

An Exploratory Study of Strategic Value of Information Technology:
A Theoretical Application of the Co-Alignment Model

by

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(ABSTRACT)

Despite the impact of Information Technology (IT) in today's service economy, its nature and role are elusive or ambiguous to say the least. This ambiguity has made it so difficult to measure the value of IT. To clarify the ambiguity, this study, with a focus on the strategic dimension of IT application in the web of organizational activities, proposes a conceptual model that relates IT application to Knowledge Management and then to Strategy. In this effort, incorporating the Co-alignment model as a theoretical binding agent, the role of IT is defined as a facilitator of organizational knowledge management that is regarded as the core of strategic management.

The conceptual model proposed is further developed into a structural model for empirical testing. The goodness of fit of the model is assessed through the technique of the Structural Equation Modeling (SEM) along with first-order and second-order confirmatory factor analyses (CFA) using the survey responses of unit managers of multi-unit restaurant companies of the U.S. and Korea. Since the mail survey was conducted in two different nations, relevant multi cultural issues are also addressed to justify the use of combined samples for the study.

The results of the statistical analyses indicate that IT application can be incorporated successfully into the domain of strategic management of restaurant companies as the facilitator of Knowledge Management activities. The hypotheses of the links between IT application and financial performance remained unsolved due to invalid data. However, this study made a certain degree of contribution in identifying the dynamics of IT application in the process of strategic management incorporating the principle of the Co-alignment model.

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Chapter One: Introduction

1.1 Introduction

Information Technology (IT) has been described as one of the most influential factors in providing unprecedented opportunities to business organizations during the past few decades. In the hospitality industry, it is commonly understood by researchers that IT, as a critical success factor (Cho, 1996; Cline and Blatt, 1998; Cline and Rach, 1996, Connolly, 1999), should be incorporated into the organizational structure (Connolly, 1999). Despite the rich literature on this topic, however, measuring the value of IT or the investment related to it has been an ambiguous issue for a long time. Two most common complaints related to this ambiguity are the difficulty of relating IT investment to business strategy, and of identifying the adequacy of the payoff from IT investments (Bensaou and Earl, 1998).

This study tries to clarify the ambiguity about the value of IT by relating IT to business strategy, and then strategy to organizational performance. For this purpose, it is intended to analyze the role and function of IT in a business organization. Through the review of existing literature, a few constructs and their relationships will be identified. The result of this finding will be introduced as a conceptual model. This conceptual model will be developed into a measurement model and then, finally, into a structural model for empirical testing. Throughout the entire study, the co-alignment model proposed by Olsen et al. (1998) is used as the framework that binds the two different concepts of IT and strategy.

1.2 Problem Statement

IT as a research topic has evolved during the second half of the 20th century in two dimensions: technology, and performance. The technology dimension covers such issues as hardware and software, while the performance dimension refers to what can be accomplished with the available technology. The research on performance-related topics has evolved from the concept of data processing and moved to management information systems, and decision support systems (Sprague and Watson, 1983). Recently, converging with the technology of telecommunications, the realm of IT has expanded to cover a new segment of e-commerce (Zhou, 2003) gaining more significance in its role in shaping the future (Negroponte, 1995). However, in this approach of viewing IT as a technical black box, or a simple tool, that is designed to enhance productivity, articulations of the nature and role of IT are often missing in efforts of theory development (Orlikowski and Iacono, 2001). This study departs from the previous trends in that it tries to identify the role of IT by addressing its function as a web of strategic context, or the infrastructure that supports strategic implementation effectively to achieve the ultimate goal of the organization.

Identifying the value of IT in a business organization has been a continuing quest (Mayor, 2000; Pastore, 2000; Torkzadeh and Doll, 1999). However, it has not been clearly defined yet how to identify the value of IT, despite the importance of its role. It has been frequently mentioned that the investment in IT is difficult to justify due to its ambiguous nature when organizational performances are evaluated under current accounting practices (Bharadwaj, Bharadwaj, and Konsynski, 1999). The outcome of IT application is usually intangible (Bharadwaj and Konsynski, 1997) and widely spread. It

can be hidden in many different aspects of business activities, making it almost impossible to pinpoint the causal relationships of IT (Connolly, 1999). It is believed that this problem mainly stems from the lack of suitable measurement tools, techniques, and criteria (Blair and Wallman 2000; Saunders and Jones 1992).

It has been suggested that the discounted cash flow (DCF) model be used to measure the value of IT investment (Bacon, 1992). Reasonable as it sounds when considering the industry-wide application of the technique for valuation of assets, there are still some technical difficulties for practitioners to accommodate such a quantitative model for this specific purpose, due to the reasons mentioned above as well as other limitations involved in the budgeting process (Bacon, 1992; Hubbard, 1999). Furthermore, when business performances are summarized into consolidated financial statements under current accounting rules, it is quite difficult to point out in numerical terms specific input-output relationships of the IT related activities. Connolly (1999) concludes after his exhaustive literature review that “despite a significant and positive impact on firm performance and capability, empirical attempts to quantify the contribution provided by IT have failed to conclusively validate the causal relationships between IT and related constructs because the strategic impact of IT is the most important dimension when evaluating the contribution from IT.”

From this perspective, academic research has not been successful in presenting a theory that can explain one of the most important contemporary issues. Admitting this fact, it can be concluded that with regards to IT and related issues, despite such a rapid advancement in IT itself and in its impact on business environments during the past few decades, academic research in the realm of measuring the value of IT’s contribution is

still in its embryonic stage. With the definition of research being any study involving critical inquiry and examination aimed at the discovery and interpretation of new knowledge (Khan and Olsen, 1988), this lack of theoretical support to the industry about this issue needs to be addressed with a fresh approach.

The lack of support from academic research in the field of hospitality management has been pointed out for a long time. In their report on this issue, Khan and Olsen (1988) lament “it is paradoxical that an industry of this size has thrived despite the limited amount of scholarly research directed to the problems and relationships occurring in all segments of the field.” Among many aspects that need academic support in the field, the measuring mechanism of the efficacy of IT is critical.

One conspicuous attribute of hospitality firms is that they rely on their customers’ experiences for financial success. This means that customers’ satisfaction about their experiences becomes the instrumental goal that should be justified by the price tag attached to the services provided. Satisfaction is the perception that cannot be easily quantified. The intangibility of this main instrument imposes the initial difficulty of valuing any investments that are supposed to enhance its effect. IT, traditionally regarded as the typical service instrument that is applied to enhance productivity, inherently creates intangible effects. In other words, the direct effect of IT remains elusive, not to mention the changing value of IT applications over time (Grover et al. 1997, Post et al. 1990). Similar difficulties have been addressed in the hospitality research as well by David, Grabski, and Kasavana (1996). With the indirect nature of IT, it is quite natural that IT applications in the hospitality industry cannot be directly measured for their monetary value. Thus, the investigation of the effect of IT needs to be

“more comprehensive over the entire organizational structure, people, and the jobs involved” (Leavitt, 1965).

1.3 Research Objectives

Based on the problem identified above, this study intends to explore a new scope of the role of IT and to propose a conceptual model that explains how IT functions guide managerial effort in an organization to achieve its goal of adding value. Implied in this statement is that this study is more about the strategic effectiveness of IT than about efficiency. The conceptual model will be developed into a measurement model and then into a structural model so that certain causal relationships can be measured between identified constructs related to IT and performance. In doing this, the format of a cross-sectional study will be taken within the boundary of casual-theme, multi-unit restaurant companies for empirical testing. Developing a structural model is of particular importance because it can be used as a generic model to compare and monitor effectiveness of IT application at the firm-specific level.

As mentioned earlier, the Co-alignment model is conjoined in this effort to connect the abstract nature of the suggested constructs – IT and its strategic effectiveness. The co-alignment model clearly defines and explains the process of formation and implementation of the strategy of a firm, which is proposed in this study to be the result of IT application. Details of the Co-alignment model will be presented later in this chapter. In conclusion, this study intends to explain the effectiveness of IT by relating the performance of the firm to its knowledge-related activities.

1.4 Theoretical Underpinnings

With a societal shift to the service economy, knowledge as an intangible asset plays a vital role in creating value replacing that of tangible assets (Cline and Blatt, 1998; Cline and Rach, 1996; Drucker, 1993, Toffler, 1980). IT has long been recognized as the critical success factor, but scientists have not been successful in presenting an economic theory about the value of knowledge (Drucker, 1993). IT, combined with the two different functions of information and technology, plays an indispensable role in creating relevant knowledge for the strategic management of organizational activities. For this reason, a study about IT spans multiple disciplines (Currie, 1995) of strategic management, including organizational theories beyond the boundary of information systems. The linkage of service with IT has also been a subject of academic attention.

There are arguments addressing the importance of knowledge management in the area of strategic management, emphasizing knowledge acquisition and transfer (Gupta and Govindarajan, 2000; Yli-Renko, Autio and Sapienza, 2001). The topic of knowledge transfer is also introduced as inter- or intra-organizational communication systems (Segars and Kohut, 2001; Lai, 2001; Chang, 2001; Scalet, 2001). Most of these arguments are based on the systems perspective of an organization. However, none of these yet seems to be successful in operationalizing their conceptual arguments to propose practically applicable models in explaining the role of IT. Instead, the perspectives of competitive advantage and core competency have been adopted to explain the issue (Duhan, Levy and Powell, 2001). The majority of IT related research in the hospitality industry is still in the immature stage. According to a classification scheme established by the National Research Foundation, referred to by Khan and Olsen (1988),

there are three categories of research – basic, applied, and developmental. According to Khan and Olsen (1998),

“Basic research consists of original investigation for the advancement of scientific knowledge that may not have any specific commercial objectives. Applied research is about discovery of new scientific knowledge that has specific commercial objectives with respect to products or processes. Finally, developmental research refers to technical activities of a non-routine nature concerned with translating research findings or scientific knowledge into products or processes.”

Considering the highly applied aspect of the hospitality industry, it can be understood that discovering or advancing scientific knowledge is a challenging demand. Most of the research in the hospitality industry on the issue of IT seems to remain in the stage of descriptive analysis of what types of technology are available and/or how to use them. In other words, researchers still tend to be concerned with finding empirical facts instead of developing theories.

On the other hand, in the area of strategic management, an example of theory building is found in the hospitality field. Olsen et al.'s (1998) proposal of the co-alignment principle is it, which could be considered an effective model that has operationalized details of strategy – from formation to implementation. The Co-alignment model explains the entire process of strategy from pre-establishment to the evaluation. Being a comprehensive model, it covers all the necessary constructs – environmental scanning, choice, structure, implementing details in the forms of competitive methods and core competency, and measurement of performance. With the

comprehensive nature, it works effectively to connect two ambiguous concepts of Knowledge Management and Strategic Management.

The co-alignment model is believed to be the synthesis of the previous two academic approaches that tried to explain the causal factor of sustainable superiority in organizational performance – competitive advantage and the RBV (resource-based view) (de Chabert, 1998). While Powell (2001) asserts with a logical explanation that all the arguments based on RBV are analytic propositions, the co-alignment model deserves a different evaluation since it is not exactly a proposition. Instead, it is more of a guideline that provides detailed instructions about strategic implementation. What makes the co-alignment model stronger in its effectiveness is that it focuses on the unique aspects of the service areas of the hospitality industry.

1.5 Research Question

Due to the utility (service) function of IT (Ascher & Whichard, 1987; Baumol, 1986; Daniels, 1993), the focus of this study starts with the argument about the service revolution that states the economies of most industrial nations today, including that of the U.S., are increasingly dependent on services and/or experiences. As Quinn points out (1988), “the value of even a physical product is in the utility it represents.” In this regard, valuing an asset is actually a conversion process of putting a price tag on its utility. For this reason, this study focuses on the utility aspect of IT contribution to identify its value.

Different from the attributes of physical (tangible) goods, it is extremely difficult to measure the value of utility except for the price paid for them. Likewise, it is difficult to quantify the value of investment and expenditure of resources required after they

produce utility, or to assess whether expenditures on the inputs of producing intangibles are effective (Blair and Wallman, Oct. 2000).

To address this difficulty, the primary research question of this study is “how do we know whether an investment in IT will increase the overall value of the firm, resulting in maximizing the shareholders’ wealth?” More specifically, this question can be put as “On what theoretical relationships, do we rest our belief, or at least our feelings of belief (Popper, 1956), that IT, or investment in IT, will increase the value of the firm?”

Since the question specifies certain relationships, the answer should be structured from the effort of identifying appropriate relationships. In addition, the question, being theoretical, had better be answered through theoretical analysis of the function of IT, which is the main approach of this study. The next section introduces necessary arguments to develop a conceptual model that identifies theoretical relationships of IT to the value of the host firm.

1.6 Development of the Conceptual Model

1.6.1 Introduction

The contribution of IT to the firms’ performance has been conceptually recognized (Roach, 1988), but academic research has been relatively silent in explaining functional details of how IT contributes to performance. This study starts with constructing a conceptual model that explains the connection between the two with an in-depth analysis of the functional aspect of IT within hospitality firms.

To do this, it is necessary to identify the role of IT in the business environment. IT is made up of two different functions – information and technology. The information

function provides the material (*what*) that contributes to organizational effectiveness during the process of decision-making, while the technology function provides the mechanism (*how*) that operationalizes the role of specific information by refining its quality through consolidation and diffusion into the stage of solid knowledge required for decision-making. With these two different functions combined, IT becomes an indispensable set of resources that contributes to achieving organizational congruenceⁱ that plays the role of the moderating variable between strategy and performance. In this context, IT can be considered effective when it is successfully applied to achieve a predetermined organizational goal within the blueprint of the firm's strategic plan. From this perspective, it is logical that IT should be incorporated into the structure of an organization to be the most effective (Connolly, 1999).

IT can be viewed as a strategic instrument that enables an organization to manage its intelligence effectively. Organizational intelligence, defined as any activity that converts data or information into a useful piece of knowledge (Kahaner, 1996), requires intensive processing of data and information. An organization must be equipped with this function of intelligence to make knowledge work to achieve its goal (Drucker, 1993). From this view, information is defined as an intangible raw material to be processed, or to be refined into the final product – that is, a useful body of knowledge – for the organization (Takeuchi and Nonaka, 2000). This body of knowledge includes, but is not limited to, organizational know-how – operational as well as managerial (Grundstein, 2000) and causal relations identified for managerial issues that require decision-making. Only when this happens, the body of knowledge possessed by an organization can be

ⁱ Organizational congruence represents the stage in which everyone in the organization knows what he/she needs to know to make the best decisions that will work for the company in the long run.

regarded as an intangible asset, while IT is the instrument that is applied to generate and activate the asset. Therefore, it will be more logical to address the instrumental value of IT rather than to address its intrinsic value. However, the difficulty is that the instrumental value of IT (and the related investment) cannot be easily captured because there are intermediate conceptual steps, which are other instruments, during the process of completing its role. Therefore, it is important to identify the intermediate constructs that exist between the concept of IT and performance and to identify their interrelationships to the final goal of an organization.

1.6.2 Open System View of an Organization

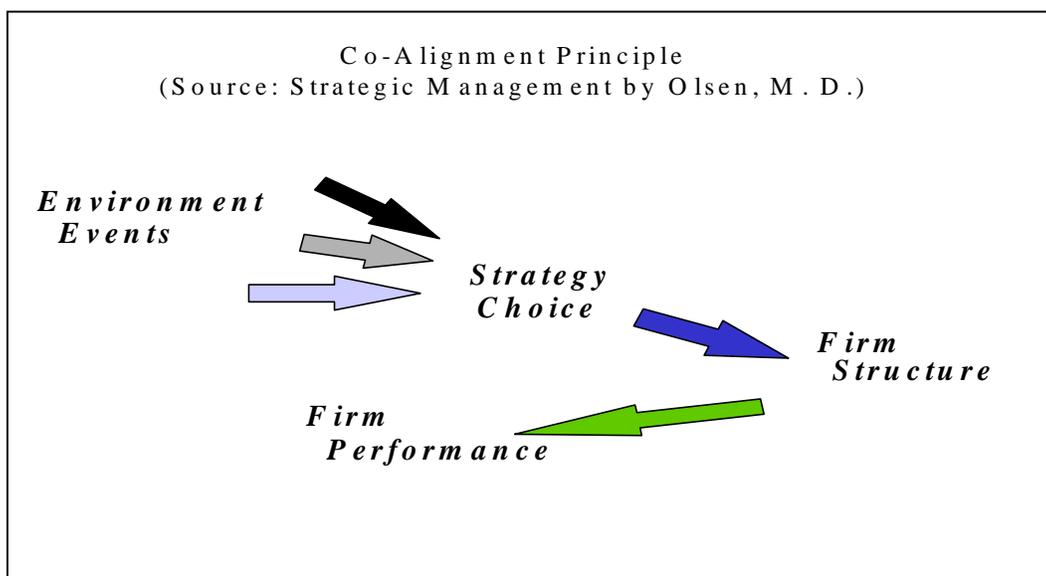
According to the open system theory, organizations absorb resources from their external environment (supra-system) and process them to achieve their goals. A system is defined as “an organized, unitary whole composed of multiple interdependent components or subsystems and delineated by identifiable boundaries from its environment” (Kast and Rosenzweig, 1979). This argument suggests that an organization has multiple subcomponents that process information. In this sense, an organization can be considered a cluster of mini information refineries. The connections among the subcomponents are better known as structure. The type of information as the raw material for one component may not be the same as that for another component. These mini refineries are interrelated with one another and generate necessary knowledge for other components as well as for themselves. With all these small sets of knowledge combined together, the organization accumulates its body of knowledge. This is considered the knowledge-generating role of IT suggested in this study.

In addition to the knowledge-generating role, IT also plays another role in the communication channel so that necessary knowledge is effectively delivered to relevant subcomponents within the organization. Only through this communication channel, be it formal or informal, relevant people get access to the information they need for their performance. From this view, IT capacitates the resource (knowledge) creation, and becomes the logistic center as well. It is important to understand that the communication channel must include external stakeholders of the organization in its list of destinations.

1.6.3 The Co-Alignment Model and the Role of IT

Based on the postulation above, the co-alignment model (Olsen et al. 1998) is used as the binding agent to develop the main argument of this study. The co-alignment model, as the synthesis of its previous two academic perspectives (de Chabert, 1998) – industrial organization (I/O) theory and the resource-based view (RBV) – states that an organization must look out for its environmental trends and constantly adjust (or co-align) itself in line with these trends to be successful (see Figure 1.1).

Figure 1.1



The main point of the Co-alignment model in terms of IT application coincides with that of Sun Tzu's maxim introduced in his book Art of War. Twenty-five centuries ago, this military strategist argued as follows:

"If you are ignorant of both your enemy and yourself, then you are a fool and certain to be defeated in every battle. If you know yourself, but not your enemy, for every battle won, you will suffer a loss (half and half). If you know your enemy and yourself, then you will win every battle."

Being a military strategist, Sun Tzu's argument is all about how to win a war. However, the point lies in the intelligence activity. The same logic is presented for today's business environment in the co-alignment principle. The co-alignment principle emphasizes the importance of intelligence activities by putting the top priority to the activity of environmental scanning to identify major trends and adjusts the organization to them in advance. It requires well-coordinated organizational activities. The success of this coordination is dependent on how effectively their information systems are utilized. The key word is "effective" here.

IT is often considered an important core competency that enables the organization to enhance its performance. However, IT alone cannot be a sufficient condition. There are other hidden variables that surround IT in overall intelligence activity. The level of success in this intelligence is dependent on the quality of the organization's effort to utilize its IT. IT application must be aimed at enhancing the overall quality of information, which was one of the factors pointed out by Lawrence and Lorsch (1967). In this context, the effectiveness of IT application, in the first place, can be measured by the quality of the knowledge generated through the IT. In turn, the quality of knowledge

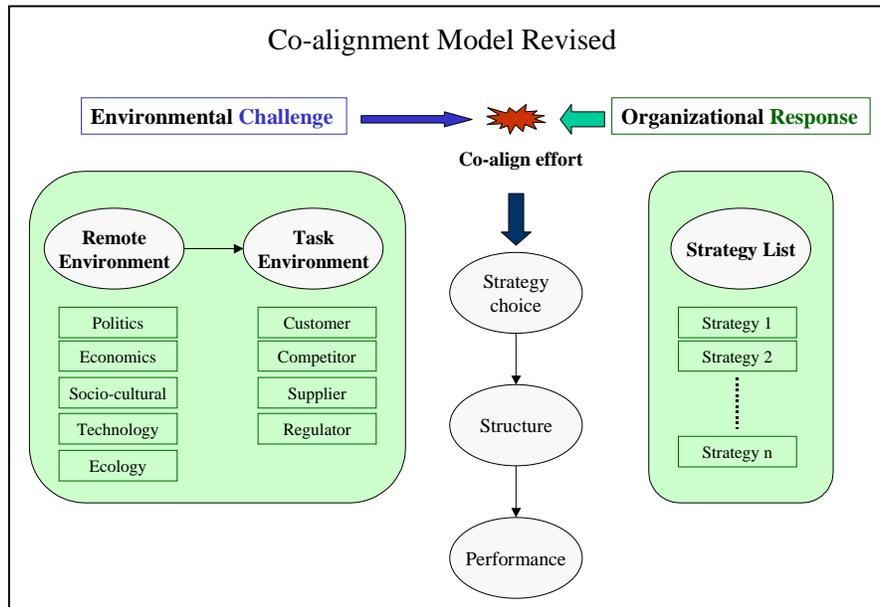
can be perceived by its pertinence to the task. Therefore, the role of IT is to generate a piece of knowledge that is directly relevant to the task of the organization.

The Co-alignment model explains this role as the step of environmental scanning. As aforementioned, this model can be clearly understood from the perspective of information processing. The activity of environmental scanning is mainly about processing external information with the goal of identifying forces driving changes that are expected to bring an impact on the future of the organization (Knowing your enemy, in Sun Tzu's remark). At the same time, however, internal information must be processed to enhance the level of understanding about the organization itself (Knowing yourself). The outcome of these two separate but related activities must converge to create effective knowledge for strategic plans (Lentz and Engledow, 1986), which enables the step of "choice" in the co-alignment model. The details of this convergence must be clearly communicated to everyone in the entire organization – the step of "structure" in the co-alignment model. The best performance can only be expected when this communication is continuously and effectively taking place. In this process, the effectiveness has a higher priority over the efficiency. This is a simplified normative description of the co-alignment principle.

From this view, the environmental scanning part of the co-alignment model can be divided into two separate constructs of external information processing and internal information processing. This concept is similar to SWOT analysis – analysis of Strength, Weakness, Opportunity, and Threat – that is popular in the design school of strategy (Mintzberg, Ahlstrand, and Lampel, 1998). The performance is often measured by its

financial result. Based on these arguments, a revised form of the original co-alignment model is introduced in Figure 1.2.

Figure 1.2



Environment, perceived as quite dynamic, turbulent, and uncertain in its nature, imposes a high level of risk upon business organizations (Olsen, 1980, De Noble and Olsen, 1986). It requires a lot of speculation and guesswork for managers to understand the potential impacts upon their organization. Lawrence and Lorsch (1967) say it is difficult to predict with accuracy the impact of environmental trends because ‘there is always lack of clarity in the information obtained; clear causal relationships are hard to define; and it is unclear to define the time span for feedback’ (Olsen, 1980). Strategic application of information technology (IT) should be understood from this point of view as a process that is designed to reduce the ambiguities of environmental influence so that the level of risk can be eventually lowered. Since lowered risk will result in higher value

of the firm according to the DCF (Discounted Cash Flows) Model, the efficacy of IT can be explained by the reduced level of risk. This is how IT can strategically contribute to achieving the organizational goal of maximizing its value to the stakeholder groups.

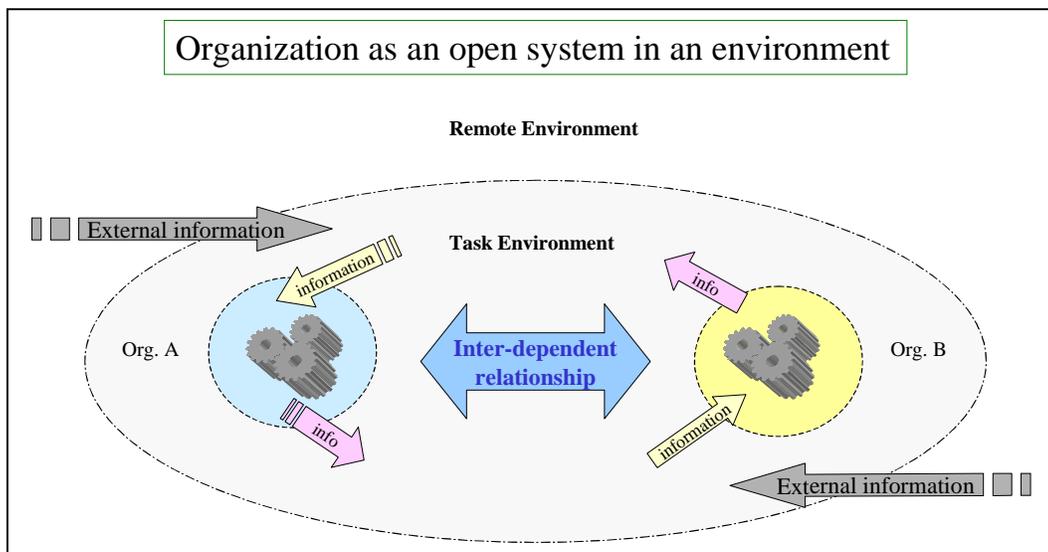
1.6.4 Environment as The Source of Information

In the knowledge society of today, the main resource an organization absorbs from its environment is information. Information has become the major fuel to process for organizations to achieve their goals. This suggests that the environment is the source of the fuel for the survival of organizations. This statement supports the view of an organization as an open system. One missing point in this approach is that an organization, as a subcomponent of the larger supra-system (environment), emits certain information back into the environment (Johnston & Gregor, 2000). Since the environment is made up of varieties of subcomponents including different types of organizations, the environment becomes filled with various types of information as the result of each organization's activities. Actually, the information that organizations absorb comes from other organizations in the environment as the result of their activities. In this view, the environment becomes an interwoven web of eco-systems of organizations. It is up to individual organizations to screen them to decide which information to absorb and which to reject. Environmental dynamism and complexity can be understood from this point of view.

At the level of individual organization, this information-processing activity can be compared to the mechanism of an internal combustion engine where information is used as the fuel for energy generation. At the level of the environment, the entire suprasystem

becomes the source of information for its subcomponents – individual organizations. This is the interdependent relationship of organizations explained by Daniels (1993). Environmental scanning eventually identifies the interrelated causal relationships among the subcomponents within the boundary of the environment (supra-system). Figure 1.3 explains the relationships and mechanism discussed so far.

Figure 1.3



1.6.5 The Conceptual Model

A limited interpretation of this argument may create a concern that emitting specific information will leave the firm in a defenseless position in protecting its valuable knowledge. This concern stems from the view described as information mercantilism (McDonald, 1998) that is behind the attitude that regards information as a static asset that should not be transmitted into the market but be contained by the organization. In addition to this concern, IT in the hospitality industry is considered one of the easiest to

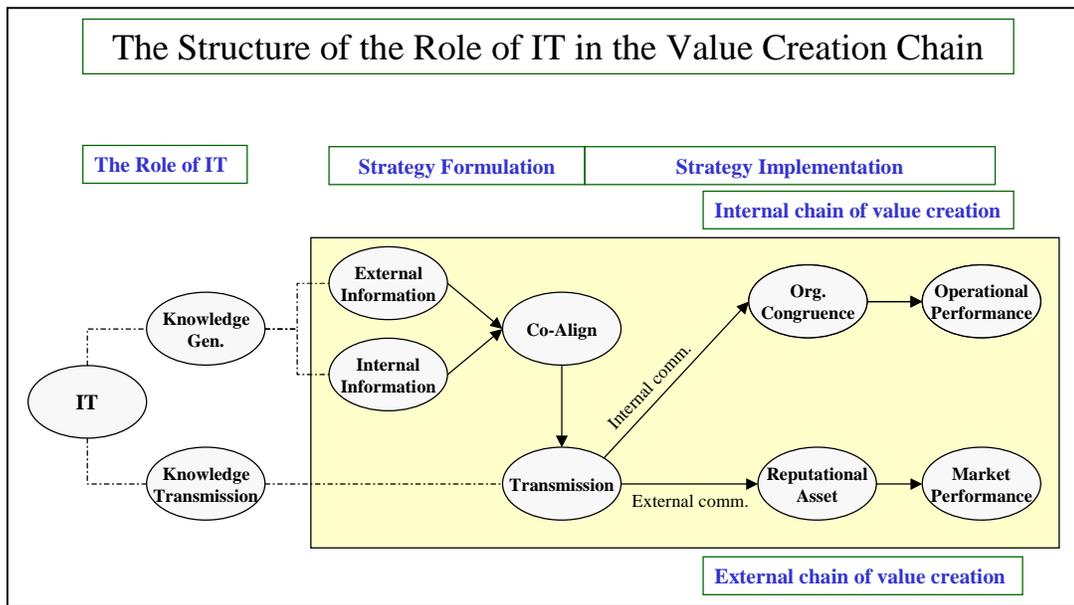
copy (Olsen et al, 1998). In this context, hospitality firms have failed to create sustainable competitive advantages (or methods) from the power of IT, because a sustainable competitive advantage (or method) should be hard to imitate (Barney, 1991; Olsen et al., 1998; Rumelt, 1984). The fact is, however, superficial methods of an organization's technology may be easily copied by competitors, but the real effect of the technology application is always combined with the organizational culture into the unique body of knowledge of the organization, which plays a more important role in the service industry. Takeuchi and Nonaka (2000) describe this "Tacit Knowledge."

The quality of the final product or service as the result of the firm's core competency wrapped in the visible method will never be easily imitated by others that do not possess the same level of competency. In other words, methods can be copied, but competency cannot. Furthermore, there are many other subcomponents than direct competitors in the environment – customers, suppliers, and regulators in the task environment. All these sub-groups are interrelated in a web of interaction that creates the industry structure. Through the web of interaction, each organization receives and transmits different types of information (Johnston and Gregor, 2000). By transmitting as much information as possible to relevant stakeholder groups, the firm will eventually reduce information asymmetry, obtain a better understanding and better support as the consequence from the external stakeholders as well as from the internal ones to sustain its potential to maximize its long-term value (Fombrun, Gardberg, and Barnett, 2000).

Figure 1.4 is the conceptual model that displays the summary of the argument. When viewed from the perspective of IT, the co-alignment process is mainly about the activities of generating and sharing knowledge. Details of this co-alignment activity need

to be communicated to the outside world (public), as well as inside the organization. This is conducted through the communication function of IT. Internal transmission of the created knowledge is supposed to enhance organizational congruence and lead to the optimized performance, while knowledge transmission to the external environment enhances the stakeholders' perception by eliminating the negative effect of information asymmetry. Elimination of information asymmetry will reduce the level of risk about the firm perceived by the public by enhancing the firm's reputational assets –social and psychological (Fombrun, Gardberg, and Barnett, 2000). Perceived lower risk will, in turn, maximize the market value of the firm.

Figure 1.4



1.7 Laws of Interaction

In this study, to explain the linkage between IT and the value of the host firm, conceptual background has been established in the previous sections. In summary, a

relationship is proposed between the two. In this relationship, IT is a major facilitator of the value of a business because information and knowledge play a central role in value accumulation. However, the relationship is not direct. Instead, an intermediate variable of organizational congruenceⁱⁱ is proposed in between. IT application of knowledge creation and its internal communication to operators lead to the stage where employees become aware of why they do what they do the way they do. Only when this three-dimensional – why, what, and how – knowledge about their job task within their organization is completely structured, can they feel comfortable understanding that they are doing something good to their organization as well as for themselves. When this three-dimensional knowledge is continuously shared by the entire staff, the organization can have the highest level of congruence. The level, or the quality, of congruence is proposed in this study to be related to the internal (operational) performance of the organization bridging IT and the firm value.

At the same time, the external stakeholders need to be informed of the firm's knowledge and strategies regarding how it navigates in its environmental trends. The external knowledge-transmission will result in a better perception that creates reputational assets and can possibly reduce the level of risk perceived by shareholders, which will eventually result in a higher share price in the market. This study, however, will only address the internal functions of IT, leaving the external function for future studies.

ⁱⁱ Organizational congruence represents the stage in which everyone in the organization knows what he/she needs to know to make the best decisions that will work for the company in the long run. (refer to page 10)

1.8 Construct Definition

Knowledge, as undeniable facts and objective truths, is defined as an institutionalized enactment of reality (Furusten, 1995). It is further defined as reasoning about information and/or data to actively enable performance (Beckman, 1999). From this perspective, knowledge is believed to include the holder's beliefs and commitments (Takeuchi and Nonaka, 2000). The purpose of knowledge lies in reducing environmental uncertainty (Kast and Rosenberg, 1979).

Knowledge Generation, as a part of the whole concept of Knowledge Management, stands for the activity of creating necessary knowledge for an organization through environmental scanning process.

Knowledge Transmission, as another part of Knowledge Management, represents the activity of transferring the created knowledge to the staff of an organization. Since the definition of knowledge provided above includes the holder's beliefs and commitments, the amount and the content of knowledge will increase as it is transmitted further. Due to this nature, the term Knowledge Diffusion is interchangeably used in this study.

Co-alignment stands for the stage where a company's policies correspond to the expectation of its staff including operators at the unit level in their practical situation. This concept was derived from the **Co-alignment Principle (or Co-alignment Model)**, which is a theoretical model introduced by Olsen (1998) in his book titled Strategic Management for Hospitality Industry. The model emphasizes the importance of establishing good fit (or match) of an organization with its environmental trends.

Organizational Congruence stands for the stage where all the staff in an organization feels comfortable with the purpose and technical aspects of the organizational knowledge including policies and directions they share. It is hypothesized that, at this stage, employees can develop full trust on their organization and show the highest level of dedication.

Performance, in this study, stands for the financial result of each unit in achieving its planned goal (or budget). Since sales growth or net profit growth is already included in the budget, performance is measured by the degree of the discrepancy between the two (budget and the actual).

1.9 Organization of the Study

To identify the relationship between IT and the firm value, this study is organized into five chapters. The specific information contained in each chapter is as follows.

Chapter One introduces the background of the research question including the theoretical underpinning. It also introduces a conceptual model with necessary arguments to justify the model in general.

Chapter Two provides a review of existing literature to explain the specific links proposed in the conceptual model. In this sense, this chapter is the highlight of this study.

Chapter Three introduces the development of a theoretical model from the conceptual model with an explanation of the conversion process. In this chapter, final constructs of the theoretical interest are explained with scale development. The topics of sampling and data collection process are also introduced in this chapter.

Chapter Four presents the result of the statistical analysis including the reliability and validity issues. This chapter also covers the multicultural issue that justifies the use of the multiple data sources.

Chapter Five is about the findings of this study and implication of them to managerial practice. The limitation of the study and suggestions for future research are included in this chapter.

Chapter Two: Literature Review

2.1 Introduction

As mentioned in the previous chapter, despite the positive perception about the effectiveness of IT on organizational performance, it remains unclear how IT contributes to firm performance, or even how to relate the value of IT to organizational performance. To clarify this ambiguity, one of the objectives of this research is set to identify the mechanism of IT that contributes to organizational performance. In doing so, the focus will be given primarily on logical analysis and synthesis of existing theories and arguments so that content validity can be provided. By doing so, this chapter tries to provide logical explanation of how each construct has been established. In this context, the literature review has been conducted from the following perspectives:

1. Information Technology in relation to Knowledge Management
2. Organizational theories
3. Strategic Management including the Co-Alignment Principle

It is important to point out that the focus of this study is neither on strategy nor on information technology itself, but has to do with addressing the relationship between IT and organizational performance. Despite the generally perceived positive relationship between the two constructs, negative arguments such as the information paradox still linger. This ambiguous effect of IT on performance may be better clarified by investigating the issue with a theoretical approach.

2.2 Theoretical Application of the Co-Alignment Model

As described in the previous chapter, the co-alignment principle states that a firm has to scan for environmental trends and constantly adjust (co-align) itself to these trends to be successful (Olsen et al., 1998). This model, synthesizing its two preceding academic perspectives (de Chabert, 1998) – industrial organization (I/O) theory and resource based view (RBV) –has successfully addressed the conceptual issue of strategic management in practical terms. It materializes the axiomatic arguments of Sun Tzu in his Art of War and suggests technical guidelines of applying competitive methods and core competencies. Competitive methods are more externally oriented strategy, whereas core competencies are more internally oriented one. With in-depth analysis and explanation, Olsen et al. (1998) present an effectively coordinated model balancing the two different strategic perspectives, creating a synthesis of I/O theory and RBV.

However, the co-alignment principle, by itself, seems to lack the theoretical attributes of testability, or falsifiability, which is one of the most critical elements of a theory (Bacharach, 1989; Popper, 1999). In other words, content needs to be filled into its concept (Pitt, 2003). When combined with functional content, this conceptual principle, with such a robust practical applicability, can accommodate a variety of testable relationships. Being practically plausible, the Co-alignment model can be used as a strong theoretical binding agent that can contribute to advance the current body of knowledge of the conceptual dimensions of strategic management and/or organizational studies. In this paper as an exploratory effort, it is applied with the dimension of IT.

The discipline of strategic management has witnessed similar examples of non-theoretical propositions being accepted later as robust theories when empirically testable

attributes were established. For example, although Bacharach (1989) denies the acceptability of typology as a theory, the strategic typology proposed by Miles and Snow (1978) seems to have been accepted and developed later into a theory. The generic typology of strategy proposed by Porter (1985) has been accepted and used as a revolutionary theory. The reason that those typologies have been accepted as theoretical basis is that advocates of those models have provided them with testable dimensions (or relationships) so that the validity of the models can be tested empirically. In other words, the typologies achieved falsifiability. Except for the testable relationships provided by the advocates, the above models may not have gained strength and popularity as robust theories. Compared with the typologies mentioned above, the co-alignment model is in a more advanced format specifying detailed steps of how to implement strategy. With this advanced attribute, this model can be transformed into a powerful theory that can explain causal relations between selected concepts.

2.3 IT as a Facilitator of Knowledge

In a traditional view, technology in conjunction with science has been understood as a means for improving human welfare. More specifically, technology has been accepted as the primary means to increase productivity by reducing human labor. For this reason, research on technology has focused mainly on the mechanical aspects in its application in the use of tools and machines, which are only the physical artifacts of technology (Kast & Rosenzweig, 1979). In modern society, however, there is an obvious need to expand this view beyond its tangible dimension into the intangible aspects of information and knowledge. Technology, in this context, can be expanded to include

not only physical manifestations such as tools and machines, but also intellectual techniques and processes used in solving problems in obtaining desired outcomes (Ellul, 1964; Pitt, 2003; Quinn and Pacquette, 1990) by increasing the quality of knowledge as well as the quantity.

In the information society of today, the technology consists more of the design of work through which knowledge is applied to human activities (Pitt, 2003) and their products, directly bearing on the content of the work itself (Child & Loveridge, 1990). This notion of technology supports the view that technology is any activity employed in the conversion of inputs into outputs (Mills & Moberg, 1990) within organizational structure (Pitt, 2003) in efforts to achieve practical goals. This argument suggests that technology presumes information. In this sense, the argument made by Quinn and Pacquette (1990) makes more sense. They claim that technology can be viewed as knowledge itself that explains relationships between certain problems – physical or chemical. Whichever argument is closer to the truth, the linkage between information and technology is obvious. Furthermore, dimensions of knowledge introduced by Beckman (1999) – storage media, and accessibility – point out the function of IT as the facilitator of knowledge.

The convergence of technology with information has added its role of creating and applying knowledge to its importance in the modern economy. The industrial shift in the overall economic structure in the modern history – from the primary industry (extractive industry, i.e., agriculture) to the secondary (transformative industry, i.e., manufacturing), and then finally to the tertiary, or service industry – has expanded involvement of knowledge as an input in its value-creating processes (Drucker, 1993;

Toffler, 1970, 1980; Tschetter, 1987). Bell (1973) suggests that the post-industrial society will be based increasingly on the utilization of knowledge, which has been reiterated by many futurists and management philosophers, including Drucker and Toffler.

In the service-driven economy, the input of knowledge is not only for the achievement of socio-economic benefit but also for creating new technology (Kast and Rosenzweig, 1979). Technology, thus, is regarded as a creator of knowledge as a result of the use of knowledge at the same time. Drucker (1993) interprets this as the most distinguishable trend in the knowledge society – the cycle of knowledge applied to knowledge itself. In this process, technology becomes the mechanism of creating new knowledge, that is, a facilitator of knowledge.

2.4 The Role of Knowledge

Along with this shift, there has been a profound change in addressing the role of knowledge during the past few decades. The shift of technology application to knowledge has placed the role of knowledge under the academic spotlight. Now knowledge itself began to be viewed as a catalyst in the process of accumulating further knowledge, which contributes to the ‘Management Revolution’ (Drucker, 1993). He says,

“The first application of knowledge to work – the idea of Frederick Taylor – has increased the productivity of manual labor drastically. This is regarded as the Productivity Revolution. The Productivity Revolution has worked successfully in the primary and the secondary industries.

However, it faced a huge obstacle on its way into the tertiary counterparts in increasing the productivity of non-manual workers. Instead of being applied to the work or tools, knowledge began to be applied to knowledge itself to create new knowledge, defining what new knowledge is needed, whether it is feasible, and what needs to be done to make the knowledge effective.”

Knowledge is defined as undeniable facts and objective truths as well as an institutionalized enactment of reality (Furusten, 1995), or a set of justified beliefs (Marshall, Prusak, and Shpilberg, 1996). Further defined as reasoning about information and data to actively enable performance, problem-solving, and decision-making (Beckman, 1999), the role of knowledge in the ‘Management Revolution’ has changed the role of management from supervising and controlling to the service function of supplying knowledge to find out how existing knowledge can be best applied to produce an expected result (Drucker, 1993). This is why today’s managers are described as, and have to be ‘Knowledge Workers.’

2.5 The Structure of Knowledge and Its Function in An Organization

Knowledge plays the central role in managerial practice in modern organizations. Knowledge, in its structure, is a set of organized information (Woolf, 1990; Turban, 1992). This definition necessitates the explanation of the hierarchy in knowledge structure. Despite the interchangeable usage of the terms – data, information, and knowledge – there is a certain hierarchy (or “pecking order”) depending on the degree of explanatory power in the intelligence structure. The hierarchy is, in ascending order of

the explanatory power, data, information, and then knowledge (Alter,1996; Tobin,1996; Van der Spek and Spijkervet, 1997)

Data remain at the lowest level of this pecking order in the form of statistics, bibliographical data, business documents, the characteristics of processes, or forecasts and models and outcomes based on available data or experimental results (Beckman, 1999; Daniels, 1993). Discrete data are processed to form meaningful information. Instincts, ideas, and rules are added to information so that an increment of knowledge emerges (Beckman, 1999). This knowledge is applied to increase efficiency by reducing certain types of environmental uncertainty (Kast and Rosenzweig, 1979).

Under this definition, information, albeit filtered and formatted from a large amount of data, still can be regarded as the intermediate material for synthesized knowledge anchored in the beliefs and commitments of the holder (Takeuchi and Nonaka, 2000). Kahaner (1996) describes this process as intelligence. The synthesized knowledge is a function of stance, perspective, or intention. With this definition, synthesized knowledge includes meaning and action (Takeuchi and Nonaka, 2000) that have to be put to work. It is used to propose hypotheses to predict unknown results for trial purposes in organizational activities. These hypotheses are used as alternatives in business decision-making processes. When the most appropriate alternative is selected and implemented, the positive result can strengthen the predicting, or at least the explanatory power of the hypothesis involved. The same hypothesis can be continuously applied in similar situations with the expectation of similar success as long as the expected results keep emerging. If the result turns out to be negative, however, contradicting the expected results, the hypothesis will lose its power and will be

discarded from future application. The management needs to, as a part of their function of developing knowledge, investigate why it has not worked in a specific condition. With this process repeated, the organization will eventually filter out those that do not work out and will eventually possess a set of highly refined, and consequently effective, organizational knowledge that can bring them the expected level of performance in similar situations. This is how organizational knowledge is applied to reduce environmental uncertainty. What should be noticed here is that this process is performed by individuals through interaction. In other words, knowledge creation requires an organized structure of individuals and their interactions. This way, organizational knowledge can be understood as a process that systematically amplifies the knowledge created by individuals and crystallizes it as a part of the knowledge network of the organization (Takeuchi and Nonaka, 2000). This statement contains the knowledge creation and transmission that are suggested in the model (Figure 1.4).

The organizational function – putting knowledge to work as a means to achieve its goal (Drucker, 1993) – requires information to produce knowledge. The whole process of this cycle is considered IT or IS (Information System). There are two sources of generating information – external and internal data. Internal data emanates from the organization's own activities, while external data comes from the environment (Eilon, 1979). Collecting and processing data from these two sources are described as the preliminary step of 'environmental scanning' in the co-alignment model (Olsen et al., 1998).

The outcome of this process – organizational knowledge – is not exactly scientific knowledge yet because it takes place within a limited boundary of one organization.

Being merely empirical facts, it cannot be generalized. However, the process is the same as the way scientific knowledge is created. Scientific knowledge can only become available through multiple tests of empirical facts in a deductive manner. In a report about the role of academic research in the hospitality discipline, Khan and Olsen (1988) argue that research should lead to new knowledge by testing theories regarding the relationships or fundamental principles against observations. Popper (1999), one of this century's leading philosophers of science (Horner and Westacott, 2000), also argues about the same process of generating academic knowledge.

Information, to gain more importance, must be integrated with other information and finally put into a physical action (McDonald, 1998). This is why information is said to gain value only when it is transferred to the right place at the right time along a systematically designed flow in an organization (Eilon, 1979). In this context, information systems (IS) that define how information should flow in an organization are vital to the decision-making process. The effectiveness of this system of information flow is necessary for the effectiveness of IT.

The importance of information in today's economy has been well perceived by industry practitioners as well as by academicians. It has been pointed out frequently that what counts is not raw muscle power such as capital or assets, but information (Bell, 1973; Drucker, 1968, 1993; Toffler, 1970, 1980). Related to this issue, Jonscher (1994) argues, referring to Arrows (1973), that an economic analysis of technological developments must be based on a thorough understanding of the role of information in the economy. From this perspective, information is becoming an "economically

interesting category of goods which have not hitherto been afforded much attention by economic theorists” (Jonscher, 1994).

2.6 IT and Organizational Structure

It has been suggested that information should be regarded as the ingredient for knowledge, and technology as the mechanism to create and to transmit it for effective knowledge generation. Now it seems possible to converge these two functions into a single construct of IT that includes the entire processing system. Under this postulation of IT as a new construct of the entire system, it sounds logical to propose that it consists of two sub-constructs of knowledge generation and knowledge transmission. This argument explains the proposed model that posits IT as the capaciator of the knowledge activity that supports the entire organization.

One of the major consequences of changing IT has been the increasing specialization of knowledge in management. The modern managerial system is not comprised of a single individual who has overriding knowledge and power. It is, instead, made of a complex team of trained specialists who contribute their expertise by processing information to organizational performance. In this structure, isolated knowledge is sterile. It becomes effective only when it is combined with other pieces of knowledge and is put together into an action to work for a unified goal. When the function of organizations is regarded as making knowledge productive to achieve an overall goal (Drucker, 1993; Shrode and Voich, 1974), the formation of the organization naturally presupposes the purpose of creating knowledge and distributing it as well. Therefore, one of the major reasons to form an organization is to capture individual

knowledge systematically into the boundary of organizational knowledge so that it can be embedded into the organizational routines and processes that enable action (Myers, 1996). This synergistic attribute of information and knowledge is very important in forming an organization. The management is responsible for integrating this knowledge in order to make it effective. The effectiveness of knowledge can be seen as the determining factor in the competitive advantage of a company.

The definition of technology as a processing mechanism that converts input into output implies that it is inherently an effective structure. In other words, an organization utilizing a certain technology presumes a certain structure that is designed to receive input, process it, and finally produce the final product. When this structural function uses data as its input, it becomes the intelligence system that synthesizes higher quality information, and finally, the organizational knowledge. In this case, however, information is not the final product. Instead, information is a tool, material, or a commodity (Eilon, 1979) that plays the role of the catalyst that keeps the entire organization conscious of its existence and behavior. Traditionally this was considered the function of monitoring and controlling. With the shift of managerial function from traditional roles to the service role of providing knowledge, as mentioned earlier, the argument that information is at the center of the service function (Baumol, 1986), in that service enhances the efficiency (Quinn, 1988), makes more sense.

