decision Making Workshop
  - 1989 and 1990 Virginia Senate Productivity Awards Conferences
  - 1987 Washington, 1989 Toronto, 1989 Atlanta, 1990 San Francisco, and 1991 Detroit Institute of Industrial Engineers International Conferences
  - 1990 International Conference on Self-Managed Work Teams, Denton, Texas, September 26-8
  - *Quality, Productivity, and Competitive Position* 4-day Deming Seminar, Greenville, South Carolina, February 5-8, 1991.
  - *Instituting Dr. Deming's Methods for Management of Productivity and Quality*, 2-day Seminar, Washington, D.C., July 11-12, 1991.

V. PAPERS AND PROJECTS

"A Multiple Case Study on the Information System to Support Self-Managing Teams" unpublished M.S. Thesis, Blacksburg: Virginia Tech.

"Implementing TQM in the NAVSEA Standardization Process," paper co-authored and presented at the 1991 International Conference for Productivity and Quality Research III.

"Using Group Behavior Training to Improve Action Team Performance," paper co-authored and presented at the 1991 ICPQR III.

"Case Study of Knowledge Worker Performance Measurement," paper co-authored and presented at the 1990 San Antonio IIE Conference, October.