Organizational structure, which is addressed as a part of technology here (Pitt, 2003), provides the logistic function so that the role of information can be effectively performed. For this reason, structure often represents the formal organizational communication channel through which information and knowledge are transferred (Eilon,

1979). Thus, it can be concluded now that IT – the combination of information and technology (or structure) – is the central force that drives the effectiveness of an entire organization’s activities.

This view of identifying IT as the driving force of organizational effectiveness carries a significant importance in advancing the argument of this study, in that the purpose of this study includes proposing a theoretical view that helps us understand the value of IT by identifying its role in organizational activities.

2.7 Links between Knowledge, Strategy, and Organizational Performance

According to Davenport (1999), there have long been efforts to establish theoretical linkages between knowledge and strategy, and organizational performance, mostly in the realm of economics. Nelson and Winter (1982) and Arrow (1974) describe knowledge as the central material in economic evolution, while Teece (1986) explains the role of knowledge from the perspectives of technology management and the diffusion of innovations. The common factor of all these efforts is that knowledge has been considered from the early days to be one of the key organizational resources (Penrose, 1959), or the only sustainable competitive advantage (Winter, 1986).

However, despite the relative successes in establishing the theoretical linkage between knowledge and strategy, connections between knowledge management and organizational performance are even more difficult to construct. Therefore, knowledge has not been tied to strategy and/or performance in practice (Davenport, 1999; Griliches, 1998). What is needed is a good theory that can explain the practical links between knowledge and strategy, which is an economic theory for knowledge (Drucker, 1993).

Now the question becomes “how can knowledge be connected to strategy in practice?” It may require a chain of thought, but there seems to be a high correlation between the nature of strategy and knowledge. In sum, strategy itself seems to be a type of shared knowledge because an organization’s strategy is a set of knowledge structures that are widely shared within the organization (Lyles and Schwenk, 1991). The knowledge structure is a type of knowledge developed in the organization about its environmental constituents – namely, customers, competitors, and regulator groups, among others (Skyrme, 2000). It would generally be held by senior managers of a firm because strategy formulation requires a vast range of information and it is still regarded as the innate responsibility of the senior management (Davenport, 1999). However, as McDonalds (1998) argues, more decisions are made at the local level as the firm develops a more sophisticated system. In theory, the smaller the operation and the closer it is to the environment in which it operates, the more it replicates the mechanism of a small firm and consequently the more its information-gathering and information use can imitate those of the small firm (McDonalds, 1998). This statement can easily be applied to chain restaurant operations in the hospitality industry.

The association of knowledge with strategy is based on the resource-based view (RBV) that emphasizes the firm’s capability and core competency (Stalk, Evans and Schulman, 1992; Prahalad and Hamel, 1990) in that strategy formulation and implementation are closely linked with what people know in their organization. However, knowledge by itself does not guarantee the success of the strategy unless it is effectively shared and put into actions. In this context, strategy also contains a conversion process of knowledge into actions to achieve a goal, which is the step of

implementation in the Co-alignment model. This statement implies that strategy formulation is the same process as that of theory construction in the deductive method, and that implementation is the follow-up of the formulation. However, since theory is always less tidy than practice, there will be many occasions in which formulated strategies must be improvised (Orlikowski, 1996 referred to by Tsoukas, Vladmirou, and Young, 2001). As the result of the difference between theory and practice, realized strategy usually is often different from intended strategy. Mintzberg (1978) explains this as intended and emergent strategies. The knowledge shared within the entire organization becomes more important in implementing those emergent strategiesⁱⁱⁱ.

Increasingly central to organizational management for better performance is an integrated data architecture that facilitates information about all facets of the organization itself, as well as its external environment (Sena and Shani, 1999). Information is meant to change the way the receiver perceives something, to have an impact on a decision maker's judgment and behavior (Davenport and Prusak, 1998). This way, successful knowledge management involves more than merely deploying the newest and fastest IT products that are only the physical artifact of technology (Kast & Rosenzweig, 1979). Beyond this, a business process needs to be created that enables employees to make better use of the information they have, and the culture that encourages knowledge-sharing (Dash, 1998; Ives, Torry, and Gordon, 2000), because one important attribute of knowledge is the need to achieve a common understanding so that accurate and complete communication can occur (Ives, Torry, and Gordon, 2000). Effective IT infrastructure to handle these requirements is an essential foundation for effective knowledge management

ⁱⁱⁱ Emergent strategies are usually regarded as revised (or often improvised), therefore, short-term oriented and more urgently developed and implemented by operators (author's interpretation).

(Skyrme, 2000). In this context, the role of IT in terms of knowledge management has two dimensions: one is creating new knowledge, while the other is making existing knowledge accessible to everyone so that they “know what they know” (Skyrme, 2000) – knowledge transfer.

To ensure that information technology becomes a part of the firm’s strategy, it is essential to alter the way in which information technology is viewed within the organization. The key is that IT should be seen as a new engine for growth (Griffith, 1997). Information management is the application of sound management principles to information. It includes three components: data resources, process, and IT management. Underlying this statement is the belief that the value of data is optimized when data is so managed that it can be shared by many applications and knowledge workers, and when processes are managed to maximize value-adding activities and to eliminate non-value-adding activities, and when technology is exploited to enable just-in-time delivery of information (English, 1996).

In this sense, IT needs to be viewed as the exogenous facilitator for the entire strategy establishment – from formulation to implementation. In this view, information can be no longer just the responsibility of a specific group of people in an organization. It is not just a technical resource – instead, information is a business resource used by business personnel, created by business personnel, and defined and guided by business personnel. Since knowledge workers use information as raw material in their work, the reliance on data producers to create accurate and quality-based information is paramount

to capture facts that may not be needed in their jobs or business units, but could be required by everyone else in downstream activities (Sena and Shani, 1999)^{iv}.

There is a burgeoning literature that attempts to associate knowledge, or “intellectual capital,” to organizations’ balance sheets and share prices. The usual formulation of this linkage addresses the “intangible” aspect of knowledge, which cannot be found on the formal balance sheet, even though it clearly plays an important role in an organization’s financial success (Davenport, 1999). Defined as ‘non-physical factors that contribute to producing goods or providing services,’ intangibles have not been treated as wealth. However, the importance of intangibles has been growing in the production, marketing, and distribution of physical goods as well as the delivery of services by providing applicable knowledge (Blair and Wallman, 2000). Recently, the ratio between a firm’s book value and its market cap is often referred to as the indicator of a firm’s intangible capacity perceived by the public.

2.8 Organizations and Their Environments

So far, arguments have focused mainly on explaining the function of knowledge addressing the dimension of the creation of knowledge. As suggested in figure 1.4, however, there is another dimension of IT that an organization should not ignore – the flow of information and knowledge. This dimension can be better explained by addressing the relationship between organizations and their environments.

An organization is a man-made institution – a group composed of multiple staff working individually, but together on a common task. Its function is to make knowledge

^{iv} This is regarded as the most important necessary condition of achieving the organizational congruence.

productive (Drucker, 1993) for all the participants to achieve their objectives. This definition of an organization implies that there can be multiple organizations pursuing goals of their own. Naturally, some organizations will go after the same goal competing against one another (competitive) for material as well as for their target market, while some organizations support one another (supplementary) in various aspects. These relationships – either competitive or supplementary – create the concept of the environment as we know it today. Thus, the environment can be viewed as the result of the activities of organizations (Refer to Figure 1.3 in page 16).

Environment has been a popular topic for many researchers. Bourgeois (1980) summarizes research trends on the environment in organization theory. He lists three perspectives taken by environmental research – objects, attributes, and perception. Objects are the constituents of the task environment as we know it today – customers, suppliers, competitors, and regulators. Attributes are dimensions. Perception is the managerial perception about the environmental attributes (dimensions).

Many previous studies have defined environment from several dimensions. In terms of the type of environment, which addresses the objects of study in Bourgeois's view, there is a consensus that is made of two different layers – the remote environment and the task environment – depending on the degree of direct impact on the organization. The dimensions, or attributes, of the environment can be addressed from the perspectives of the dimensions of certainty-uncertainty (Burns and Stalker, 1971; Downey and Slocum, 1975; Pfeffer and Salancik, 1978), placid-turbulent (Emery and Trist, 1965) followed by many others. In their book, Strategic Management in the Hospitality Industry, Olsen, et al. (1998) introduce three environmental dimensions, including

certainty, complexity, and munificence as the most important. There is also a consensus in today's world that the business environment is very turbulent, hostile, dynamic, and uncertain for any organization to compete in it (Olsen, 1980). Imposing all these influences, the environment brings significant challenges to the organization in its goal-pursuing activities.

The normative theories from the contingency school (Mintzberg et al., 1998) state that the environmental influence is uni-directional – from the environment to the individual organization. In this context, the co-alignment model, which is used as a theoretical binding agent for this study, does not seem to be an exception, at least on the surface. However, the model clearly argues for the importance of the proactive drive initiated by management. With this approach, the co-alignment model departs from other normative theories. It advances beyond the scope of the contingency school by accommodating the power dimension suggested by Azumi and Hage (1972), Etzioni (1965), Olsen (1980), and Thompson (1967). The argument that organizations try to gain power and to control their environment makes more sense when the environment itself is viewed as the consequent force created by the emergence of organizations and their activities. Therefore, it appears that the environmental influence is actually the result of a collectively interrelated power struggle of organizations in the boundary of the domain in which they exist. In this context, the co-alignment model is an advanced view that better explains the relationship between organizations and their environment.

Any proactive efforts made by organizations to align themselves to environmental trends can be considered to be the power struggle for survival. However, it is beyond the scope of this study to argue about the direction of the causal relationships between

organizations and their environment. The point is that all the unfriendly influences of the environment perceived today by organizations – turbulence, dynamism, hostility, and uncertainty – will only become more severe as more organizational activities are anticipated in the future. More organizational activities will create more groups of stakeholders, demanding more knowledge. This view supports the argument that organizations of the post-industrial society are, in themselves, destabilizers because their function is to put knowledge to work (Drucker, 1993), which results in more knowledge as an output.

From this perspective, an organization is considered a host system that is supposed to process information to create knowledge (Takeuchi and Nonaka, 2000) when a system is defined as an organized, unitary whole made of multiple interdependent parts or subcomponents (Kast and Rosenzweig, 1979). This unitary whole must be delineated by identifiable boundaries from its environmental subsystems (Kast and Rosenzweig, 1979; Shrode and Voich, 1974). According to Eilon (1979), a system can also be combined with another system, converging into a bigger system. As a system, an organization directs its behavior toward its goals and objectives that are understood by its stakeholder groups. In this way, an organization can be defined as a social system that is organized for the purpose of attainment of a certain goal (Parsons, 1956). Being a social system working to achieve its ultimate goal, an organization is a human group, composed of specialists working together on a common task (Drucker, 1993).

An important attribute of an organization as a system is that it reacts to its input – either deterministically or randomly. A deterministic reaction implies that the system always reacts in the same way to a given set of circumstances, so that when the

circumstances are known in advance it is possible to forecast accurately how the system will behave (Eilon, 1979). This view is in the same lines as the typology of the mechanistic organizations versus organistic ones (Burns and Stalker, 1967). The criterion of this typology is the complexity of the technology used to deal with the uncertainty imposed by its environment.

With the definition of an organization as a system, one more attribute needs to be introduced to support the viewpoint of this study. In thermodynamics theories, two different types systems are proposed – open and closed. An open system is one for which there is a flow of materials across the boundaries of the system, whereas in a closed system such a flow does not occur (Eilon, 1979). This theory, created in the natural science (or in engineering), can be adapted to explain the information processing mechanism of an organization as the function of an open system.

2.9 Environmental Scanning – Information Processing

In the process of pursuing its goals and objectives, an organization creates and diffuses knowledge to the entire organization. The activity of knowledge creation is the synthesis, through the organization's intelligence mechanisms (IT), of collected information from two different sources – the external information it absorbs from its adjacent environment and the internal information generated within itself (Eilon, 1979). In this mechanism, the environment structurally becomes the source of information. It is generally assumed that the quality of the knowledge is affected by environmental uncertainty and the consequent equivocality of the information obtained (Lawrence and

Lorsch, 1967). Thus, the view of an organization as an open system emphasizes the information flow from its external environment.

Information has been described as the material for creating knowledge that becomes the fuel for the organizational activities (Takeuchi and Nonaka, 2000). As pointed out by Eilon (1979), internal information obtained within the organization itself is no less important than external information in arriving at balanced knowledge about itself. This is what Sun Tzu pointed out 25 centuries ago – “knowing your enemy and knowing yourself will lead you to win every battle you engage.” An active performance of this process is labeled as environmental scanning in the Co-alignment Model. This activity must take place on an on-going basis (Olsen et al., 1998). One of the reasons for the failure in knowledge management is that companies often focus too much on recycling existing knowledge rather than on generating new knowledge (Birkinshaw, 2001). Generating new knowledge, or updating it, is important for an organization to align itself constantly to the ever-changing external environment. In conclusion, environmental scanning is the continuous activity of information processing.

The purpose of environmental scanning is to successfully identify the key forces driving changes within the domain of the organization. According to Olsen et al. (1998), the developers of the co-alignment model, this scanning system should “(1) identify each force, the variables making it up, and their interdependencies among one another, (2) suggest cause-and-effect relationships, and (3) determine the history and timing associated with the development of forces.” This process can be rephrased as the process of (1) problem definition and operationalization of it, (2) adopting hypothetico-deductive method to generalize it, and (3) predict it for future specifics. This is identical with that

of theory construction in terms of knowledge generation. This systematic process, when it functions effectively, will eliminate the difficulties proposed by Lawrence and Lorsch (1967).

There is a hidden procedure in this model, however. The authors of the Co-alignment model also point out that the manager needs to synthesize information that comes from a variety of sources. Synthesizing information into a useful piece of knowledge involves human judgment in the environmental scanning process. Human judgment in its nature involves subjectivity. Because knowledge is a function of a particular stance, perspective, or intention (Takeuchi and Nonaka, 2000) of individuals, organizational knowledge cannot be completely objective in its final stage, which seems to explain why some succeed while others fail. In other words, knowledge is generated through the prism of individual perception, which is covered in the following section.

2.10 Perception Is Reality

In the normative theory, environmental contingency precedes and elicits the organizational response of structuring. In this argument, the managerial capacity for rational decision-making has not been mentioned. In fact, it seems to be taken for granted in most of the prescriptive strategy research that people react rationally once environmental trends are identified.

In the sequential relationship between environmental contingency and organizational structure, the environment is seen as the antecedent and structure as the consequent. One important factor that is missing in this equation is the perception of management about their environmental influence. Identifying ambiguous trends through

scanning heavily depends upon the individual's perceptive capacity. Thus, the perception of management seems to play the most important role by imposing its subjective stance and judgment over general perspectives formed in the organization. For this reason, in an organization there is an expectation that individuals will see things as their colleagues do (McDonad, 1998). Reaching a rational conclusion out of perceived observation has more to do with the psychological domain. Related to rationality, however, a group of researchers has argued about the importance of objective environmental scanning against the risks of subjective scanning (Lentz and Engledow, 1986a; Olsen, 1980), referring to the argument that "perception is everything" (Child, 1972).

Due to the inevitable subjectivity involved in the process of knowledge creation affected by the perceived environment, the decision-making of management about strategy choice and the consequent organizational structure tend to be independent of the objective impact of the environment upon the structure (Slattery and Olsen, 1984). Literature is plentiful on this issue (Aldrick and Mindlin, 1978; Child, 1972a; Miller and Droge, 1986; Miller and Toulouse, 1986; Miller et al. 1988). Similar arguments have been made by Mintzberg et al. in their book titled Strategy Safari, explaining the role of the manager in providing the vision for the future of the organization he/she leads (Mintzberg, Ahsstrand, and Lampel, 1998).

Slattery and Olsen (1984) argue that perceived or not, an actual event in the environment that has important implications for the organization will not disappear, or be made harmless if it is perceived incorrectly. For this reason, strategic choices produce positive organizational effectiveness only if they are based on accurate (objective) assessments of the environment.

Arguments introduced above strongly address the importance of objective perception about the environment. Only with objective perception, can the most effective strategy choice be made, followed by the most effective structure, which are undeniably necessary conditions for successful performance. Objective perception about the environment can be obtained by establishing organizational congruence through democratic methods of sharing information. Sharing information and knowledge also requires free participation of organizational members in the knowledge diffusion process. In this diffusion process, efficiency should not be overemphasized because an efficiency-oriented approach may cause ineffectiveness in knowledge creation. As Sena and Shani (1999) argue, knowledge-workers' reliance on data producers to create accurate and quality-based information is paramount to capture facts that may not be needed immediately in their jobs or business units, but could be required by those in downstream activities.

From the speculations thus far, a conclusion can be drawn that organizational performance is the result of the integrated efforts – sequentially and simultaneously – put in by its subcomponents' participation into the knowledge sharing activities that are structured in the organization's internal communication channel. In this view, integration is seen as the direct result of the application of IT that promotes organizational congruence. When this integration is effectively achieved through organizational congruence, the result of the performance will have the maximized synergistic effect.

2.11 IT and Decision-Making

IT, as the convergent construct of information and technology, is often evaluated in terms of its pertinence for decision-making. A decision is the culmination of the control process – the final stage of information processing – that puts information into an action (Eilons, 1979; Shrode and Voich, 1974). This has been described as the knowledge application. Until the decision is made, discrete data are processed to create meaningful information so that related knowledge is incremented to maximize the probability of the success of the implementation of the decision.

Decisions mentioned here do not have to be limited to those made by the top management. The top management tends to monopolize information (Davenport, 1999), due to the information-intensive nature of activities of knowledge creation. However, as introduced earlier, the more advanced a firm is in its effectiveness, the more strategic decisions are taken at the local level. In theory, the smaller the operation and the closer it is to the environment in which it operates, the more it replicates the small firm and consequently, the more its gathering and use of information can imitate those of a small firm (McDonald, 1998). In the service industry, all the employees in every layer of the organization are subject to constant decision-making as boundary spanners. Decisions create new data and information. Every decision, regardless of the magnitude of its importance, is transmitted to other subcomponents – horizontally as well as vertically – with relevant information attached.

This is an advanced approach of viewing IT as the facilitator, or an exogenous factor, of management practice. Traditionally, IT has been considered as a tool, or an endogenous factor. With the traditional view, the primary benefit of IT has been looked

for in the automation effect it provides. However, it is suggested that the benefit should be sought in the information effect – better control, monitoring, and decision-making (Mitra and Chaya, 1996). This is an effectiveness-oriented perspective of viewing IT as a service (or utility) function. To extend this argument of viewing the role of IT as the facilitator of organizational effectiveness, this study suggests organizational congruence as the intermediate construct that relays the role of IT to performance. A similar, but limited, proposition has been made by De Chabert (1998). She tested and verified a positive relationship between the organizational congruity and unit performance in terms of cash flow in the boundary of multi-unit restaurant operations.

2.12 The Value of IT

The value of IT has been often assessed by financial metrics (Bensaou and Earl, 1998) trying to calculate the monetary value of IT applying a cost-benefit analysis based on the productivity concept. This approach seems to stem from the automation effect of technology (Mitra and Chaya, 1996) applied traditionally in the manufacturing segment. Under the framework of the ratio between input and output (Shrode and Voich, 1974), higher productivity leads to a more successful business. This way, as long as the ratio between the output and input remains high, the input is justified.

In financial metrics, the most popular index for output is ‘return’, or more specifically, the surplus generated from input – simply, productivity. One of the most frequently mentioned productivity indices in valuing IT is the return on investment (ROI). It has been reported that many business executives are not convinced about the

true return on their investment into IT (Bensaou and Earl, 1998), despite their general perception about the importance of IT.

The ROI approach has been working well in the manufacturing segment, where it is easy to calculate cost-effectiveness because all the variables are clear – e.g., reduced cost by cutting labor force, the investment made for machinery and installation, even the timeframe for expected feedback. However, it needs to be pointed out that the manufacturing segment is not as heavily involved in knowledge work compared to other supporting segments (Andreu, Ricart, and Valor, 1992). When the focus shifts to the area that is intensive in knowledge creation and application -- namely, the service segment -- everything suddenly becomes a blur. In that area, efficiency cannot be easily identified or measured. Since the role of information and knowledge provides services to enhance organizational effectiveness, focusing on the efficiency of services may not be appropriate. Supporting functions have to be effective to complete their tasks. If any of the organizational objectives cannot be achieved due to insufficient supply of information – in terms of quantity as well as quality – it means that the specific IT designed for the function has failed to work. This is when people say, “The system doesn’t work.” In this situation, specific IT deployment may have worked successfully to achieve efficiency, but failed in effectiveness (Andreu, Ricart, and Valor, 1992).

The term ‘value’ is frequently used, but without specifying its exact meaning. An economic theory explains that value is created because of limited supply (or scarcity) of resources. The concept of value can be addressed from two dimensions. A resource input theory from the supply side states that the value of a good is a weighted sum of the quantities of all inputs that are embodied in the good. This statement leads to a fallacy

that a good can have value when there is no demand for it. This contradiction suggests that the demand side approach will be more suitable to explain what value is. On the demand side, the use theory states that value is measured in terms of the satisfaction that individuals derive from consuming or using a good. From this perspective, value is subjective rather than objective, in that it is determined by the individual who consumes it (Perman and Scouller, 1999).

The effort of identifying the value of IT should be addressed from the demand side. In so doing, the user of IT needs to be identified. In this research, IT has been described as infrastructure that makes knowledge available by creating and diffusing it. The knowledge made available becomes productive with the input from the user at every node of the IT network in the organization. This way, the members in the organization become the user group, and the ultimate beneficiary of IT is the organization itself. This speculation leads to the next argument that IT must be perceived to be valuable to the knowledge-workers themselves who are service providers themselves. In this structure, customers are remotely located from the direct transaction of the service. In other words, no one directly pays for the services provided by IT. For this perceptual aspect of IT, trying to measure the direct monetary return from the IT investment may be misleading. This is why the focus needs to be shifted to the information effect (Mitra and Chaya, 1996). Supportive to this argument is a warning about converting knowledge to financial measures in spite of its utility because it may cloud the effect of intangible aspects by focusing only on tangible financial results (Sveiby, 1997).

This view about IT describes it as an internal service provider in the form of knowledge facilitator. The conventional concern to identify the nature of services

emphasizes their value in particular to users (Marshall and Wood, 1995). Also, the role of service is often found in its function of increasing productivity or efficiency (Quinn, 1988). As stated earlier, when the final users are the organizational staff, the value of the service provided by IT needs to be found in the increased effectiveness rather than in the direct monetary return it creates. Figure 1.4 on page 19 (its replica is on page 58) indicates that IT is indirectly related to performance through various conceptual steps. Therefore, the value of IT can only be measured as the result of identifying the effectiveness of the organization's overall strategy implementation. It is argued in this study that the effectiveness of the organization's strategy can be measured by looking at how accurately its original forecasting or planning has been achieved. This is how IT, as a critical success factor (Cho, 1996; Cline and Blatt, 1998; Cline and Rach, 1996, Connolly, 1999), can be incorporated into the strategy of the organization (Connolly, 1999).

2.13 External Stakeholders As The Jury for Organizational Performance

Arguments in this study have focused so far on the internal functions of IT that forms co-alignment and congruence within an organization. As shown in the proposed model (Figure 1.4), however, IT can be, actually should be deployed to diffuse organizational knowledge to the external stakeholders. This potential of IT has not been given much attention in academic research thus far.

Among stakeholder groups of an organization, there are external stakeholders. More specifically, they are shareholders in the case of public firms. External (or public) stakeholders – shareholders – have their own objectives from the organization and they

have to rely more often than not on the firm's public communication channels to learn about its performance. There are several intermediary groups that deliver related information to the public. Investment banks are prime examples, followed by industry analysts. By the law, public firms are required to transmit accurate information about their performance. However, current accounting standards cannot guarantee the objective whole truth of the information delivered to the public because of the limitations of accounting rules that can be manipulated. Moreover, top management does not want to reveal any more than what is required by the law. This attitude was mentioned earlier as information mercantilism. There are some concerns from the intermediary groups about the vagueness of the public companies' information disclosure. The irony is that public companies as open systems want to absorb as much information as they can about their environmental constituents, but without releasing much if possible, about themselves. This habitual secrecy actually costs companies a lot without their realizing the cost (Scalet, 2001).

The argument that the information diffusion inside the organization enhances congruence also applies to external stakeholders. It is possible that better market performance of the firm can be made possible by increasing transparency about organizational knowledge because external stakeholders are not only interested in the firm's financial performance itself, but also in the organization's stage of co-alignment regarding how the firm has achieved the current level of performance and how long the success (or failure) will last into the future.

The theory of the efficient market states that the market price of a firm's stock already contains all the necessary information. This theory can be interpreted as that by

diffusing sufficient amount of information into the market, a firm can achieve the transparency that will lead to the optimum market value of its stock. To achieve this goal, the information for the public should include, beyond the range of simply the financial data, the firm's organizational knowledge content and structure that explain its strategic stance to cope with the environmental trends. That is, the level of the firm's co-alignment stage.

Segars and Kohut (2001) present a quantitative model that tests the effectiveness of the quality of information transmitted to the public. The authors argue that "the CEO's letter is regarded, among many forms of communication channels a firm has, as the most effective strategic tool in conveying the well-being and future direction of the enterprise. These letters have become even more visible with the advent of the World Wide Web and its use as a primary forum for communicating the CEO's message." In their study, using the CEO's letter as the unit of analysis, the authors have addressed the causal relationships between the four dimensions of credibility, efficacy, commitment, and responsibility as independent variables and the firm's financial performance as the dependent variable. Overall model fits turned out to be statistically significant, and the research was seen to have construct validity.

There has been little research, however, into dimensions that characterize the effectiveness of how this kind of communication channel may benefit the overall enterprise in terms of improved financial position.

2.14 Issues about Measuring Performance

Performance probably is the most widely used dependent variable in organizational research. Yet, it remains one of the most loosely defined constructs (Rogers and Write, 1998). It is a multi-faceted construct, where the construct is referred to as the conceptual definition of a variable (Schwab, 1980). In the field of strategy, performance is almost entirely measured by financial results (Rogers and Write, 1998 quoting Row, Morrow, and Finch, 1995). Venkatraman and Ramanujam (1986) suggest that operational indicators be included in the performance measure in addition to financial indicators.

Performance presumes output. However, output cannot be the only representative of performance, since output conceptually requires input. In this context, performance is more about the result of the process. This relationship leads to the conclusion that the discussion of performance necessarily entails the topics of effectiveness and efficiency (Rogers and Write, 1998) of the whole process.

Effectiveness means the achievement of objectives, whereas efficiency refers to the rate of resource usage in achieving objectives. As mentioned, every organization has its own goals and multiple stakeholder groups. In accomplishing the ultimate organizational goal, each stakeholder group's objectives must be achieved. Since each stakeholder group seeks different interests from the performance of the organization, relying solely on financial indicators to measure organizational performance may not be sufficient to measure the true effectiveness of organizational activity.

As mentioned earlier, when IT is effectively applied in the strategy process – from formulation to implementation – the result should be measured in the form of reduced

risk. Since risk is defined as variance in return, or more specifically variance in future cash flows (Olsen et al., 1998), the successful strategic application of IT is believed to reduce the variance between the budget (or pro forma) and the actual operational results. The concept of cash flow per share is strongly recommended by many experts in the financial analysis of a firm (Rappaport, 1998; Schmidgall, Geller, and Ilvento, 1993; Olsen et al., 1998). However, the cash flow information is only available at the corporate level in the consolidated reports that do not disclose details of unit operations. Due to the decentralized operations style, which is one of idiosyncratic nature of hospitality firms, consolidated reports may not sufficiently explain the details of strategic performance at the unit level. This is the reason that this study focuses on the unit level for its investigation.

2.15 Conclusion

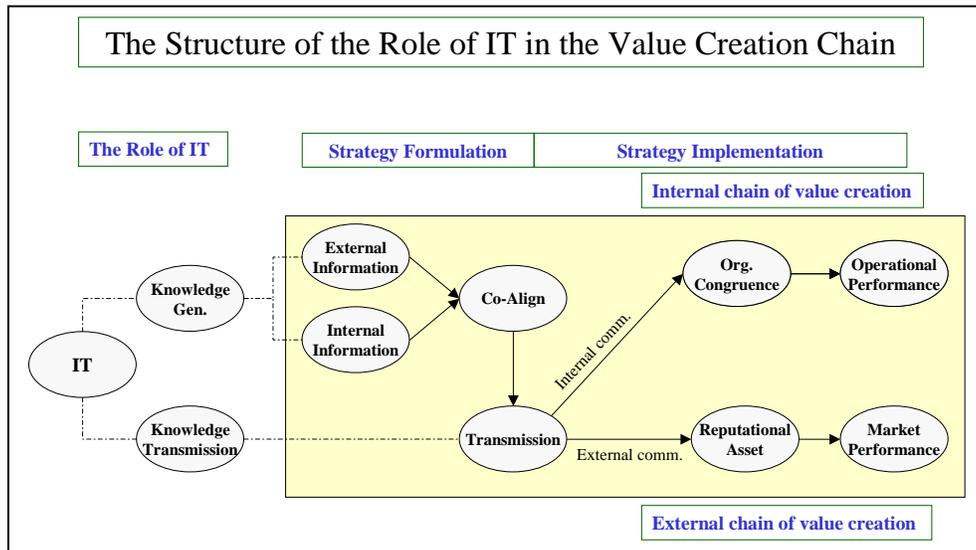
This chapter tried to explain the links between the suggested constructs through discussion of existing literature by addressing IT as a construct that enables knowledge management. In turn, knowledge management – creation and diffusion – keeps the entire organization conscious about its existence by providing a sufficient amount of knowledge to all the users in the organization^v. This activity of knowledge management is closely related to organizational strategy. Strategic activities of an organization are made up of conceptually dichotomized, but behaviorally connected sub-activities of formulation and implementation. It is conceptually dichotomized because there exists a spatio-temporal separation between the formulation and implementation of organizational strategy.

^v Refer to page 31.

However, formulated strategy must be clearly understood and positively perceived by the operator group that has to implement it. This is why these two – formulation and implementation – are behaviorally connected. This behavioral connection is represented by the constructs of “Co-Alignment” and “Congruence” in this study. “Co-Alignment” represents the conformity, or applicability, of the formulated strategy at the operation level for implementation. When the conformity– clear understanding and positive perception of company decisions by the operator group – is effectively established, the organization can achieve the highest level of “Congruence”. It is suggested in this study that “Co-Alignment” is the direct result of the organizational activity of knowledge generation about its environment as well as about itself, while internal “Congruence” is more directly affected by the activity of knowledge transmission. Both “Co-Alignment” and “Congruence” are proposed to have direct impact on the organization’s performance. More details of relationships between constructs will be introduced in the next chapter when the conceptual model is further developed into a measurement model.

The following is a replica of the proposed conceptual model. A close look into the model with explanation provided in this chapter will reveal that it is an extended interpretation of the co-alignment model from the perspective of IT application. As mentioned earlier, the versatility and the robustness of the co-alignment model make it applicable to numerous types of functional strategic applications in hospitality firms. This study only taps the surface of it with the concept of IT.

Figure 2.1: (Replica of Figure 1.4)



Chapter Three: Methodology

3.1 Introduction

The purpose of this study is to explore the relationship between IT and firm value by addressing the research question “How do we know that IT increases the value of the firm?” The question becomes clearer when it is put as “On what theoretical relationships, do we rest our belief, or at least our feelings of belief, that IT, or investment in IT, will increase the value of the firm?” This can be answered with an explanation about how IT is related to the value adding performance. Prediction may be the ultimate goal of scientific theory, but explanation is also essential to theory and practice (Pentland, 1999) because explanation also answers to the queries of “why” (Sutton and Staw, 1995).

The previous two chapters introduced a conceptual model that was developed through synthesizing arguments presented in existing literature. In that process, the nature of IT was divided into two separate concepts of information and technology. Information was explained as raw material for the final product; while technology was explained as intellectual techniques and processes used in solving problems and in obtaining desired outcomes (Ellul, 1964; Kast & Rosenzweig, 1979; Pitt, 2003; Quinn and Pacquette, 1990). Overstretched as it may sound to define IT this way especially when viewed from the perspective that emphasizes hard-core technology itself, it can be regarded as an expanded definition that makes it possible to address the comprehensive effect of IT over the entire organizational structure, people, and the jobs involved as pointed out by Leavitt (1965).

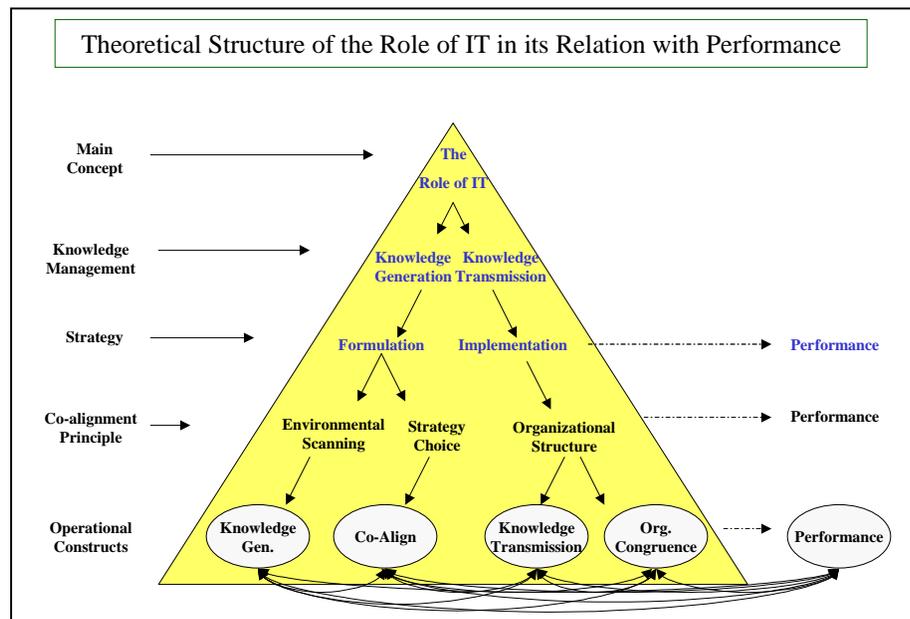
This chapter starts with the introduction of the theoretical underpinning necessary in the process of converting the conceptual model into a theoretical one with boundary

establishment – conceptual and empirical – and methodological details including the definition of constructs.

3.2 The Development of the Theoretical Model

To provide a logical explanation to the research question, the model presented in the previous chapter is restructured into a conceptual cascade in Figure 3.1. The triangle displays the layout of constructs. Displayed to the left side of the triangle are conceptual steps that label the activities of individual constructs presented in the same layer of the triangle. At the top of the structure is the concept of the role of IT, which has been defined in this study as generating and transmitting necessary knowledge within an organization. It is represented by the two activities of “Knowledge Generation” and “Knowledge Transmission” in the next layer. They are labeled as “Knowledge Management” on the left side.

Figure 3.1



The ambiguous nature of IT (Bharadwaj, Bharadwag, and Konsynski, 1999) makes it possible to view it from various perspectives. Depending on the angle from which IT is viewed, it can be explained with different focus. For this reason, this study has established a conceptual boundary by linking the role of IT to the concept of Knowledge Management within the internal chain of value creation of the conceptual model (refer to Figure 1.4 or its replica 2.1 for more details).

A logical link has been established from the constituents of “Knowledge Management” to those of “Strategy,” based on Takeuchi and Nonaka (2000) and Myers (1996). Takeuchi and Nonaka (2000) argue that synthesizing knowledge in an organization includes meaning and action, and it can be viewed as a process that systematically crystallizes and amplifies existing knowledge. Myers (1996) points out that one of the major functions an organization performs is to embed its collective knowledge into the routines and processes that enable action. These two arguments are synthesized in this study to relate the concept of “Knowledge Management” with “Strategy.” In fact, Myer’s argument about the function of an organization with its knowledge is a more specific description of Drucker’s (1993) remark that the purpose of organization is to make knowledge effective, which clearly indicates the close relationship between knowledge management and the implementation aspect of organizational strategy. The relationship between knowledge management and strategy has been addressed by many other researchers (Davenport, 1999; Griliches, 1998; Lyles and Schwend, 1991; Skyrme, 2000). Simply, knowledge creation is a necessary condition for strategy because strategy formulation requires possession of knowledge (Mintzberg, 1990; Tsoukas, 1996).

The next layer is the Co-Alignment model, which is used in this study as a theoretical binding agent that fuses concepts of IT and Strategy into a structural model, which specifies causal relationships between the constructs of theoretical interest. As mentioned earlier, strategy can be divided into conceptually dichotomized, but behaviorally connected activities of “Strategy Formulation” and “Implementation.” “Strategy Formulation” is considered a specific activity of “Knowledge Management” in that it leads to the organizational activities of “Environmental Scanning” and “Choice,” while “Implementation” leads to “Structure.”

Figure 1.4 (and its replica 2.1) introduced in previous chapters depicts the sequential relationships between strategic activities that relate the concept of IT to performance. From this perspective, it is more of a process model than a variance model (Langley, 1999).^{vi} Figure 3.1 converts the process model of Figure 1.4 into a variance model for empirical testing. The operational constructs displayed on the bottom of the structure will be further explained in the next section and finally developed into a structural model for empirical tests.

3.3 Description of Constructs in the Model

In the previous section, the relationship between the role of IT and performance was explained in a few sequential layers of concepts (Figure 3.1). The bottom layer in Figure 3.1 presents four operational constructs that are believed to have causal effects on performance. In other words, the role of IT transforms its function into the four

^{vi} Langley introduces the concept of process theory to explain evolution of strategic changes and pattern development. Her idea seems to fit well in explaining the procedural aspects of IT in relation with strategy.

operational constructs displayed on the bottom layer through a series of organizational activities of knowledge management before it is linked to performance.

As introduced earlier, information must be transferred to the right place at the right time through a systematically designed flow (Eilon, 1979) and integrated with other information (McDonald, 1998) to gain value. To make the integration and flow effective in an organization, there must be coordinated efforts (Grant, 1996), which is addressed in this study as IT application. In this sense, an organization exists as an institute to provide a certain structure in which multiple individuals can integrate their specialized knowledge (Grant, 1996) for their common good. Traditionally, this structure is viewed as vertical hierarchy that imposes bureaucratic process of top-down communication channel. In modern days, however, the structure of business organizations is becoming flattened reducing the size of the vertical layers. Consequently, the reliance on the lateral coordination for knowledge integration must be gaining its importance. In fact, the boundary of a firm can be determined by analyzing the vertical as well as horizontal boundaries in terms of knowledge utilization (Grant, 1996).

Based on this argument, this study adopts the operators' perception about the effectiveness of their company policies (strategic material – *what*) and methods of coordination (methods of application – *how*) for the measurement scale. By doing so, it is believed to measure the effectiveness of IT application on the performance of the firm through vertical structure as well as horizontal coordination. Operators' perception about the effectiveness of their company policies is important because company policies are a direct form of the organizational knowledge that needs to be converted into the action at the operators' level. In other words, top management's knowledge is transcended at the

operational level into the form of taking actions (Takeuchi and Nonaka, 2000), which is considered the ultimate form of knowledge activity.^{vii}

The following sections explain the characteristics of each construct shown on the bottom layer. Since constructs are conceptual variables that cannot be observed directly, they must be represented by manifest variables, or indicator variables, as proxies for observation. Due to this unobservable nature, they are often described as latent variables. These two terms – constructs and latent variables – are interchangeably used in this study.

3.3.1 Knowledge Generation

The first construct of “Knowledge Generation,” is regarded as the result of the “Environmental Scanning” activity of the organization described in the Co-Alignment model. Chapter 2 explained the necessity of scanning the internal and external environment. The combination of these activities will lead to the creation of sets of organizational knowledge. Since the structure of the knowledge developed in an organization is about its environmental constituents (Skyrme, 2000), the dimensions of this construct’s manifest variables are limited to the organization’s knowledge about its task environmental components: customer, competitor, supplier, and regulator groups.

3.3.2 Co-Alignment

The second construct of “Co-Align,” derived from the step of “Strategy Choice” in the Co-alignment model (Olsen et al., 1999), represents the stage where a company’s strategic choices correspond to the expectation of operators for practical purposes. It is

^{vii} Refer to section 2.5 of Chapter 2 for details

measured by the degree of the unit level operators' perception about the match between the company's corporate policies and their day-to-day operational details.

The causal effect of co-alignment on performance has been tested in previous studies of De Chabert (1998), and Taylor (2002). They developed measurement scales using multivariate techniques that compare the level of conformity between competitive methods driven by the corporate executives and core competencies performed by operators. Taylor (2002) included the perception of customers in her analysis. The same approach is adopted in this study to measure this specific construct of co-alignment, but with a slight modification due to the difference in research method. De Chabert and Taylor conducted qualitative research using the case study method. However, the method of mail survey adopted for the current study imposes a serious limit to the number of the questions on the survey.

Company policies on task environmental components – customers, competitors, suppliers, and regulators – are supposed to be interrelated with one another when they are to be implemented at the operations level as displayed in Table 3.1. It shows sixteen different dimensions to address the interrelations of four components of the task environment when viewed from the perspectives of the corporate level and from the unit operations level in the multivariate approach. The horizontal dimension represents the nature of corporate policies related to individual components. The vertical dimension represents the degree of usefulness of them as perceived by unit operators when comparing the policies with their unique operational details.

Each intersected concept needs to be developed into a separate conceptual factor. Since the technique of Confirmatory Factor Analysis requires at least 3 valid manifest

variables for each concept to have validity, it is suggested that the questionnaire have at least 5 questions or more per each dimension (Hatcher, 1994). This way, the number of questions for this section only can easily grow into 80 or more, which is highly undesirable for a mail survey. For this reason, the number of dimensions has been limited to those that are highlighted in the Table 3.1 – customer, competitor, supplier, and regulator.

Table 3.1: The Dimensions of the Measure of Co-Alignment

	Corporate policies directed to unit level (Competitive Methods)				
		Customer	Competitor	Supplier	Regulator
Corporate Strategies perceived by the unit level operators (Core Competency)	Customer	Questions			
	Competitor		Questions		
	Supplier			Questions	
	Regulator				Questions

3.3.3 Knowledge Transmission

The next construct – “Knowledge Transmission” – represents all types of communication channels and activities, formal or informal that the organization initiates to share its knowledge with everyone in the company. Put differently, it is the “knowledge network” through which an organization provides its staff, including unit managers, with opportunities to collaborate their ideas and information to accomplish

their common goal. This activity is also described as social networks within the organization that provides individual operators with an information environment (Parker, Prusak, and Borgatti, 2001).

For this attribute of network, “Knowledge Transmission” covers a much wider range than just sophisticated hardware technology (McDonald, 1998). Parker et al. (2000) also assert that physical IT can only be subordinate to the human network for knowledge creation and sharing. They introduced a framework of Social Network Analysis (SNA) to address qualities that promote effective knowledge sharing. Elements of SNA will be introduced in the section of Measures for Knowledge Transmission.

The purpose of knowledge sharing is simply to make sure that everyone in the organization knows what he/she knows by condensing dispersed – discrete, asymmetric, and uncertain – knowledge within the organization (Becker, 2001), which is a process that systematically crystallizes and amplifies existing knowledge (Takeuchi and Nonaka, 2000). This leads to the next construct of “Organizational Congruence” of this study.

3.3.4 Congruence

The fourth construct – “Congruence” – stands for the organizational condition in which all operators feel comfortable about themselves with shared organizational knowledge as the result of the previous construct (Knowledge Transmission). Organizational congruence indicates the degree of understanding of the operator group about the company’s generic policies and strategies, which, in turn, promotes trust and dedication from the organizational staff who are commonly at the receiving end of the knowledge transmission network. It is hypothesized in this study that the effectiveness of

knowledge transmission is directly related to this stage. In other words, employees' trust and dedication can be promoted through providing the most effective "social network" through which they can obtain clear understanding about their organization. Indicator variables for this construct are developed based on this assumption.

3.3.5 Performance

Widely used as a dependent variable in organizational research, performance remains yet one of the most loosely defined constructs (Rogers and Write, 1998), due to its multi-faceted nature. It is sometimes suggested to include operational indicators in the performance measure (Venkatraman and Ramanujam, 1986), but this study adopts financial indicators, which seems to be the main stream in the field of strategy (Rogers and Write, 1998 referring to Row, Morrow, and Finch, 1995). However, this study departs from previous ones in that it investigates the degree of discrepancy between the forecast and the actual performance – sales, cost of sales, and operating income for the proxy of cash flow from operations. Since the analysis is about the effectiveness of IT application in the form of knowledge management, it appears to be more logical to relate effective forecasting, which is the knowledge work as the result of IT application, to the enhanced accuracy that results in reduced discrepancy than looking for growth in sales and/or profit. Growth in sales and profit is an important criterion to measure financial performance. However, it is usually planned based on forecasting, and operators are expected to achieve the planned growth. If the organizational knowledge is accurate about its business environment (co-aligned well, in other words), there should be little, if

any, discrepancy between the plan and the actual. It is based on this speculation that this study adopts the discrepancy level for the measurement.

3.4 Development of Models for Empirical Testing

With the description of constructs introduced, the next step is to develop a model that indicates the relationships among them. Due to the latency of proposed constructs, each of them is represented by observable variables (also known as manifest variables or indicator variables) for testing. For this reason, the empirical testing is made of two steps. First, the relationship between manifest variables and individual constructs needs to be verified. Once this step is taken successfully, relationships between each construct will be addressed. This two-step procedure is introduced as the developing of a measurement model and a structural model (Anderson and Gerbing, 1988). Specifics of each model will be explained in the following sections.

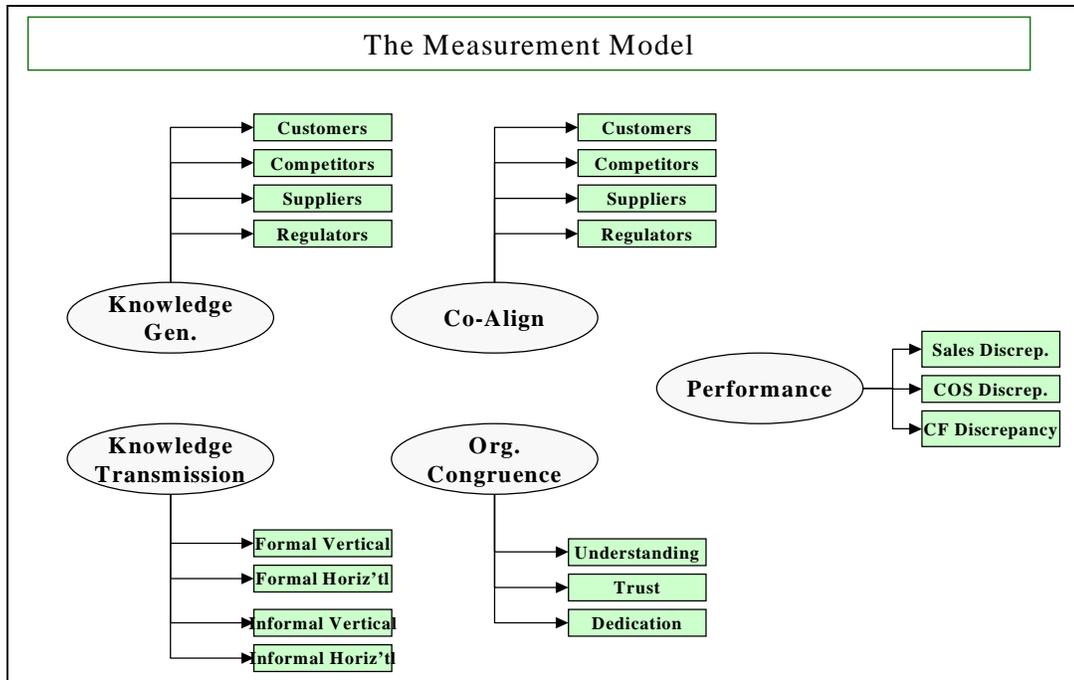
3.4.1 Step One: The Measurement Model

The measurement model describes the relationship between the latent factors and their indicator variables. The purpose of this model is for the evidence that indicator variables really measure the underlying constructs of interest, and that the model demonstrates an acceptable fit to the data (Hatcher, 1994). However, a measurement model does not specify any causal relationships between the constructs. (Hatcher, 1994; Hoyle, 1995; Hoyle and Panter, 1995).

At this step, the Confirmatory Factor Analysis (CFA) is used to test this model for individual constructs separately. It examines the unidirectionality of each construct

(Anderson & Gerbing, 1988). By doing this, CFA tests hypotheses proposed between the manifest variable and the construct (Byrne, 1994). Figure 3.2 depicts the relationships between individual constructs and their indicator variables.

Figure 3.2

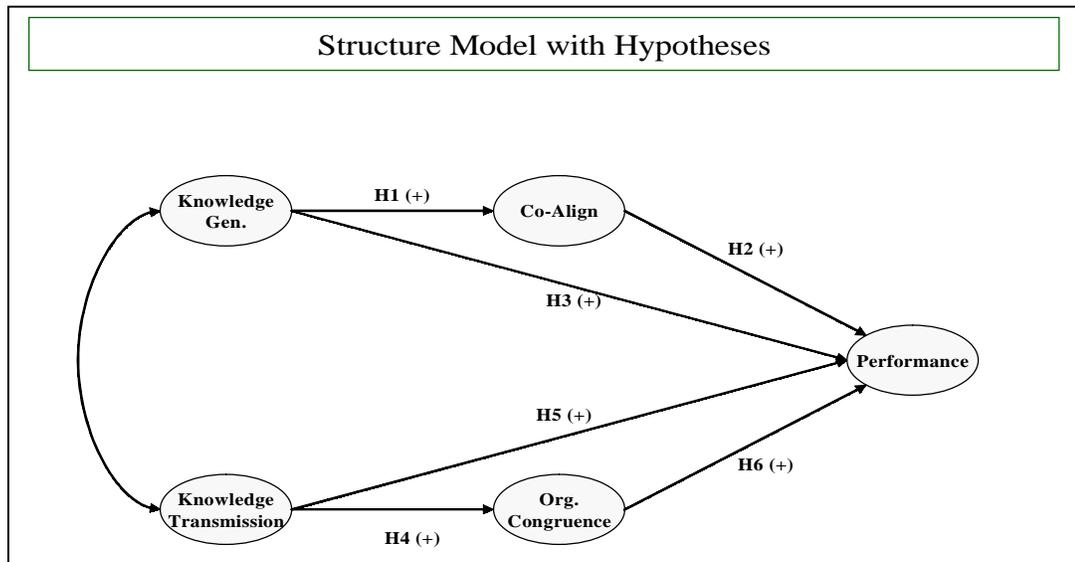


3.4.2 Step Two: The Structural Model

Once the measurement model provides acceptable fit, the second step is to develop a structural model that specifies causal relations between latent variables (or constructs) by addressing the research hypotheses proposed. This is conducted through a path analysis with latent variables. It is at this stage that testing hypotheses becomes possible as to causal effects of a certain construct upon others. The structural model (or the causal model) describes the predicted causal relationships between the constructs

(Hatcher, 1994). If the data provided indicates a high degree of correspondence to the predicted relationships, the model is said to present a “good-fit” to the data. With a “good-fit” to the data, the model is confirmed. The most commonly used fit indices include, but are not limited to, the Chi-square index, goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). Figure 3.3 is the structural model with hypotheses suggested in the next section.

Figure 3.3



Hatcher (1994) points out two advantages of using a structural model with latent variables. One is that it assesses the convergent and discriminant validity of its measures that provides evidence of construct validity. The other is that a latent-variable analysis provides the opportunity to work with perfectly reliable causes and effects with error terms within the structural model (pp. 257 – 8).

3.5 Research Hypotheses

Based on the arguments constructed so far regarding the research question, the following hypotheses are established for empirical testing. It needs to be emphasized again that the perception of operators (unit managers) is the focus of the measurement because operators are the ones that conduct the ultimate knowledge work as the final decision makers by taking actions based on their judgment with the knowledge created and transmitted to them. In other words, effectiveness of IT application can be operationalized if organizational knowledge is perceived positively and practically put into actions by the operators.

- H1:** Operators' perceptions about top management's efforts to create knowledge about the firm's task environment are positively related to the co-alignment status at the unit level.
- H2:** Operators' perceptions about the firm's co-alignment (the match between the firm's directions and the operators' reality) are positively related to the firm's performance by reducing the discrepancy between the result of planned and actual operations.
- H3:** Operators' perceptions about top management's effort to create knowledge about the firm's task environment are positively related to the firm's performance by reducing the discrepancy between the plan and the actual.
- H4:** Operators' perceptions about firm's effort of knowledge transmission (sharing) are positively related to organizational congruence by increasing the level of trust and dedication.

H5: Operators' perceptions about the firm's effort of knowledge transmission (sharing) are positively related to organizational performance by reducing the discrepancy between the plan and the actual.

H6: Organizational congruence is positively related to the firm's performance.

3.6 Unit of Analysis

The objective of this study is to explain the mechanism of how an IT application influences business performance in the web of strategic context that is addressed as the managerial infrastructure for knowledge management. In this context, the focus will be limited on the internal chain of value creation within an organization. Since organizational strategy is considered a well-conceived plan, which simply awaits implementation by a willing crew of team workers (Moore, 2000), operators' needs to create, comprehend and manage complex duties have to be counter-intuitive (Sparrow, 2000). Choices cannot be viewed from the dichotomy of being correct or incorrect. As Sparrow (2000) points out, "correctness of decision depends on the view that is used to evaluate it." This way, unit managers represent the 'information world' by employing their organizational knowledge structure that helps them infer their perceived intelligence about new information. This argument puts unit managers into the spot of information brokers who manage a web of information interaction taking place within the organization (Sparrow, 2000).

The above statements emphasize the difficulty of the managers' role in converting intelligence into managerial actions because real life settings never present ideal solutions of strategic behavior. In other words, in applied settings, no one strategic model is likely

to predominate (Moore, 2000). This difficulty in the managers' role in knowledge management seems to justify the selection of the unit operators' perception about their organizational strategies as the unit of analysis to connect to their business performance.

In conclusion, this study focuses on the analysis of the unit operators' level of perception about the effectiveness of the general guidance provided by their top management – intended strategy (Mintzberg, 1998) – in their daily activities. It is assumed that better understanding about their organization's ultimate goal will help them design better fitness that will result in higher performance. The performance will be measured by the degree of variance between the pro forma financial results and actual ones at the unit level.

3.7 Boundary of the study

Boundary establishment is one of the important premises that need to be laid out to construct a theory. Boundary is defined as the explicit spacio-temporal restriction by which all theories are constrained (Bacharach, 1989). However, boundary also includes the implicit values of the theorist. Bacharach (1989) further argues, "if a theory is to be properly used or tested, the theorist's implicit assumptions which are for the boundaries of the theory must be understood."

Despite the importance of boundary setting in research, it is extremely difficult to establish clear boundaries in the hospitality industry. Being so huge in volume, and so fragmented in its nature and in size as well as in types of operations, it is very difficult to define what the hospitality industry is. Perhaps this is one of the reasons for the lack of scientific theory in this discipline lamented by Khan and Olsen (1988). At the same time,

this also seems to be closely related to the “yes, but... syndrome” pointed out by Zemke and Albrecht (1985). Whenever any solutions are suggested, the usual reaction is “Yes, but it will not work in our firm, because we are different from others in that...”

With this difficulty in mind, the boundary – physical as well as logical – of this research at this step is limited to multi-unit restaurant firms. Being an exploratory research, this study does not intend to infer the finding as a deductive argument for the entire industry. Instead, it intends to describe or explain the general level of contribution of IT application to achieving its strategic goal in the selected segment of the industry. When a series of more refined research is conducted, the result can be used as a framework to deduce the findings to cover a wider range of the industry, or it can be used as measuring criterion for individual firms.

3.8 Measures

A set of survey instruments has been developed to measure the level of perception of the respondents based on those used in previous studies on similar topics. West (1988) and Tse (1988) have developed a structured questionnaire for their studies about the relationship between strategy and performance. A similar approach is also found in the study conducted by Strempek (1997), who included a survey instrument developed by Venkatraman.

This study has adopted relevant portions of the material with appropriate modification and arrangement so that each scale would fit into each construct.

Since all these original survey instruments have already been used in previous studies with appropriate statistical tests for reliability and validity, the primary criterion

of the reliability of the manifest variables is met. The instrument developed for this study will take the form of semantic differential, which is considered to provide interval data (Zikmund, 1997 & 2001).

3.8.1 Measures for Knowledge Generation

This section introduces a set of scales that measures the unit managers' level of perception about the quality and quantity of knowledge regarding the environment created by the top management of the company. Accommodating Skyrme's argument (2000) that the structure of the knowledge is about the firm's environmental constituents, the dimensions of this scale are limited to the organization's knowledge about its customer, competitor, supplier, and regulator groups. The following are the dimensions prepared with slight modification and regrouping from those used by West (1988), Tse (1988).

- 1) Customers' needs and wants in general
- 2) The current trends of customers' needs and wants
- 3) Demographic changes for customers' future behavior trends
- 4) Purchasing behavior of your customers
- 5) Future changes in customer needs and wants
- 6) Customers' price-value related behavior

- 7) Competitors' action plans in general
- 8) Competitors' expansion plan in your area
- 9) Products and services developed by competitors
- 10) Competitors' pricing strategies
- 11) Possible entry of new competitors into your local market

- 12) The suppliers' condition that may affect pricing of raw material
- 13) The current cost situation of material
- 14) The current availability of raw material
- 15) The near future cost fluctuation of raw material
- 16) The near future availability of raw material
- 17) Competitors' employee compensation policies
- 18) Your specific local labor market situation

- 19) The regulation changes in general (nationwide)
- 20) The regulation changes caused by threats of ecological epidemics such as Mad Cow Disease or Foot and Mouth Disease
- 21) The regulation changes in labor related issues

- 22) Any other type of information that is helpful but not provided by the company (open-ended question for further research)

3.8.2 Measures for Co-Alignment

The construct of “Co-Align” represents the degree of conformity of the company policy and strategy directed by their top management to the operation level. It is to be measured by the perception level of the unit managers about the applicability of the company’s strategic choice in day-to-day operations.

As introduced in an earlier section, the same method and technique developed by De Chabert (1998) and Taylor (2002) is applied in this study to measure this specific construct. However, due to the difficulty related to a mail survey, some modification has to be made. In addition, to maintain the conformity in the scale, the dimensions will be limited to those of the same constituents of task environment used in the previous construct. The following is the scale to measure the current construct.

- 1) Skills and techniques to deal with customers’ needs and wants
- 2) Specific information about demographic changes
- 3) How to deal with changes in purchasing behavior of customers
- 4) How to prepare for future changes in customers’ needs and wants
- 5) How to deal with customers’ price-value related behavior

- 6) How to react to competitors’ action plans in general
- 7) How to react to competitors’ expansion plan in your area
- 8) How to react to products and services developed by competitors
- 9) Guidelines to deal with competitors’ pricing strategies
- 10) How to deal with possible entry of new competitors into your market

- 11) Timely advices on pricing conditions of raw material
- 12) Information on cost situation of material

- 13) Information on the availability of raw material
- 14) Advices on the future cost fluctuation of raw material
- 15) Advices on the future availability of raw material
- 16) Information on competitors' employee compensation policies
- 17) Consult on your specific local labor market situation

- 18) Information on the regulation changes in general (nationwide or chain-wide)
- 19) Consult on the regulation changes caused by threats of ecological epidemics
- 20) Consultation on the regulation changes in labor related issues

3.8.3 Measures for Knowledge Transmission

The third construct of “Knowledge Transmission” includes all types of communication channels and activities - formal or informal – that the organization initiates to share its knowledge with everyone in the company. Knowledge Transmission is believed to provide an organization’s staff including unit managers with opportunities to “knowledge network” in order to collaborate their ideas and information to accomplish their common goal (Parker, Prusak, and Borgatti, 2001). For this attribute of network, “Knowledge Transmission” covers a much wider range than just sophisticated hardware technology (McDonald, 1998).

In addition to the concept of “Knowledge Transmission,” the framework of Social Network Analysis (SNA) introduced by Parker et al. (2000) has been incorporated to create the scale for this construct. The framework of SNA introduces four elements of effective knowledge sharing. They are:

- Knowledge: Knowing what they (including others) know in the organization
- Access: Access to other people’s knowledge in timely fashion
- Engagement: Level of cooperation from the help providers
- Safety: Level of tolerance in challenging the relevance or effectiveness

From the four elements introduced, those of Access and Engagement are incorporated in developing the following scale for the current construct. One aspect of the scale focuses on official channels of communication by asking “Regular” activities. The other aspect focuses on non-official channels by asking “Occasional” activities. The following is the scale developed for this construct.

- 1) Regular company-wide management meeting
- 2) Regular regional management meeting
- 3) Regular visits of executives
- 4) Regular official company reports
- 5) Regular e-mails from executives
- 6) Regular phone conversation with executives

- 7) Regular company-wide conferences with unit managers
- 8) Regular regional conferences with unit managers
- 9) Regular e-mails with your counterparts in other units
- 10) Regular phone conversations with your counterparts in other units

- 11) Occasional company-wide management meeting
- 12) Occasional regional management meeting
- 13) Occasional visits of executives
- 14) Occasional official company reports
- 15) Occasional e-mails from executives
- 16) Occasional phone conversation with executives

- 17) Occasional company-wide conferences with unit managers
- 18) Occasional regional conferences with unit managers
- 19) Occasional e-mails with your counterparts in other units
- 20) Occasional phone conversations with your counterparts in other units

3.8.4 Measures for Congruence

The fourth construct – “Congruence” – stands for the organizational condition in which informational asymmetry is eliminated between operators and the top management. At this stage, operators know not only what they should know but also

they know that their top management knows about what they do, and vice versa.

Consequently at this stage, a high level of trust is established between different groups within the organization through the complete transparency in information and knowledge by integrating dispersed knowledge. Becker's (2001) idea of 'dispersed knowledge' is incorporated in creating this construct and related scale. The framework of SNA introduced in the previous construct has been also applied.

The following is the scale.

- 1) The upper management is supportive of my efforts to identify current and future problems.
- 2) The upper management understands the unique situations of my unit when reviewing my performance.
- 3) The upper management evaluates unit performance from at least a few different perspectives.
- 4) The decisions made by the top management is usually trustworthy
- 5) The top management of the company has the clear understanding of the business we are in.
- 6) The top management has a clear vision for the future of the company
- 7) I feel comfortable to raise my voice against inappropriate decisions delivered from the upper management.
- 8) I have enough communication channels to deliver my opinion to the upper management, if needed.
- 9) I can trust the final decision made by the executives has been through a collaborated discussion including my opinion.
- 10) I am quite confident that I am making a positive progress in my career under the company's guidance
- 11) If there should a revolutionary change in the industry, my company will survive and eventually be successful

3.8.5 Measures for Performance

Performance is the dependent variable in this study. As aforementioned, financial indicators are used, instead of operational indices, in the form of discrepancy between the

forecasted performances (pro forma) and the actual ones in sales, cost of sales, and operating income.

The following is the scale.

- 1) The difference in percentage between your sales in budget and actual in the last year
- 2) The difference in percentage between your cost of sales in budget and actual in the last year
- 3) The difference in percentage between your operating income in budget and actual in the last year

3.9 Pilot Study and Pretest

The original questionnaire was proofread by two individuals and one group. One of them is an educator who teaches hospitality management at a community college in North Carolina. Another is a corporate staff member of a nationwide restaurant company. With the help of another executive chef at a nationwide chain restaurant, a group of unit managers of the company participated in reviewing the questionnaire. This procedure provided the researcher with the opportunity to discover any possible errors in design or unclear wording in the questions. At this stage, a concern has been expressed by the last group about the length of the questionnaire.

At the concern described above, a group of multi-unit restaurant operators in the Midwest region was contacted to verify the reasonableness of the questionnaire again. The group was made of 3 regional directors of different nationwide companies and 4 managers who supervised at least 2 or 3 units of casual theme, full-service restaurants. None of them were notified about the previous concern. However, all of them unanimously expressed the same concern pointing out that the questionnaire was too lengthy addressing too many aspects for operators to handle. Accommodating their

suggestion, the questionnaire has been reduced in its dimensions by eliminating the aspects of supplier and regulators from the constructs of Knowledge Generation and Co-alignment. The result is shown in the Table 3.2.

Table 3.2 (Revised)

The Structure of The Final Questionnaire for Co-Alignment

	Corporate strategies directed to unit level (Competitive Methods)				
		Customer	Competitor	Supplier	Regulator
Corporate Strategies perceived by the unit level operators (Core Competency)	Customer	Questions			
	Competitor		Questions		
	Supplier			<i>Eliminated</i>	
	Regulator				<i>Eliminated</i>

3.10 Sample & Data Collection

The sampling frame has been prepared from the list of chain restaurant companies presented in the handbook distributed by the Richard K. Miller & Associates, Inc. At this point, Quick Service Restaurant (QSR) chains were not included in the sampling frame. Fifteen casual-theme, full- or limited-service restaurant companies were finally selected for contact based on the criteria of the number of units and the geographic coverage of more than 5 states in the U.S. Then the address of each unit has been obtained from each company's web site. The total number of the potential sampling frame was 4,445. To

ensure random sampling, this list has been sorted by the zip code. It turned out that each area under one zip code has at least two chain restaurants. Areas with dense population, usually large cities, have 5 to 6, sometimes up to 12 casual-theme full-service restaurants per area under one zip code.

Assuming a low response rate of around 7 percent, it was determined to draw a random sample of approximately 3,000 restaurants. With this decision, one third of the sampling frame needed to be taken off the list. This procedure was handled by assigning sequential numbers of 1 through 3 to the entire list of the sampling frame sorted in the order of zip code and then in alphabetical order of each restaurant. Then from 3 cards prepared with a number of 1, 2, or 3 in the back, one card was randomly drawn. Since the card drawn had the number of 3, every third unit in the list has been deleted from the sampling frame. The entire process was conducted using Microsoft Excel spreadsheet program. The remaining 2,966 restaurants were contacted with the survey instrument and a cover letter. At this point, no incentive has been offered.

During the following 3 weeks, only 61 managers have replied. Due to this insufficient number of reply, another attempt has been made to encourage participation. The second mailing was sent out to the remaining operators who had not responded. A small amount of cash bonus was offered at this time. However, this extra effort brought in only 12 new responses, making the total number of responses 73. The number of returned mail approached close to 110, mostly due to inaccurate addresses. This indicates the poor level of accuracy of information posted in restaurant companies' web sites. The poor response rate was predicted by those who had participated in the pilot test. They predicted with concern that unit restaurant managers do not have enough time

to participate in mail survey unless they are forced to. This was confirmed later by several unit managers at private gathering events.

One of the researcher's contacts, who has been teaching hospitality management in Korea, expressed a high level of interest in the research topic and offered help in data collection. Korea, one of the world's economic powerhouses today, has been trying to develop its image as the international tourism destination by focusing on its hospitality industry. Due to this effort with its vigorous market activity, numerous chain restaurant companies are operating there including many franchisees of U.S. based companies.

Since English is not the main language of communication in Korea, the original questionnaire had to be translated into Korean. To prevent the potential bias that may happen in the process of translating into Korean, three different translation procedures were taken – first by the researcher who is a native speaker of Korean, second and third by the Korean faculty and one of his students. All these translation activities were conducted separately and simultaneously, and the results were collected through e-mail communication and verified by the researcher. There were a few minor differences in wording and vocabularies. However, these small differences did not cause any substantial problems at all.

Four hundred (400) copies of the translated version of the questionnaire were distributed to individual unit managers by regional directors of each company in Korea. Of those distributed, 128 valid copies have been collected. The comment on participation effort made by American executives was reiterated by their Korean counterparts. That is, unit managers need to be forced to participate in a mail survey by their supervisors. One difference found at this stage is the information mercantilism. The US restaurant

executives carry unnecessary amount of fear about releasing their companies' information, protecting the information heavily as proprietary material, while their counterpart in Korea seem to be more open-minded regarding sharing their information with academia.

Chapter 4 Analyses and Results

4.1 Introduction

This study is designed to identify a certain relationship between IT application and financial performance by theorizing that IT is applied in the strategic management through the chain of knowledge management in organizational structure. In this effort, a theoretical model has been developed to operationalize the links between financial performance and organizational knowledge management by investigating operators' perception on their company's effort of generating and transmitting necessary knowledge that is considered useful in everyday operations at the unit level

This chapter presents results of relevant statistical analyses including the description of respondents, multicultural issue, incremental development of a causal model, statistical fitness, and issues about reliability and validity. All these steps have been taken using the technique of Structural Equation Modeling (SEM) provided by SAS system's CALIS procedure (SAS Institute Inc., 1989). The technique of SEM assesses relationships among latent or observed variables (Hoyle, 1995) by evaluating the degree of fitness between hypothetical constructs and the obtained data (Bollen 1989; Hoyle, 1995; Hoyle & Smith, 1994).

Since SEM assumes multivariate normality (Bollen & Long, 1994), descriptive statistics was computed, with the values of skewness and kurtosis of all measured variables (Appendix I). Kurtosis shows the degree of peaked distribution. Positive value indicates that the distribution is relatively peaked. On the other hand, skewness shows normality. Values over +/- 1 indicate substantially skewed compared to a normal distribution. Normality, the degree to which the distribution of data corresponds to a

normal curve, has been assessed through the Normal Probability Plot provided by SPSS (Appendix II). Normal Probability Plot is the graphical comparison of the distribution where a normal distribution is displayed by a 45-degree angle straight line, and the actual distribution is plotted against it (Hair et al. 1995).

The scale reliability and internal consistency have been assessed through Cronbach's Alpha and composite reliability (Fornell and Larcker, 1981; Hatcher, 1994). The distribution properties of all items have been examined in the display of residuals (generated by CALIS program) to ascertain possible deviations from multivariate normality.

4.2 Profile of the Sample

The restaurant industry has been selected as the initial boundary of this study. However, since the restaurant industry is so huge and fragmented in terms of concepts, type of service, and the structure of management to name only a few, the initial boundary needs to be narrowed down further. Due to the nature of the research question that demands a multi-layered chain of command for information flow within an organization, multi-unit chain operations have been targeted for data collection. Among many different types of restaurant concepts, casual-theme, full- or limited-service restaurants have been selected.

The sampling frame of 15 restaurant companies has been prepared as explained in the previous chapter from more than 20 multi-unit restaurant companies. The selection criteria used were the number of units operated at the end of the year 2002, geographic dispersion, total sales volume, the type of service, and the service concept. Also included

in the criteria was the availability of address list of each unit on the company's web site. The following table shows the list of the companies contacted.

Table 4.1(a) The List of U.S. Restaurant Companies Contacted

Number	Name	Units
1	Applebee's	765
2	Bennigan's	270
3	Bob Evans	325
4	Carrabba's	105
5	Charthouse	37
6	Golden Corral	460
7	Marie Callender	156
8	Morton	56
9	Motorola Food Service	45
10	Olive Garden	405
11	Outback	610
12	Ponderosa	315
13	Red Lobster	488
14	Ruth Chris	60
15	Ryan's	348
	Total	4,445

This list covers 15 different companies throughout the entire U.S. except Alaska and Hawaii. As explained earlier, two thousand nine hundred and sixty-six (2,966) units were randomly selected from the sampling frame of 4,445. A research packet has been mailed out including a cover letter that explains the nature of the study. Return envelopes with prepaid postage were also included in the packet. Fewer than 60 responses were made in the first 3 weeks. With this disappointing response rate, the second request has been mailed out to those who had not responded. At this time, a small amount of cash

bonus was offered to expedite their participation. About a dozen responses arrived with the second expedition. The response rate in total was barely 2.5%.

With this poor response rate, another attempt was made toward a different target. As mentioned earlier, a researcher and educator in Hospitality Management in Korea expressed a high level of interest and offered help in data collection. In fact, the measurement scale used for this study can be applied to a wider area with different demographic characteristics depending on the purpose. In its smallest application, it can be used for an individual organization for a case study. In a complex environment, however, it can also expand its application to the entire segment of the industry as long as the structure of chain of command remains the same. In conclusion, there is no need to limit the samples to a certain geographic or even a cultural area as long as necessary conditions are met. Multicultural concerns regarding the sample groups selected for this study will be addressed in the next section.

With this background, a translated version of the questionnaire was prepared for restaurant companies in Korea, where substantial cooperation was provided. From the total of 400 questionnaire distributed, 138 valid responses were collected. The following is the list of Korean companies that participated in the survey.

Table 4.1(b) The List of Korean Restaurant Companies Contacted

Number	Name	No. of Responses
1	TGI Friday	23
2	Popeye's & KFC	17
3	Lotteria	54
4	Sun at Food (domestic chain)	29
5	Bakery Chain of Chosun Hotel (Franchise of Westin Hotel)	15

With this result, 213 observations have been used to conduct this investigation. Altogether, 35.2% of the responses came from the United States representing 18 different states with no concentration in any specific region, and 64.8% of the responses came from Korea. A few of the Korean companies were franchisees of the companies based in the U.S. Respondents identified themselves as professional restaurant operators with up to over 40 years of experience in the industry. The average length of experience in the industry turned out to be 8.7 years with the standard deviation (SD) of 7.6 years. The average length of time spent in the current company was close to 5 years with the SD of 3.3 years. The average length of time spent in the current position of the unit manager turned out to be slightly over 3 years with the SD of 2.46.

More than half (54.5%) of the respondents identified themselves as managers of chain unit, while 35.2% of them answered they were running franchise operations. Twenty-two respondents left this question blank. Twenty-four managers (11.3% of the respondents) said they had a degree in a culinary discipline, while another 34 (16%) answered they majored in the Hospitality Management. Combining these two, 27.3% of the restaurant managers turned out to have hospitality related degrees. Thirty-seven respondents (17.4%) hold business degrees, and 46 (21.6%) answered they were certificate holders.

4.3 Multicultural Issue

4.3.1 Introduction

As mentioned, the multiple sources of data for this study may raise a methodological concern to some readers related to multicultural issues. Hofstede (1983a)

reports a considerable amount of disparity when dominant managerial theories have been applied to workforces in countries outside the U.S. The argument is that since many of the predominant managerial theories were developed in the Western culture, it is possible that they are culturally bounded. For this reason, research conducted on multicultural settings must address differences in the underlying value structures associated with cultural identity (Becker and Murrmann, 2000).

There is no denying that there are differences in people's behavior patterns depending on their traditional value systems and cultural norms. However, most studies on multicultural issues have failed to mention one fundamental common factor that all human beings as a homo sapiens group possess – the capacity of rational thinking. Luria (1981), citing Wurzburg psychologists' argument, points out that “humans possess some kind of ‘logical feeling’ or experience of the correctness or incorrectness of an idea.” He further explains that this capacity is “a feeling similar to that we experience when we are given a syllogism and arrive immediately at a logical conclusion.” This “logical process,” (Adams, 1975) or “analytical mechanism or inductive principle” (Chomsky, 1975), which is innate, is quite different from those examined in psychology as perception or sensation (Luria, 1981).

With this point of view in the background, this study suggests that the sample groups selected from two different cultural settings have shown similar, if not completely identical, way of “forming ideas” (Adams, 1975) when they answered the given set of questions. Each question was designed to ask respondents to come up with certain relationships between specific pieces of information and its usefulness. This requires

respondents' logical feeling or experience about correctness or incorrectness that was pointed out by Luria (1981).

The framework introduced by Becker and Murrmann (2000) seems perfect for this purpose. According to them, there are three dimensions to consider: equivalence dimension, sampling dimension, and data analysis dimension. The equivalence dimension, again, is divided into four sub-dimensions of conceptual equivalence, functional equivalence, measurement equivalence, and language equivalence.

Each of these dimensions will be addressed in this section, as aforementioned, to justify the use of two sample groups from different cultural settings. Statistical results in detail will be introduced later in the relevant section that follows. In summary, the purpose of applying this framework is to prove that the two sample groups are, despite their cultural differences, not different in patterns and directions of their collective activity of cognition in forming strategic ideas.

4.3.2 Equivalence Dimension

4.3.2.1 Conceptual Equivalence

Conceptual equivalence exists when the meaning of research concepts is equivalent across cultures (Becker & Murrmann, 2000). Put differently, if respondents with different cultural backgrounds understand the concept in a similar way, the conceptual equivalence is justified. From this perspective, this section explains why it has to be the same that respondents of this study from both countries (the U.S. and Korea) understand the concept presented in the scale.

To construct an answer to the question presented in this study – “On what relationship, do we rest our belief, or our thought of belief that IT increases the value of the host firm?” – a series of arguments has been developed with the focus on the strategic sequence of knowledge creation and transfer with regards to the business environment of an organization. The questionnaire has been designed in this context to explore the reasoning dimension of the participants’ perception about the idea of “usefulness” or “applicability” that is said to be “innate” (Chomsky, 1975). Put differently, individual questions explore each respondent’s conclusion drawn from his/her observation. Designed this way, the answers provided are more about the respondents’ “logical process” or “forming ideas,” which is a cognitive activity that transforms their sensory experience into rational experience (Luria, 1981).

The difference between the “sensory experience” and the “forming ideas (or “logical process”) has been experimented by many psychologists. Reasoning enables humans to draw conclusions from their direct observations beyond their direct (sensory) observations (Luria, 1981). In fact, people are born with that kind of constitution, according to Descartes (Adams, 1975; Chomsky, 1975; Horner and Westacott, 2000). Furthermore, innatists agree that all men have basically the same abilities with regard to the formation of ideas as long as they are of roughly similar intelligence (Adams, 1975). Chomsky (1975) also refers to this inborn ability of forming ideas as “Common Notion.” He explains the existence of this “Common Notion” by pointing out that deep structure of grammar seems very similar from language to language (Chomsky, 1975). As an innate concept that is identical to every human being, this “Common Notion” can be applied to any “normal men” with “appropriate experience.” The category of “normal men”

excludes those who are out of their mind or mentally incapable. The second qualification, “appropriate experience” refers to the ability of eliciting or activating their innate principles (Chomsky, 1975).

This study, with the theory of rationalism introduced so far on its philosophical base, proposes that there is no significant difference in the cognitive behavior in forming concepts of (or analyzing) the given scale between the two sample groups (the U.S. and the Republic of Korea). Perhaps there might be more significant differences within each group than between the two (Dobbins and Skilling, 1991 referring to Miles, 1982; Sue & Zane, 1987). To support further the validity of this argument with empirical evidences, all other equivalence dimensions for assessment suggested by Becker and Murrmann (2000) will be followed through.

4.3.2.2 Functional Equivalence

Functional equivalence exists when similar activities or products serve the same functions across all cultures in the study (Becker and Murrmann, 2000). Due to the intangible nature of the activity to be analyzed in this study – information and its usefulness, it is impossible to illustrate tangible examples to assess their functional equivalence. However, it is possible to illustrate the existence of the same structure and dimensions of constructs across two different cultures. CFA (confirmatory factor analysis), as a confirmatory tool for hypothesis testing of the unidirectionality between the first-order factor and manifest variables, can be applied to individual sample groups separately for comparison. The existence of similar unidirectionality between first-order

and second-order factors in each group can be regarded as evidence that the two sample groups display functional equivalence.

The result of CFA demonstrated that almost all indices and parameters are highly acceptable (refer to Appendix III for details). With this result, it is safe to say that suggested latent factors influence manifest variables uniformly in both sample groups. In other words, both groups have demonstrated identical structure and directions in using the given scale. This result can be used as functional equivalence.

4.3.2.3 Measurement Equivalence

Measurement equivalence can be justified when there is evidence that sample groups from multiple cultural sets perceived the scale item and used them identically (Becker and Murrmann, 2000). Becker and Murrmann (2000), referring to various existing literature, point out an important issue when Asian culture is involved in Likert-type scales. They argue that since disagreeing is not a culturally supported option in traditional Asian culture, the use of semantic differential scales is recommended to assure measurement comparability, which happened to be the scale used for the current study.

Measurement equivalence can be tested through cluster analysis in an attempt to determine whether disparate tendencies are present per culture in the data set (Aldenderfer & Blashfield, 1984). If two sample groups perceived the scale items differently, cluster analysis will have to generate two distinct groups mainly by the nationality. Therefore, unless two distinguishable clusters are formed significantly separated by their nationality or cultural setting, it is justifiable that these two groups are not different in their way of perceiving the scale items.

The result of cluster analysis applied using SPSS (v. 12.0) to four constructs used to test research hypotheses shows that all four of them have failed to generate any clusters divided by national or ethnic cultural characteristics. Factor groups of F1 through F3 have generated 3 clusters according to their agglomeration schedules and dendrograms. Only F4 generated two clusters. However, each factor of F1 through F3 shows one dominant cluster that includes a random mix of nationality with very small outlier groups in subsequent clusters. The fourth factor (F4) also shows one dominant cluster with a well-blended mix of nationality and relatively a small cluster that contains outlying respondents. The numbers of subjects included in subsequent clusters are fewer than 5 for factors 1 & 3, and close to 20 for factors 2 and 4. The dendrogram of each cluster analysis is also available in Appendix IV.

This finding can be interpreted two different ways. One is that the two sample groups do not show significant cultural difference in their way of understanding the concept of the scale. The other is that the scale items were perceived and used identically by the two “culturally” different groups.

4.3.2.4 Language Equivalence

It is suggested by Becker and Murrmann (2000) that a direct translation is the most common method that uses a bilingual translator to translate the instrument between the two different languages. In addition to a direct translation, they also point out the necessity of incorporating the methods of back-translation and parallel translation to overcome the possible problems associated with the translation of the instrument.

The author of this study, being bilingual in Korean and English, took all three methods introduced in the framework with the help of a group of researchers in Korea.

4.3.3 Sampling Dimension

As recommended by Becker and Murrmann (2000) referring to Malhotra et al. (1996), nation-state affiliation is used as a surrogate measure of cultural identity of respondents. However, soliciting the respondents' primary language was not included in the original scale with an assumption that most unit managers in the U.S. are native English speakers, or at least they are multi-lingual including English.

Compatibility of sample composition within each group is obtained by selecting unit managers of multi-unit restaurant companies in both countries, which is regarded as the best sampling strategy (Becker and Murrmann, 2000). In fact, this methodology supports Chomsky's argument of conditions of "normal men" to apply "Common Notion" introduced earlier. Details of this process will be presented later in the section of Descriptive Statistics.

4.3.4 Data Analysis

During the process of justifying equivalence between the two sample groups, each sample group has been tested separately to prove that they are not different from each other. This process has been cross-cultural analysis as suggested by Becker and Murrmann (2000). With the result obtained through the previous steps, these two cultural groups will be combined for general analysis later in this chapter.

4.3.5. Conclusion

This section has been prepared as a post hoc analysis to justify the use of multiple data sources for the study. Following the framework provided by Becker and Murrmann (2000), all three dimensions have been covered with the appropriate methodological approach. The result indicates that there is no significant cultural difference between the two sample groups. In other words, the result indicates that the samples collected from two countries with different cultural backgrounds are not culturally bounded. With this finding, combining the two groups into one for the current study is justified.

4.4 Procedure of Model Development and Statistical Analyses

As introduced briefly in the previous chapter, the model is developed in a two-step process – a measurement model and a structural model (Anderson and Gerbing, 1988). Through this process, two types of relationships are identified: (1) the relationship between indicator variables and the factor that represents them, and (2) the relationship between latent variables (or factors). However, in the first step of the measurement model development, the first part is conducted, that is, only the relationship is identified between indicator variables and the factor that represents them. Causal relationships between latent variables are identified in the second step.

During the first step, a combination of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) is utilized to refine the initial measures and test for the internal consistency of the scale. With the result verified through EFA for each of the constructs (f11, f12, f21, f22, f31-33, & f41-42), first-order one-factor models are tested using the CFA with maximum likelihood (ML) method. The use of CFA is important at

this stage in order to examine the unidirectionality of each construct, which is crucial in theory development and testing (Anderson & Gerbing, 1988). In this context, CFA is used for hypothesis testing for a structure of the model determined a priori (Byrne, 1994) to develop it into the one that demonstrates an acceptable fit to the data.

In the second step, the measurement model is structured so that it can represent the theoretical causal relations. This causal model is tested and revised until the result demonstrates acceptable model fit. The summaries of statistical analyses are provided in the text, and details are available in Appendix 4 & 5.

4.5 Confirmatory Factor Analyses of First-Order Factors

4.5.1 Explanation of Statistical Indices

As stated in the previous section, conducting CFA is the preliminary step to support the logic of the proposed model. CALIS (Covariance Analysis of Linear Structural Equation) procedure is adopted for this purpose. Using the factor structure proposed by the investigator as a guide, CALIS generates an estimated matrix, and compares it with the actual one. If small differences were found between the two, then the proposed factor structure would be viewed as a plausible one. Many statistical indices are quoted for this purpose.

Unfortunately, however, there is no consensus regarding how to determine when the difference found is small. Chi-square, which is used as the primary technique for this purpose, is highly sensitive to sample sizes (Hatcher, 1994; Byrn, 1994). When the sample size is large, it has the tendency of distorting statistical outcomes (Hayduck, 1987; Jorescog and Sorbom, 1989, 1993a, 1993b, 1996). Due to this nature, it is

recommended to assess the fitness of the model with several other indices rather than relying solely on the Chi-square test (Bollen, 1989, p. 281), including the goodness-of-fit index (GFI) (Joreskog and Sorbom, 1996), the normed-fit index (NFI) (Muliak, James, Van Alstine, Bennett, Lind and Stilwell, 1989). Besides, even when the Chi-Square index is reviewed, it is also recommended that the index be compared with the degree of freedom (df) and address the ratio between the two. The rule of thumb is that if the ratio is smaller than 2, it is considered a good-fit (Hatcher, 1994). However, Hatcher (1994) points out that this is only a rule of thumb with no scientific evidence.

The GFI, an estimate of the overall fit, approximates a coefficient of determination in the range from 0 to 1, with a value of 1.0 indicating a perfect fit. However, this index is also known to be sensitive to sample size (Muliak et al., 1989). Many researchers interpret GFI in the range of .80 to .89 as a reasonable fit, while the score of .90 and higher an evidence of good fit (Doll et al., 1995).

The normed-fit index (NFI) represents “the proportion in reduction in lack of fit between the null and saturated models achieved by the intermediate model’s fixing power and estimating more parameters” (Muliak et al., 1989, p. 433). This index is also sensitive to variations in sample size (Marsh, Balla, and McDonald, 1988).

Accommodating these recommendations, this study includes several fit indices: the goodness-of-fit index (GFI), the comparative fit index (CFI; Bentler, 1989), the normed fit index (NFI) along with the root-mean-square residual (RMSR; Joreskog and Sorbom, 1989) beside the Chi-square score. The following table (4.1) presents the consolidated summary of statistical indices that show the degree of fit of the first-order factors. The result shows that almost all the statistical indices of first-order factors indicate good- or at

least reasonable-fit. The following sections provide detailed analysis of the result of CFA of individual first-order factors.

Table 4.2: Consolidated Summary of Statistical Indices of First-Order Factors

	Index	F-11	F-12	F-21	F-22	F-31	F-32	* F-33	F-41	F-42
1	GFI	0.96	0.94	0.97	0.96	1.00	0.94	1.00	0.94	0.97
2	Chi-Square	23.58	47.70	14.70	26.99	-	35.54	-	28.20	10.56
3	Chi-Square DF	5.00	9.00	5.00	9.00	n.a	5.00	n.a	5.00	2.00
4	Chi-Square / DF	4.72	5.30	2.94	3.00	n.a	7.11	n.a	5.64	5.28
5	RMSEA	0.13	0.14	0.10	0.10	-	0.17	-	0.15	0.14
6	CFI	0.96	0.92	0.98	0.98	1.00	0.94	0.99	0.96	0.98
7	NNFI	0.92	0.87	0.98	0.96	1.00	0.89		0.93	0.94
8	NFI	0.95	0.91	0.97	0.96	1.00	0.93	1.00	0.96	0.98
9	Cronbach's Alpha	0.86	0.85	0.90	0.91	0.83	0.88		0.90	0.88

4.5.2 Perceived Effort of the Company to Create Knowledge about Customers

(F-11)

Exploratory Factor Analysis (EFA) has confirmed the predicted single-factor model with 5 indicator variables. Confirmatory Factor Analysis (CFA) has generated an evidence of good fit with all of GFI, CFI, NNI, and NFI higher than 0.9 (Doll et al., 1995) with an exception only with the Chi-square test and the ratio between Chi-square and the degree of freedom (df). Considering the limited nature of the Chi-square index,

with all other indices representing good fit of the model, this model can be accepted. Chronbach's alpha coefficient of .86 indicates a high level of internal consistency.

Overall reliability of this construct is examined by the factor loadings of indicator variables. Standardized loading estimates range from .72 to .84 with all the t-values significant ($p < .001$). Composite reliability of this construct turned out to be .87, where .7 is the reasonably acceptable level (Hatcher, 1994). Table 4.3 displays the summary.

Table 4.3: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F-11 Knowledge Generation on Customers	q 101	0.7702	12.6015	0.5932	0.4068
	q 102	0.8413	14.3048	0.7078	0.2922
	q 103	0.7477	12.0249	0.5591	0.4409
	q 104	0.6667	10.3707	0.4445	0.5555
	q 105	0.7173	11.4256	0.5145	0.4855
Composite Reliability				0.87	

The questions asked are as follows:

The following questions ask the level of your perception as a manager who has to deal with day-to-day operations. Do you think the top management of your company works hard enough to collect the following information for you to use? Please indicate the level of its effort that you think is most appropriate.

	None (0) ←	→ Sufficient (10)
1) Trends of purchasing behavior of your customers.....	0	10
2) Customers' price-value related behavior.....	0	10
3) Demographic changes in your customer base.....	0	10
4) Customers' needs and wants in general.....	0	10
5) General information about customer base.....	0	10

4.5.3 Perceived Effort of the Company to Create Knowledge about Competitors (F-12)

Exploratory Factor Analysis (EFA) has generated a single-factor model with 6 indicator variables as anticipated. Confirmatory Factor Analysis (CFA) has demonstrated a high level of acceptable result with all of GFI, CFI, and NFI higher than 0.9 (Doll et al, 1995). The only exception, NNI at .87, is still close to .9, which is a reasonable fit. Again, chi-square test and the ratio between Chi-square and the degree of freedom (df) turned out to be significant. However, as in the case of the previous model, with all other indices indicating good-fit, this model is accepted. Chronbach's alpha coefficient at .85 indicates a good level of internal consistency.

Overall reliability of this construct has been assessed through examining the relationship between individual indicator variables and each factor that is considered to influence them. Standardized loading estimates range from .57 to .78 with all the t-values significant ($p < .001$). Composite reliability of the entire construct turned out to be .85, which is much higher than the reasonably acceptable level of .7 (Hatcher. 1994). The summary is displayed in the Table 4.4.

Table 4.4: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F-12 Knowledge Generation on Competitors	q 106	0.7361	11.7223	0.5418	0.4582
	q 107	0.7817	12.7357	0.6111	0.3889
	q 108	0.7567	12.1741	0.5726	0.4274
	q 109	0.6518	9.9837	0.4248	0.5752
	q 110	0.6745	10.4345	0.4550	0.5450
	q 111	0.5679	8.4167	0.3225	0.6775
Composite Reliability				0.85	

The questions asked are as follows:

The following questions ask the level of your perception as a manager who has to deal with day-to-day operations. Do you think the top management of your company works hard enough to collect the following information for you to use? Please indicate the level of its effort that you think is most appropriate.

	None (0) ←	→ Sufficient (10)
6) Existing competitors' expansion plans in your area.....	0	10
7) Possible entry of new competitors into your local market.....	0	10
8) Products and services developed by competitors.....	0	10
9) Competitors' pricing strategies.....	0	10
10) General information about competitors.....	0	10
11) Competitors' employee compensation policies.....	0	10

4.5.4. Perceived Level of Usefulness of the Knowledge about Customers (F-21)

Exploratory Factor Analysis (EFA) has led to a single-factor model with 5 indicator variables. Confirmatory Factor Analysis (CFA) has generated almost perfect fitness with all of GFI, CFI, and NFI much higher than 0.9. Although chi-square test and the ratio between chi-square and the degree of freedom (df) are significant, all other indices represent the degree of good-fit. Internal consistency is high with the Chronbach's alpha coefficient at .90.

The overall reliability of this single factor model is displayed in the following table (4.4) that displays the relationship between indicator variables and the factor. Standardized loading estimates range from .76 to .85 with all their t-values significant ($p < .001$). Composite reliability of the entire construct turned out to be .90. The summary is displayed in Table 4.5 below.

Standardized loading estimates ranges from .72 to .83 with all the t-values significant ($p < .001$). Composite reliability of the entire construct turned out to be .91 demonstrating a high level of internal consistency. Table 4.6 shows the result.

Table 4.6: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F-22 Knowledge Generation on Competitors	Q 206	0.7154	11.6450	0.5118	0.4882
	Q 207	0.7565	12.5890	0.5723	0.4277
	Q 208	0.8514	15.0257	0.7249	0.2751
	Q 209	0.8083	13.8714	0.6533	0.3467
	Q 210	0.8287	14.4071	0.6867	0.3133
	Q 211	0.7514	12.4689	0.5646	0.4354
Composite Reliability				0.91	

The questions asked are as follows:

The following questions ask about your perception about the usefulness of information delivered to you by the top management. How useful is the information provided to you in your day-to-day operations? Please indicate the most appropriate level you think it is. If no such information is delivered to you, please select 0.

	Not useful at all (0) ←										→ Very useful (10) (Highly effective)
6) How to react to competitors' expansion plan in your area.....	0	1	2	3	4	5	6	7	8	9	10
7) How to react to entry of new competition into your area.....	0	1	2	3	4	5	6	7	8	9	10
8) How to react to new products and services developed by Competitors.....	0	1	2	3	4	5	6	7	8	9	10
9) How to deal with competitors' pricing strategy.....	0	1	2	3	4	5	6	7	8	9	10
10) Competitors' employee compensation policies.....	0	1	2	3	4	5	6	7	8	9	10
11) General information about competitors.....	0	1	2	3	4	5	6	7	8	9	10

4.5.6 Communication Channel: Vertical – Official ((F-31))

Exploratory Factor Analysis (EFA) has led to single-factor model with 3 indicator variables. Confirmatory Factor Analysis (CFA) has generated perfect match with 1.0 for all of GFI, CFI, NNI, and NFI. Chronbach's alpha coefficient was .85.

The relationship between individual indicator variables and each factor is represented by standardized loading estimates that range from .70 to .85 with all the t-values significant ($p < .001$). Composite reliability of the entire construct turned out to be .84, which is much higher than the reasonably acceptable level (Hatcher, 1994). The result is displayed in the Table 4.7.

Table 4.7: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F-31 Vertical Comm. Official	Q 301	0.8491	13.5884	0.7210	0.2790
	Q 302	0.8346	13.3096	0.6966	0.3034
	Q 303	0.6957	10.7716	0.4840	0.5160
Composite Reliability				0.84	

The questions asked are as follows:

The top management of your company tries hard to deliver enough information about market situation and related company policies through many channels. The following questions ask about how effective those channels are. Please indicate what you think about the effectiveness of the following methods in your day-to-day operations. If any specific method is not available, please select "0."

Ineffective at all (0) ← → Highly effective (10)
(Not available)

-
- 1) Presentations made by executives at company meetings 0 1 2 3 4 5 6 7 8 9 10
 - 2) Directions delivered via company reports or memos..... 0 1 2 3 4 5 6 7 8 9 10
 - 3) Directions delivered when corporate executives visit..... 0 1 2 3 4 5 6 7 8 9 10

4.5.7. Communication Channel: Vertical – Non Official (F-32)

Exploratory Factor Analysis (EFA) has confirmed a single-factor model with 5 indicator variables. Confirmatory Factor Analysis (CFA) has indicated a high level of fitness with all of GFI, CFI, and NFI at higher than .9 (Doll et al., 1995). The only exception, which is NNI at .89, is close to .90. Chronbach's alpha coefficient was .88.

As shown in the Table 4.8, standardized loading estimates ranges from .70 to .82 with all the t-values significant ($p < .001$). This result demonstrated good fit between indicator variables and the factor that is believed to influence them. Composite reliability of the entire construct turned out to be .88.

Table 4.8 Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F-32 Vertical Comm. Non-official	q 304	0.8082	13.6072	0.6532	0.3468
	q 305	0.6995	11.1161	0.4893	0.5107
	q 306	0.7525	12.2854	0.5663	0.4337
	q 307	0.8210	13.9260	0.6740	0.3260
	q 308	0.7637	12.5425	0.5832	0.4168
Composite Reliability				0.88	

The questions asked are as follows:

The top management of your company tries hard to deliver enough information about market situation and related company policies through many channels. The following questions ask about how effective those channels are. Please indicate what you think about the effectiveness of the following methods in your day-to-day operations. If any specific method is not available, please select "0."

Ineffective at all (0) ← → Highly effective (10)
(Not available)

- | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|----|
| 4) E-mails or phone calls from corporate executives..... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 5) Conversations with corporate executives as needs occur | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 6) Directions delivered when regional managers visit..... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 7) E-mails or phone calls from regional managers..... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 8) Conversations with regional managers as needs occur..... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

4.5.8 Communication Channel: Lateral with Peers (F-33)

Exploratory Factor Analysis (EFA) for this model has generated a single-factor model with 2 indicator variables. This resulted from the original design of the scale,

which divided the entire communication channel into four quadrants from two dimensions – official/non-official and vertical/lateral. However, EFA generated only 3 factors as introduced. Future research will have to consider this for addressing the type of communication channels.

The overall reliability of this single factor model shows consistency as displayed in the following table. Standardized loading estimates are .83 and .94 with their t-values significant ($p < .001$). Composite reliability of the entire construct turned out to be .88. Summary is displayed in the Table 4.9 below.

Table 4.9: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F-33 Lateral Comm.	Q 309	0.8344	15.2128	0.6962	0.3038
	Q 310	0.9368	18.7104	0.8776	0.1224
Composite Reliability				0.88	

The questions asked are as follows:

The top management of your company tries hard to deliver enough information about market situation and related company policies through many channels. The following questions ask about how effective those channels are. Please indicate what you think about the effectiveness of the following methods in your day-to-day operations. If any specific method is not available, please select “0.”

Ineffective at all (0) ← → Highly effective (10)
(Not available)

-
- 9) Group discussions with other unit managers at company meetings..... 0 1 2 3 4 5 6 7 8 9 10
- 10) Conversations with other unit managers as needs occur..... 0 1 2 3 4 5 6 7 8 9 10

4.5.9 The Level of Trust on the Top Management (F-41)

Exploratory Factor Analysis (EFA) has confirmed the prediction of a single-factor model with 5 indicator variables. In this analysis, however, the fourth scale – the upper management’s understanding about the unique situation – was dropped because it failed to obtain strong correlation with the underlying factor of F-41. Instead, the scale is closely related to the next factor of F-42. Confirmatory Factor Analysis (CFA) has generated almost perfect fit with all of GFI, CFI, and NFI much higher than 0.9 (Doll et al., 1995). The result of the Chi-square test is significant, and the ratio between Chi-square and the degree of freedom (df) is much higher than 2. Chronbach’s alpha coefficient turned out to be .90.

The overall reliability of this single factor model is displayed in the following Table 4.10. Standardized loading estimates ranges from .78 to .84 with all the t-values significant at $p < .001$. Composite reliability of this construct turned out to be .90.

Table 4.10: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F-41 Trust on The Top Management	Q 401	0.7967	13.5185	0.6347	0.3653
	Q 402	0.8448	14.7723	0.7137	0.2863
	Q 403	0.8193	14.0970	0.6713	0.3287
	Q 405	0.7788	13.0753	0.6065	0.3935
	Q 406	0.7971	13.5279	0.6354	0.3646
Composite Reliability				0.90	

The questions asked are as follows;

As a unit manager, you must make various decisions on a variety of operational details. The following questions have been designed to measure how comfortable you feel about your upper management’s perspectives and support. Please read the following questions and indicate how much you agree.

Totally disagree (0) ← → Totally agree (10)

- 1) The top management of my company has clear understanding of the business we are in..... 0 1 2 3 4 5 6 7 8 9 10
- 2) The top management has a clear vision for the future of the company..... 0 1 2 3 4 5 6 7 8 9 10
- 3) The upper management always supports me as a manager to make right decisions 0 1 2 3 4 5 6 7 8 9 10
- 5) The top management evaluates unit performance from at least a few different perspectives..... 0 1 2 3 4 5 6 7 8 9 10
- 6) The decisions made by the top management are trustworthy.. 0 1 2 3 4 5 6 7 8 9 10

4.5.10 The Level of Support from the Top Management (F-42)

Exploratory Factor Analysis (EFA) has confirmed the predicted single-factor model with 4 indicator variables. Confirmatory Factor Analysis (CFA) has generated very high level of fitness with all of GFI, CFI, and NFI much higher than 0.9 (Doll et al., 1995). Although the chi-square test is significant with the ratio between Chi-square and the degree of freedom (df) over 5, the result was deemed acceptable due to all other indices at the level described earlier. Chronbach’s alpha is .88.

The following table (4.11) shows the overall reliability of this single factor model. Standardized loading estimates ranges from .72 to .87 with all the t-values significant ($p < .001$). Composite reliability of the entire construct turned out to be .88.

Table 4.11: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F-42 Participation	q 404	0.7240	11.6768	0.5242	0.4758
	q 407	0.7558	12.3950	0.5712	0.4288
	q 408	0.8731	15.2827	0.7623	0.2377
	q 409	0.8704	15.2110	0.7576	0.2424
Composite Reliability				0.88	

The questions asked are as follows:

As a unit manager, you must make various decisions on a variety of operational details. The following questions have been designed to measure how comfortable you feel about your upper management's perspectives and support. Please read the following questions and indicate how much you agree.

Totally disagree (0) ← → Totally agree (10)

- | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|----|
| 4) The upper management understands the unique situations of unit operations when making company decisions | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 7) I trust final decisions made at the corporate level have been through collaborative discussion including my opinion..... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 8) I feel comfortable to raise my voice against decisions I view Inappropriate delivered from the upper management..... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 9) I have enough communication channels to deliver my opinion in opposition to upper management, if needed..... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

4.5.11 Summary

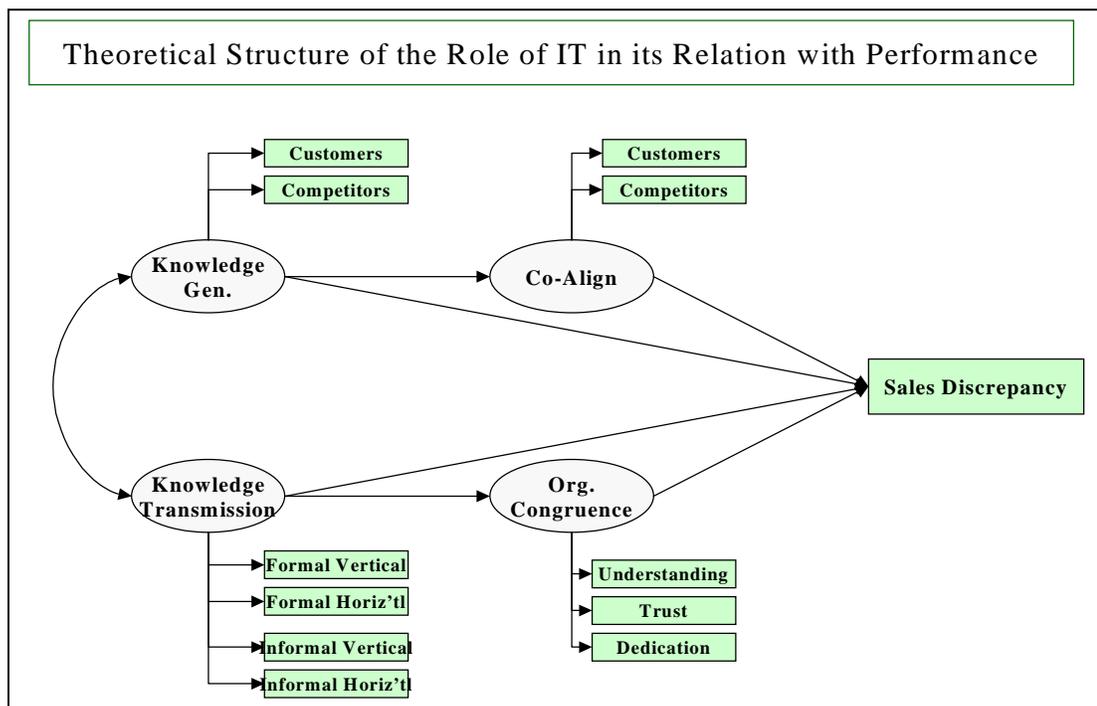
Confirmatory Factor Analyses in this process have demonstrated reasonable fitness for individual single factor models. With this result, the next step is taken to test second-order factors that are considered to influence single-factors introduced so far. This procedure adopted conventions introduced by Byrne (1994).

4.6 Confirmatory Factor Analyses for Second-Order Factors

4.6.1 Introduction

One of the features that separate this study from previous research work is the multi-layer factor structure included in the originally proposed theoretical model. The replica of Figure 4.1 below depicts the structure of the original model. All the constructs of “Knowledge Generation,” “Co-Align,” “Knowledge Transmission,” “Organizational Congruence,” and finally “Performance” are represented by their sub-components. These sub-components have been tested as single-factor models in the previous section. In other words, these sub-components are First-Order Factors that were hypothesized to be influenced by the main factors – Second-Order Factors (Byrne, 1994). This section explains and tests details of the structure of the second-order factor using CFA.

Figure 4.1:

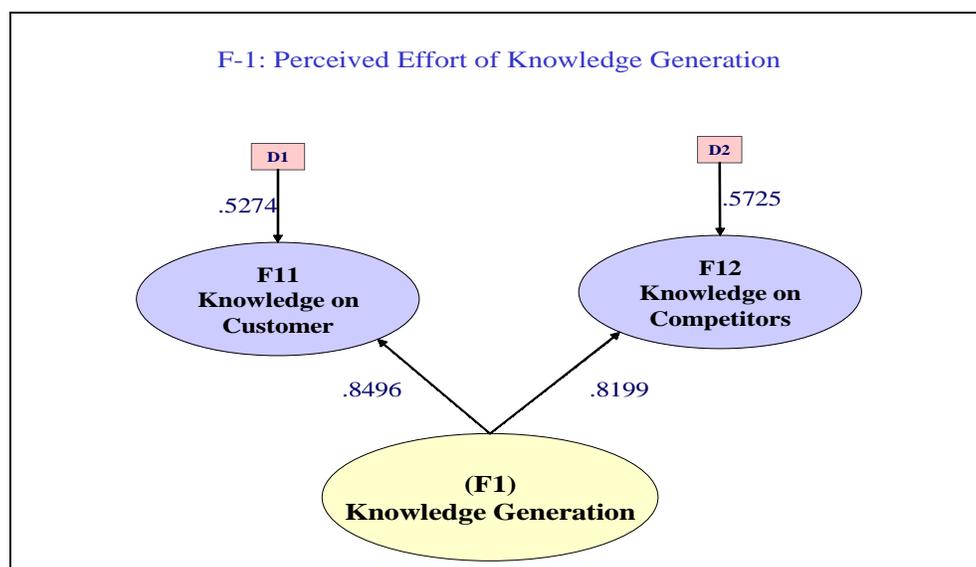


4.6.2 Knowledge Generation (F-1)

The second-order construct of “Knowledge Generation” was determined *a priori* to influence operators’ perception level about their company’s effort of environmental scanning on customers and competitors. Strategy literature has identified two more dimensions of “supplier” and “regulator” in this area. However, as aforementioned, these two dimensions have been eliminated from the focus of this study due to the concern expressed by the participants of the pilot study. The structure of this factor is depicted in the figure (4.2).

Again, PROC CALIS has been used to address this analysis following the convention introduced by Byrne (1994). The result turned out to be highly acceptable with all the indices over .90 (GFI, CFI, NNI, NFI). The ratio between Chi-square and the *df* turned out as 2.14, when 2 is reasonably acceptable. Standardized path coefficients from the main construct to sub-constructs (F11 and F12) are .85 and .82, respectively.

Figure 4.2: Second-Order Factor Analysis of F1



Composite reliability of the entire factor also turned out highly acceptable at .91 with all factor loadings range from .60 to .85. All t-values are significant ($p < .001$).

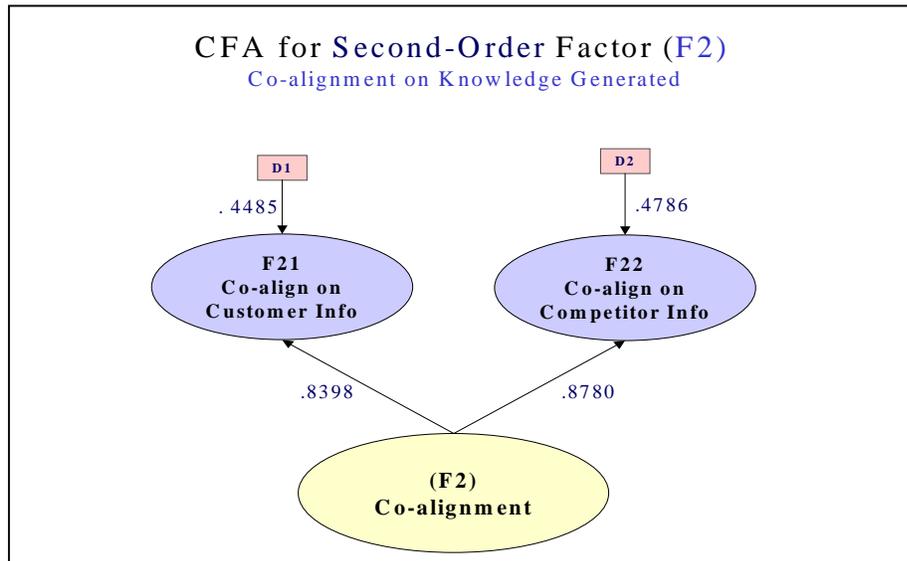
Table 4.12: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F 1 Knowledge Generation	q 101	0.7854	11.4301	0.6169	0.3831
	q 102	0.8530	12.1866	0.7276	0.2724
	q 103	0.7436	10.8106	0.5529	0.4471
	q 104	0.6264	8.9496	0.3924	0.6067
	q 106	0.7605	9.5163	0.5784	0.4216
	q 107	0.8236	10.0294	0.6783	0.3271
	q 108	0.7470	9.3670	0.5580	0.4420
	q 110	0.6060	7.8396	0.3672	0.6328
Composite Reliability				0.91	

4.6.3 Co-Alignment (F – 2)

The second-order construct of “Co-Alignment” was determined *a priori* to represent the operators’ perception level about the usefulness of the knowledge delivered by their upper management. The range of this knowledge has been limited to the dimensions of “customer” and “competitor” due to the same concern explained earlier. The structure of this factor is displayed in the following figure.

Figure 4.3: Second-Order Factor Analysis of F2



The result of CFA turned out to be highly acceptable with all the indices over .90 (GFI, CFI, NNI, NFI), with the Chi-square test at a non-significant level. Standardized path coefficients from F2 to F21 and F22 are .84 and .88 respectively, indicating a high level of influence of F2 on both F21 and F22.

Composite reliability of the entire factor also turned out highly acceptable at .94 with all factor loadings range from .73 to .86. All t-values are significant ($p < .001$).

Table 4.13: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F 2 Co-Alignment	q 201	0.8497	11.8783	0.7220	0.2780
	q 202	0.8605	11.9789	0.7405	0.2595
	q 203	0.8091	11.3630	0.6546	0.3454
	q 205	0.7253	10.2062	0.5261	0.4739
	q 207	0.7385	9.9867	0.5454	0.4546
	q 208	0.8539	11.3126	0.7291	0.2709
	q 209	0.8191	10.9347	0.6709	0.3291
	q 210	0.8297	11.0764	0.6884	0.3116
	q 211	0.7500	10.1306	0.5625	0.4375
Composite Reliability				0.94	

4.6.4 Knowledge Transmission (F – 3)

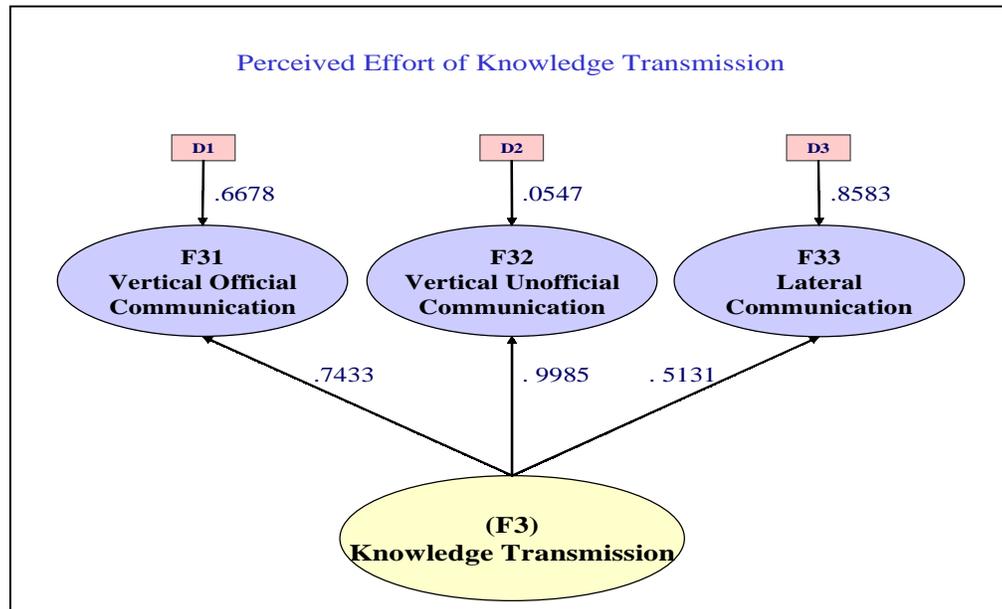
The second-order construct of “Knowledge Transmission” represents the operators’ perception about their company’s usage of communication channels. The effective usage of the communication channel is used in this study as the proxy of the sophisticated application of IT. In this context, this factor is hypothesized to influence three sub components of “Vertical Communication – Official,” “Vertical Communication – Non Official,” and finally “Lateral Communication.” The structure of this factor is depicted in the following table.

As shown in Figure 4.4, standardized path coefficients from F3 to individual sub-constructs are .74, .99, and .51, respectively. It is noticeable that the path coefficient from F3 to F32 (Vertical Unofficial Communication) is almost perfect. This may indicate that unit managers prefer this channel most for their knowledge management

activities. That is, communication channels that are non-official with their immediate supervisor group seem to be the most preferred method of acquiring their knowledge.

This needs further investigation since the t-values are not significant.

Figure 4.4: Second-Order Factor Analysis of F3



The result indicates a high level of acceptable fitness with all the indices (GFI, CFI, NNI, NFI) over .90 (Doll et al., 1995). The ratio between Chi-square and the *df* turned out to be over 2. Composite reliability of the entire factor also turned out highly acceptable at .93 with all factor loadings range from .70 to .93. All t-values are significant ($p < .001$) except those of q305, q307, and q308. As aforementioned, a further investigation is needed to clarify this conflict among t-values of indicator variables. Results are shown in the Table 4.14.

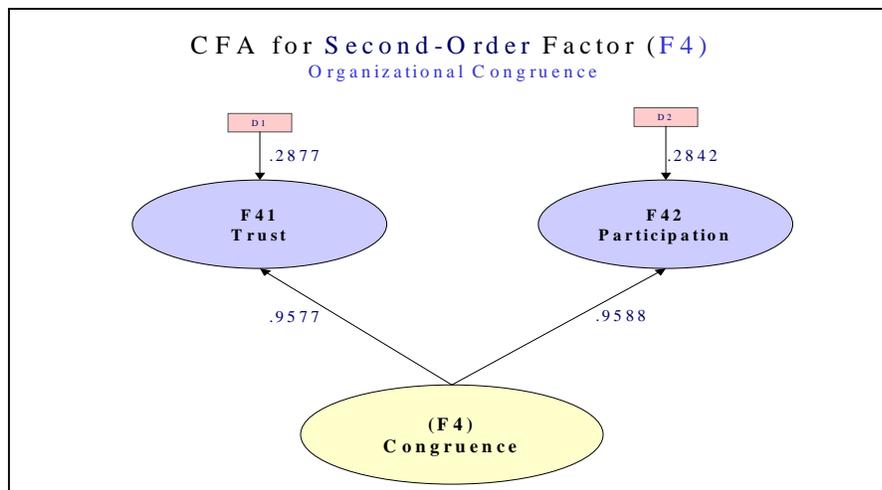
Table 4.14: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R ²)	Error Variance
F 3 Knowledge Transmission	q 301	0.8323	8.4238	0.6927	0.3073
	q 302	0.8132	8.3215	0.6613	0.3387
	q 303	0.7319	7.8631	0.5357	0.4643
	q 305	0.7495	0.0426	0.5618	0.4382
	q 307	0.7479	0.0426	0.5594	0.4406
	q 308	0.8232	0.0426	0.6777	0.3223
	q 310	1.0000	18.3241	1.0000	0.0000
Composite Reliability				0.93	

4.6.5 Organizational Congruence (F – 4)

The second-order construct of “Organizational Congruence” represents the level of operators’ trust in their upper management and the degree of their participation in major decision-making processes. It has been argued by several organizational researchers that coherence is important for better performance. The structure is displayed in the following figure (4.5).

Figure 4.5: Second-Order Factor Analysis of F4



The result indicates almost perfect fit with all the indices close to 1.0 (GFI, CFI, NNI, NFI). The ratio between Chi-square and the df turned out to be 1.56. Composite reliability of the entire factor also turned out highly acceptable at .93 with all factor loadings range from .77 to .85. All t-values are significant at $p < .001$.

Table 4.15: Composite Reliability and Variance Extracted Estimates

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance
F 4 Organizational Congruence	Q 402	0.7651	6.1475	0.5854	0.4126
	Q 403	0.8506	6.3240	0.7235	0.2765
	Q 404	0.7791	6.1992	0.6070	0.3930
	Q 405	0.8147	0.2608	0.6637	0.3363
	Q 406	0.8222	6.2758	0.6760	0.3240
	Q 407	0.8271	6.2589	0.6841	0.3159
	Q 409	0.7670	6.1748	0.5883	0.4117
Composite Reliability				0.93	

4.6.6 Performance (F – 5)

Performance is assessed from the perspective of accuracy in operational results based on the financial result. This is another feature that separates this study from previous ones that addressed strategy related issues. The scale was designed to address the accuracy in three dimensions of operational results – sales, cost, and operating income. However, the quality and quantity of responses of this section turned out extremely disappointing. Fewer than one-third of the respondents provided only partial answers. Even those who answered failed to provide reliable data. Both groups (U.S and Korea) responded poorly in this section. The associate of the researcher who collected data in Korea casually and verbally investigated this problem with several executives and

operators. Their answers indicated that field operators usually do not pay much attention to the discrepancy level mainly due to their workload that is so heavily involved with daily operations. For this reason, they do not seem to pay much attention to specific numbers that are financially related. This phenomenon may need further investigation to identify exact reason in the industry.

For this reason, only the available portion of the sales discrepancy has been tested in this study to identify the existence of correlation. It is meaningless to try to identify any specific magnitude of path coefficient.

4.6.7 Consolidated Summary of CFA Indices

The summary of statistical indices for individual 2nd-Order-Factors has been introduced in the previous sections when necessary. The following is a table that consolidates them.

Table 4.16

Summary of Statistical Indices of 2nd-Order CFA					
	Index	F - 1	F - 2	F - 3	F - 4
1	GFI	0.96	0.95	0.96	0.98
2	AGFI	0.92	0.91	0.91	0.95
3	Chi-Square	38.50	48.00	32.31	18.71
4	Chi-Square DF	18.00	25.00	12.00	12.00
5	Chi-Square / DF	2.14	1.92	2.69	1.56
6	RMSEA	0.07	0.07	0.09	0.05
7	CFI	0.97	0.98	0.97	0.99
8	NNI	0.96	0.97	0.94	0.99
9	NFI	0.95	0.96	0.95	0.98

4.7 Developing the Final Measurement Model

4.7.1 Overview

As specified in the previous section, the measurement model for the posited theoretical model is developed at this point consolidating the results of the second-order factor analyses. The model investigated in this study consists of 4 latent factors and 1 indicator variable. In this context, this is a non-traditional model (Hatcher, 1994). To convert second-order factors into indicator variables that are believed to be influenced by four latent factors (F1 through F4), each group of indicator variables used in the previous step has been converted into factor scores. Once factors are identified, factor scores can be used as indicator variables for subsequent analyses (Hair, 1997; Hatcher, 1994). The following is the general introduction of the final measurement model.

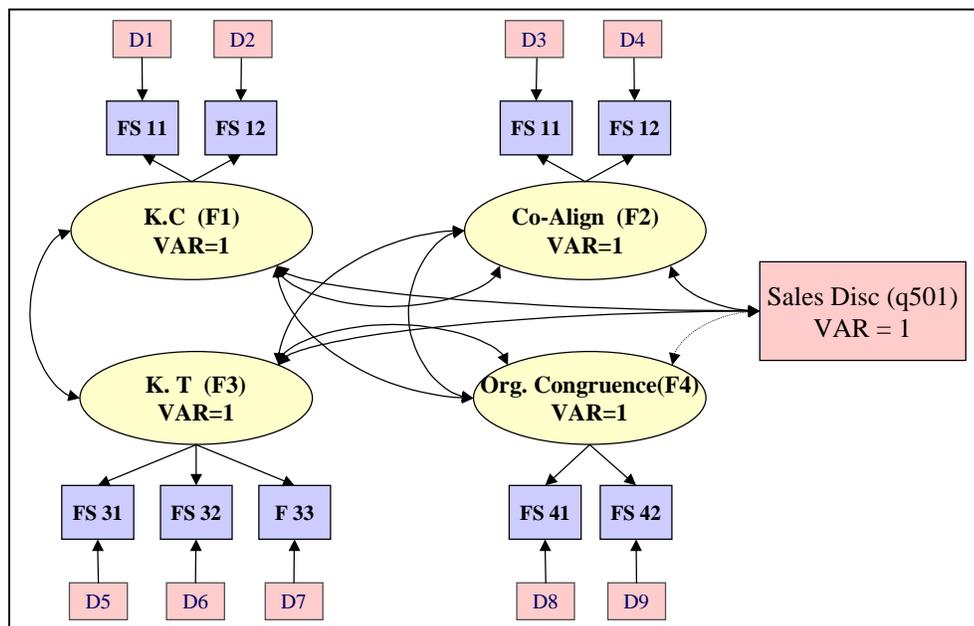
A measurement model describes the nature of the relationship between (a) a number of latent variables, and (b) the manifest indicator variables that measure those latent variables (Hatcher, 1994). At this stage, instead of positing unidirectional paths between constructs, each pair of them is allowed to covary, and covariances are estimated. In Figure 4.6, covariences are indicated by a curved, two-headed arrow connecting each F variable (latent factor) to all other F variables. All F variables are represented in oval shape, while indicator variables and errors are represented by rectangles.

Data are analyzed using PROC CALIS procedure provided by SAS system (SAS Institute Inc., 1989). This process will identify the magnitude of covariance between each pair, and that of path coefficients between each factor and indicator variables.

4.7.2 The Measurement Model

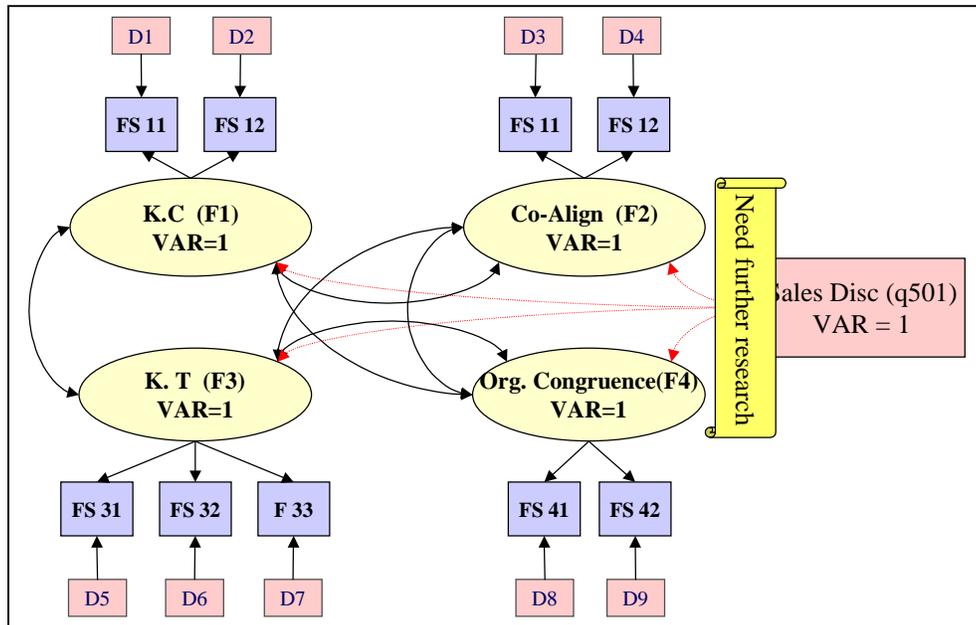
The measurement model displayed in Figure 4.6 has been estimated using the maximum likelihood method. In this test, all the latent factor variables and one indicator variable that is considered to represent “Performance” have been included for the entire model’s fitness. However, as anticipated from the beginning, the lack of quality in the responses in the Performance area has caused a serious problem to continue the test. PROC CALIS procedure simply could not identify any possible correlation of the performance variable. This was mainly due to the large quantity of missing values as well as the poor quality of the response. The test for multivariate linearity has failed with the model that includes the variable of “Performance.”

Figure 4.6: Initial Measurement Model



For this reason, the final variable of Performance has been tentatively eliminated from the investigation. With the final variable (Performance) removed from the analysis, the purpose of the model has to be readdressed. The original goal of the study was to identify the relationship between the concept of Information Technology (IT) and operational performance. Pursuing this goal in the previous steps, this study has linked the mechanism of IT application into the arenas of Knowledge Management and Strategic Management. Therefore, it is still a valid research effort to identify the relationship among constructs that are believed to represent Knowledge Management in the multi-unit restaurant operations. The following is a figure that depicts the modified structure of this study.

Figure 4.7: Revised Measurement Model



Data analysis has demonstrated a significant Chi-square value ($p < .0001$). A number of other results indicate, however, highly acceptable goodness of fit with GFA, CFA and NNI at higher than .9 (Doll et al., 1995).

Standardized factor loadings for indicator variables are significant with their t -values ranging from 8 to 17. The distribution of residuals is relatively symmetrical, centered on zero, with few large values. With this result, this model can be accepted tentatively as the final measurement model of this study. A review of the residual matrix and the result of the Lagrange Multiplier test have revealed that FS-22 and FS-33 might be the source of the significant chi-square value. Two other tests have been conducted to see how the results could be enhanced in their fitness with FS-22 and FS-33 eliminated respectively from the original model. The results of both new additional tests did not demonstrate significant enhancement. Therefore, the result obtained with the original test is accepted tentatively as the final measurement model. Details are displayed in the Table 4.17.

Table 4.17: Statistical Indices for the Measurement Model

	Index	Magnitude
1	GFI	0.93
2	AGFI	0.86
3	Chi-Square	70.47
4	Chi-Square DF	21.00
5	Chi-Square / DF	3.36
6	RMSEA	0.10
7	CFI	0.96
8	NNI	0.93
9	NFI	0.94

4.7.3 Issues on Validity and Reliability

Many scholars in social science have pointed out the importance of the use of observable variables as the proxy of conceptual issues of social phenomena. In this context, IT as a research topic is no exception. Researchers have been trying very hard to establish valid indicators that can represent the effect of IT (Orlikowski and Iacono, 2001), allowing tangible goods to stand in its stead as indicators due to their solid measurability (McDonald, 1998, Orlikowski and Iacono, 2001). The solid measurability of the indicators, combined with the advancement in computing technology, has enabled researchers to rely on sophisticated quantitative techniques for their work. One caution is that the misuse of the sophisticated quantitative techniques may lead to meaningless results, which is lamented as ‘methodological faddism.’ (Cole, 1980).

In justifying the use of measurable proxies in place of conceptual issues, reliability and validity of indicators need to be assessed as a necessary condition. In this activity, there are two conditions to be covered – technical and conceptual (Hatcher, 1994, p. 131). Technical conditions can be explained by verifying statistical indices generated by the technique itself. However, conceptual conditions are often left to the decision of the researcher (Carmine and Zeller, 1979).

In general, reliability refers to consistency of measurement (Carmine and Zeller, 1979; Hair, 1994; Zikmund, 1995). Ideally, indicators already should have shown to be reliable and valid through previous research. This is why it is often preferred to use previously developed instruments.

In technical terms, reliability in the factor analysis is defined as the square of the correlation between a latent factor and the indicator. The reliability indicates the percent

of variation in the indicator that is explained by the factor that it is supposed to measure (Long, 1983a, in Hatcher, 1994). The CFA using PROC CALIS in SAS can assess item reliability with Proc CORR command (Hatcher, 1994) that generates information to calculate composite reliability of the construct. “A widely used rule of thumb of .70 has been suggested by Nunnally (1978), but in social science literature does report studies employing variables with coefficient alpha reliabilities under .70 and sometimes even under .60” (Hatcher, 1994). The reliability of individual constructs is assessed using the composite reliability test. The result shows that the composite reliability index for every construct turned out to be higher than .70 (refer to Table 4.17 below). In addition to this, the reliability of the survey instrument for this study has been provided with Chronbach’s alpha in the sections of first- and second-order factor analyses.

Table 4.18: Reliability Table of the Measurement Model

Construct	Indicators	Standardized Loading	T-Score	Indicator Reliability (R^2)	Error Variance	Composite Reliability
F1	Fs11	0.9242	15.4728	0.8541	0.1459	0.76
	Fs12	0.6320	9.7195	0.3994	0.6006	
F2	Fs21	1.0500	17.3988	1.1025	-0.1025	0.87
	Fs22	0.6651	10.0965	0.4424	0.5576	
F3	Fs31	0.7901	13.0491	0.6243	0.3757	0.79
	Fs32	0.8841	15.3070	0.7816	0.2184	
	Fs33	0.5508	8.1742	0.3034	0.6966	
F4	Fs41	0.9690	17.7700	0.9390	0.0610	0.89
	Fs42	0.8092	13.6234	0.6548	0.3452	

Reliability, although it is a necessary condition, is not sufficient by itself (Zikmund, 1994). It must also be valid. Generally, measuring devices are valid if they do what they are expected to do. Thus, validity concerns the crucial relationship between a construct and indicators. Validity also is about the interpretation of data arising from a specified procedure (Cronbach, 1971 quoted in Carmine and Zeller, 1979). There are a few different types of validity in this dimension – criterion validity, content validity, and construct validity (Carmine and Zeller, 1979; Zikmund, 1994, 2000).

Criterion validity depends on the extent of the correspondence between the test and the criterion – in the form of correlation coefficient. Straightforward as its underlying logic is, criterion valuation procedures cannot be applied to all measurement situations in social science research, mostly due to its serious limitation that there simply do not exist any relevant criterion variables (Carmine and Zeller, 1979). Due to this attribute, criterion validity has a potential of being abused in an atheoretical but empirically dominated manner^{viii}. Because of this difficulty, criterion validity of the instrument for this study will not be addressed.

Content validity refers to the comprehensiveness of an empirical measurement that reflects a specific domain of content. To be content valid, it is necessary that variables reflect every dimension of the main issue of the research. However, in social sciences, it is also difficult to think of any abstract concept to have every domain of content agreed upon to be relevant to the issue (Carmines and Zeller, 1979). In this study, to maintain the content validity, the scales in the sections related to strategy

^{viii} “For example, if there is a strong correlation between horseshoe pitching records and academic performance, horseshoe pitching can be used as a valid criterion for academic performance” (Nunally, 1978 quoted in Carmines and Zeller, 1979).

formulation covered all the constituents of the task environment that have been agreed upon by the participants of the pilot test.

Both criterion validity and content validity, despite their importance, have limited usefulness in practical use. Partly for this reason, primary attention has been given to construct validity. Cronbach (1955) is quoted as to this issue again by Carmine and Zeller (1979) that construct validity must be investigated whenever no criterion or content validity is accepted as entirely adequate to define the quality to be measured. Construct validity is often achieved by verifying convergent validity and discriminant validity (Zikmund, 1994). As was with the case of reliability, these validities can also be assessed by using PROC CALIS in SAS in CFA (Hatcher, 1994). Convergent validity can be assessed by reviewing the t-scores of the factor loadings. If all factor loadings for the indicators measuring the same construct are statistically significant (t-values are greater than twice their standard errors), then this is viewed as evidence supporting the convergent validity of those indicators (Anderson & Gerbing, 1988).

Standardized factor loadings for the indicator variables are shown in Table 4-17. Their t-values are all significant providing the evidence of convergent validity of the indicators (Anderson & Gerbing, 1988). The table also provides the reliability of indicators (the square of the factor loadings), along with the composite reliability for each construct. Composite reliability is a measure of internal consistency comparable to coefficient alpha (Fornell & Larcker, 1981). As displayed, all the factor loadings are statistically significant and their t-values are larger than twice their error variance. Thus, convergent validity of the suggested model has been demonstrated.

Discriminant validity is demonstrated when different instruments are used to measure different constructs, and correlations between the measures of these different constructs are relatively low (Hatcher, 1994). There are three different methods suggested by Hatcher (1994); (1) chi-square difference, (2) confidence interval test, and finally (3) variance extracted test. Hatcher (1994) recommends one of these tests when discriminant validity is in doubt. This study adopts the confidence interval test introduced by Hatcher (1994).

In this approach, individual factor loadings were tested with twice its corresponding standard error. The result that contains the value “1” within its range indicates the failure of the test. No parameter, as displayed in the table above, contains no value of “1” in its range. The discriminant validity of the measurement model has been thus demonstrated. Table 4.19 below displays the result of the test.

Table 4. 19: Discriminant Validity Table of the Initial Measurement Model

Parameter	Correlation Estimated	Std. Error	Min. Value	Max Value
CF1F2	0.7417	0.0493	0.6431	0.8403
CF1F3	0.7770	0.0454	0.6863	0.8677
CF1F4	0.7383	0.0453	0.6478	0.8288
CF2F3	0.5638	0.0552	0.4533	0.6742
CF2F4	0.5370	0.0537	0.4296	0.6443
CF3F4	0.8207	0.0353	0.7500	0.8913

Combined, these findings generally support the reliability and validity of the constructs and their indicators used in this study. Therefore, the original measurement model has been retained as this study’s final measurement model.

4.8 Development of the Structural Model

4.8.1 Initial Structural Model

Statistical results of all the models tested so far have demonstrated acceptable level of fitness and unidirectionality of relationships among constructs. This result justifies the continuation of testing the theoretical model presented. This section describes the theoretical model and statistical analysis of it. The analysis of this model can be described as a path analysis with latent variables.

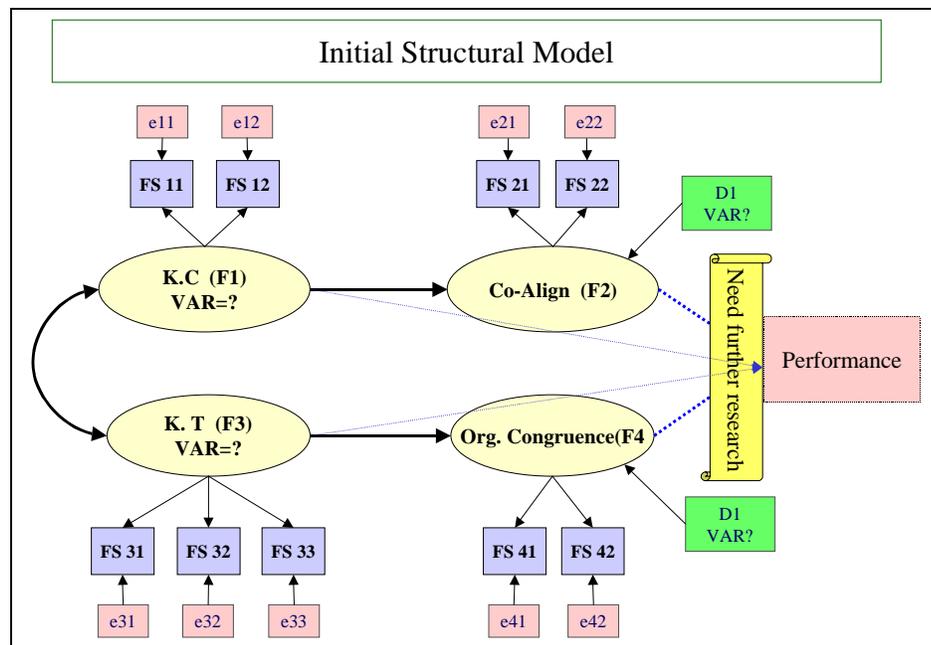
The model presented in the Figure 4.8 proposes that Knowledge Generation Effort perceived by the unit managers (F1) is the precedent of the level of the Co-alignment of the company (F2) that represents the perceived level of usability of the information distributed to them by the management. This construct has been named the “Co-Aligned” stage of the organization. At the same time, the perceived level of the company’s effort to transmit Knowledge within the organization (F3) is the precedent of the overall level of organizational congruence (F4), which is represented by operators’ trust about their company and their perceived opportunity to participate in managerial decision making process. However, original relations that were suggested to lead from these constructs to the company’s financial performance in operations have been tentatively eliminated due to serious lack of quality as well as quantity of data provided.

The structural model displayed in Figure 4.8 is estimated using the CALIS procedure again. The adequacy of a structural model is determined by the same set of indices as in the measurement model. At this step, nomological validity needs to be assessed by testing the difference between the chi-square values of the measurement model and the structural model. If a significant difference is found between the chi-

square value, the structural model is considered unsuccessful in explaining the observed relationships between the latent variables (Anderson & Gerbing, 1988).

The chi-square difference test is conducted by addressing the significance level of the difference between the chi-square of the measurement model and that of the theoretical model at the difference of degrees of freedom. The chi-square difference is smaller than 6 ($76.43 - 70.47 = 5.96$) with the *df* difference of 3 ($24 - 21$). This result shows that chi-square is nonsignificant ($p > .1$). Therefore, the structural model is tentatively accepted for further investigation.

Figure 4.8:



All the values are over .90 with GFI, CFI, NNI, and NFI. Bentler (1990) argues that the most appropriate fit index is the Comparative Fit Index (CFI) because it has a small sampling variability, and it is not affected by sample size. All the t-values for path

coefficients proved to be significant at $p < .01$ level indicating meaningful relationship between the suggested concepts (Bollings and Wroten, 1978).

A review of the normalized distribution of residuals revealed symmetrical distribution centered on zero. However, a few residuals have been found to carry relatively large values (excess of 2.0) mainly with F33 and F22. This is the same result as found with the measurement model. The result of Lagrange Multiplier test (Bentler, 1989) suggests some improvement by modifying paths. The following section explains the modified model.

Table 4.20:

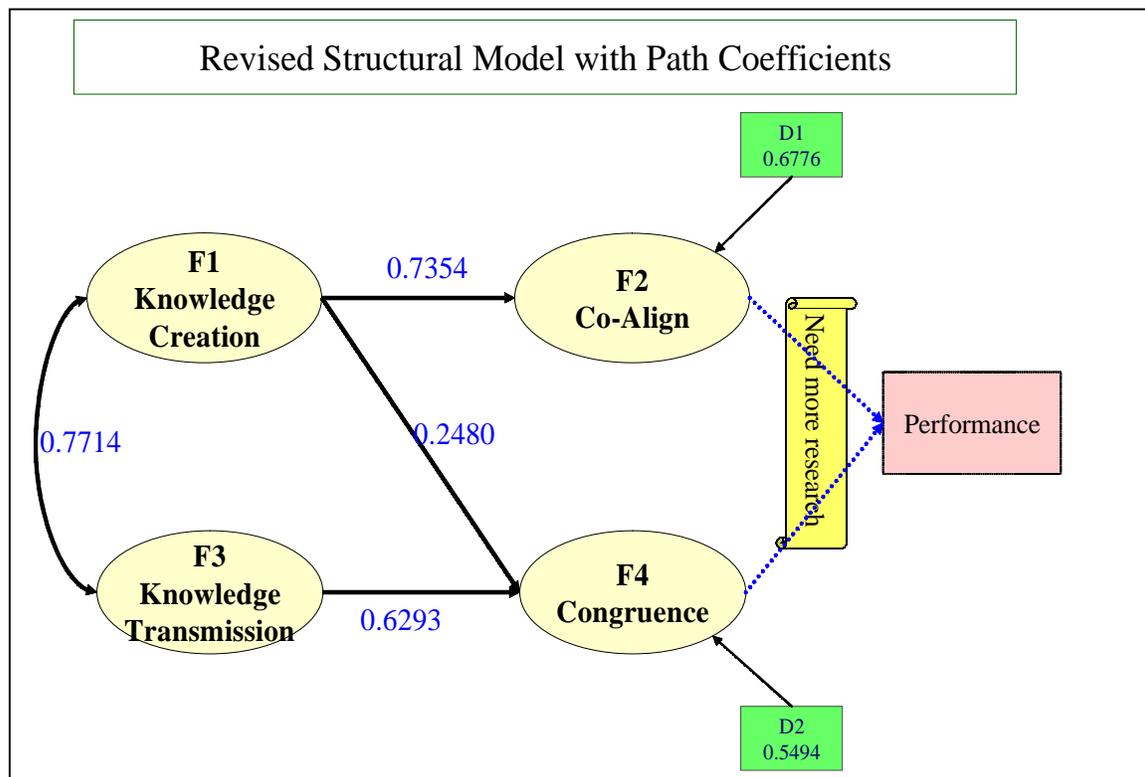
Summary of Statistical Indices for Initial Structural Model		
	Index	Magnitude
1	GFI	0.93
2	Chi-Square	76.43
3	Chi-Square DF	24.00
4	Chi-Square / DF	3.18
5	RMSEA	0.10
6	CFI	0.95
7	NNI	0.93
8	NFI	0.93

4.8.2 Revised Structural Model

As aforementioned, the result of Lagrange Multiplier test (Bentler, 1989) suggests some improvement by adding one path between F1 and F4. When modifications are made, the revised model's chi-square should not increase significantly. A significant increase in the chi-square of the revised model indicates the new model's fitness is worse than the previous one. The result of the chi-square difference test showed decreased chi-square value. With this result, the newly revised model is accepted replacing the initial structural model. Figure 4.9 shows the modified structural model.

Path coefficients are shown in the diagram. All of their t-values are significant ($p < .001$). Table 20 shows almost the same result as that of the initial structural model except its chi-square is smaller. The ratio between the chi-square and its degree of freedom decreased slightly from 3.18 to 3.07.

Figure 4.9:



The final result shows highly acceptable model fitness with most of indices larger than .90. The distribution of residuals turned out symmetrical, centered on zero. A few large residuals have been noticed with interactions between F22 (co-alignment on competitor information). This interaction will be mentioned in the discussion section.

Table 4.21

Summary of Statistical Indices for Revised Structural Model		
	Index	Magnitude
1	GFI	0.93
2	AGFI	0.87
3	Chi-Square	70.53
4	Chi-Square DF	23.00
5	Chi-Square / DF	3.07
6	RMSEA	0.09
7	CFI	0.96
8	NNI	0.93
9	NFI	0.94

4.9 Analysis of Hypotheses

The hypotheses have been tested using CALIS path analysis. Due to the serious lack of quality in the financial performance data, the paths leading to the Performance cannot be tested. However, the structure of precedents of Performance, that is, the process of strategic management based on Knowledge Management has been empirically identified.

The result shows that the operators' perceived level of their top management's effort to generate knowledge on the company's customers and competitors (F1) positively

affect the perceived usability of the information (F2). Put differently, when operators think their top management works hard to collect information about their customers and competitors, the information delivered is considered useful. It implies that the judgment about the usefulness of the information is related to the perceived effort of the top management. It needs to be mentioned that the sequence of this cause-and-effect relationship might be reversed. This will be mentioned again later in the section of the limit of the study.

As a mechanism of delivering the knowledge, the proposed construct (F3), represented by 3 activities of official top-down communication, non-official top-down communication, and lateral communication within the organization, positively influence operators' dedication to and trust on their top management (F4). The summary of this analysis is in the following.

Hypothesis		Result
H1	Operators' perceptions about top management's efforts to create knowledge about the firm's task environment is positively related to the co-alignment status at the unit level.	Supported
H2	Operators' perceptions about the firm's co-alignment (the match between the firm's directions and the operators' reality) is positively related to the firm's performance by reducing the discrepancy between the forecast and actual.	Unidentifiable: Further research is required.
H3	Operators' perceptions about the top management's effort to create knowledge about the firm's task environment is positively related to the firm's performance by reducing the discrepancy between the forecast and the actual.	Unidentifiable: Further research is required.
H4	Operators' perceptions about the firm's effort of knowledge transmission (sharing) is positively related to organizational congruence by increasing the level of understanding, trust and dedication.	Supported
H5	Operators' perceptions about the firm's effort of knowledge transmission (sharing) is positively related to organizational performance.	Unidentifiable: Further research is required.
H6	Organizational congruence is positively related to the firm's performance in reducing the discrepancy between the forecast and actual.	Unidentifiable: Further research is required.

In addition to the specified hypotheses, organizational Congruence (F4) is also found to be influenced by the construct F1 – perceived effort of the top management regarding knowledge generation. This relation may need further research.

As expected, a strong covariance has been identified between Knowledge Transfer (F3) and Knowledge Generation (F1). This strong covariance supports the argument made in this study that these two constructs represent the second-order construct of Knowledge Management, which is the role of IT.

4.10 Summary

This chapter presented the result of statistical test of the measurement model and the final structural model with hypotheses introduced. In this process, individual sub-constructs have been also tested using the combination of techniques of Exploratory Factor Analysis and Confirmatory Factor Analysis. In doing so, the technique of Second-Order Confirmatory Factor Analysis has been adopted to verify the reasonableness of the argument synthesized in Chapter 2 based on existing literature in multiple domains.

Even though the links that lead to Performance from Co-Align and Congruence have not been identified due to insufficient quality of the collected data, all other links have been identified as significant. Issues about reliability and validity have also been addressed with acceptable result.

Chapter 5. Discussion and Conclusion

5.1 Introduction

In the process of identifying relationships between IT application and firm performance, a set of constructs has been developed through literature review. Those constructs cover domains of IT, Knowledge Management, and Strategy. At the same time, theoretical underpinning has been established to justify the relationship between each construct.

Although it was impossible to identify the final causal link to Financial Performance due to aforementioned defect in data, this study still has achieved a few important findings that can be regarded as ground setting for future research as explained in the following section.

5.2 Major Findings and Contribution

The contribution of this study can be viewed from two different perspectives: a conceptual dimension and an empirical dimension. In this effort, two different types of theory construction techniques of process theory and variance theory (Langley, 1999) were applied respectively. In the conceptual dimension, this study provided a framework of relating IT application into Knowledge Management. In addition, it has conceptually related Knowledge Management into Strategic Management with the use of Co-Alignment Principle as a theoretical binding agent. In doing this, arguments from multiple domains have been synthesized to construct a conceptual model that explains the web of strategic network that activates the effect of IT application.

In the empirical dimension, this study has identified the role of IT as two-dimensional construct made of Knowledge Generation and Knowledge Transmission, which was suggested only conceptually in previous research (Gupta and Govindarajan, 2000; Yli-Rendo, Autio, and Sapienza, 2001). It also has identified a close relationship between the two. The result of the final structural equation model (Figure 4.9 on page 143) clearly shows that strong covariance exists between the two sub-constructs. As pointed out earlier, however, the concept of IT in general can be viewed from many different perspectives from the one taken in this study. Readers need to be reminded that this study started with a conceptual boundary that limits the view of IT from the perspective of Knowledge Management.

Another contribution is that Co-Alignment Principle, presented by Olsen et al. (1998), has been put into an empirical test to relate the concept of Knowledge Management to Strategy and then to Performance. This study is not the first one that put the Co-alignment Principle to test. Several studies have tested this principle different ways, and successfully proved its effectiveness (De Chabert, 1998; Chathoth, 2002; Taylor, 2002). However, this is the first effort that used the co-alignment principle as a strategic procedure that develops “co-aligned stage” of organizational knowledge application to support operators’ day-to-day activities. This way, the role of the co-alignment principle is justified as an important theoretical binding agent to explain the sequence of strategic management activities, which can be further developed to explain their impact on performance. The absence of the link between strategy and performance has been pointed out in the previous research, too (Davenport, 1999; Griliches, 1998). Even though the link between strategic sub-constructs and performance were not

identified due to unexpected poor quality of the collected data, this process has introduced an empirical framework to address this line of research. At the least, the significant path coefficient has been identified between the “Knowledge Generation” and the “Co-Alignment,” which indicates high level of causal effect between the two. This result also includes preliminary empirical tests of dimensions of customers and competitors for strategic knowledge generation and co-alignment. The results of the first-order CFA’s conducted for individual factor analysis have demonstrated clear evidences of those dimensions.

The stage of organizational congruence has been mentioned in the domain of organizational behavior studies as an important factor for successful organizations. This argument also was conceptual. This study has empirically identified a link from Knowledge Transfer to Organizational Congruence, as well as the one from Knowledge Generation effort. This finding indicates the importance of internal communication within an organization for achieving congruence. The statistical result indicates that operators seem to rely significantly on official communication channel for their daily operations. It also indicates, however, that there is a strong possibility that operators rely more on lateral communications for knowledge on competitors. This finding will be discussed with more detail later in the section of “Suggestion for Future Research.”

Another technical contribution of this study is the use of second-order confirmatory factor analysis in its hypotheses testing. Using this technique, it has identified a few conceptual arguments proposed in the discipline of Information Technology and Strategic Management. For example, at least two dimensions of customers and competitors have been identified as environmental constituents. When an

appropriate level of cooperation becomes available from the industry, the other two dimensions – supplier and regulator – can be identified in the same manner.

As for the construct of Knowledge Transfer that represents the internal information delivery system, originally 4 quadrants were suggested from two different dimensions – vertical /lateral dimension and official/non-official dimension. This way, original questions were grouped into the categories of official-vertical communication channel, nonofficial-vertical channel, official-lateral channel, and nonofficial-lateral channel. This suggestion was partially proven. The result of the Exploratory Factor Analysis (EFA) has yielded only three significant factors, eliminating the suggested factor of official-lateral communication channel. This result indicates that restaurant operators seem to rely on official vertical channel, non-official vertical channel, and the lateral communication channel for their knowledge management activity.

The constituents of the Organizational Congruence are identified as Trust and Participation. The sub-factor of “Dedication” was eliminated in the result. This indicates that when organizational knowledge is fully transmitted and finally diffused within the organization, mutual trust is established from participation. At this stage, it is also assumed that operators feel comfortable with the degree of their participation in the organizational knowledge delivered to them. A further study may be necessary to identify a causal relation between these two – trust and participation – to determine which one precedes the other.

In conclusion, this study has provided a framework to address the research question of “On what relationship do we rest our feeling of belief that IT application increases the value of the firm?” by suggesting with empirical evidences that strategic co-

alignment and organizational congruence are dependent on organizational communication practice, which is addressed as result of IT application. Although the links have not been successfully identified between the strategic application of IT and performance, it has obtained empirical evidence of how IT contributes to strategic management. With this result, therefore, the proposed research question can be investigated further. However, a few modifications need to be made in future research on the same topic. It will be discussed in the following section.

5.3 Limitation

This study, as most exploratory research would do (Zikmund, 1997, 2001), has identified more problems than solutions about the research question in its process. First of all, as pointed out several times in previous sections, this study is not successful in identifying the final links to performance from strategic co-alignment and organizational congruence, mainly due to the serious lack of sincere responses from the participants of the survey. Pilot studies and follow-up activities have identified that restaurant operators usually concentrate on their daily operational details such as staffing, accommodating customers, sales and inventory control, to name a few. Besides, most of them seem to have genetic phobia in releasing operational details in hard numbers, which has been described as “Information Mercantilism” by McDonald (1998). This suggests that the scale must be redesigned first to reduce the level of unnecessary fear in mentioning their financial performance, and second to induce their sincere participation.

Another aspect to address is the validity of asking performance related questions directly to operators. One executive of a regional master franchisee of a national chain

restaurant company in the North-East of the U.S. says that it is common in the restaurant industry that budgets of individual units are often reevaluated and modified at the corporate level (or at regional offices) after they are prepared by the operators.

Considering this fact, the original scale for this information was not carefully designed by asking direct amount and percentage of discrepancy.

Another limitation is the reduction of the dimensions of the original scale. Due to the expected difficulty in data collection, two dimensions of suppliers and regulators were eliminated from the original scale. Even though the remaining dimensions of customers and competitors in strategic management turned out significant, the study still needs to address the dimensions that are eliminated.

Related to the issue of mail survey, the difficulty of encouraging participation is almost cliché. To add to this, it was also found that many addresses of restaurant units listed in their company web sites were wrong. In fact, there were more returned mails than the participants. This indicates the poor reliability of the information found in the web sites of each company.

Two more limitations need to be addressed. One is related with the definition of Information Technology. In this study, the functional aspect of IT in an organization is emphasized by focusing on communication channel and their effectiveness. In this effort, core technology dimension was not addressed enough. The other is the conceptual limitation caused by the technical aspect of the Structural Equation Technique (SEM). Powerful technique as it is in many ways, it still explains only the result of cross sectional studies in recursive models. From this perspective, the result is only a snap shot picture of the topic of the study. Even though the result indicates strong fitness from the current

data set, it is unclear how consistent it will be when the same survey is conducted later with other samples.

5.4 Suggestions for Future Research

As an exploratory study, the result of this study points out various future research topics and methodology. The findings of this study have scratched only the surface of a huge iceberg, even though certain relationships were identified among proposed constructs.

First of all, the final links to “Performance” must be readdressed and identified. In doing this, a careful design of scale must be preceded. More preliminary investigation must be conducted about how restaurant operators incorporate their financial records in their daily operations. This needs to be conducted with the support of top management of industry practitioners, which leads to another suggestion that this type of research may achieve better results from case studies with individual companies rather than a cross-sectional research. Unless full-scale cooperation is obtained from an entire company including the top management, using a closed-end question with nominal scale seems more effective, as found in another study for similar variables (Lee, 1999). When substantial cooperation is obtained, as aforementioned, eliminated dimensions of the task environment can to be reinstated into the study to complete the research.

Another limitation is the sample size. The sample size barely met the minimum requirement of the technique used for the study. For this reason, the result of the study may not be sufficient to be used to generalize the strategic effectiveness of IT application. Instead, the model can be used as a generic comparison material that describes the central

tendency of the industry behavior. Individual companies will show different types of IT application at different level of IT application, depending on management's strategic focus. In other words, the outcome of each firm will show different structure even though specific variables can be clustered under the same constructs in the model. For example, some companies may achieve its organizational congruence with the focus on customers while others may achieve with the focus on competitors, and so forth. Simply, there cannot be a predominant strategic model that every firm will follow (Moore, 2000). When the same tests are conducted for the same company periodically, a pattern can be identified for a company to analyze the evolution of the effectiveness of its strategic application of IT.

Basically, this limitation stems from the idiosyncrasy of the strategy itself rather than from the model because each organization is supposed to have its own unique strategic application of Information Technology. If all the firms in the same industry use the same strategy depicted in the same model, it is hardly a strategy any more.

Another suggestion for future research is to accommodate additional dimensions of Information Technology into the model beyond what has been addressed in this study. As stated earlier, IT is a versatile topic. For this nature, it can be viewed from many different perspectives depending on the specific domain of the researcher. Expanding the horizon of the study incorporating many different points of views of IT, we may get closer to the ultimate truth of the reality of Information Technology.

While conducting statistical analysis, a close relationship has been identified between Lateral Communications (F33) and the "Usability of Knowledge on Competitors (F22)." Although this result and other similar ones have faded away in the array of

other major findings of this research, individual first-order factors had better be investigated separately. This new line of investigation will provide more interesting findings about IT application and the organizational behavior.

In the process of developing the third construct of Communication Channel, only three factors were identified to the contrary of the original assumption. Originally, two dimensions were addressed from the viewpoint of Vertical/Horizontal and Official/Non-official dimensions, which result in four quadrants. Both sample groups – U.S. and Korea – have demonstrated almost the same pattern of answer with vertical and lateral dimensions in their reply. To stick to the original assumptions as close as possible, the method of fixed number of factors was enforced. However, the results were statistically significant. This scale needs to be revised to address the vertical/horizontal dimension more clearly for future studies.

One last thing to point out for future research is that untapped area in the conceptual model needs to be addressed. That is, external value chain of communication is not covered in this study. According to the DCF (Discounted Cash Flow) model, the value of a firm is calculated by dividing projected future cash-flows (defined as operating profit before income taxes, depreciation & amortization minus capital expenditure) by the firm's cost of capital. What has been mentioned in this study, albeit limitedly, touches only the internal aspects that are related with cash-flow. The argument suggested in the beginning of this study states that the effectiveness of strategic application of IT should also reduce the size of risk perceived by the market. Only when this happens, the real value of the firm will be increased. In this context, this study has tapped into only a half

of the entire dimension of the chain of value creation. Future research needs to consider both aspects.

5.5 Conclusion

In an effort to clarify the ambiguity of the value of Information Technology, this study set out to identify a positive relationship between IT and the firm value by connecting IT application to performance variables. Pursuing this research goal, it introduced various arguments from existing literature and synthesized them into a conceptual model. It further developed the concept into a theoretical model for an empirical testing. Even though the empirical test failed to provide a complete result, it still contributed, at least conceptually with partial empirical evidences, in providing the layout of intermediate constructs between the concept of IT application and the firm performance by relating the role of IT to Knowledge Management, and then Knowledge Management to Strategic Management. In this process, adopting the logic of process theory construction (Langley, 1999), the Co-alignment model was used as a theoretical binding agent that combines the concepts of Knowledge Management and Strategic Management.

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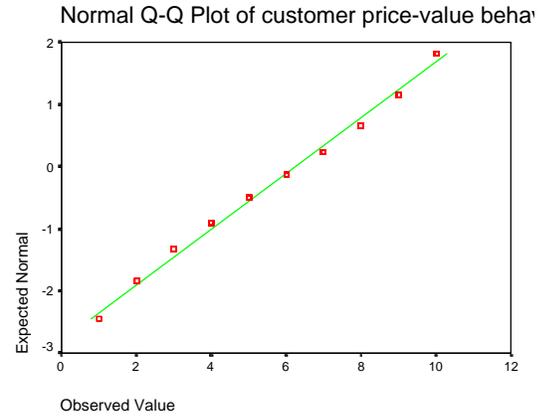
Appendix I: Descriptive Statistics

	N	Mean	Std. Dev.	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
customer purchasing behavior	213	6.02	2.306	-.206	.167	-.921	.332
customer price-value behavior	213	6.25	2.222	-.193	.167	-.781	.332
customer demographic change	213	5.88	2.265	-.229	.167	-.597	.332
customer need & want	213	6.59	1.976	-.519	.167	.393	.332
customer info in general	213	6.28	2.047	-.426	.167	-.173	.332
competitor expansion	213	6.08	2.211	-.245	.167	-.367	.332
competitor new entry	213	6.24	2.380	-.416	.167	-.429	.332
competitor product & service	213	6.17	2.066	-.504	.167	.025	.332
competitor pricing strategy	213	6.31	2.096	-.460	.167	-.145	.332
competitor info in general	213	6.36	2.015	-.494	.167	.058	.332
competitor employee policy	213	5.81	2.366	-.496	.167	-.215	.332
customer purchasing behavior	213	5.70	2.348	-.411	.167	-.077	.332
customer price-value behavior	212	5.78	2.242	-.288	.167	-.176	.333
customer demographic change	213	5.53	2.256	-.345	.167	-.263	.332
customer need & want	213	6.11	2.045	-.468	.167	.411	.332
customer info in general	213	5.99	2.144	-.378	.167	.306	.332
competitor expansion	213	5.92	2.276	-.566	.167	.204	.332
competitor new entry	213	5.92	2.313	-.515	.167	-.024	.332
competitor product & service	213	5.83	2.335	-.530	.167	.080	.332
competitor pricing strategy	213	5.86	2.288	-.507	.167	.012	.332
competitor employee policy	213	5.92	2.417	-.801	.167	.303	.332
competitor info in general	213	6.17	2.342	-.630	.167	-.130	.332
top mgmt in conference	213	5.82	2.406	-.340	.167	-.587	.332
company reports and memo	213	6.26	2.199	-.355	.167	-.462	.332
regular visits of top mgmt	213	5.96	2.335	-.477	.167	-.173	.332

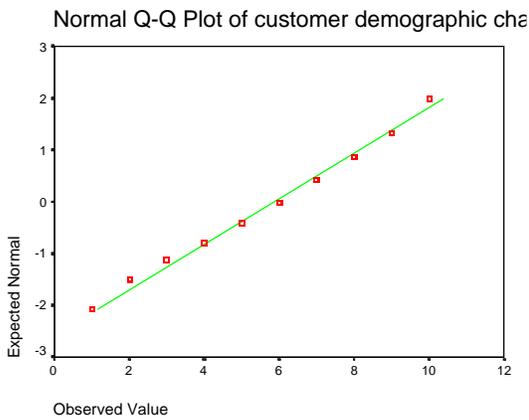
	N	Mean	Std. Dev.	Skewness		Kurtosis	
				Statistic	Std. Error		N
comm. from top mgmt (electronic)	213	6.44	2.093	-.434	.167	.180	.332
irregular comm with top mgmt	213	6.10	2.368	-.493	.167	-.117	.332
regualr visits of mid mgmt	213	6.33	2.208	-.382	.167	-.185	.332
comm. from mid mgmt (electronic)	213	6.56	2.161	-.564	.167	.201	.332
irregualr comm with mid mgmt	213	6.33	2.285	-.522	.167	-.115	.332
official lateral communication	212	6.36	2.398	-.436	.167	-.407	.333
unofficial lateral communication	212	6.61	2.463	-.661	.167	-.224	.333
top mgmt understanding of business	213	6.70	2.482	-.578	.167	-.410	.332
top mgmt vision	213	6.59	2.286	-.225	.167	-.581	.332
support from upper mgmt	213	6.00	2.435	-.215	.167	-.579	.332
upper mgmt understanding of operations	212	5.92	2.413	-.456	.167	-.189	.333
performance evaluation criteria	213	6.14	2.193	-.176	.167	-.452	.332
trustworthiness of top mgmt decision	213	6.22	2.260	-.411	.167	-.243	.332
perceived respect about my opinion	212	5.97	2.358	-.322	.167	-.444	.333
willingness to accommodate my opinion	213	6.09	2.379	-.435	.167	-.239	.332
communication channel & opportunity	213	5.96	2.449	-.343	.167	-.401	.332
career successfulness	213	6.23	2.304	-.326	.167	-.191	.332
confidence in the company future	212	6.68	2.277	-.502	.167	-.180	.333
Valid N (listwise)	208						

Appendix II: Normality Chart

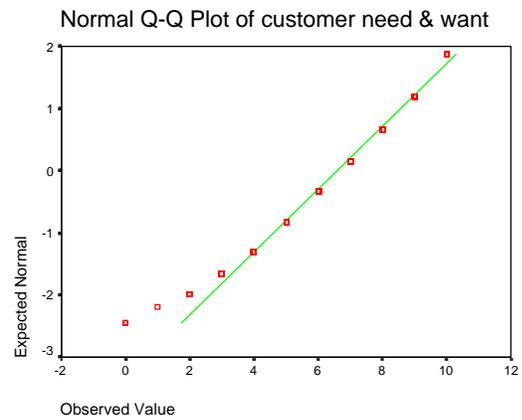
customer purchasing behavior customer price-value behavior



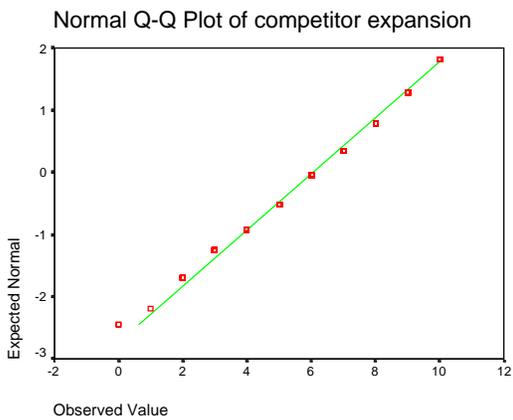
customer demographic change



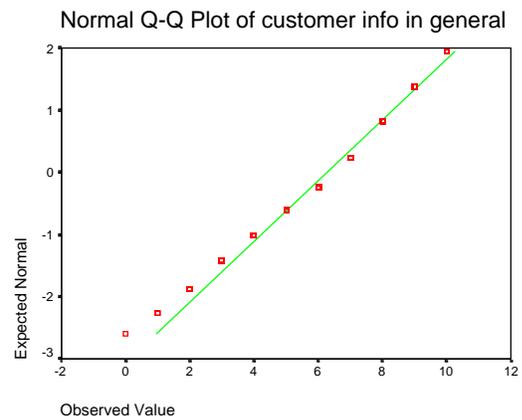
customer need & want



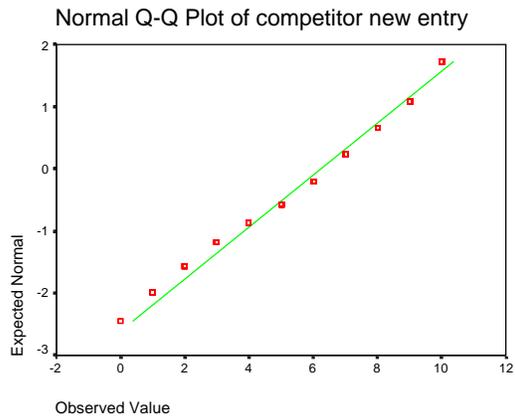
customer info in general



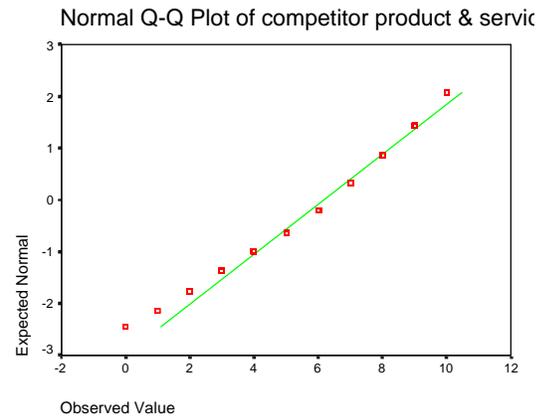
competitor expansion



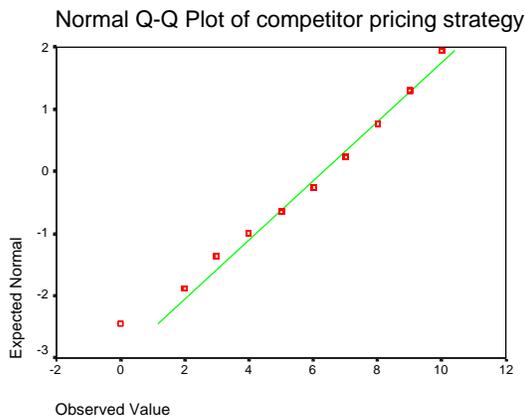
competitor new entry



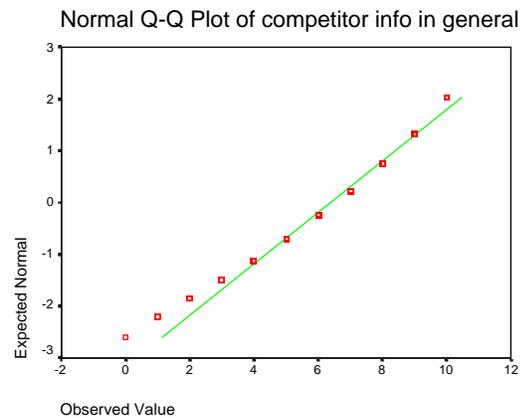
competitor product & service



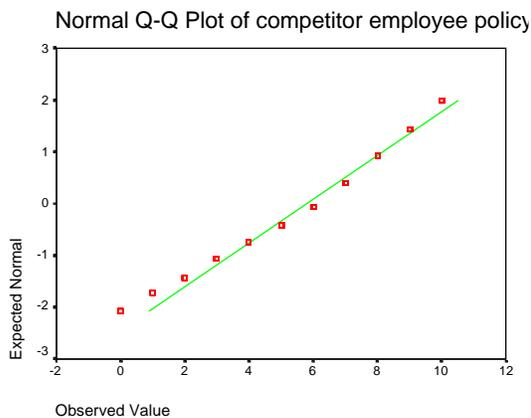
competitor pricing strategy



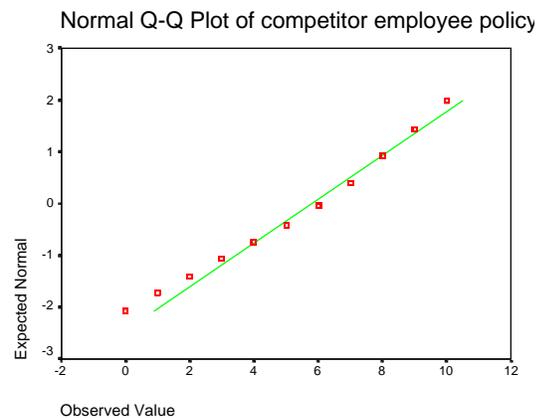
competitor info in general



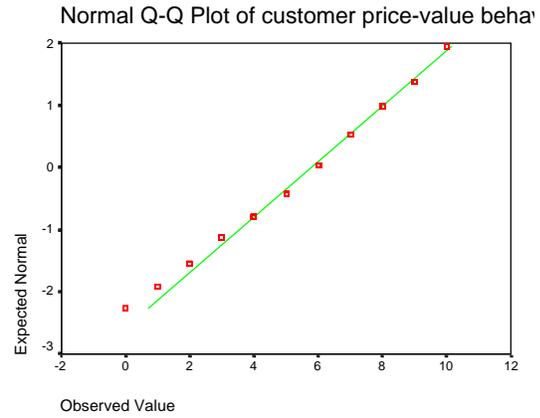
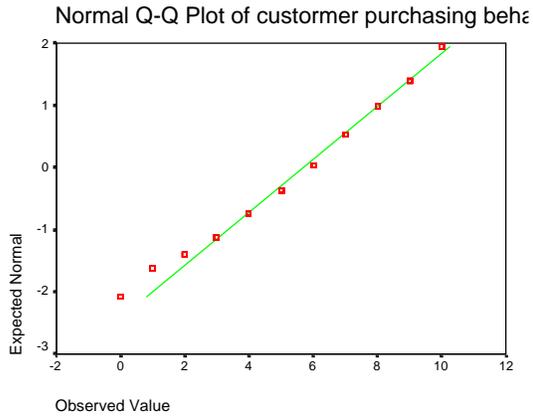
competitor employee policy



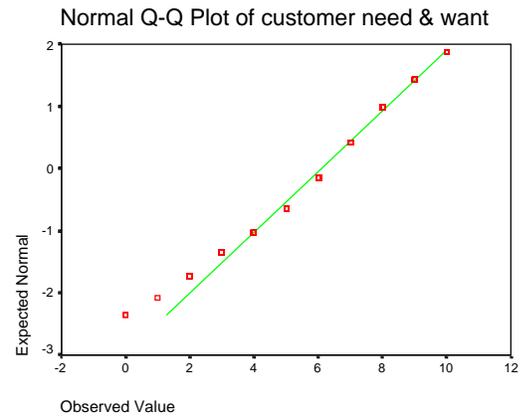
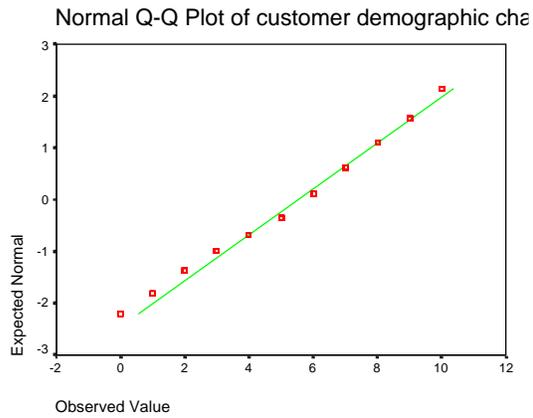
competitor employee policy



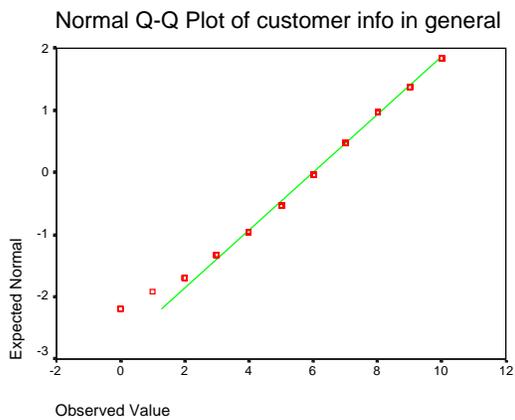
customer purchasing behavior customer price-value behavior



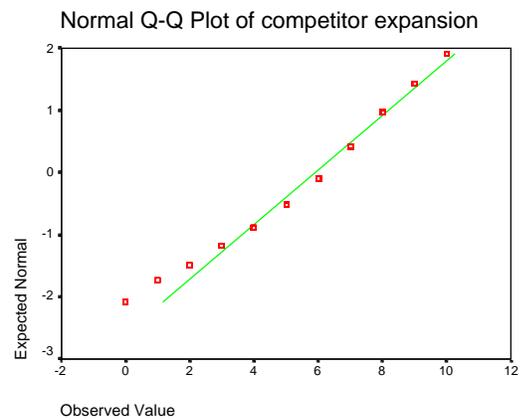
customer demographic change



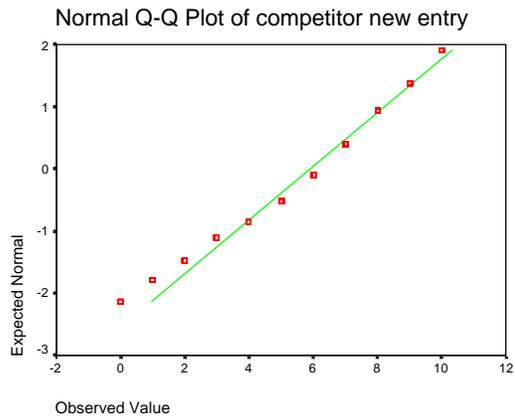
customer need & want



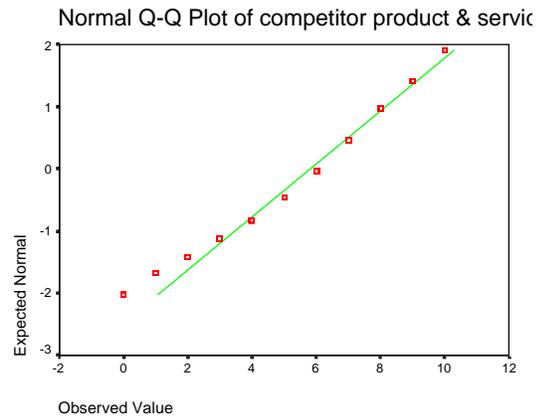
competitor expansion



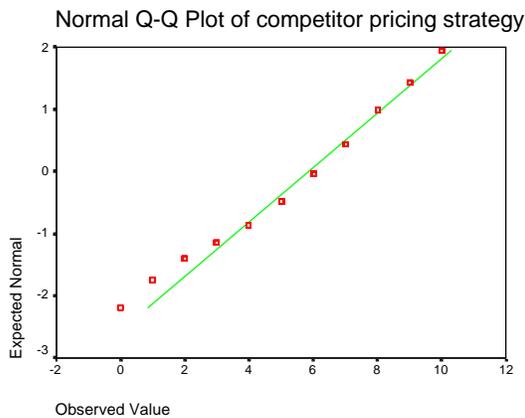
competitor new entry



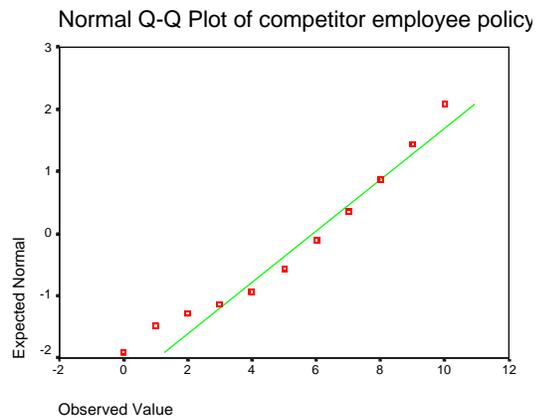
competitor product & service



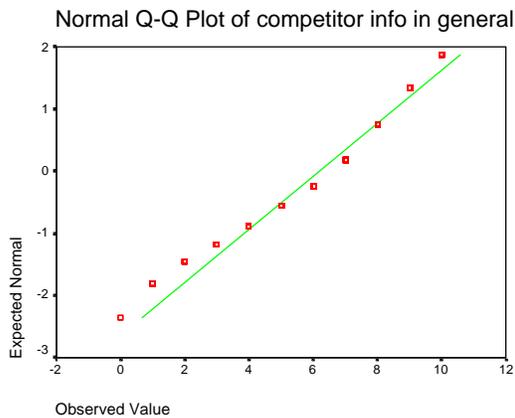
competitor pricing strategy



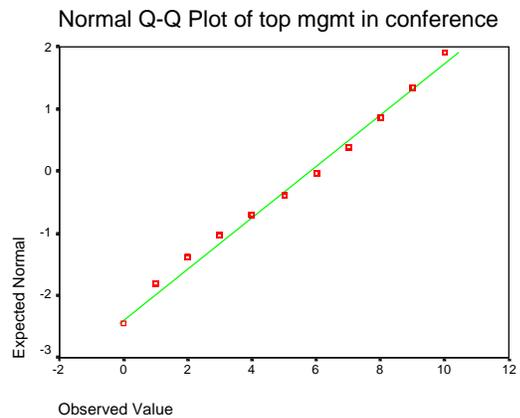
competitor employee policy



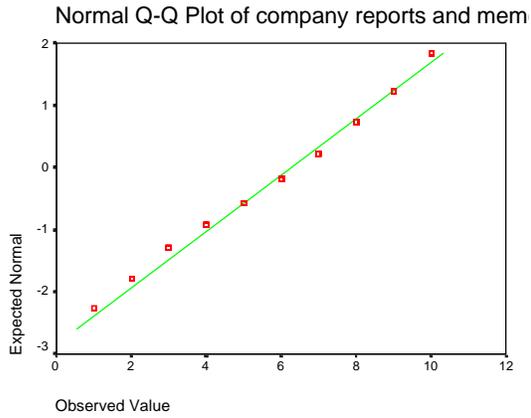
competitor info in general



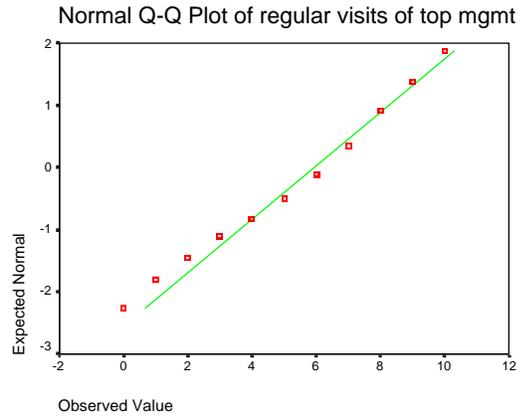
top mgmt in conference



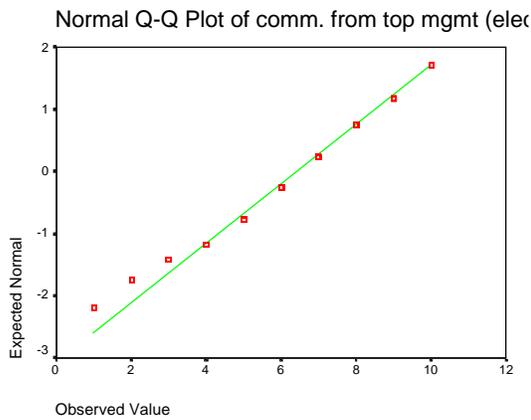
company reports and memo



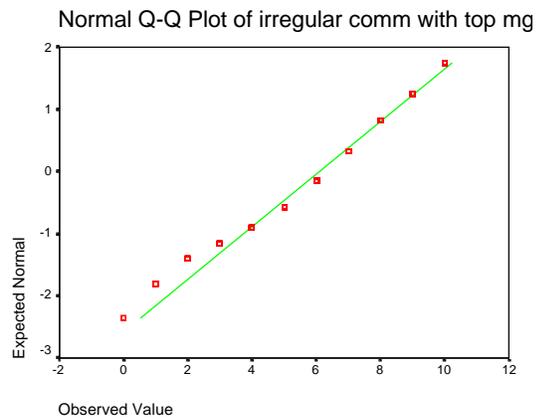
regular visits of top mgmt



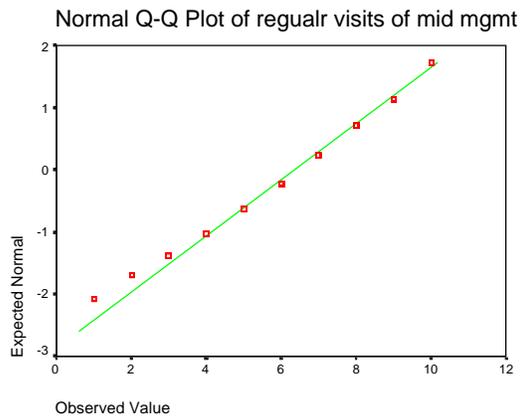
comm. from top mgmt (electronic)



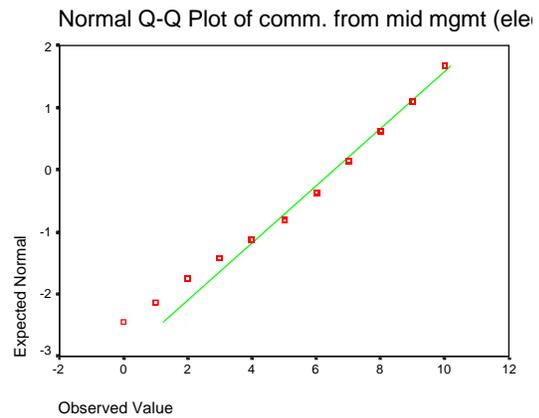
irregular comm. with top mgmt



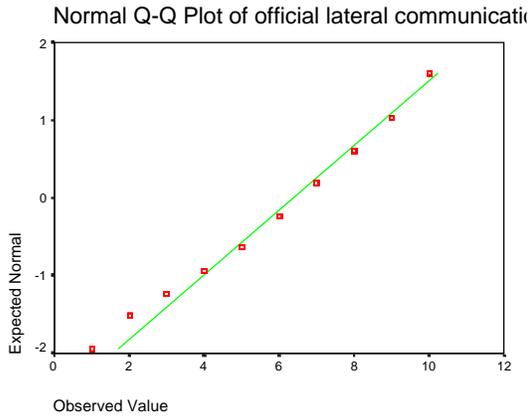
regular visits of mid mgmt



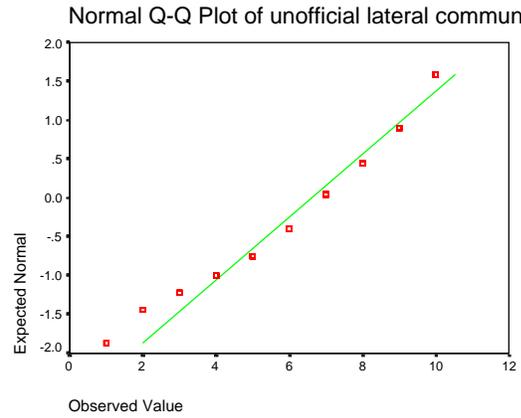
comm. from mid mgmt (electronic)



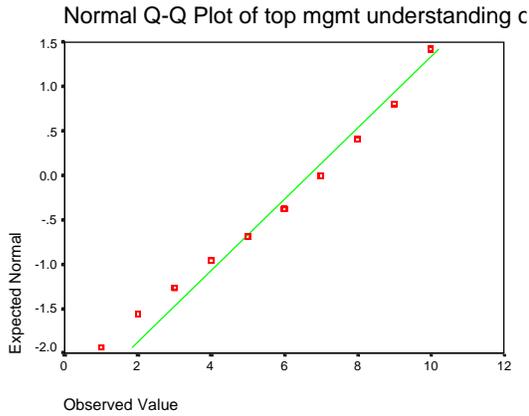
official lateral communication



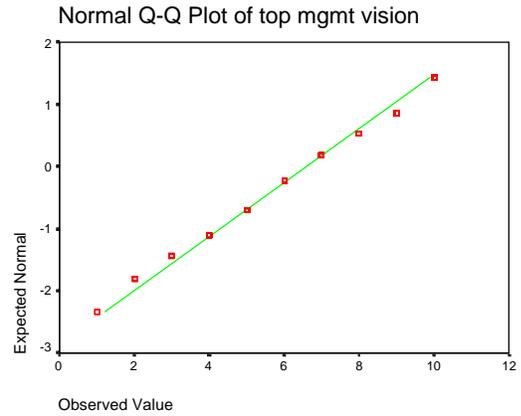
unofficial lateral communication



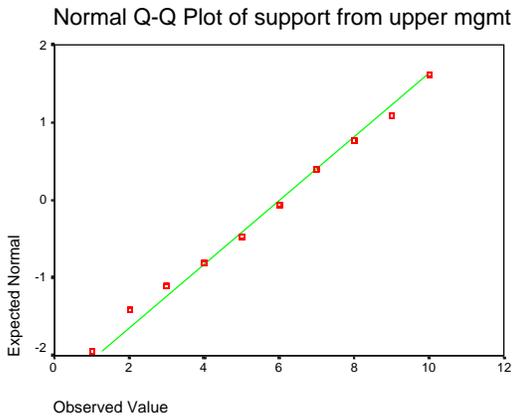
top mgmt understanding of business



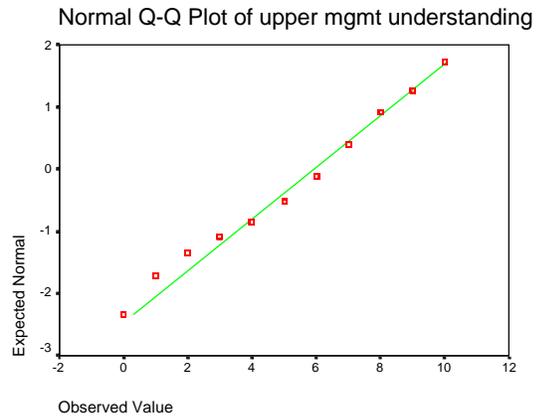
top mgmt vision



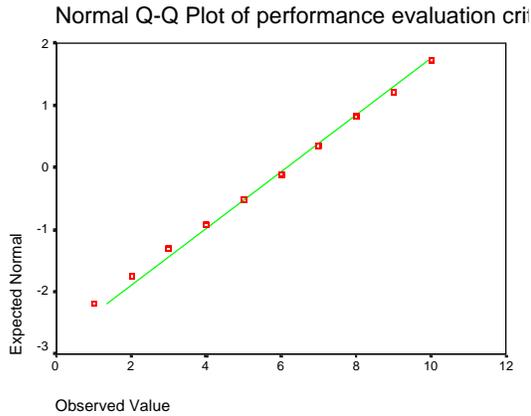
support from upper mgmt



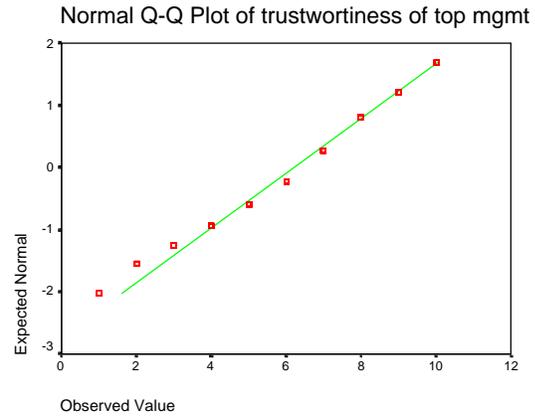
upper mgmt understanding of operations



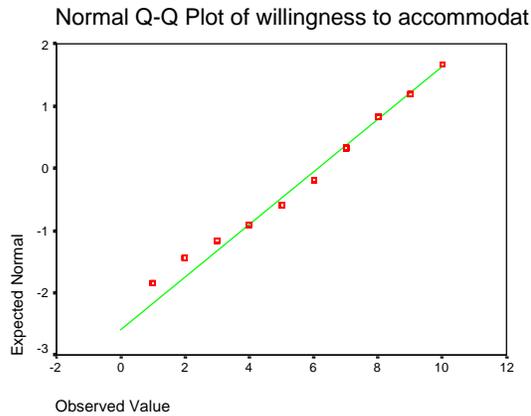
performance evaluation criteria



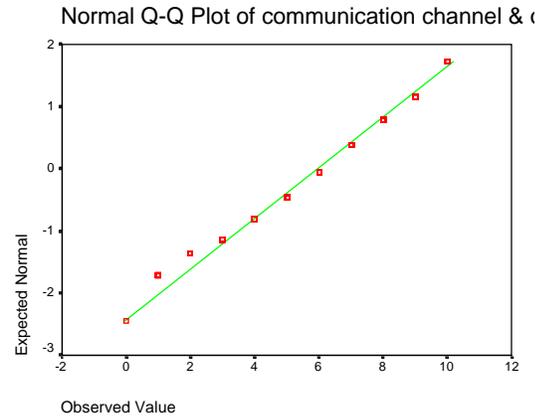
trustworthiness of top mgmt decision



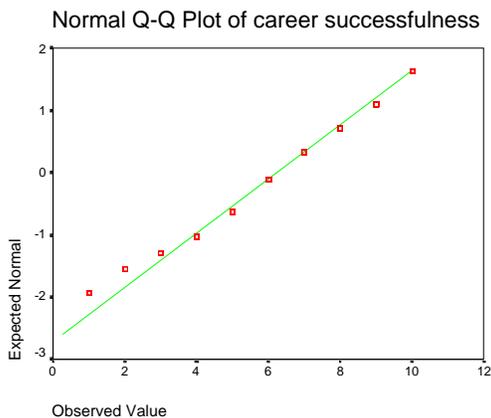
willingness to accommodate my opinion



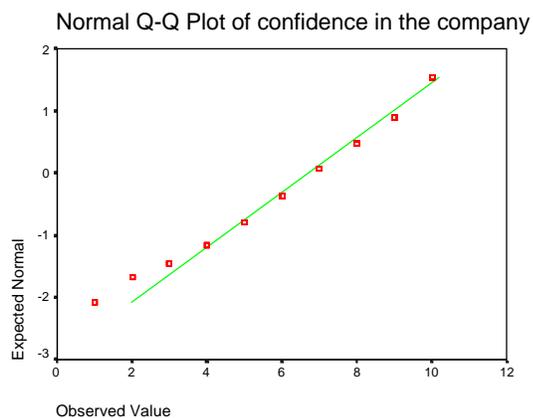
communication channel & opportunity



willingness to accommodate my opinion



career successfulness



Appendix III: Index Tables for Comparison Purpose (US vs. Korea)

Summary of Statistical Indices for F11

	Index	US	Korea
1	GFI	0.98	0.95
2	AGFI	0.94	0.87
3	Chi-Square	3.60	18.81
4	Chi-Square DF	5.00	5.00
5	Chi-Square / DF	0.72	3.76
6	RMSEA	-	0.13
7	CFI	1.00	0.94
8	NNI	1.00	0.87
9	NFI	0.99	0.91

Summary of Statistical Indices for F12

	Index	US	Korea
1	GFI	0.83	0.96
2	AGFI	0.59	0.90
3	Chi-Square	48.52	23.81
4	Chi-Square DF	9.00	9.00
5	Chi-Square / DF	5.39	2.65
6	RMSEA	0.25	0.11
7	CFI	0.87	0.92
8	NNI	0.79	0.87
9	NFI	0.85	0.88

Summary of Statistical Indices for F21

	Index	US	Korea
1	GFI	0.92	0.98
2	AGFI	0.77	0.94
3	Chi-Square	14.30	8.36
4	Chi-Square DF	5.00	5.00
5	Chi-Square / DF	2.86	1.67
6	RMSEA	0.16	0.07
7	CFI	0.98	0.99
8	NNI	0.95	0.97
9	NFI	0.96	0.96

Summary of Statistical Indices for F22

	Index	US	Korea
1	GFI	0.88	0.95
2	AGFI	0.72	0.89
3	Chi-Square	30.33	21.35
4	Chi-Square DF	9.00	9.00
5	Chi-Square / DF	3.37	2.37
6	RMSEA	0.18	0.10
7	CFI	0.95	0.95
8	NNI	0.92	0.92
9	NFI	0.93	0.92

Summary of Statistical Indices for F31

	Index	US	Korea
1	GFI	1.00	1.00
2	AGFI		
3	Chi-Square	n.a	n.a
4	Chi-Square DF	n.a	n.a
5	Chi-Square / DF	#VALUE!	#VALUE!
6	RMSEA		-
7	CFI	1.00	1.00
8	NNI	-	-
9	NFI	1.00	1.00

Summary of Statistical Indices for F32

	Index	US	Korea
1	GFI	0.88	0.94
2	AGFI	0.65	0.81
3	Chi-Square	27.76	22.74
4	Chi-Square DF	5.00	5.00
5	Chi-Square / DF	5.55	4.55
6	RMSEA	0.25	0.16
7	CFI	0.92	0.93
8	NNI	0.85	0.86
9	NFI	0.91	0.91

Summary of Statistical Indices for F33

	Index	US	Korea
1	GFI	1.00	1.00
2	AGFI	-	-
3	Chi-Square	n.a	n.a
4	Chi-Square DF	n.a	n.a
5	Chi-Square / DF	#VALUE!	#VALUE!
6	RMSEA	-	-
7	CFI	0.99	0.99
8	NNI	-	-
9	NFI	1.00	1.00

Summary of Statistical Indices for F41

	Index	US	Korea
1	GFI	0.95	0.88
2	AGFI	0.86	0.64
3	Chi-Square	7.90	39.25
4	Chi-Square DF	5.00	5.00
5	Chi-Square / DF	1.58	7.85
6	RMSEA	0.09	0.22
7	CFI	0.99	0.90
8	NNI	0.97	0.80
9	NFI	0.96	0.89

Summary of Statistical Indices for F42

	Index	US	Korea
1	GFI	0.97	0.98
2	AGFI	0.83	0.90
3	Chi-Square	5.01	5.25
4	Chi-Square DF	2.00	2.00
5	Chi-Square / DF	2.51	2.63
6	RMSEA	0.14	0.11
7	CFI	0.98	0.98
8	NNI	0.95	0.95
9	NFI	0.97	0.98

Summary of Statistical Indices for F-1

	Index	US	Korea
1	GFI	0.87	0.94
2	AGFI	0.74	0.89
3	Chi-Square	52.36	33.47
4	Chi-Square DF	18.00	18.00
5	Chi-Square / DF	2.91	1.86
6	RMSEA	0.16	0.08
7	CFI	0.92	0.95
8	NNI	0.88	0.93
9	NFI	0.89	0.91

Summary of Statistical Indices for F-2

	Index	US	Korea
1	GFI	0.88	0.94
2	AGFI	0.78	0.89
3	Chi-Square	50.27	38.73
4	Chi-Square DF	25.00	25.00
5	Chi-Square / DF	2.01	1.55
6	RMSEA	0.12	0.06
7	CFI	0.96	0.97
8	NNI	0.95	0.96
9	NFI	0.93	0.92

Summary of Statistical Indices for F-3

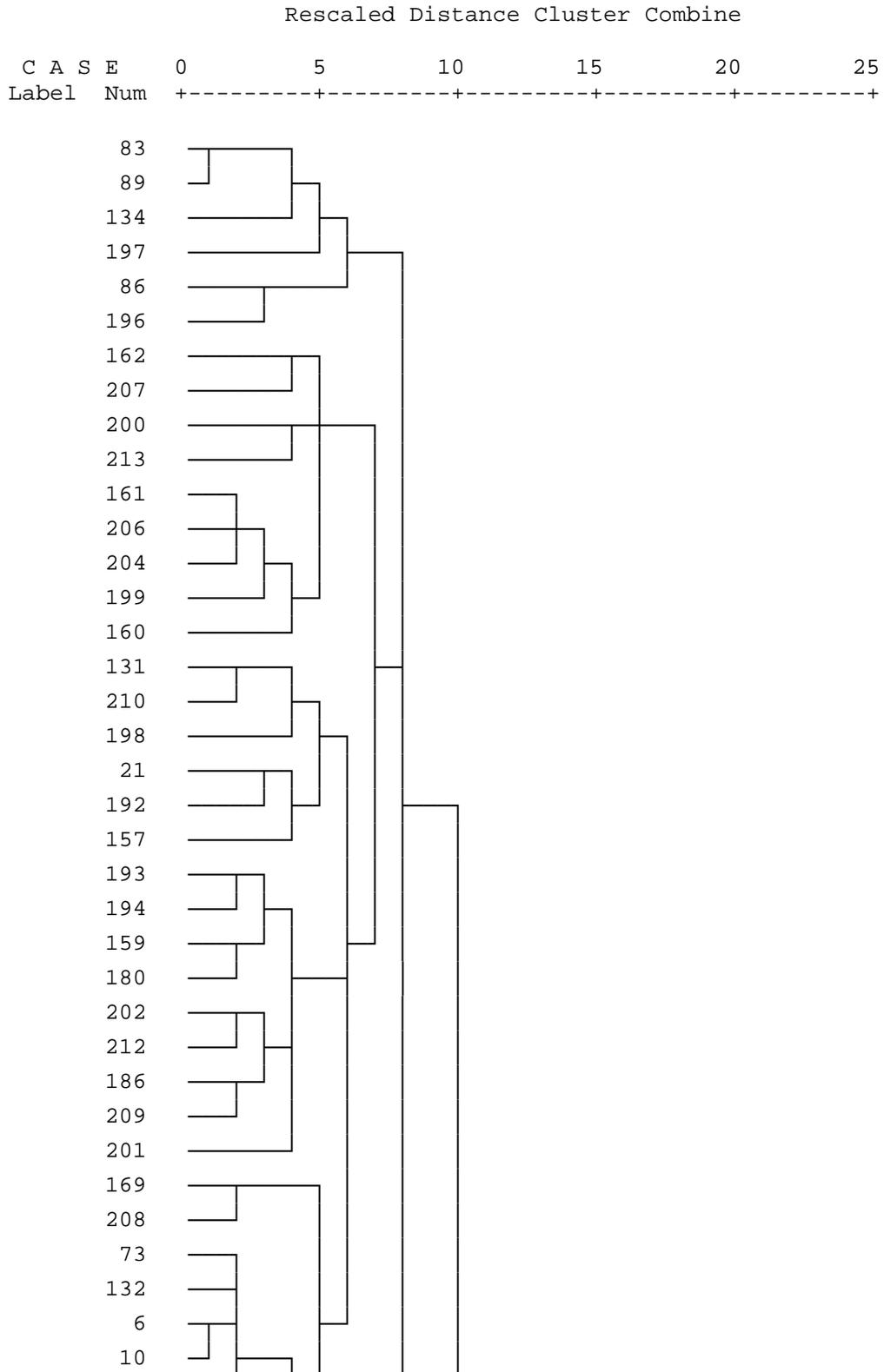
	Index	US	Korea
1	GFI	0.89	0.93
2	AGFI	0.71	0.84
3	Chi-Square	38.46	36.08
4	Chi-Square DF	11.00	12.00
5	Chi-Square / DF	3.50	3.01
6	RMSEA	0.19	0.12
7	CFI	0.91	0.08
8	NNI	0.83	0.87
9	NFI	0.88	0.89

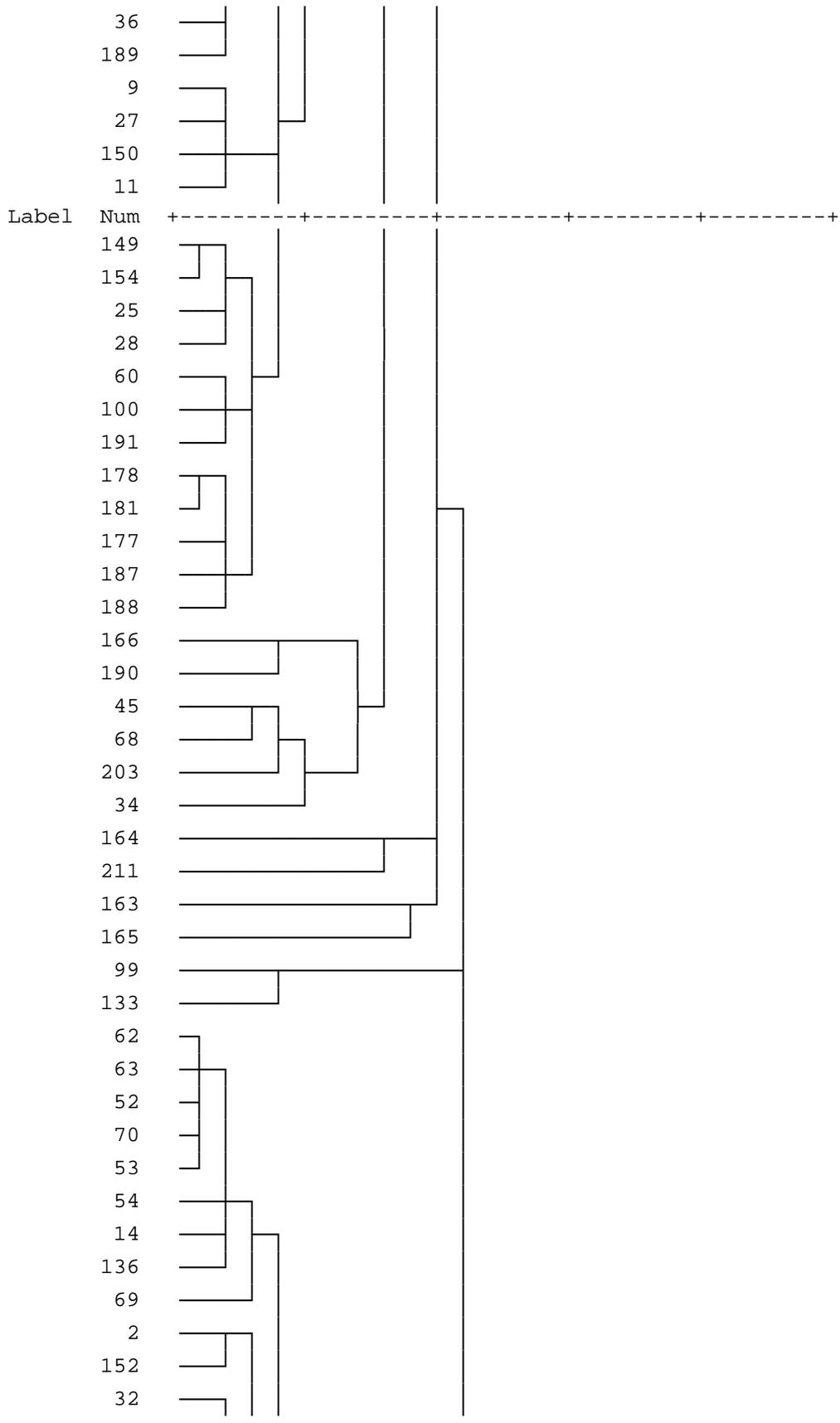
Summary of Statistical Indices for F-4

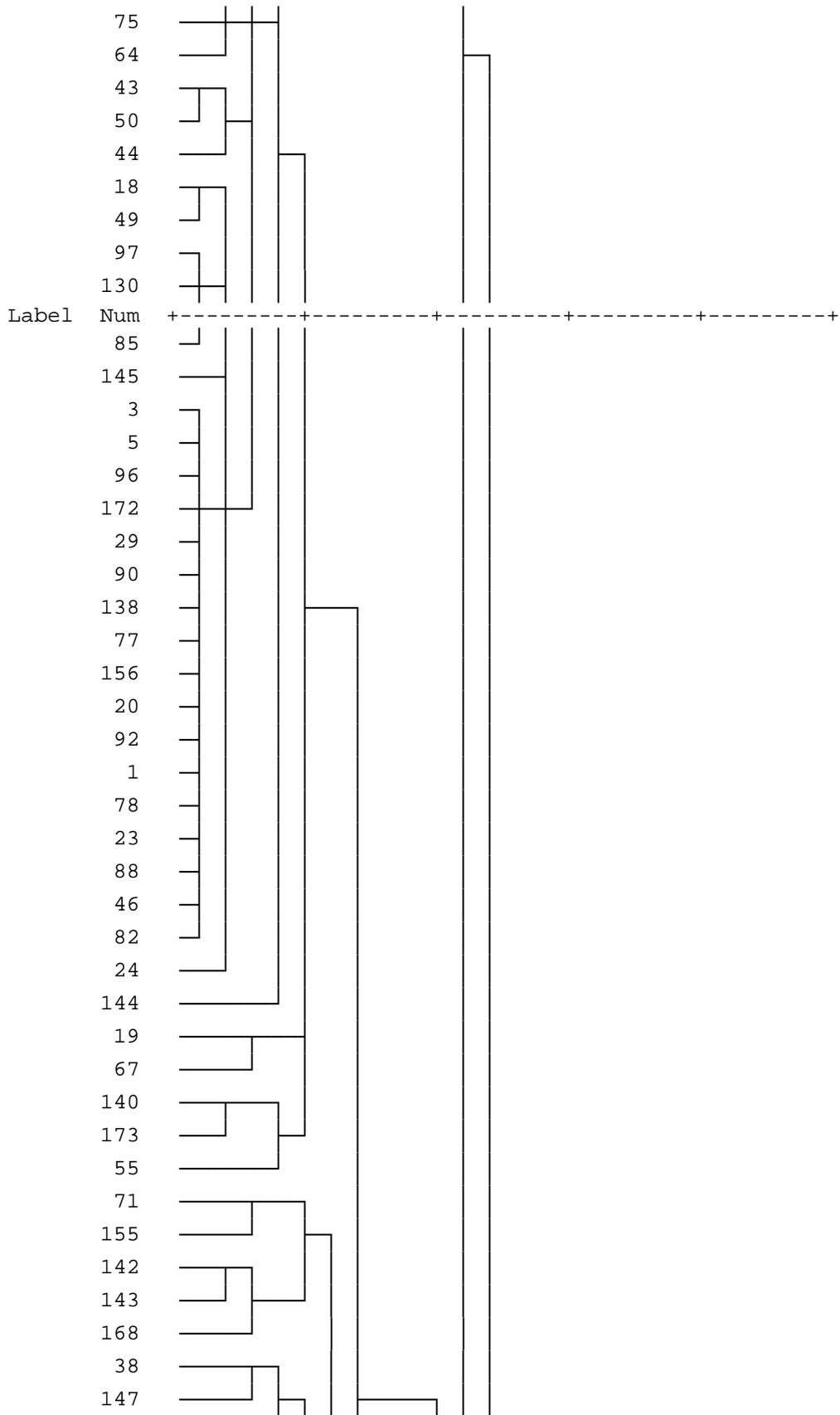
	Index	US	Korea
1	GFI	0.90	0.97
2	AGFI	0.76	0.93
3	Chi-Square	34.07	14.82
4	Chi-Square DF	12.00	12.00
5	Chi-Square / DF	2.84	1.24
6	RMSEA	0.16	0.04
7	CFI	0.93	0.99
8	NNI	0.87	0.99
9	NFI	0.90	0.97

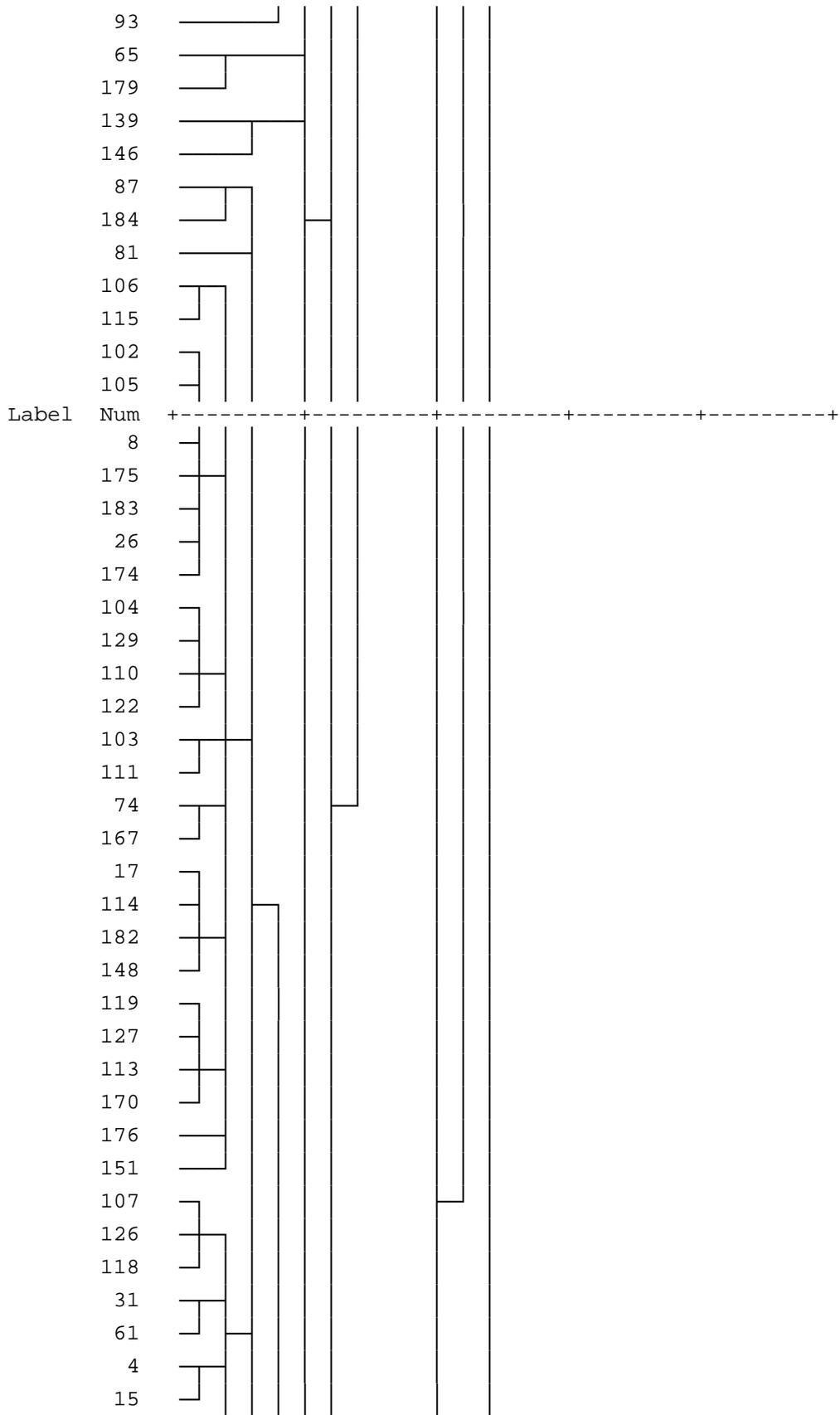
Appendix IV-a: The Result of the Cluster Analysis of F-1

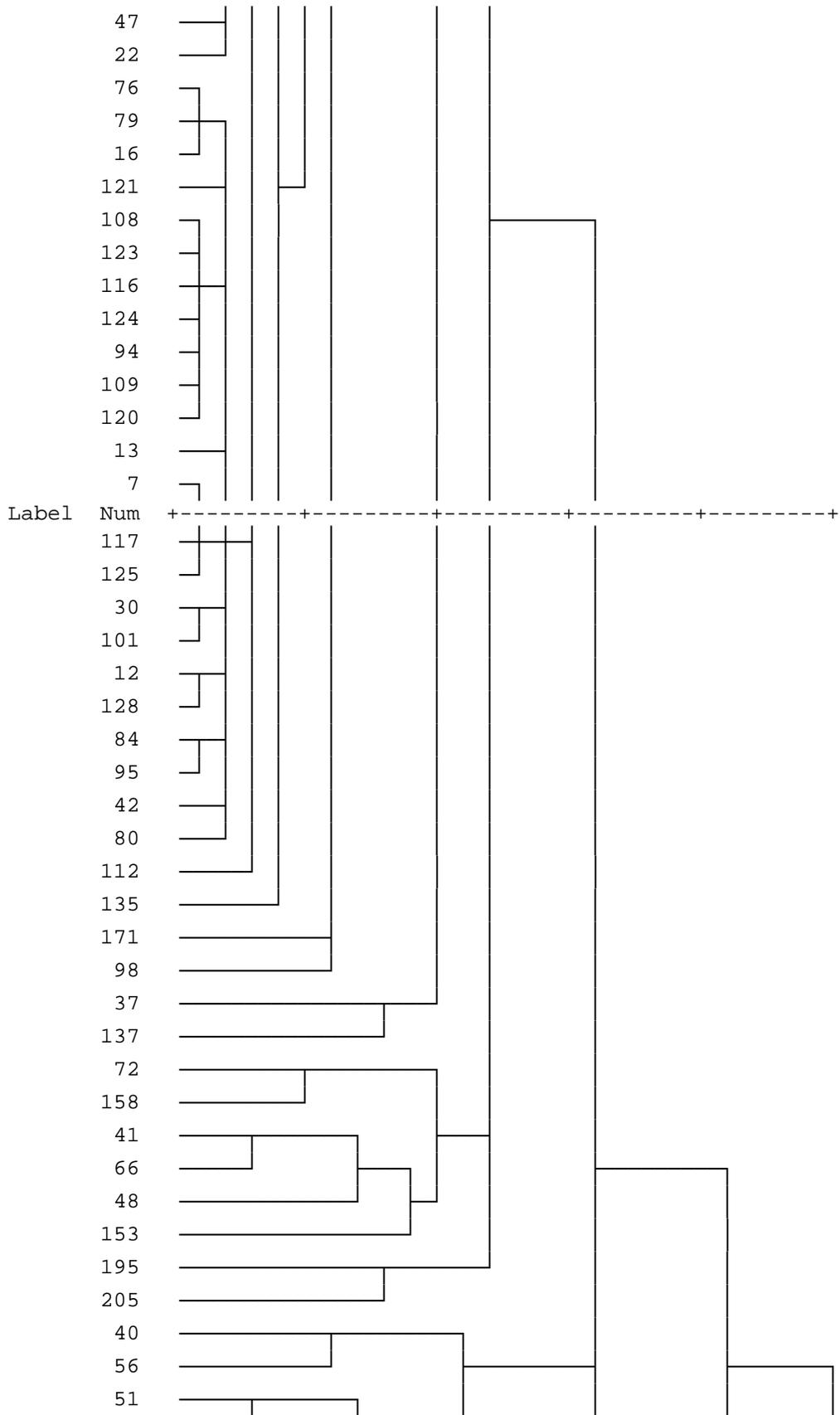
Dendrogram using Average Linkage (Between Groups)

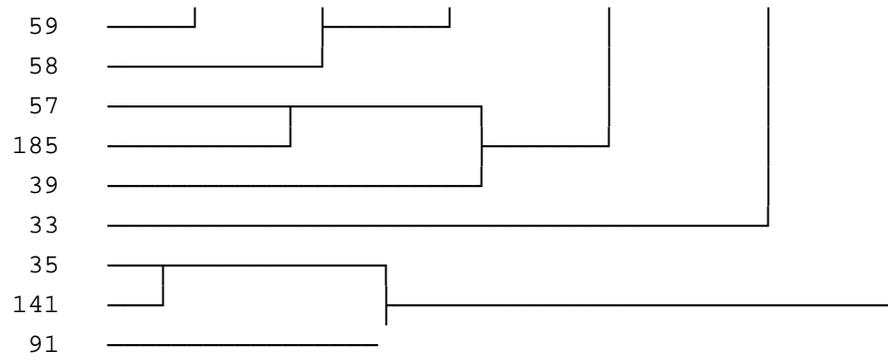






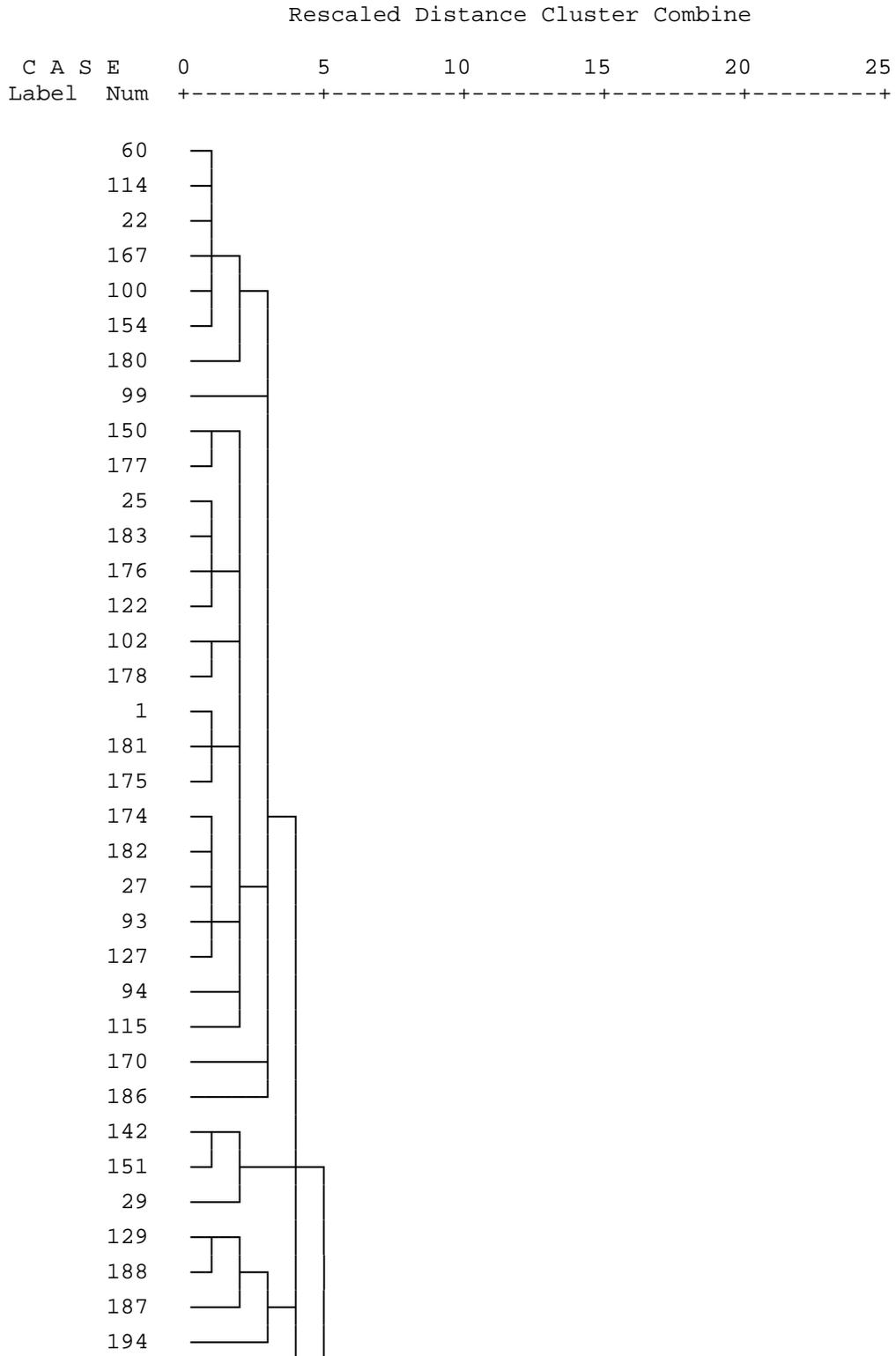


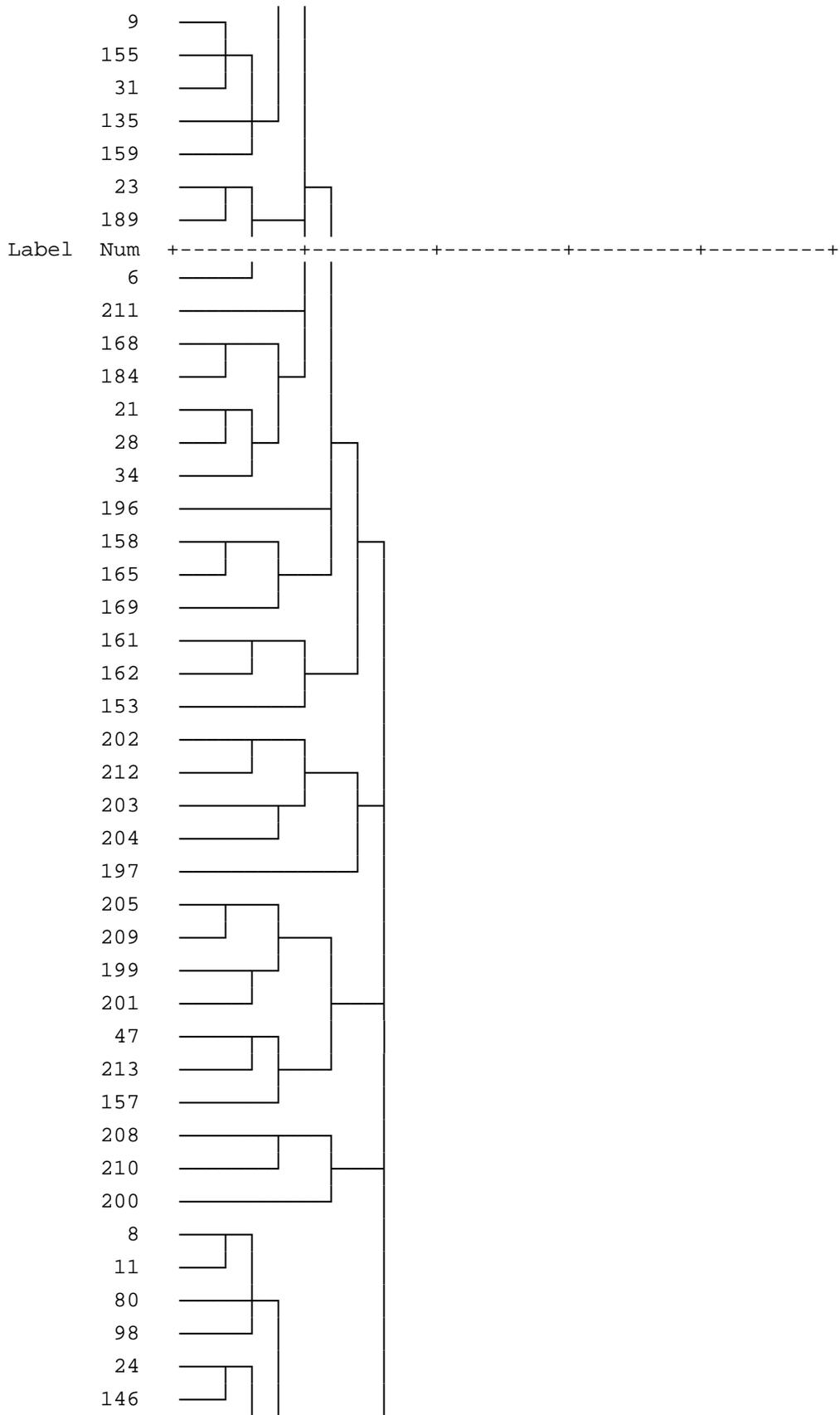


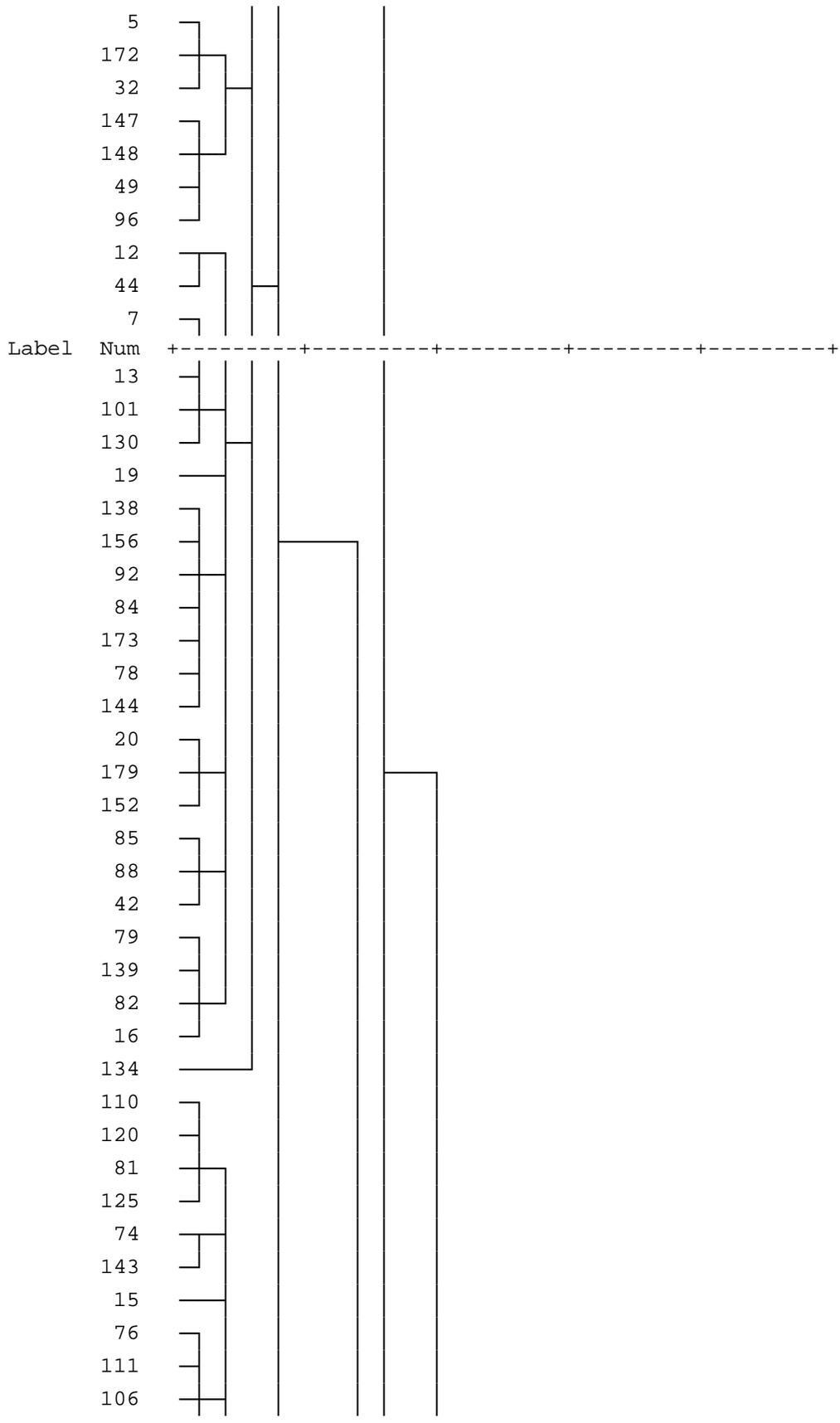


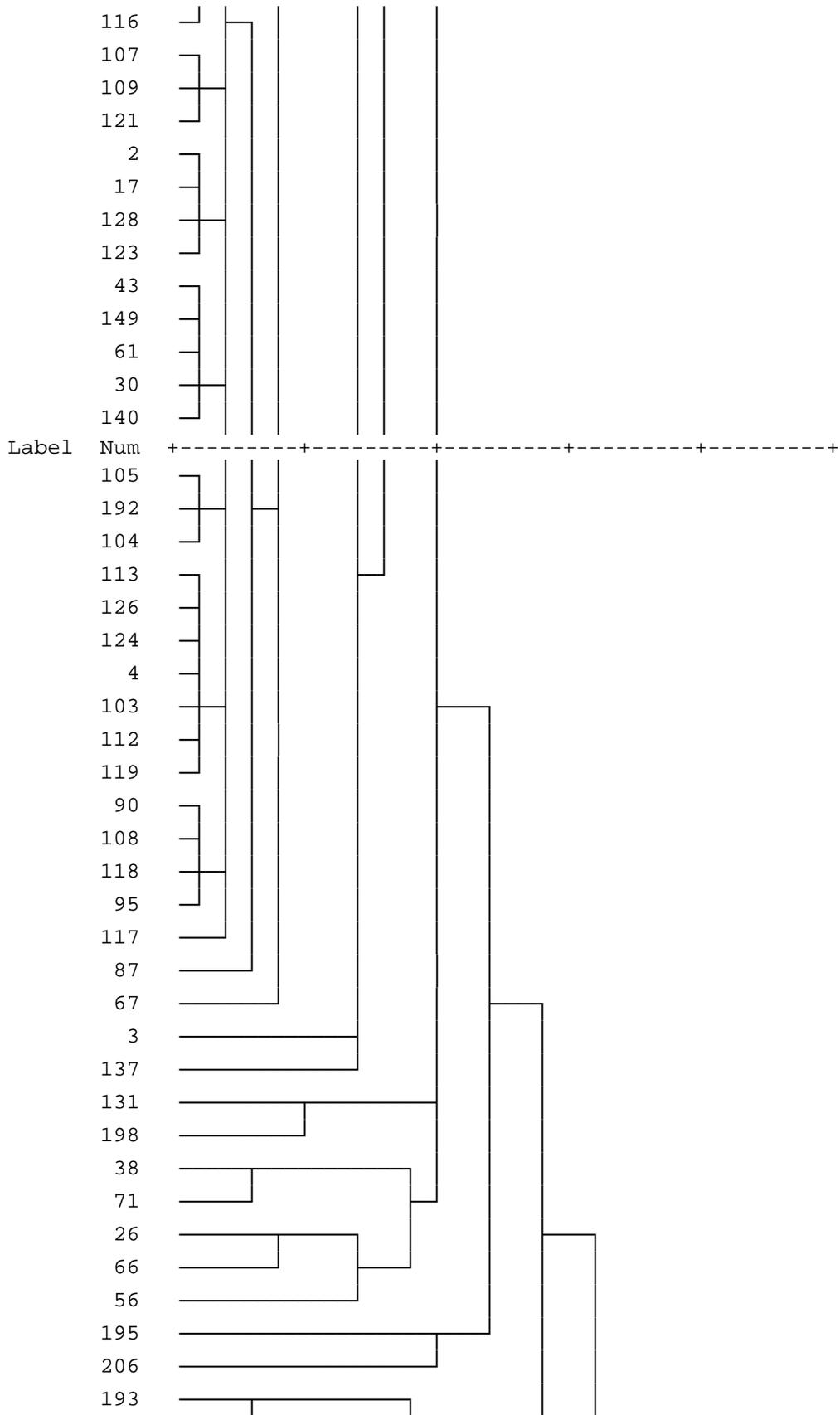
Appendix IV-b: The Result of the Cluster Analysis of F-2

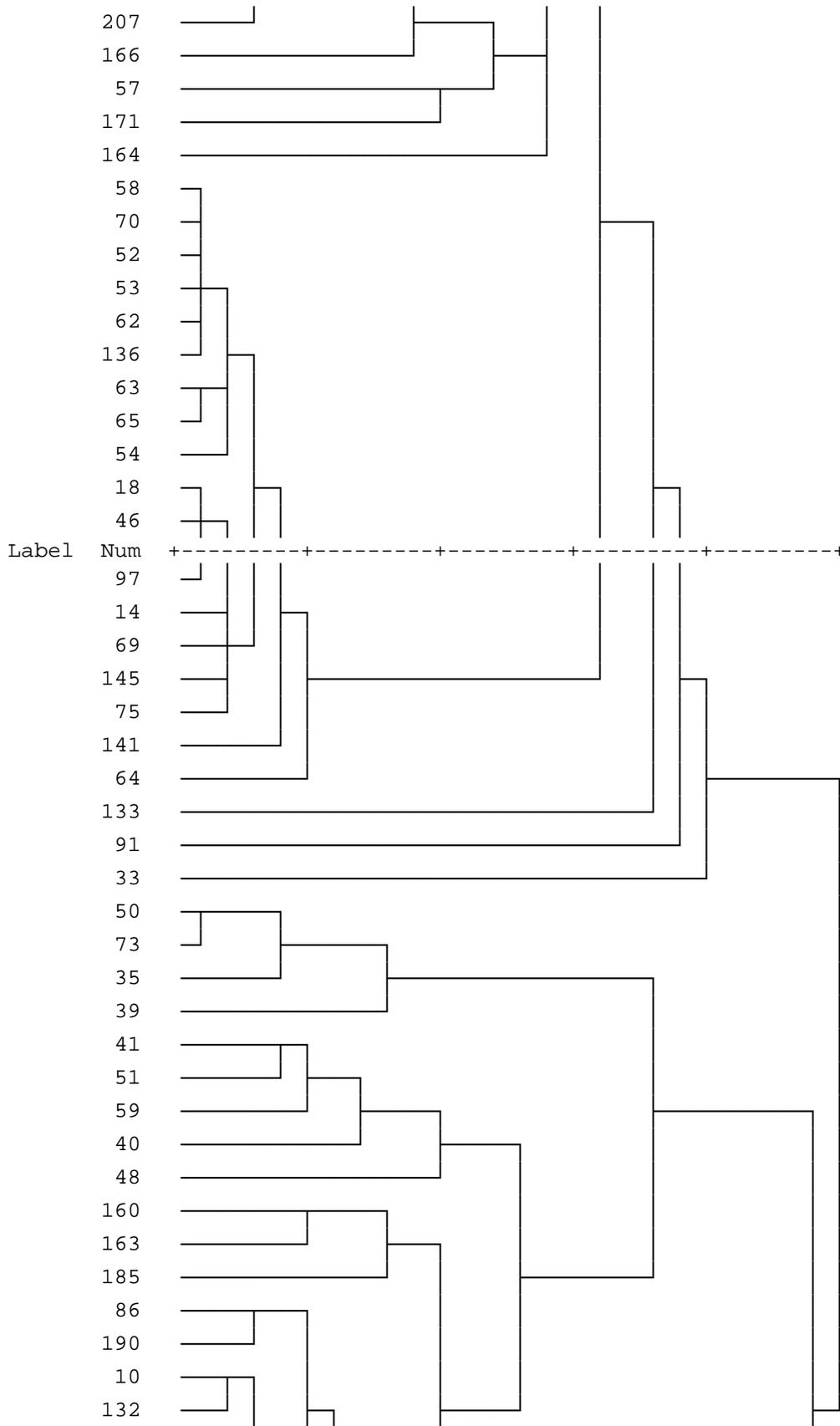
Dendrogram using Average Linkage (Between Groups)

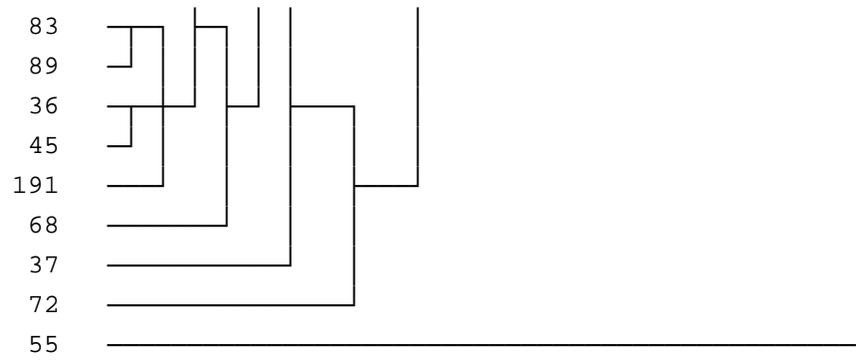






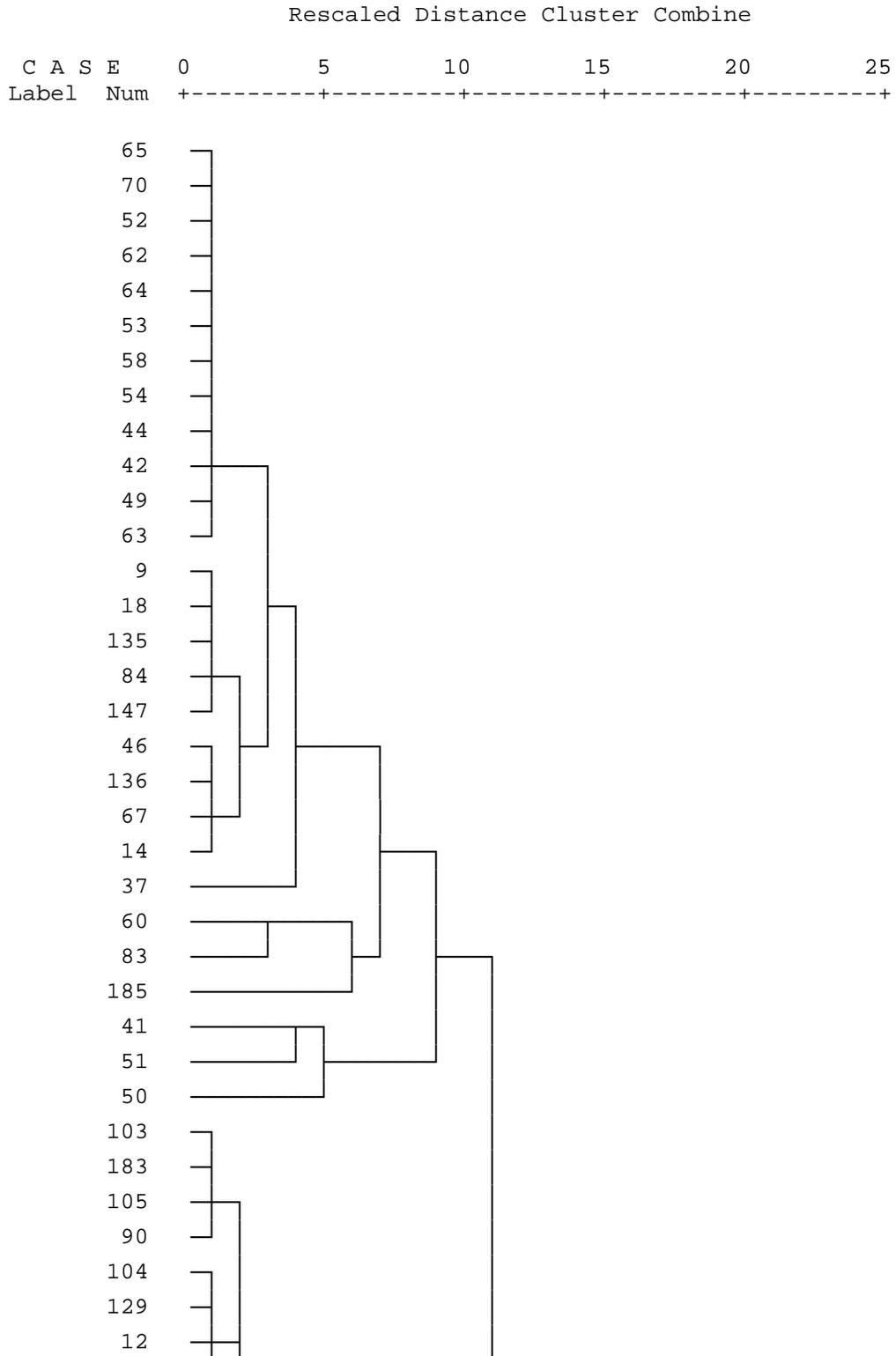


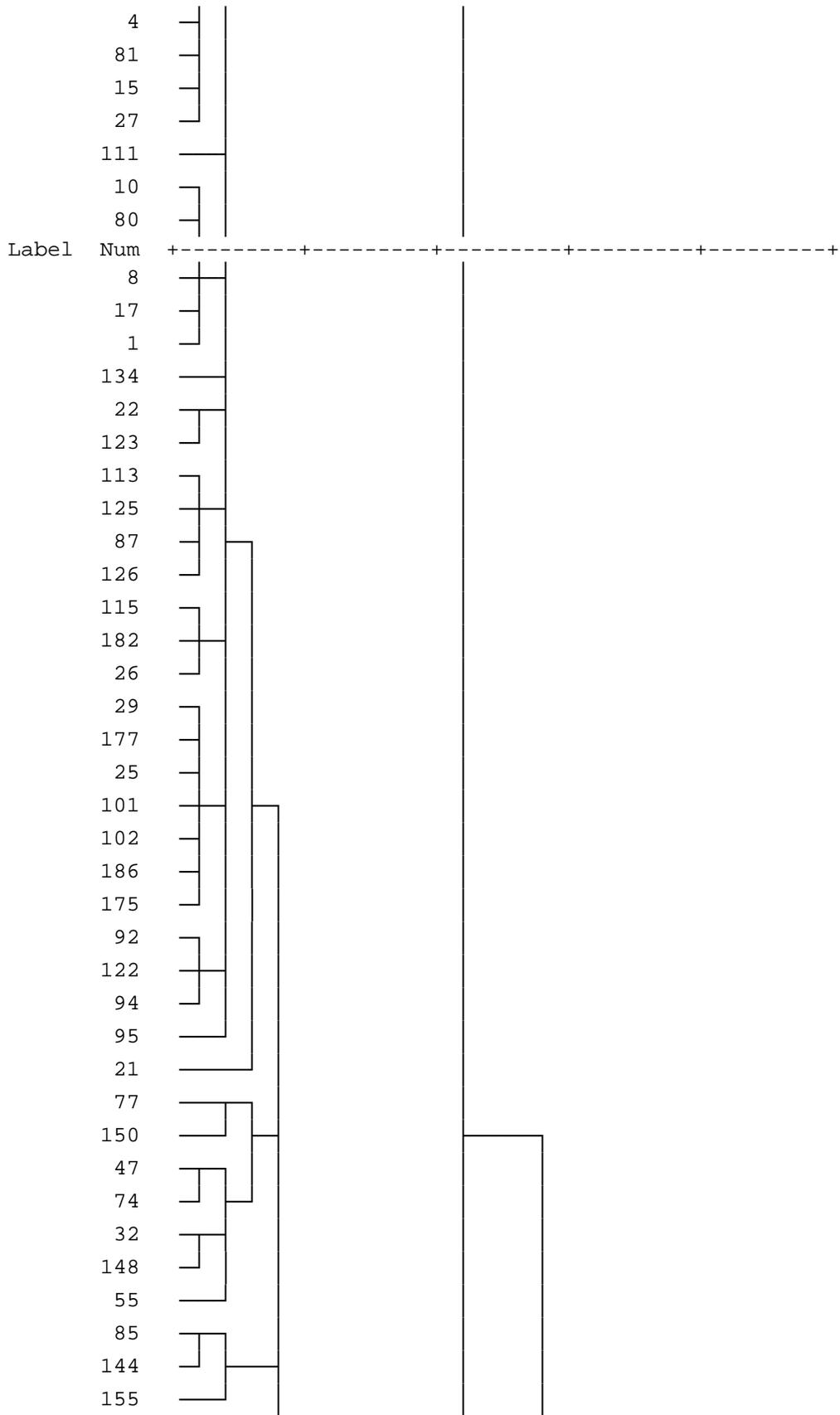


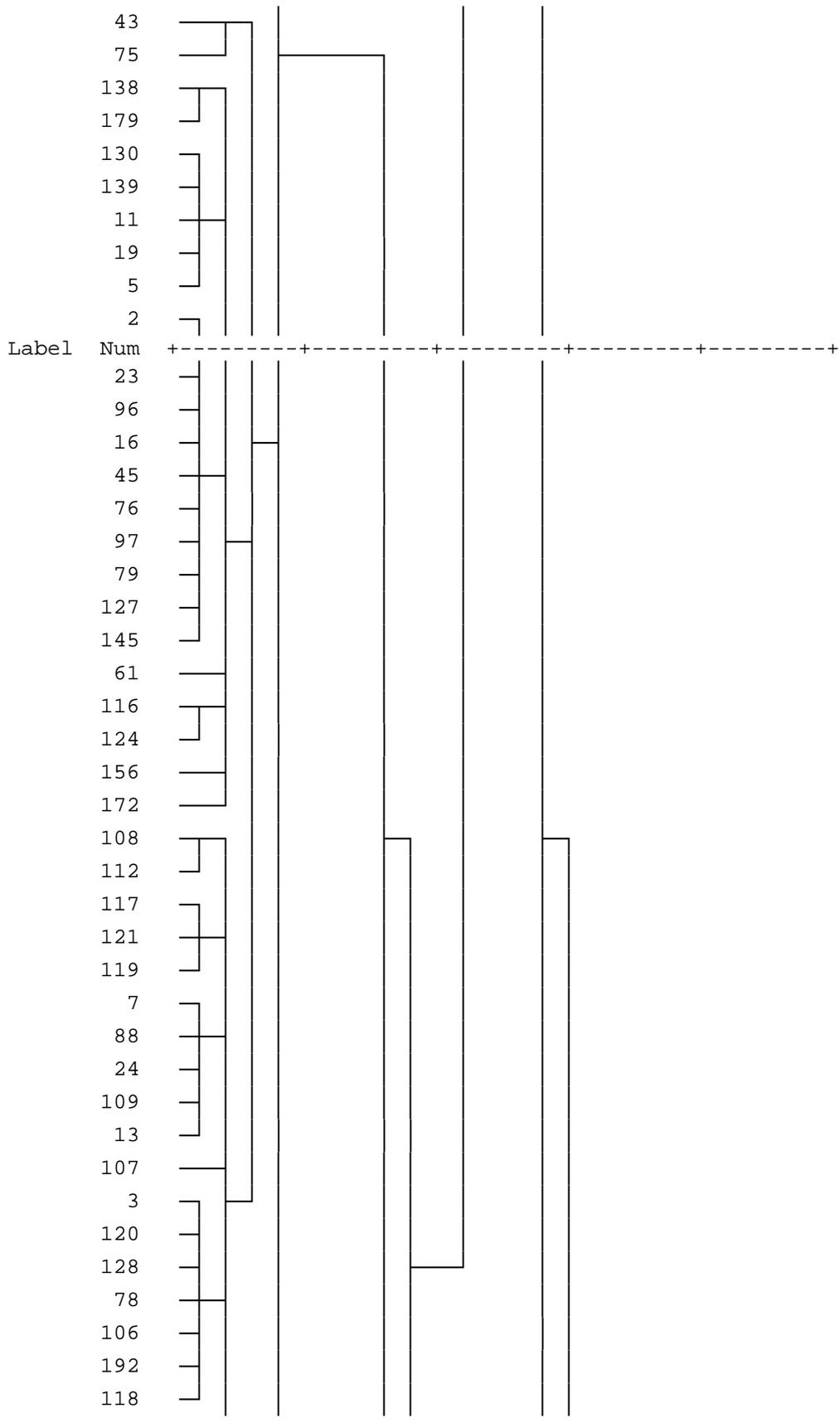


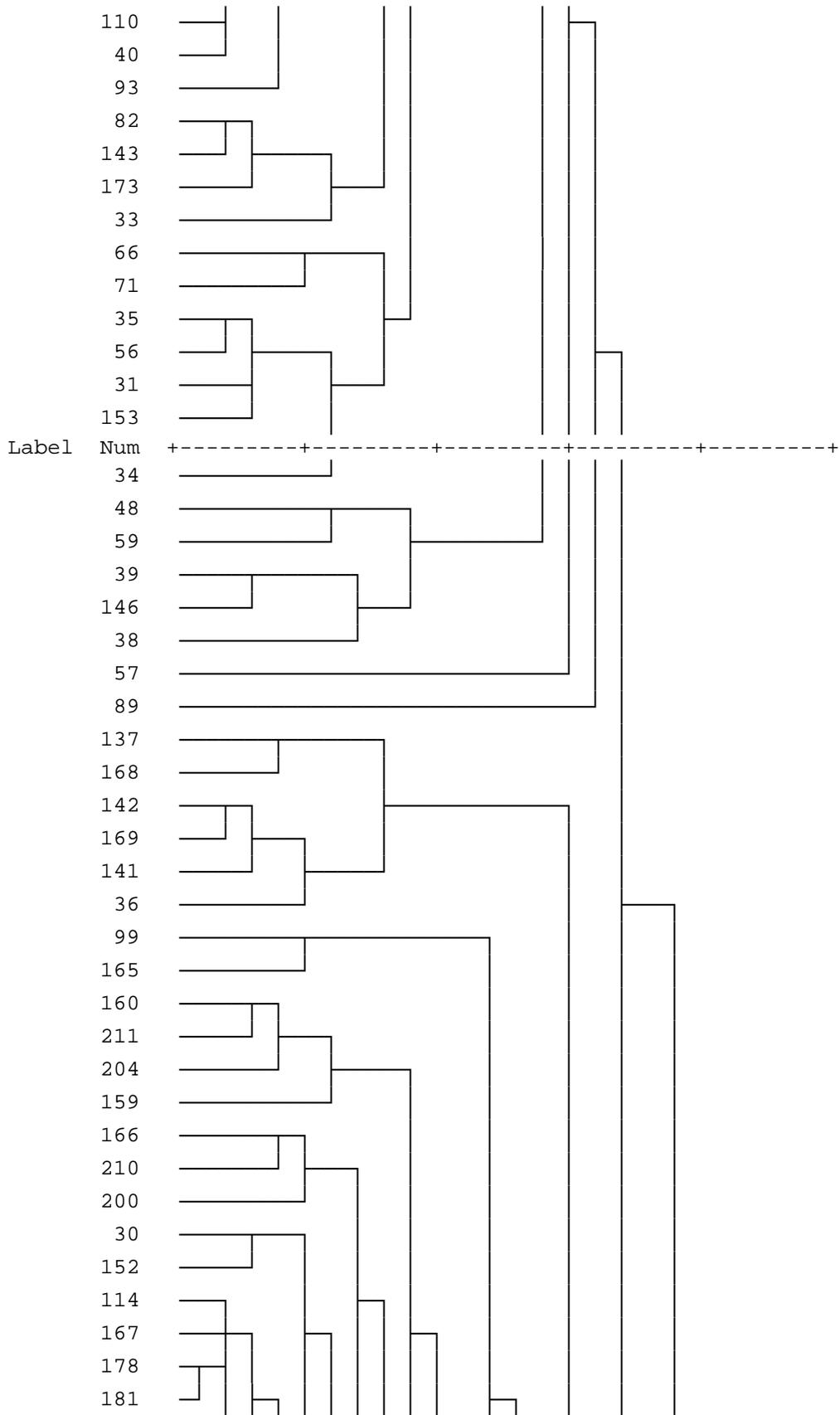
Appendix IV-c: The Result of the Cluster Analysis of F-3

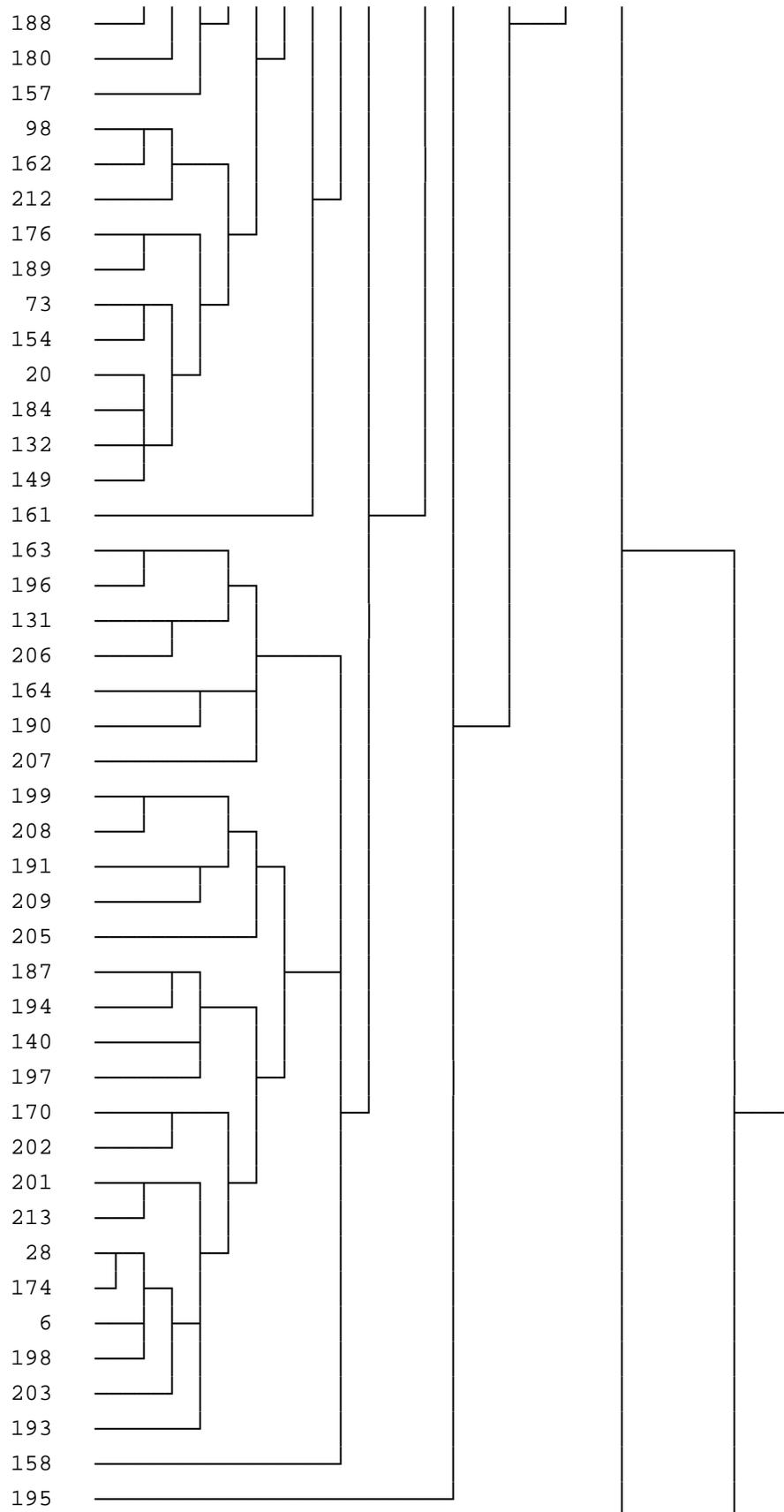
Dendrogram using Average Linkage (Between Groups)

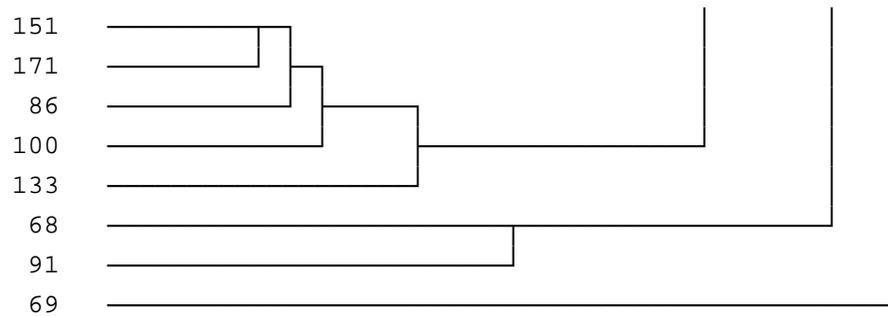






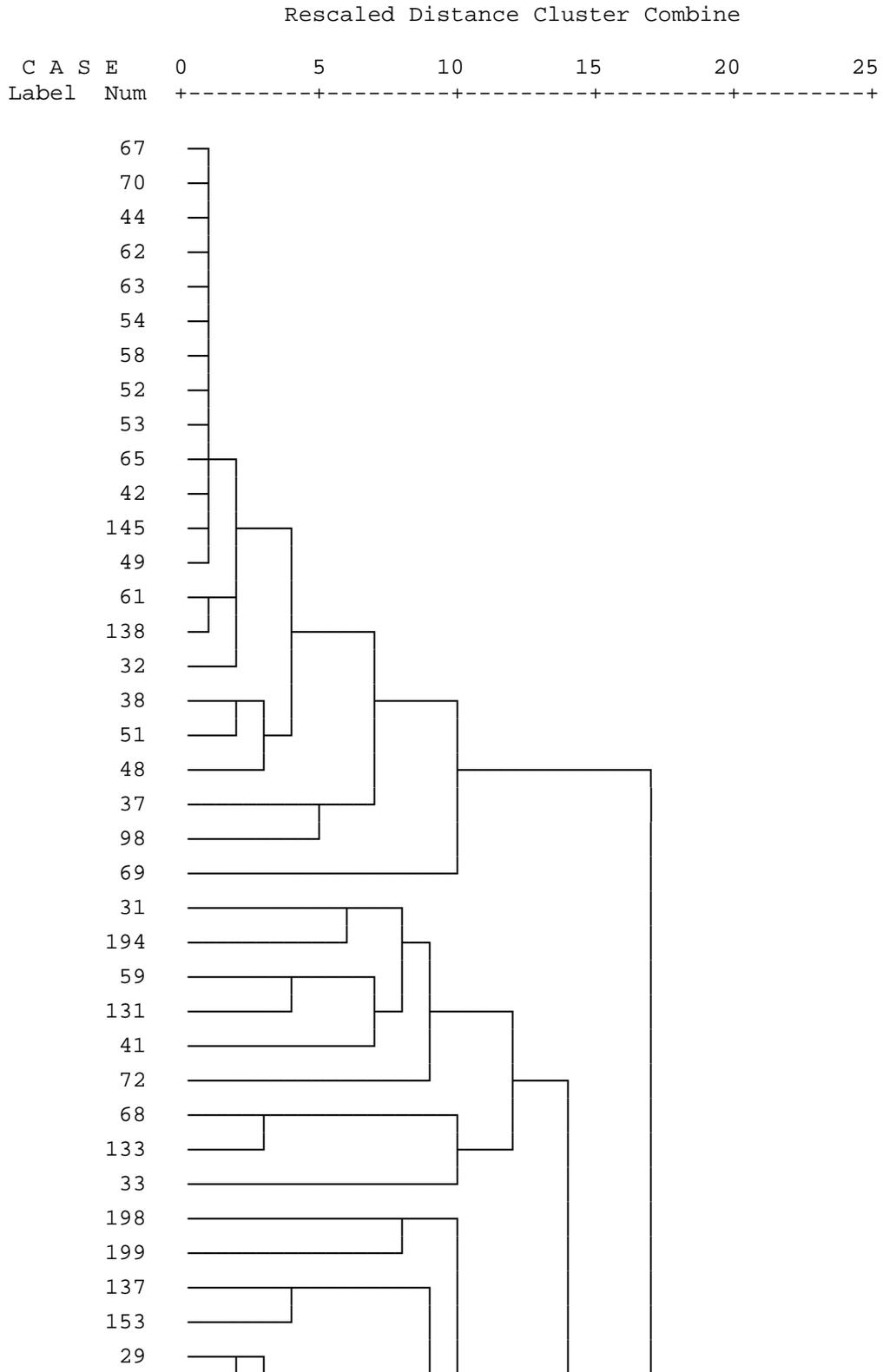


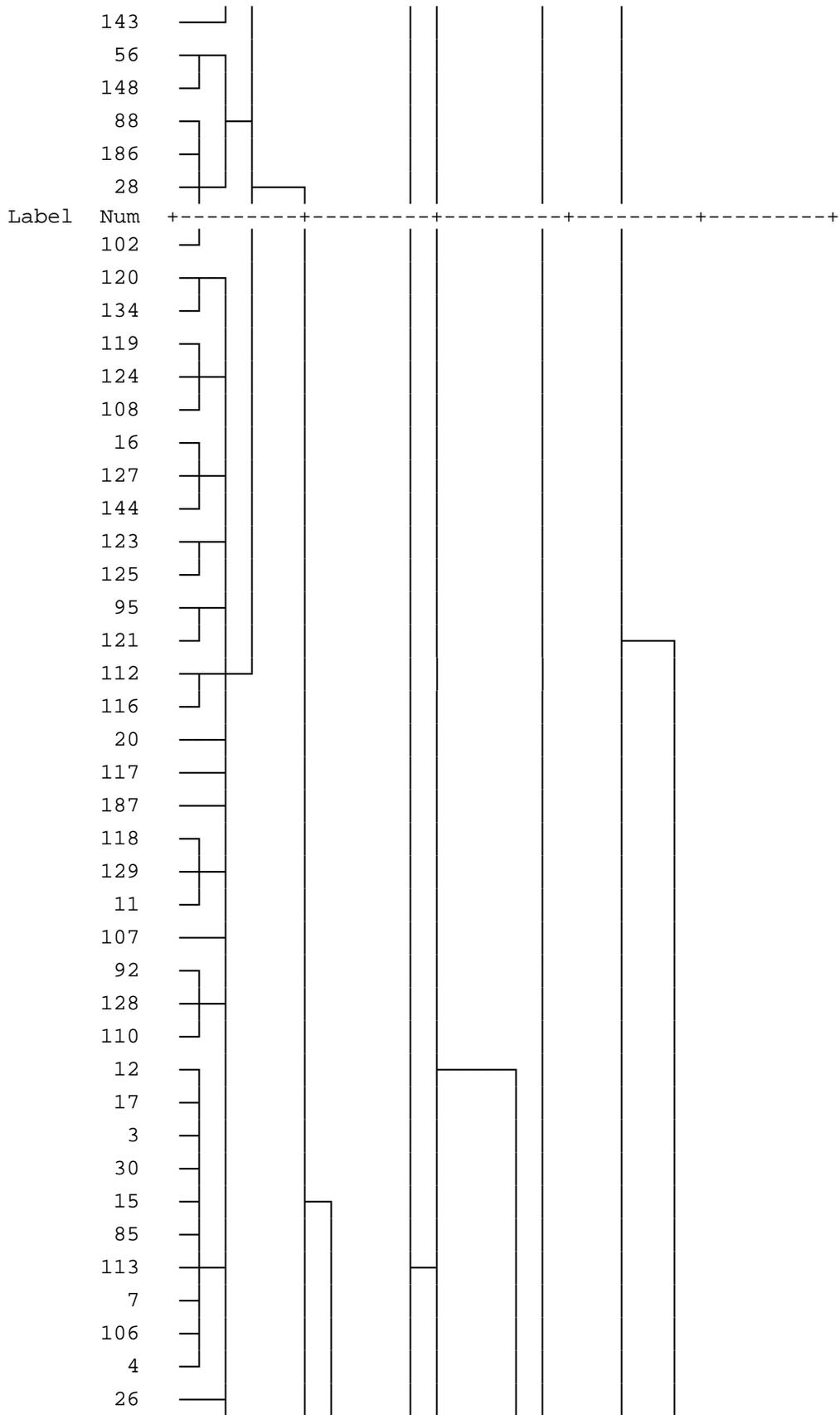


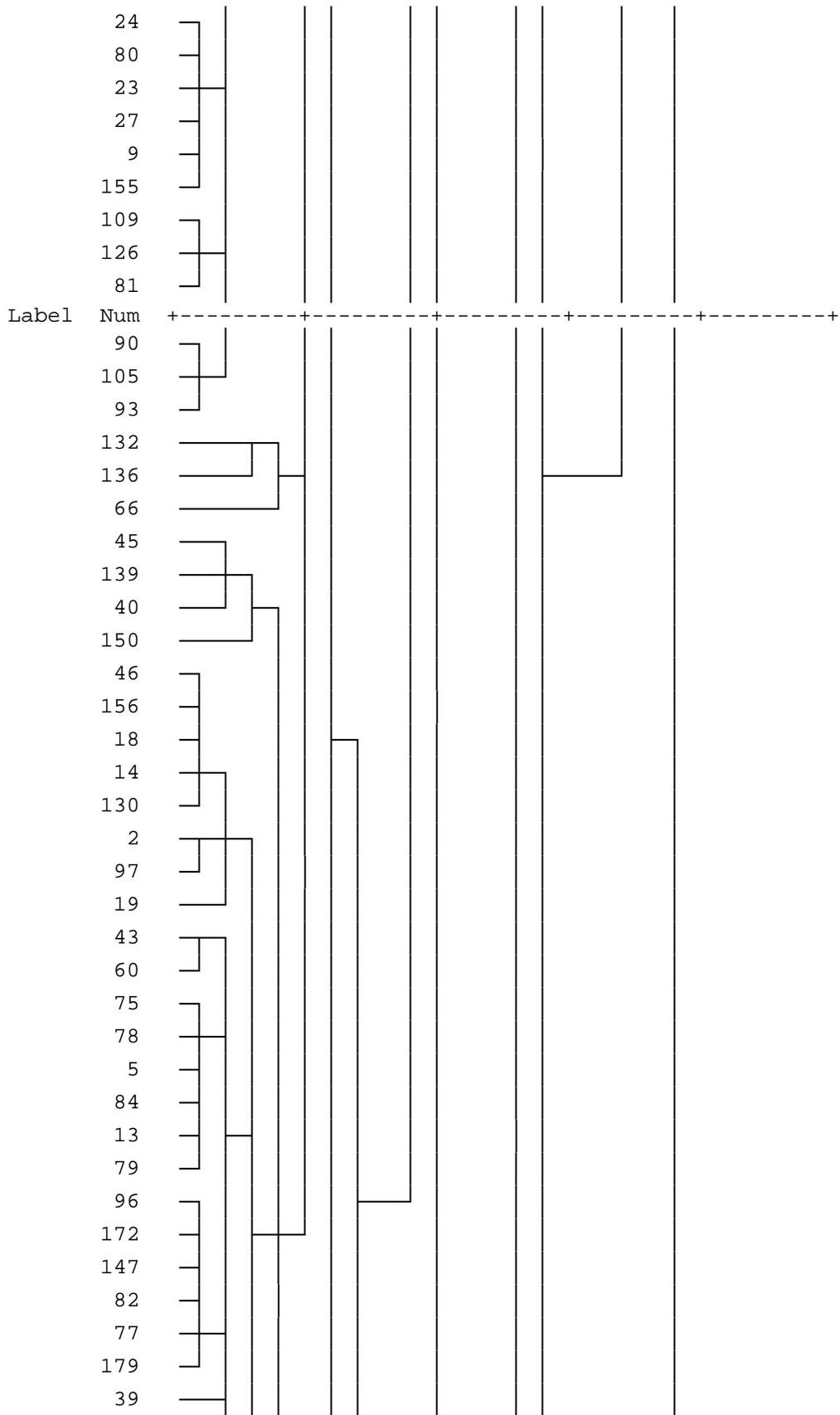


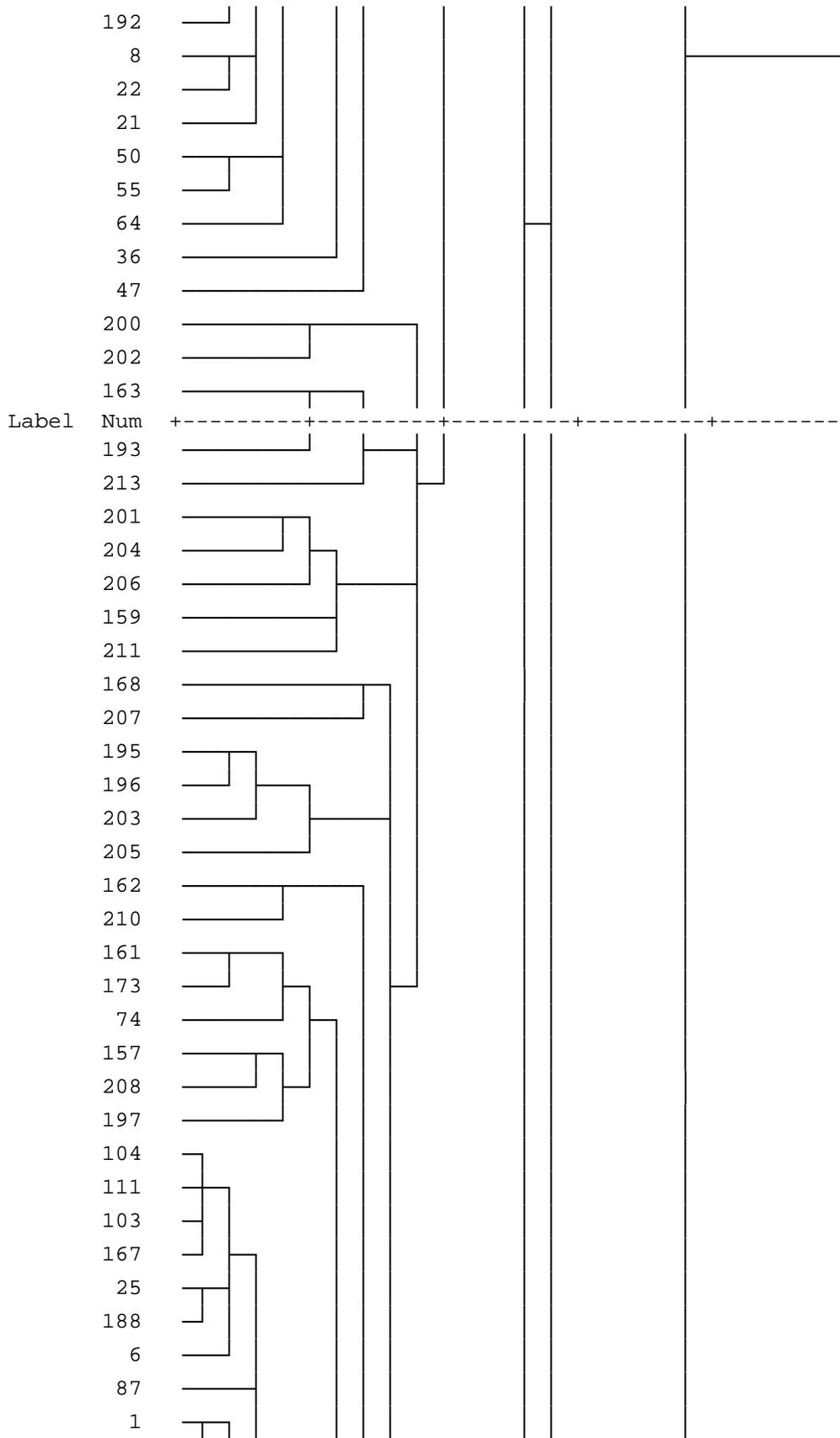
Appendix IV-d: The Result of the Cluster Analysis of F-4

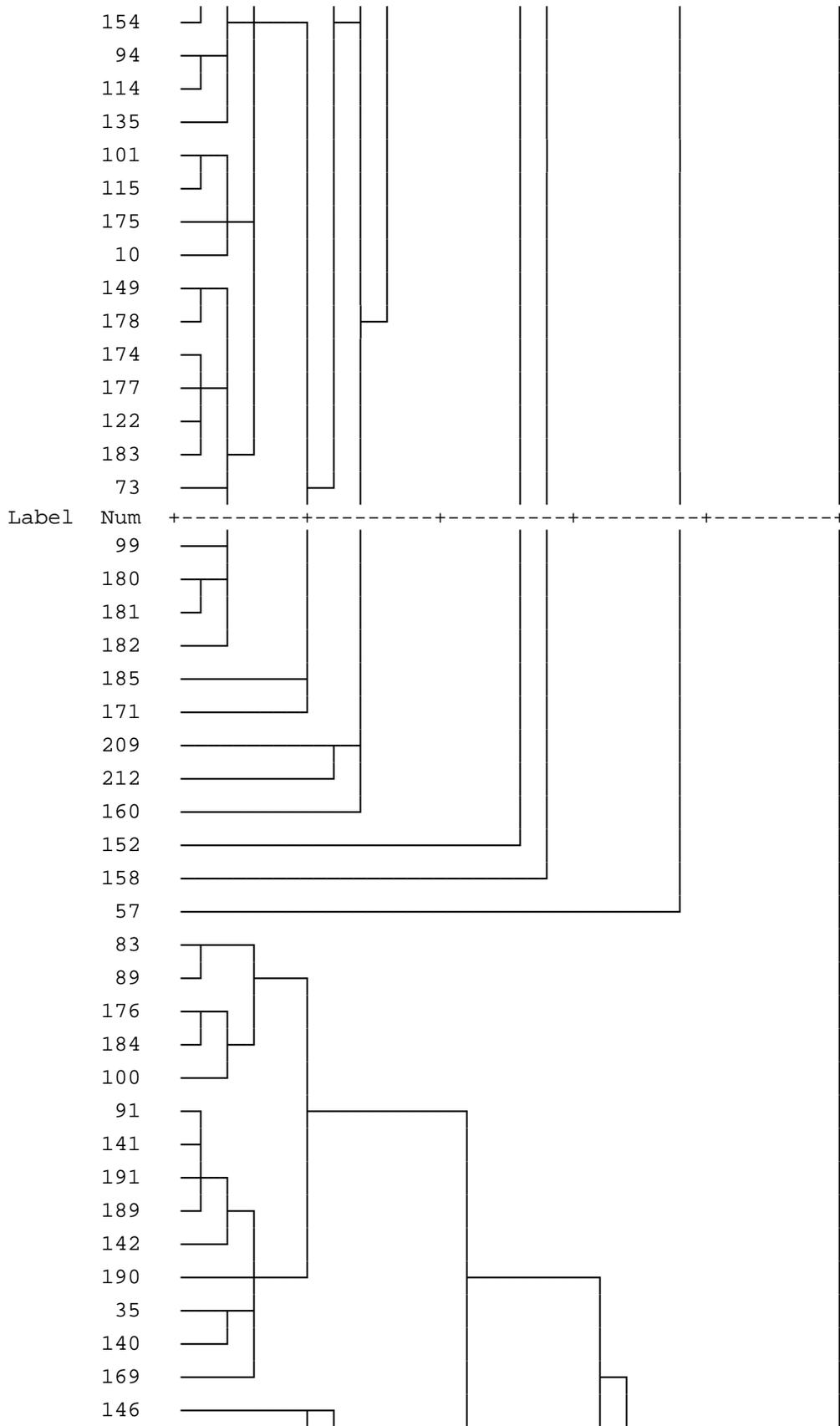
Dendrogram using Average Linkage (Between Groups)

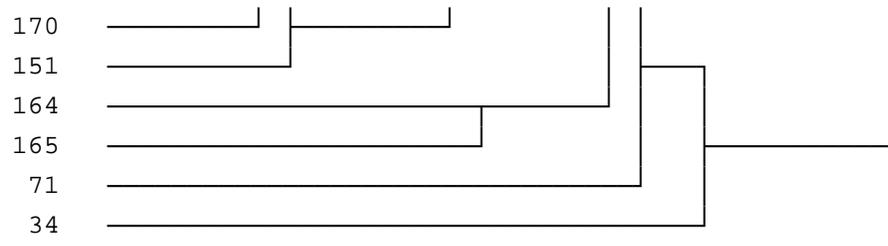












Appendix V-a: The Result of Statistical Analysis of F-11

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	213	Model Terms	1
Variables	5	Model Matrices	4
Informations	15	Parameters	10

Variable		Mean	Std Dev
Q101	Q101	6.02347	2.30553
Q102	Q102	6.25352	2.22158
Q103	Q103	5.88263	2.26548
Q104	Q104	6.59155	1.97564
Q105	Q105	6.27700	2.04738

Fit Function	0.1112
Goodness of Fit Index (GFI)	0.9587
GFI Adjusted for Degrees of Freedom (AGFI)	0.8762
Root Mean Square Residual (RMR)	0.0391
Parsimonious GFI (Mulaik, 1989)	0.4794
Chi-Square	23.5800
Chi-Square DF	5
Pr > Chi-Square	0.0003
Independence Model Chi-Square	483.88
Independence Model Chi-Square DF	10
RMSEA Estimate	0.1324
RMSEA 90% Lower Confidence Limit	0.0816
RMSEA 90% Upper Confidence Limit	0.1884
ECVI Estimate	0.2083
ECVI 90% Lower Confidence Limit	0.1536
ECVI 90% Upper Confidence Limit	0.2996
Probability of Close Fit	0.0054
Bentler's Comparative Fit Index	0.9608
Normal Theory Reweighted LS Chi-Square	22.8161
Akaike's Information Criterion	13.5800
Bozdogan's (1987) CAIC	-8.2265
Schwarz's Bayesian Criterion	-3.2265
McDonald's (1989) Centrality	0.9573
Bentler & Bonett's (1980) Non-normed Index	0.9216
Bentler & Bonett's (1980) NFI	0.9513
James, Mulaik, & Brett (1982) Parsimonious NFI	0.4756
Z-Test of Wilson & Hilferty (1931)	3.4220
Bollen (1986) Normed Index Rho1	0.9025
Bollen (1988) Non-normed Index Delta2	0.9612
Hoelter's (1983) Critical N	101

The SAS System
Manifest Variable Equations with Standardized Estimates

```
Q101 = 0.7702*f11      + 0.6378 e101
      lq101f11
Q102 = 0.8413*f11      + 0.5406 e102
      lq102f11
Q103 = 0.7447*f11      + 0.6674 e103
      lq103f11
Q104 = 0.6667*f11      + 0.7454 e104
      lq104f11
Q105 = 0.7173*f11      + 0.6968 e105
      lq105f11
```

Appendix V-b: The Result of Statistical Analysis of F-12

The SAS System

Observations	213	Model Terms	1
Variables	6	Model Matrices	4
Informations	21	Parameters	12

	Variable	Mean	Std Dev
	Q106	6.08451	2.21112
	Q107	6.24413	2.38045
	Q108	6.17371	2.06564
	Q109	6.30516	2.09578
	Q110	6.36150	2.01546
	Q111	5.81221	2.36572

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.2250
Goodness of Fit Index (GFI)	0.9377
GFI Adjusted for Degrees of Freedom (AGFI)	0.8547
Root Mean Square Residual (RMR)	0.0498
Parsimonious GFI (Mulaik, 1989)	0.5626
Chi-Square	47.7004
Chi-Square DF	9
Pr > Chi-Square	<.0001
Independence Model Chi-Square	505.22
Independence Model Chi-Square DF	15
RMSEA Estimate	0.1424
RMSEA 90% Lower Confidence Limit	0.1042
RMSEA 90% Upper Confidence Limit	0.1834
ECVI Estimate	0.3421
ECVI 90% Lower Confidence Limit	0.2563
ECVI 90% Upper Confidence Limit	0.4645
Probability of Close Fit	0.0001
Bentler's Comparative Fit Index	0.9211
Normal Theory Reweighted LS Chi-Square	42.2290
Akaike's Information Criterion	29.7004
Bozdogan's (1987) CAIC	-9.5513
Schwarz's Bayesian Criterion	-0.5513
McDonald's (1989) Centrality	0.9132
Bentler & Bonett's (1980) Non-normed Index	0.8684
Bentler & Bonett's (1980) NFI	0.9056
James, Mulaik, & Brett (1982) Parsimonious NFI	0.5434
Z-Test of Wilson & Hilferty (1931)	4.8889
Bollen (1986) Normed Index Rho1	0.8426
Bollen (1988) Non-normed Index Delta2	0.9220
Hoelter's (1983) Critical N	77

The SAS System

```

Q106 = 0.7361*f12 + 1.0000 e106
Std Err 0.0628 lq106f11
t Value 11.7223
Q107 = 0.7817*f12 + 1.0000 e107
Std Err 0.0614 lq107f11
t Value 12.7357
Q108 = 0.7567*f12 + 1.0000 e108
Std Err 0.0622 lq108f11
t Value 12.1742
Q109 = 0.6518*f12 + 1.0000 e109
Std Err 0.0653 lq109f11
t Value 9.9837
Q110 = 0.6745*f12 + 1.0000 e110
Std Err 0.0646 lq110f11
t Value 10.4345
Q111 = 0.5679*f12 + 1.0000 e111
Std Err 0.0675 lq111f11
t Value 8.4176

```

Manifest Variable Equations with Standardized Estimates

```

Q106 = 0.7361*f12 + 0.6768 e106
      lq106f11
Q107 = 0.7817*f12 + 0.6237 e107
      lq107f11
Q108 = 0.7567*f12 + 0.6537 e108
      lq108f11
Q109 = 0.6518*f12 + 0.7584 e109
      lq109f11
Q110 = 0.6745*f12 + 0.7383 e110
      lq110f11
Q111 = 0.5679*f12 + 0.8231 e111
      lq111f11

```

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q106	0.45809	1.00000	0.5419
2	Q107	0.38900	1.00000	0.6110
3	Q108	0.42734	1.00000	0.5727
4	Q109	0.57519	1.00000	0.4248
5	Q110	0.54506	1.00000	0.4549
6	Q111	0.67754	1.00000	0.3225

Appendix V-c: The Result of Statistical Analysis of F-21

Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	212	Model Terms	1
Variables	5	Model Matrices	4
Informations	15	Parameters	10

	Variable	Mean	Std Dev
	Q201	5.69340	2.35184
	Q202	5.77830	2.24197
	Q203	5.52830	2.26118
	Q204	6.09906	2.04559
	Q205	5.97642	2.14507

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.0697
Goodness of Fit Index (GFI)	0.9735
GFI Adjusted for Degrees of Freedom (AGFI)	0.9205
Root Mean Square Residual (RMR)	0.0240
Parsimonious GFI (Mulaik, 1989)	0.4867
Chi-Square	14.7055
Chi-Square DF	5
Pr > Chi-Square	0.0117
Independence Model Chi-Square	643.01
Independence Model Chi-Square DF	10
RMSEA Estimate	0.0959
RMSEA 90% Lower Confidence Limit	0.0412
RMSEA 90% Upper Confidence Limit	0.1546
ECVI Estimate	0.1673
ECVI 90% Lower Confidence Limit	0.1296
ECVI 90% Upper Confidence Limit	0.2419
Probability of Close Fit	0.0771
Bentler's Comparative Fit Index	0.9847
Normal Theory Reweighted LS Chi-Square	14.3633
Akaike's Information Criterion	4.7055
Bozdogan's (1987) CAIC	-17.0774
Schwarz's Bayesian Criterion	-12.0774
McDonald's (1989) Centrality	0.9774
Bentler & Bonett's (1980) Non-normed Index	0.9693
Bentler & Bonett's (1980) NFI	0.9771
James, Mulaik, & Brett (1982) Parsimonious NFI	0.4886
Z-Test of Wilson & Hilferty (1931)	2.2635
Bollen (1986) Normed Index Rho1	0.9543
Bollen (1988) Non-normed Index Delta2	0.9848
Hoelter's (1983) Critical N	160

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

```

Q201 = 0.8391*f21 + 1.0000 e201
Std Err 0.0575 lq201f11
t Value 14.6028
Q202 = 0.8536*f21 + 1.0000 e202
Std Err 0.0569 lq202f11
t Value 14.9971
Q203 = 0.8027*f21 + 1.0000 e203
Std Err 0.0588 lq203f11
t Value 13.6518
Q204 = 0.7821*f21 + 1.0000 e204
Std Err 0.0595 lq204f11
t Value 13.1388
Q205 = 0.7584*f21 + 1.0000 e205
Std Err 0.0603 lq205f11
t Value 12.5703
    
```

Manifest Variable Equations with Standardized Estimates

```

Q201 = 0.8391*f21 + 0.5440 e201
      lq201f11
Q202 = 0.8536*f21 + 0.5209 e202
      lq202f11
Q203 = 0.8027*f21 + 0.5965 e203
      lq203f11
Q204 = 0.7821*f21 + 0.6232 e204
      lq204f11
Q205 = 0.7584*f21 + 0.6517 e205
      lq205f11
    
```

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q201	0.29590	1.00000	0.7041
2	Q202	0.27132	1.00000	0.7287
3	Q203	0.35575	1.00000	0.6442
4	Q204	0.38836	1.00000	0.6116
5	Q205	0.42475	1.00000	0.5752

Appendix V-d: The Statistical Analysis of F-22

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	213	Model Terms	1
Variables	6	Model Matrices	4
Informations	21	Parameters	12

Variable		Mean	Std Dev
Q206	Q206	5.91549	2.27629
Q207	Q207	5.91549	2.31329
Q208	Q208	5.83099	2.33504
Q209	Q209	5.85915	2.28797
Q210	Q210	5.91549	2.41700
Q211	Q211	6.17371	2.34176

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.1273
Goodness of Fit Index (GFI)	0.9621
GFI Adjusted for Degrees of Freedom (AGFI)	0.9115
Root Mean Square Residual (RMR)	0.0308
Parsimonious GFI (Mulaik, 1989)	0.5772
Chi-Square	26.9918
Chi-Square DF	9
Pr > Chi-Square	0.0014
Independence Model Chi-Square	763.88
Independence Model Chi-Square DF	15
RMSEA Estimate	0.0971
RMSEA 90% Lower Confidence Limit	0.0563
RMSEA 90% Upper Confidence Limit	0.1403
ECVI Estimate	0.2444
ECVI 90% Lower Confidence Limit	0.1876
ECVI 90% Upper Confidence Limit	0.3383
Probability of Close Fit	0.0312
Bentler's Comparative Fit Index	0.9760
Normal Theory Reweighted LS Chi-Square	25.0812
Akaike's Information Criterion	8.9918
Bozdogan's (1987) CAIC	-30.2598
Schwarz's Bayesian Criterion	-21.2598
McDonald's (1989) Centrality	0.9586
Bentler & Bonett's (1980) Non-normed Index	0.9600
Bentler & Bonett's (1980) NFI	0.9647
James, Mulaik, & Brett (1982) Parsimonious NFI	0.5788
Z-Test of Wilson & Hilferty (1931)	2.9707
Bollen (1986) Normed Index Rho1	0.9411
Bollen (1988) Non-normed Index Delta2	0.9762
Hoelter's (1983) Critical N	134

The SAS System

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

```

Q206 = 0.7154*f22 + 1.0000 e206
Std Err 0.0614 lq206f11
t Value 11.6450
Q207 = 0.7565*f22 + 1.0000 e207
Std Err 0.0601 lq207f11
t Value 12.5890
Q208 = 0.8514*f22 + 1.0000 e208
Std Err 0.0567 lq208f11
t Value 15.0257
Q209 = 0.8083*f22 + 1.0000 e209
Std Err 0.0583 lq209f11
t Value 13.8714
Q210 = 0.8287*f22 + 1.0000 e210
Std Err 0.0575 lq210f11
t Value 14.4071
Q211 = 0.7514*f22 + 1.0000 e211
Std Err 0.0603 lq211f11
t Value 12.4689
    
```

Manifest Variable Equations with Standardized Estimates

```

Q206 = 0.7154*f22 + 0.6987 e206
      lq206f11
Q207 = 0.7565*f22 + 0.6540 e207
      lq207f11
Q208 = 0.8514*f22 + 0.5245 e208
      lq208f11
Q209 = 0.8083*f22 + 0.5887 e209
      lq209f11
Q210 = 0.8287*f22 + 0.5596 e210
      lq210f11
Q211 = 0.7514*f22 + 0.6598 e211
      lq211f11
    
```

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q206	0.48821	1.00000	0.5118
2	Q207	0.42768	1.00000	0.5723
3	Q208	0.27508	1.00000	0.7249
4	Q209	0.34657	1.00000	0.6534
5	Q210	0.31320	1.00000	0.6868
6	Q211	0.43535	1.00000	0.5646

Appendix V-e: The Result of Statistical Analysis: F-31

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	213	Model Terms	1
Variables	3	Model Matrices	4
Informations	6	Parameters	6

Variable		Mean	Std Dev
Q301	Q301	5.82160	2.40599
Q302	Q302	6.26291	2.19914
Q303	Q303	5.96244	2.33483

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.0000
Goodness of Fit Index (GFI)	1.0000
GFI Adjusted for Degrees of Freedom (AGFI)	.
Root Mean Square Residual (RMR)	0.0000
Parsimonious GFI (Mulaik, 1989)	0.0000
Chi-Square	0.0000
Chi-Square DF	0
Pr > Chi-Square	<.0001
Independence Model Chi-Square	256.83
Independence Model Chi-Square DF	3
RMSEA Estimate	0.0000
RMSEA 90% Lower Confidence Limit	.
RMSEA 90% Upper Confidence Limit	.
ECVI Estimate	0.0577
ECVI 90% Lower Confidence Limit	.
ECVI 90% Upper Confidence Limit	.
Probability of Close Fit	.
Bentler's Comparative Fit Index	1.0000
Normal Theory Reweighted LS Chi-Square	0.0000
Akaike's Information Criterion	0.0000
Bozdogan's (1987) CAIC	0.0000
Schwarz's Bayesian Criterion	0.0000
McDonald's (1989) Centrality	1.0000
Bentler & Bonett's (1980) Non-normed Index	.
Bentler & Bonett's (1980) NFI	1.0000
James, Mulaik, & Brett (1982) Parsimonious NFI	0.0000
Z-Test of Wilson & Hilferty (1931)	.
Bollen (1986) Normed Index Rho1	.
Bollen (1988) Non-normed Index Delta2	1.0000
Hoelter's (1983) Critical N	.

The SAS System

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

Q301 = 0.8491*f31 + 1.0000 e301
Std Err 0.0625 lq301f31
t Value 13.5884
Q302 = 0.8346*f31 + 1.0000 e302
Std Err 0.0627 lq302f31
t Value 13.3096
Q303 = 0.6957*f31 + 1.0000 e303
Std Err 0.0646 lq303f31
t Value 10.7716

Manifest Variable Equations with Standardized Estimates

Q301 = 0.8491*f31 + 0.5282 e301
lq301f31
Q302 = 0.8346*f31 + 0.5508 e302
lq302f31
Q303 = 0.6957*f31 + 0.7183 e303
lq303f31

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q301	0.27896	1.00000	0.7210
2	Q302	0.30337	1.00000	0.6966
3	Q303	0.51595	1.00000	0.4840

Appendix V-f: The Result of Statistical Analysis: F-32

The SAS System
Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	213	Model Terms	1
Variables	5	Model Matrices	4
Informations	15	Parameters	10

	Variable	Mean	Std Dev
	Q304	6.44131	2.09280
	Q305	6.09859	2.36816
	Q306	6.33333	2.20776
	Q307	6.56338	2.16140
	Q308	6.33333	2.28545

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.1677
Goodness of Fit Index (GFI)	0.9396
GFI Adjusted for Degrees of Freedom (AGFI)	0.8187
Root Mean Square Residual (RMR)	0.0414
Parsimonious GFI (Mulaik, 1989)	0.4698
Chi-Square	35.5454
Chi-Square DF	5
Pr > Chi-Square	<.0001
Independence Model Chi-Square	546.28
Independence Model Chi-Square DF	10
RMSEA Estimate	0.1698
RMSEA 90% Lower Confidence Limit	0.1199
RMSEA 90% Upper Confidence Limit	0.2243
ECVI Estimate	0.2648
ECVI 90% Lower Confidence Limit	0.1918
ECVI 90% Upper Confidence Limit	0.3740
Probability of Close Fit	0.0001
Bentler's Comparative Fit Index	0.9430
Normal Theory Reweighted LS Chi-Square	34.0971
Akaike's Information Criterion	25.5454
Bozdogan's (1987) CAIC	3.7389
Schwarz's Bayesian Criterion	8.7389
McDonald's (1989) Centrality	0.9308
Bentler & Bonett's (1980) Non-normed Index	0.8861
Bentler & Bonett's (1980) NFI	0.9349
James, Mulaik, & Brett (1982) Parsimonious NFI	0.4675
Z-Test of Wilson & Hilferty (1931)	4.5881
Bollen (1986) Normed Index Rho1	0.8699
Bollen (1988) Non-normed Index Delta2	0.9436
Hoelter's (1983) Critical N	68

The SAS System

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

```

Q304 = 0.8082*f32 + 1.0000 e304
Std Err 0.0594 lq304f32
t Value 13.6072
Q305 = 0.6995*f32 + 1.0000 e305
Std Err 0.0629 lq305f32
t Value 11.1161
Q306 = 0.7525*f32 + 1.0000 e306
Std Err 0.0613 lq306f32
t Value 12.2854
Q307 = 0.8210*f32 + 1.0000 e307
Std Err 0.0590 lq307f32
t Value 13.9260
Q308 = 0.7637*f32 + 1.0000 e308
Std Err 0.0609 lq308f32
t Value 12.5425
    
```

Manifest Variable Equations with Standardized Estimates

```

Q304 = 0.8082*f32 + 0.5889 e304
      lq304f32
Q305 = 0.6995*f32 + 0.7146 e305
      lq305f32
Q306 = 0.7525*f32 + 0.6585 e306
      lq306f32
Q307 = 0.8210*f32 + 0.5709 e307
      lq307f32
Q308 = 0.7637*f32 + 0.6456 e308
      lq308f32
    
```

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q304	0.34686	1.00000	0.6531
2	Q305	0.51064	1.00000	0.4894
3	Q306	0.43368	1.00000	0.5663
4	Q307	0.32597	1.00000	0.6740
5	Q308	0.41677	1.00000	0.5832

Appendix V-g: The Result of Statistical Analysis: F-33

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	212	Model Terms	1
Variables	2	Model Matrices	4
Informations	3	Parameters	4

	Variable	Mean	Std Dev
	Q309 Q309	6.36321	2.39770
	Q310 Q310	6.60849	2.46348

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.0000
Goodness of Fit Index (GFI)	1.0000
GFI Adjusted for Degrees of Freedom (AGFI)	.
Root Mean Square Residual (RMR)	0.0000
Parsimonious GFI (Mulaik, 1989)	-1.0000
Chi-Square	0.0000
Chi-Square DF	-1
Pr > Chi-Square	.
Independence Model Chi-Square	199.19
Independence Model Chi-Square DF	1
RMSEA Estimate	0.0000
RMSEA 90% Lower Confidence Limit	.
RMSEA 90% Upper Confidence Limit	.
ECVI Estimate	0.0000
ECVI 90% Lower Confidence Limit	.
ECVI 90% Upper Confidence Limit	.
Probability of Close Fit	.
Bentler's Comparative Fit Index	0.9950
Normal Theory Reweighted LS Chi-Square	0.0000
Akaike's Information Criterion	2.0000
Bozdogan's (1987) CAIC	6.3566
Schwarz's Bayesian Criterion	5.3566
McDonald's (1989) Centrality	0.9976
Bentler & Bonett's (1980) Non-normed Index	.
Bentler & Bonett's (1980) NFI	1.0000
James, Mulaik, & Brett (1982) Parsimonious NFI	-1.0000
Z-Test of Wilson & Hilferty (1931)	.
Bollen (1986) Normed Index Rho1	.
Bollen (1988) Non-normed Index Delta2	0.9950
Hoelter's (1983) Critical N	.

Manifest Variable Equations with Estimates

Q309 = 0.8344*f33 + 1.0000 e309
 Std Err 0.0548 lq309f33
 t Value 15.2128
 Q310 = 0.9368*f33 + 1.0000 e310
 Std Err 0.0501 lq310f33
 t Value 18.7104

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Standardized Estimates

Q309 = 0.8344*f33 + 0.5512 e309
 lq309f33
 Q310 = 0.9368*f33 + 0.3500 e310
 lq310f33

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q309	0.30380	1.00000	0.6962
2	Q310	0.12248	1.00000	0.8775

Appendix V-h: The Result of Statistical Analysis: F-41

The SAS System
The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	213	Model Terms	1
Variables	5	Model Matrices	4
Informations	15	Parameters	10

	Variable	Mean	Std Dev
	Q401 Q401	6.70423	2.48236
	Q402 Q402	6.59155	2.28558
	Q403 Q403	6.00469	2.43500
	Q405 Q405	6.14085	2.19323
	Q406 Q406	6.22066	2.25981

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.1331
Goodness of Fit Index (GFI)	0.9444
GFI Adjusted for Degrees of Freedom (AGFI)	0.8331
Root Mean Square Residual (RMR)	0.0335
Parsimonious GFI (Mulaik, 1989)	0.4722
Chi-Square	28.2110
Chi-Square DF	5
Pr > Chi-Square	<.0001
Independence Model Chi-Square	654.76
Independence Model Chi-Square DF	10
RMSEA Estimate	0.1480
RMSEA 90% Lower Confidence Limit	0.0977
RMSEA 90% Upper Confidence Limit	0.2033
ECVI Estimate	0.2302
ECVI 90% Lower Confidence Limit	0.1679
ECVI 90% Upper Confidence Limit	0.3288
Probability of Close Fit	0.0012
Bentler's Comparative Fit Index	0.9640
Normal Theory Reweighted LS Chi-Square	31.2312
Akaike's Information Criterion	18.2110
Bozdogan's (1987) CAIC	-3.5955
Schwarz's Bayesian Criterion	1.4045
McDonald's (1989) Centrality	0.9470
Bentler & Bonett's (1980) Non-normed Index	0.9280
Bentler & Bonett's (1980) NFI	0.9569
James, Mulaik, & Brett (1982) Parsimonious NFI	0.4785
Z-Test of Wilson & Hilferty (1931)	3.9119
Bollen (1986) Normed Index Rho1	0.9138
Bollen (1988) Non-normed Index Delta2	0.9643
Hoelter's (1983) Critical N	85

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

Q401 = 0.7967*f41 + 1.0000 e401
 Std Err 0.0589 lq304f41
 t Value 13.5185
 Q402 = 0.8448*f41 + 1.0000 e402
 Std Err 0.0572 lq305f41
 t Value 14.7723
 Q403 = 0.8193*f41 + 1.0000 e403
 Std Err 0.0581 lq403f41
 t Value 14.0970
 Q405 = 0.7788*f41 + 1.0000 e405
 Std Err 0.0596 lq405f41
 t Value 13.0753
 Q406 = 0.7971*f41 + 1.0000 e406
 Std Err 0.0589 lq406f41
 t Value 13.5279

Manifest Variable Equations with Standardized Estimates

Q401 = 0.7967*f41 + 0.6043 e401
 lq304f41
 Q402 = 0.8448*f41 + 0.5351 e402
 lq305f41
 Q403 = 0.8193*f41 + 0.5733 e403
 lq403f41
 Q405 = 0.7788*f41 + 0.6272 e405
 lq405f41
 Q406 = 0.7971*f41 + 0.6038 e406
 lq406f41

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q401	0.36522	1.00000	0.6348
2	Q402	0.28636	1.00000	0.7136
3	Q403	0.32867	1.00000	0.6713
4	Q405	0.39342	1.00000	0.6066
5	Q406	0.36462	1.00000	0.6354

Appendix V-i: The Result of Statistical Analysis: F-42

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	211	Model Terms	1
Variables	4	Model Matrices	4
Informations	10	Parameters	8

	Variable	Mean	Std Dev
	Q404 Q404	5.94787	2.39486
	Q407 Q407	5.98104	2.35425
	Q408 Q408	6.13270	2.35461
	Q409 Q409	5.97630	2.45229

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.0503
Goodness of Fit Index (GFI)	0.9747
GFI Adjusted for Degrees of Freedom (AGFI)	0.8737
Root Mean Square Residual (RMR)	0.0292
Parsimonious GFI (Mulaik, 1989)	0.3249
Chi-Square	10.5620
Chi-Square DF	2
Pr > Chi-Square	0.0051
Independence Model Chi-Square	465.11
Independence Model Chi-Square DF	6
RMSEA Estimate	0.1428
RMSEA 90% Lower Confidence Limit	0.0667
RMSEA 90% Upper Confidence Limit	0.2326
ECVI Estimate	0.1283
ECVI 90% Lower Confidence Limit	0.0963
ECVI 90% Upper Confidence Limit	0.1968
Probability of Close Fit	0.0254
Bentler's Comparative Fit Index	0.9814
Normal Theory Reweighted LS Chi-Square	10.8814
Akaike's Information Criterion	6.5620
Bozdogan's (1987) CAIC	-2.1417
Schwarz's Bayesian Criterion	-0.1417
McDonald's (1989) Centrality	0.9799
Bentler & Bonett's (1980) Non-normed Index	0.9441
Bentler & Bonett's (1980) NFI	0.9773
James, Mulaik, & Brett (1982) Parsimonious NFI	0.3258
Z-Test of Wilson & Hilferty (1931)	2.5576
Bollen (1986) Normed Index Rho1	0.9319
Bollen (1988) Non-normed Index Delta2	0.9815
Hoelter's (1983) Critical N	121

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

Q404 = 0.7240*f42 + 1.0000 e404
 Std Err 0.0620 lq404f42
 t Value 11.6768
 Q407 = 0.7558*f42 + 1.0000 e407
 Std Err 0.0610 lq407f42
 t Value 12.3950
 Q408 = 0.8731*f42 + 1.0000 e408
 Std Err 0.0571 lq408f42
 t Value 15.2827
 Q409 = 0.8704*f42 + 1.0000 e409
 Std Err 0.0572 lq409f42
 t Value 15.2110

Manifest Variable Equations with Standardized Estimates

Q404 = 0.7240*f42 + 0.6898 e404
 lq404f42
 Q407 = 0.7558*f42 + 0.6548 e407
 lq407f42
 Q408 = 0.8731*f42 + 0.4875 e408
 lq408f42
 Q409 = 0.8704*f42 + 0.4924 e409
 lq409f42

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q404	0.47580	1.00000	0.5242
2	Q407	0.42876	1.00000	0.5712
3	Q408	0.23770	1.00000	0.7623
4	Q409	0.24243	1.00000	0.7576

Appendix VI-a: The Result of Statistical Analysis of 2nd-Order Factor: F-1

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	213	Model Terms	1
Variables	8	Model Matrices	4
Informations	36	Parameters	18

Variable		Mean	Std Dev
Q101	Q101	6.02347	2.30553
Q102	Q102	6.25352	2.22158
Q103	Q103	5.88263	2.26548
Q104	Q104	6.59155	1.97564
Q106	Q106	6.08451	2.21112
Q107	Q107	6.24413	2.38045
Q108	Q108	6.17371	2.06564
Q110	Q110	6.36150	2.01546

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.1817
Goodness of Fit Index (GFI)	0.9610
GFI Adjusted for Degrees of Freedom (AGFI)	0.9219
Root Mean Square Residual (RMR)	0.1819
Parsimonious GFI (Mulaik, 1989)	0.6178
Chi-Square	38.5249
Chi-Square DF	18
Pr > Chi-Square	0.0033
Independence Model Chi-Square	770.89
Independence Model Chi-Square DF	28
RMSEA Estimate	0.0733
RMSEA 90% Lower Confidence Limit	0.0409
RMSEA 90% Upper Confidence Limit	0.1054
ECVI Estimate	0.3591
ECVI 90% Lower Confidence Limit	0.2919
ECVI 90% Upper Confidence Limit	0.4644
Probability of Close Fit	0.1079
Bentler's Comparative Fit Index	0.9724
Normal Theory Reweighted LS Chi-Square	34.4384
Akaike's Information Criterion	2.5249
Bozdogan's (1987) CAIC	-75.9783
Schwarz's Bayesian Criterion	-57.9783
McDonald's (1989) Centrality	0.9530
Bentler & Bonett's (1980) Non-normed Index	0.9570
Bentler & Bonett's (1980) NFI	0.9500
James, Mulaik, & Brett (1982) Parsimonious NFI	0.6107
Z-Test of Wilson & Hilferty (1931)	2.7095
Bollen (1986) Normed Index Rho1	0.9223
Bollen (1988) Non-normed Index Delta2	0.9727
Hoelter's (1983) Critical N	160

Distribution of Normalized Residuals

Each * Represents 1 Residuals

-----Range-----	Freq	Percent	
-1.00000 -0.75000	2	5.56	**
-0.75000 -0.50000	5	13.89	*****
-0.50000 -0.25000	3	8.33	***
-0.25000 0	2	5.56	**
0 0.25000	16	44.44	*****
0.25000 0.50000	3	8.33	***
0.50000 0.75000	2	5.56	**
0.75000 1.00000	1	2.78	*
1.00000 1.25000	2	5.56	**

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

Q101 = 0.9549*f11 + 1.0000 e101
 Std Err 0.0835 lq101f11
 t Value 11.4301
 Q102 = 0.9994*f11 + 1.0000 e102
 Std Err 0.0820 lq102f11
 t Value 12.1886
 Q103 = 0.8884*f11 + 1.0000 e103
 Std Err 0.0822 lq103f11
 t Value 10.8106
 Q104 = 0.6526*f11 + 1.0000 e104
 Std Err 0.0729 lq104f11
 t Value 8.9496
 Q106 = 0.9628*f12 + 1.0000 e106
 Std Err 0.1012 lq106f12
 t Value 9.5163
 Q107 = 1.1224*f12 + 1.0000 e107
 Std Err 0.1119 lq107f12
 t Value 10.0294
 Q108 = 0.8834*f12 + 1.0000 e108
 Std Err 0.0943 lq108f12
 t Value 9.3670
 Q110 = 0.6993*f12 + 1.0000 e110
 Std Err 0.0892 lq110f12
 t Value 7.8396

Latent Variable Equations with Estimates

f11 = 1.6111*f1 + 1.0000 d1
 Std Err 0.1584 pf11f1
 t Value 10.1708
 f12 = 1.4320*f1 + 1.0000 d2
 Std Err 0.1889 pf12f1
 t Value 7.5820

Manifest Variable Equations with Standardized Estimates

$$\begin{aligned}
 Q101 &= 0.7854*f11 + 0.6190 \text{ e101} \\
 &\quad \text{lq101f11} \\
 Q102 &= 0.8530*f11 + 0.5219 \text{ e102} \\
 &\quad \text{lq102f11} \\
 Q103 &= 0.7436*f11 + 0.6687 \text{ e103} \\
 &\quad \text{lq103f11} \\
 Q104 &= 0.6264*f11 + 0.7795 \text{ e104} \\
 &\quad \text{lq104f11} \\
 Q106 &= 0.7605*f12 + 0.6493 \text{ e106} \\
 &\quad \text{lq106f12} \\
 Q107 &= 0.8236*f12 + 0.5672 \text{ e107} \\
 &\quad \text{lq107f12} \\
 Q108 &= 0.7470*f12 + 0.6649 \text{ e108} \\
 &\quad \text{lq108f12} \\
 Q110 &= 0.6060*f12 + 0.7955 \text{ e110} \\
 &\quad \text{lq110f12}
 \end{aligned}$$

Latent Variable Equations with Standardized Estimates

$$\begin{aligned}
 f11 &= 0.8496*f1 + 0.5274 \text{ d1} \\
 &\quad \text{pf11f1} \\
 f12 &= 0.8199*f1 + 0.5725 \text{ d2} \\
 &\quad \text{pf12f1}
 \end{aligned}$$

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q101	2.03666	5.31548	0.6168
2	Q102	1.34442	4.93542	0.7276
3	Q103	2.29473	5.13239	0.5529
4	Q104	2.37163	3.90314	0.3924
5	Q106	2.06129	4.88905	0.5784
6	Q107	1.82314	5.66653	0.6783
7	Q108	1.88609	4.26685	0.5580
8	Q110	2.57046	4.06210	0.3672
9	f11	1.00000	3.59559	0.7219
10	f12	1.00000	3.05059	0.6722

Appendix VI-b: The Result of Statistical Analysis of 2ne-Order Factor: F-2

The SAS System

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	212	Model Terms	1
Variables	9	Model Matrices	4
Informations	45	Parameters	20

Variable		Mean	Std Dev
Q201	Q201	5.69340	2.35184
Q202	Q202	5.77830	2.24197
Q203	Q203	5.52830	2.26118
Q205	Q205	5.97642	2.14507
Q207	Q207	5.91038	2.31756
Q208	Q208	5.82075	2.33578
Q209	Q209	5.84434	2.28312
Q210	Q210	5.91038	2.42156
Q211	Q211	6.16981	2.34661

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.2314
Goodness of Fit Index (GFI)	0.9515
GFI Adjusted for Degrees of Freedom (AGFI)	0.9127
Root Mean Square Residual (RMR)	0.1633
Parsimonious GFI (Mulaik, 1989)	0.6608
Chi-Square	48.8323
Chi-Square DF	25
Pr > Chi-Square	0.0030
Independence Model Chi-Square	1259.0
Independence Model Chi-Square DF	36
RMSEA Estimate	0.0672
RMSEA 90% Lower Confidence Limit	0.0384
RMSEA 90% Upper Confidence Limit	0.0951
ECVI Estimate	0.4304
ECVI 90% Lower Confidence Limit	0.3538
ECVI 90% Upper Confidence Limit	0.5459
Probability of Close Fit	0.1467
Bentler's Comparative Fit Index	0.9805
Normal Theory Reweighted LS Chi-Square	48.4165
Akaike's Information Criterion	-1.1677
Bozdogan's (1987) CAIC	-110.0824
Schwarz's Bayesian Criterion	-85.0824
McDonald's (1989) Centrality	0.9453
Bentler & Bonett's (1980) Non-normed Index	0.9719
Bentler & Bonett's (1980) NFI	0.9612
James, Mulaik, & Brett (1982) Parsimonious NFI	0.6675
Z-Test of Wilson & Hilferty (1931)	2.7463
Bollen (1986) Normed Index Rho1	0.9441
Bollen (1988) Non-normed Index Delta2	0.9807
Hoelter's (1983) Critical N	164

Distribution of Normalized Residuals

Each * Represents 1 Residuals

-----Range-----	Freq	Percent	
-1.25000 -1.00000	1	2.22	*
-1.00000 -0.75000	3	6.67	***
-0.75000 -0.50000	0	0.00	
-0.50000 -0.25000	6	13.33	*****
-0.25000 0	6	13.33	*****
0 0.25000	18	40.00	*****
0.25000 0.50000	6	13.33	*****
0.50000 0.75000	4	8.89	****
0.75000 1.00000	1	2.22	*

Manifest Variable Equations with Estimates

Q201 = 0.8963*f21 + 1.0000 e201
 Std Err 0.0755 lq201f21
 t Value 11.8783
 Q202 = 0.8652*f21 + 1.0000 e202
 Std Err 0.0722 lq202f21
 t Value 11.9789
 Q203 = 0.8206*f21 + 1.0000 e203
 Std Err 0.0722 lq203f21
 t Value 11.3630
 Q205 = 0.6977*f21 + 1.0000 e205
 Std Err 0.0684 lq204f21
 t Value 10.2062
 Q207 = 0.8191*f22 + 1.0000 e207
 Std Err 0.0820 lq207f22
 t Value 9.9867
 Q208 = 0.9545*f22 + 1.0000 e208
 Std Err 0.0844 lq208f22
 t Value 11.3126
 Q209 = 0.8950*f22 + 1.0000 e209
 Std Err 0.0819 lq209f22
 t Value 10.9347
 Q210 = 0.9616*f22 + 1.0000 e210
 Std Err 0.0869 lq210f22
 t Value 11.0674
 Q211 = 0.8423*f22 + 1.0000 e211
 Std Err 0.0831 lq211f22
 t Value 10.1306

Latent Variable Equations with Estimates

f21 = 1.9929*f2 + 1.0000 d1
 Std Err 0.1923 pf21f2
 t Value 10.3617
 f22 = 1.8346*f2 + 1.0000 d2
 Std Err 0.2032 pf22f2
 t Value 9.0268

Manifest Variable Equations with Standardized Estimates

Q201 = 0.8497*f21 + 0.5272 e201
 lq201f21
 Q202 = 0.8605*f21 + 0.5095 e202
 lq202f21
 Q203 = 0.8091*f21 + 0.5876 e203
 lq203f21
 Q205 = 0.7253*f21 + 0.6885 e205
 lq204f21
 Q207 = 0.7385*f22 + 0.6743 e207
 lq207f22
 Q208 = 0.8539*f22 + 0.5205 e208
 lq208f22
 Q209 = 0.8191*f22 + 0.5737 e209
 lq209f22
 Q210 = 0.8297*f22 + 0.5583 e210
 lq210f22
 Q211 = 0.7500*f22 + 0.6614 e211
 lq211f22

Latent Variable Equations with Standardized Estimates

f21 = 0.8938*f2 + 0.4485 d1
 pf21f2
 f22 = 0.8780*f2 + 0.4786 d2
 pf22f2

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q201	1.53737	5.53110	0.7221
2	Q202	1.30489	5.02641	0.7404
3	Q203	1.76538	5.11291	0.6547
4	Q205	2.18085	4.60131	0.5260
5	Q207	2.44184	5.37106	0.5454
6	Q208	1.47812	5.45584	0.7291
7	Q209	1.71535	5.21260	0.6709
8	Q210	1.82746	5.86394	0.6884
9	Q211	2.40918	5.50655	0.5625
10	f21	1.00000	4.97173	0.7989
11	f22	1.00000	4.36561	0.7709

Appendix VI-c: The Result of Statistical Analysis of 2nd-Order Factor: F-3

The SAS System

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	212	Model Terms	1
Variables	7	Model Matrices	4
Informations	28	Parameters	17

Variable		Mean	Std Dev
Q301	Q301	5.81604	2.41031
Q302	Q302	6.25943	2.20376
Q303	Q303	5.94340	2.32371
Q305	Q305	6.08019	2.35844
Q306	Q306	6.33962	2.21107
Q308	Q308	6.33962	2.28901
Q310	Q310	6.60849	2.46348

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.1531
Goodness of Fit Index (GFI)	0.9597
GFI Adjusted for Degrees of Freedom (AGFI)	0.9059
Root Mean Square Residual (RMR)	0.2284
Parsimonious GFI (Mulaik, 1989)	0.5484
Chi-Square	32.3117
Chi-Square DF	12
Pr > Chi-Square	0.0012
Independence Model Chi-Square	663.13
Independence Model Chi-Square DF	21
RMSEA Estimate	0.0896
RMSEA 90% Lower Confidence Limit	0.0530
RMSEA 90% Upper Confidence Limit	0.1275
ECVI Estimate	0.3108
ECVI 90% Lower Confidence Limit	0.2478
ECVI 90% Upper Confidence Limit	0.4115
Probability of Close Fit	0.0389
Bentler's Comparative Fit Index	0.9684
Normal Theory Reweighted LS Chi-Square	31.0520
Akaike's Information Criterion	8.3117
Bozdogan's (1987) CAIC	-43.9674
Schwarz's Bayesian Criterion	-31.9674
McDonald's (1989) Centrality	0.9532
Bentler & Bonett's (1980) Non-normed Index	0.9446
Bentler & Bonett's (1980) NFI	0.9513
James, Mulaik, & Brett (1982) Parsimonious NFI	0.5436
Z-Test of Wilson & Hilferty (1931)	3.0109
Bollen (1986) Normed Index Rho1	0.9147
Bollen (1988) Non-normed Index Delta2	0.9688
Hoelter's (1983) Critical N	139

Distribution of Normalized Residuals

Each * Represents 1 Residuals

-----Range-----		Freq	Percent	
-1.00000	-0.75000	1	3.57	*
-0.75000	-0.50000	1	3.57	*
-0.50000	-0.25000	6	21.43	*****
-0.25000	0	3	10.71	***
0	0.25000	11	39.29	*****
0.25000	0.50000	2	7.14	**
0.50000	0.75000	0	0.00	
0.75000	1.00000	2	7.14	**
1.00000	1.25000	1	3.57	*
1.25000	1.50000	0	0.00	
1.50000	1.75000	0	0.00	
1.75000	2.00000	1	3.57	*

Manifest Variable Equations with Estimates

Q301 = 1.3558*f31 + 1.0000 e301
 Std Err 0.1609 lq301f31
 t Value 8.4238
 Q302 = 1.1968*f31 + 1.0000 e302
 Std Err 0.1438 lq302f31
 t Value 8.3215
 Q303 = 1.1358*f31 + 1.0000 e303
 Std Err 0.1445 lq303f31
 t Value 7.8631
 Q305 = 0.0966*f32 + 1.0000 e305
 Std Err 2.2675 lq305f32
 t Value 0.0426
 Q306 = 0.0904*f32 + 1.0000 e306
 Std Err 2.1214 lq306f32
 t Value 0.0426
 Q308 = 0.1030*f32 + 1.0000 e308
 Std Err 2.4175 lq308f32
 t Value 0.0426
 Q310 = 2.1145*f33 + 1.0000 e310
 Std Err 0.1154 lq310f33
 t Value 18.3241

Latent Variable Equations with Estimates

f31 = 1.1145*f3 + 1.0000 d1
 Std Err 0.2132 pf31f3
 t Value 5.2270
 f32 = 18.2689*f3 + 1.0000 d2
 Std Err 430.1 pf32f3
 t Value 0.0425
 f33 = 0.5978*f3 + 1.0000 d3
 Std Err 0.0978 pf33f3
 t Value 6.1108

Variances of Exogenous Variables

Variable	Parameter	Estimate	Standard Error	t Value
f3		1.00000		
e301	vare301	1.68798	0.27860	6.06
e302	vare302	1.64502	0.24003	6.85
e303	vare303	2.50684	0.30115	8.32
e305	vare305	2.43743	0.30785	7.92
e306	vare306	2.15377	0.27122	7.94
e308	vare308	1.68827	0.26372	6.40
e310	vare310	0	0	.
d1		1.00000		
d2		1.00000		
d3		1.00000		

Manifest Variable Equations with Standardized Estimates

Q301	=	0.8423*f31	+	0.5390 e301
		lq301f31		
Q302	=	0.8132*f31	+	0.5820 e302
		lq302f31		
Q303	=	0.7319*f31	+	0.6814 e303
		lq303f31		
Q305	=	0.7495*f32	+	0.6620 e305
		lq305f32		
Q306	=	0.7479*f32	+	0.6638 e306
		lq306f32		
Q308	=	0.8232*f32	+	0.5677 e308
		lq308f32		
Q310	=	1.0000*f33	+	0 e310
		lq310f33		

Latent Variable Equations with Standardized Estimates

f31	=	0.7443*f3	+	0.6678 d1
		pf31f3		
f32	=	0.9985*f3	+	0.0547 d2
		pf32f3		
f33	=	0.5131*f3	+	0.8583 d3
		pf33f3		

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q301	1.68798	5.80960	0.7094
2	Q302	1.64502	4.85654	0.6613
3	Q303	2.50684	5.39962	0.5357
4	Q305	2.43743	5.56124	0.5617
5	Q306	2.15377	4.88796	0.5594
6	Q308	1.68827	5.23841	0.6777
7	Q310	0	6.06874	1.0000
8	f31	1.00000	2.24221	0.5540
9	f32	1.00000	334.75400	0.9970
10	f33	1.00000	1.35737	0.2633

Appendix VI-d: The Result of Statistical Analysis of 2nd-Order Factor: F-4

The SAS System
The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	211	Model Terms	1
Variables	7	Model Matrices	4
Informations	28	Parameters	16

	Variable	Mean	Std Dev
	Q402 Q402	6.60190	2.28927
	Q403 Q403	6.02370	2.43084
	Q404 Q404	5.94787	2.39486
	Q405 Q405	6.15640	2.19723
	Q406 Q406	6.21801	2.26566
	Q407 Q407	5.98104	2.35425
	Q409 Q409	5.97630	2.45229

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.0891
Goodness of Fit Index (GFI)	0.9764
GFI Adjusted for Degrees of Freedom (AGFI)	0.9450
Root Mean Square Residual (RMR)	0.1301
Parsimonious GFI (Mulaik, 1989)	0.5579
Chi-Square	18.7124
Chi-Square DF	12
Pr > Chi-Square	0.0957
Independence Model Chi-Square	926.70
Independence Model Chi-Square DF	21
RMSEA Estimate	0.0516
RMSEA 90% Lower Confidence Limit	.
RMSEA 90% Upper Confidence Limit	0.0946
ECVI Estimate	0.2475
ECVI 90% Lower Confidence Limit	.
ECVI 90% Upper Confidence Limit	0.3244
Probability of Close Fit	0.4293
Bentler's Comparative Fit Index	0.9926
Normal Theory Reweighted LS Chi-Square	17.7565
Akaike's Information Criterion	-5.2876
Bozdogan's (1987) CAIC	-57.5099
Schwarz's Bayesian Criterion	-45.5099
McDonald's (1989) Centrality	0.9842
Bentler & Bonett's (1980) Non-normed Index	0.9870
Bentler & Bonett's (1980) NFI	0.9798
James, Mulaik, & Brett (1982) Parsimonious NFI	0.5599
Z-Test of Wilson & Hilferty (1931)	1.3090
Bollen (1986) Normed Index Rho1	0.9647
Bollen (1988) Non-normed Index Delta2	0.9927
Hoelter's (1983) Critical N	237

Distribution of Normalized Residuals

Each * Represents 1 Residuals

-----Range-----		Freq	Percent	
-1.00000	-0.75000	1	3.57	*
-0.75000	-0.50000	2	7.14	**
-0.50000	-0.25000	1	3.57	*
-0.25000	0	6	21.43	*****
0	0.25000	14	50.00	*****
0.25000	0.50000	3	10.71	***
0.50000	0.75000	1	3.57	*

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

Q402	=	0.5040*f41	+	1.0000 e402
Std Err		0.0820 lq402f41		
t Value		6.1475		
Q403	=	0.5949*f41	+	1.0000 e403
Std Err		0.0941 lq403f41		
t Value		6.3240		
Q404	=	0.5304*f42	+	1.0000 e404
Std Err		0.0856 lq404f42		
t Value		6.1992		
Q405	=	0.5151*f41	+	1.0000 e405
Std Err		0.0823 lq405f41		
t Value		6.2608		
Q406	=	0.5360*f41	+	1.0000 e406
Std Err		0.0854 lq406f41		
t Value		6.2758		
Q407	=	0.5535*f42	+	1.0000 e407
Std Err		0.0884 lq407f42		
t Value		6.2589		
Q409	=	0.5347*f42	+	1.0000 e409
Std Err		0.0866 lq409f42		
t Value		6.1748		

Latent Variable Equations with Estimates

f41	=	3.3285*f4	+	1.0000 d1
Std Err		0.5648 pf41f4		
t Value		5.8936		
f42	=	3.3730*f4	+	1.0000 d2
Std Err		0.5543 pf42f4		
t Value		6.0854		

Manifest Variable Equations with Standardized Estimates

$$\begin{aligned}
 Q402 &= 0.7651*f41 + 0.6439 e402 \\
 &\quad lq402f41 \\
 Q403 &= 0.8506*f41 + 0.5259 e403 \\
 &\quad lq403f41 \\
 Q404 &= 0.7791*f42 + 0.6269 e404 \\
 &\quad lq404f42 \\
 Q405 &= 0.8147*f41 + 0.5798 e405 \\
 &\quad lq405f41 \\
 Q406 &= 0.8222*f41 + 0.5693 e406 \\
 &\quad lq406f41 \\
 Q407 &= 0.8271*f42 + 0.5621 e407 \\
 &\quad lq407f42 \\
 Q409 &= 0.7670*f42 + 0.6416 e409 \\
 &\quad lq409f42
 \end{aligned}$$

Latent Variable Equations with Standardized Estimates

$$\begin{aligned}
 f41 &= 0.9577*f4 + 0.2877 d1 \\
 &\quad pf41f4 \\
 f42 &= 0.9588*f4 + 0.2842 d2 \\
 &\quad pf42f4
 \end{aligned}$$

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	Q402	2.17307	5.24076	0.5854
2	Q403	1.63417	5.90896	0.7234
3	Q404	2.25401	5.73536	0.6070
4	Q405	1.62318	4.82780	0.6638
5	Q406	1.66346	5.13320	0.6759
6	Q407	1.75124	5.54250	0.6840
7	Q409	2.47548	6.01372	0.5884
8	f41	1.00000	12.07906	0.9172
9	f42	1.00000	12.37721	0.9192

Appendix VII: The Result of Statistical Analysis of the Final Measurement Model

The SAS System

The CALIS Procedure

Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	209	Model Terms	1
Variables	9	Model Matrices	4
Informations	45	Parameters	24

	Variable	Mean	Std Dev
	FS11	0.00445	1.00241
	FS12	0.00889	0.99749
	FS21	0.01283	1.00105
	FS22	0.01039	1.00018
	FS31	0.00452	0.99596
	FS32	-0.0004132	1.00830
	FS33	0.01443	0.98593
	FS41	-0.00151	1.00503
	FS42	0.00632	0.99245

Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.3388
Goodness of Fit Index (GFI)	0.9323
GFI Adjusted for Degrees of Freedom (AGFI)	0.8550
Root Mean Square Residual (RMR)	0.0559
Parsimonious GFI (Mulaik, 1989)	0.5439
Chi-Square	70.4672
Chi-Square DF	21
Pr > Chi-Square	<.0001
Independence Model Chi-Square	1168.7
Independence Model Chi-Square DF	36
RMSEA Estimate	0.1064
RMSEA 90% Lower Confidence Limit	0.0796
RMSEA 90% Upper Confidence Limit	0.1343
ECVI Estimate	0.5812
ECVI 90% Lower Confidence Limit	0.4750
ECVI 90% Upper Confidence Limit	0.7259
Probability of Close Fit	0.0005
Bentler's Comparative Fit Index	0.9563
Normal Theory Reweighted LS Chi-Square	67.9530
Akaike's Information Criterion	28.4672
Bozdogan's (1987) CAIC	-62.7218
Schwarz's Bayesian Criterion	-41.7218
McDonald's (1989) Centrality	0.8884
Bentler & Bonett's (1980) Non-normed Index	0.9251
Bentler & Bonett's (1980) NFI	0.9397
James, Mulaik, & Brett (1982) Parsimonious NFI	0.5482
Z-Test of Wilson & Hilferty (1931)	4.9354
Bollen (1986) Normed Index Rho1	0.8966
Bollen (1988) Non-normed Index Delta2	0.9569
Hoelter's (1983) Critical N	98

Distribution of Asymptotically Standardized Residuals

Each * Represents 1 Residuals

-----Range-----	Freq	Percent	
-3.75000 -3.50000	1	2.22	*
-3.50000 -3.25000	0	0.00	
-3.25000 -3.00000	2	4.44	**
-3.00000 -2.75000	0	0.00	
-2.75000 -2.50000	0	0.00	
-2.50000 -2.25000	1	2.22	*
-2.25000 -2.00000	1	2.22	*
-2.00000 -1.75000	1	2.22	*
-1.75000 -1.50000	0	0.00	
-1.50000 -1.25000	1	2.22	*
-1.25000 -1.00000	1	2.22	*
-1.00000 -0.75000	1	2.22	*
-0.75000 -0.50000	4	8.89	****
-0.50000 -0.25000	0	0.00	
-0.25000 0	2	4.44	**
0 0.25000	15	33.33	*****
0.25000 0.50000	2	4.44	**
0.50000 0.75000	2	4.44	**
0.75000 1.00000	2	4.44	**
1.00000 1.25000	2	4.44	**
1.25000 1.50000	1	2.22	*
1.50000 1.75000	1	2.22	*
1.75000 2.00000	0	0.00	
2.00000 2.25000	2	4.44	**
2.25000 2.50000	2	4.44	**
2.50000 2.75000	0	0.00	
2.75000 3.00000	0	0.00	
3.00000 3.25000	0	0.00	
3.25000 3.50000	0	0.00	
3.50000 3.75000	0	0.00	
3.75000 4.00000	0	0.00	
4.00000 4.25000	0	0.00	
4.25000 4.50000	0	0.00	
4.50000 4.75000	1	2.22	*

Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

FS11 = 0.9264*F1 + 1.0000 e1
 Std Err 0.0599 Lfs11F1
 t Value 15.4728
 FS12 = 0.6304*F1 + 1.0000 e2
 Std Err 0.0649 Lfs12F1
 t Value 9.7195
 FS21 = 1.0511*F2 + 1.0000 e3
 Std Err 0.0604 Lfs21F2
 t Value 17.3988

```

FS22   =  0.6653*F2      +  1.0000 e4
Std Err  0.0659 Lfs22F2
t Value  10.0965
FS31   =  0.7870*F3      +  1.0000 e5
Std Err  0.0603 Lfs31F3
t Value  13.0491
FS32   =  0.8915*F3      +  1.0000 e6
Std Err  0.0582 Lfs32F3
t Value  15.3070
FS33   =  0.5430*F3      +  1.0000 e7
Std Err  0.0664 Lfs33F3
t Value   8.1742
FS41   =  0.9739*F4      +  1.0000 e8
Std Err  0.0548 Lfs41F4
t Value  17.7700
FS42   =  0.8031*F4      +  1.0000 e9
Std Err  0.0590 Lfs42F4
t Value  13.6234

```

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Standardized Estimates

```

FS11   =  0.9242*F1      +  0.3819 e1
          Lfs11F1
FS12   =  0.6320*F1      +  0.7750 e2
          Lfs12F1
FS21   =  1.0500*F2      +  1.0000 e3
          Lfs21F2
FS22   =  0.6651*F2      +  0.7467 e4
          Lfs22F2
FS31   =  0.7901*F3      +  0.6129 e5
          Lfs31F3
FS32   =  0.8841*F3      +  0.4672 e6
          Lfs32F3
FS33   =  0.5508*F3      +  0.8347 e7
          Lfs33F3
FS41   =  0.9690*F4      +  0.2471 e8
          Lfs41F4
FS42   =  0.8092*F4      +  0.5875 e9
          Lfs42F4

```

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	FS11	0.14652	1.00482	0.8542
2	FS12	0.59757	0.99498	0.3994
3	FS21	-0.10272	1.00210	1.1025
4	FS22	0.55780	1.00036	0.4424
5	FS31	0.37264	0.99194	0.6243
6	FS32	0.22195	1.01667	0.7817
7	FS33	0.67720	0.97207	0.3033
8	FS41	0.06168	1.01008	0.9389
9	FS42	0.33995	0.98497	0.6549

Correlations Among Exogenous Variables

Var1	Var2	Parameter	Estimate
F1	F2	CF1F2	0.74167
F1	F3	CF1F3	0.77703
F2	F3	CF2F3	0.56377
F1	F4	CF1F4	0.73827
F2	F4	CF2F4	0.53696
F3	F4	CF3F4	0.82065

Appendix VIII: The Result of Statistical Analysis of the Final Structural Model

The SAS System
The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	209	Model Terms	1
Variables	9	Model Matrices	4
Informations	45	Parameters	22

Variable		Mean	Std Dev
FS11	FS11	0.00445	1.00241
FS12	FS12	0.00889	0.99749
FS21	FS21	0.01283	1.00105
FS22	FS22	0.01039	1.00018
FS31	FS31	0.00452	0.99596
FS32	FS32	-0.0004132	1.00830
FS33	FS33	0.01443	0.98593
FS41	FS41	-0.00151	1.00503
FS42	FS42	0.00632	0.99245

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.3391
Goodness of Fit Index (GFI)	0.9320
GFI Adjusted for Degrees of Freedom (AGFI)	0.8670
Root Mean Square Residual (RMR)	0.0562
Parsimonious GFI (Mulaik, 1989)	0.5955
Chi-Square	70.5372
Chi-Square DF	23
Pr > Chi-Square	<.0001
Independence Model Chi-Square	1168.7
Independence Model Chi-Square DF	36
RMSEA Estimate	0.0997
RMSEA 90% Lower Confidence Limit	0.0737
RMSEA 90% Upper Confidence Limit	0.1266
ECVI Estimate	0.5613
ECVI 90% Lower Confidence Limit	0.4562
ECVI 90% Upper Confidence Limit	0.7051
Probability of Close Fit	0.0014
Bentler's Comparative Fit Index	0.9580
Normal Theory Reweighted LS Chi-Square	68.2407
Akaike's Information Criterion	24.5372
Bozdogan's (1987) CAIC	-75.3365
Schwarz's Bayesian Criterion	-52.3365
McDonald's (1989) Centrality	0.8925
Bentler & Bonett's (1980) Non-normed Index	0.9343
Bentler & Bonett's (1980) NFI	0.9396
James, Mulaik, & Brett (1982) Parsimonious NFI	0.6003
Z-Test of Wilson & Hilferty (1931)	4.7057
Bollen (1986) Normed Index Rho1	0.9055
Bollen (1988) Non-normed Index Delta2	0.9585
Hoelter's (1983) Critical N	105

Distribution of Asymptotically Standardized Residuals

Each * Represents 1 Residuals

-----Range-----	Freq	Percent	
-3.50000 -3.25000	1	2.22	*
-3.25000 -3.00000	2	4.44	**
-3.00000 -2.75000	0	0.00	
-2.75000 -2.50000	0	0.00	
-2.50000 -2.25000	1	2.22	*
-2.25000 -2.00000	1	2.22	*
-2.00000 -1.75000	1	2.22	*
-1.75000 -1.50000	0	0.00	
-1.50000 -1.25000	1	2.22	*
-1.25000 -1.00000	1	2.22	*
-1.00000 -0.75000	0	0.00	
-0.75000 -0.50000	4	8.89	****
-0.50000 -0.25000	2	4.44	**
-0.25000 0	3	6.67	***
0 0.25000	12	26.67	*****
0.25000 0.50000	4	8.89	****
0.50000 0.75000	1	2.22	*
0.75000 1.00000	2	4.44	**
1.00000 1.25000	2	4.44	**
1.25000 1.50000	1	2.22	*
1.50000 1.75000	2	4.44	**
1.75000 2.00000	1	2.22	*
2.00000 2.25000	0	0.00	
2.25000 2.50000	2	4.44	**
2.50000 2.75000	0	0.00	
2.75000 3.00000	0	0.00	
3.00000 3.25000	0	0.00	
3.25000 3.50000	0	0.00	
3.50000 3.75000	0	0.00	
3.75000 4.00000	0	0.00	
4.00000 4.25000	0	0.00	
4.25000 4.50000	1	2.22	*

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Estimates

```

FS11  =  1.0000 F1      +  1.0000 e11
FS12  =  0.6749*F1     +  1.0000 e12
Std Err    0.0674 Lfs11F1
t Value   10.0147
FS21  =  1.0000 F2      +  1.0000 e21
FS22  =  0.6308*F2     +  1.0000 e22
Std Err    0.0681 Lfs22F2
t Value    9.2644
FS31  =  0.8826*F3      +  1.0000 e31
Std Err    0.0667 Lfs31F3
t Value   13.2410
FS32  =  1.0000 F3      +  1.0000 e32
FS33  =  0.6090*F3     +  1.0000 e33
Std Err    0.0738 Lfs33F3
t Value    8.2554
FS41  =  1.0000 F4      +  1.0000 e41
FS42  =  0.8245*F4     +  1.0000 e42
Std Err    0.0552 Lfs42F4
t Value   14.9332

```

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Latent Variable Equations with Estimates

```

F2    =  0.8307*F1      +  1.0000 D1
Std Err    0.0628 PF2F1
t Value   13.2343
F4    =  0.2591*F1      +  0.6874*F3      +  1.0000 D2
Std Err    0.0996 PF4F1      0.1112 PF3F4
t Value    2.6028          6.1804

```

Covariances Among Exogenous Variables

Var1	Var2	Parameter	Estimate	Standard Error	t Value
F1	F3	CF1F3	0.64100	0.08204	7.81

The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Manifest Variable Equations with Standardized Estimates

$$\begin{aligned}
 \text{FS11} &= 0.9298 \text{ F1} &+& 0.3682 \text{ e11} \\
 \text{FS12} &= 0.6306 * \text{F1} &+& 0.7761 \text{ e12} \\
 &&& \text{Lfs11F1} \\
 \text{FS21} &= 1.0517 \text{ F2} &+& 1.0000 \text{ e21} \\
 \text{FS22} &= 0.6640 * \text{F2} &+& 0.7477 \text{ e22} \\
 &&& \text{Lfs22F2} \\
 \text{FS31} &= 0.7901 * \text{F3} &+& 0.6130 \text{ e31} \\
 &&& \text{Lfs31F3} \\
 \text{FS32} &= 0.8842 \text{ F3} &+& 0.4671 \text{ e32} \\
 \text{FS33} &= 0.5507 * \text{F3} &+& 0.8347 \text{ e33} \\
 &&& \text{Lfs33F3} \\
 \text{FS41} &= 0.9691 \text{ F4} &+& 0.2467 \text{ e41} \\
 \text{FS42} &= 0.8091 * \text{F4} &+& 0.5876 \text{ e42} \\
 &&& \text{Lfs42F4}
 \end{aligned}$$

Covariance Structure Analysis: Maximum Likelihood Estimation

Latent Variable Equations with Standardized Estimates

$$\begin{aligned}
 \text{F2} &= 0.7354 * \text{F1} &+& 0.6776 \text{ D1} \\
 &&& \text{PF2F1} \\
 \text{F4} &= 0.2480 * \text{F1} &+& 0.6293 * \text{F3} &+& 0.5494 \text{ D2} \\
 &&& \text{PF4F1} && \text{PF3F4}
 \end{aligned}$$

Squared Multiple Correlations

	Variable	Error Variance	Total Variance	R-Square
1	FS11	0.13620	1.00482	0.8645
2	FS12	0.59933	0.99498	0.3976
3	FS21	-0.10635	1.00210	1.1061
4	FS22	0.55925	1.00036	0.4410
5	FS31	0.37275	0.99194	0.6242
6	FS32	0.22177	1.01667	0.7819
7	FS33	0.67726	0.97207	0.3033
8	FS41	0.06146	1.01008	0.9392
9	FS42	0.34009	0.98497	0.6547
10	F2	0.50898	1.10845	0.5408
11	F4	0.28629	0.94862	0.6982

Correlations Among Exogenous Variables

Var1	Var2	Parameter	Estimate
F1	F3	CF1F3	0.77141

Appendix IX: Questionnaire

I. The following questions ask the level of your perception as a manager who has to deal with day-to-day operations. Do you think the top management of your company works hard enough to collect the following information for you to use? Please indicate the level of its effort that you think is most appropriate.

	None (0) ←	→ Sufficient (10)
23) Trends of purchasing behavior of your customers.....	0	1 2 3 4 5 6 7 8 9 10
24) Customers' price-value related behavior.....	0	1 2 3 4 5 6 7 8 9 10
25) Demographic changes in your customer base.....	0	1 2 3 4 5 6 7 8 9 10
26) Customers' needs and wants in general.....	0	1 2 3 4 5 6 7 8 9 10
27) General information about customer base.....	0	1 2 3 4 5 6 7 8 9 10
28) Existing competitors' expansion plans in your area.....	0	1 2 3 4 5 6 7 8 9 10
29) Possible entry of new competitors into your local market.....	0	1 2 3 4 5 6 7 8 9 10
30) Products and services developed by competitors.....	0	1 2 3 4 5 6 7 8 9 10
31) Competitors' pricing strategies.....	0	1 2 3 4 5 6 7 8 9 10
32) General information about competitors.....	0	1 2 3 4 5 6 7 8 9 10
33) Competitors' employee compensation policies.....	0	1 2 3 4 5 6 7 8 9 10

II. The following questions ask about your perception about the usefulness of information delivered to you by the top management. How useful is the information provided to you in your day-to-day operations? Please indicate the most appropriate level you think it is. If no such information is delivered to you, please select 0.

	Not useful at all (0) ← (Not effective at all)	→ Very useful (10) (Highly effective)
13) How to deal with purchasing behavior of customers.....	0	1 2 3 4 5 6 7 8 9 10
14) How to deal with customers' price-value related behavior...	0	1 2 3 4 5 6 7 8 9 10
15) Specific information about demographic changes.....	0	1 2 3 4 5 6 7 8 9 10
16) How to deal with customers' changing needs and wants.....	0	1 2 3 4 5 6 7 8 9 10
17) General information about customer base.....	0	1 2 3 4 5 6 7 8 9 10
18) How to react to competitors' expansion plan in your area.....	0	1 2 3 4 5 6 7 8 9 10
19) How to react to entry of new competition into your area.....	0	1 2 3 4 5 6 7 8 9 10
20) How to react to new products and services developed by Competitors.....	0	1 2 3 4 5 6 7 8 9 10
21) How to deal with competitors' pricing strategy.....	0	1 2 3 4 5 6 7 8 9 10
22) Competitors' employee compensation policies.....	0	1 2 3 4 5 6 7 8 9 10
11) General information about competitors.....	0	1 2 3 4 5 6 7 8 9 10

III. The top management of your company tries hard to deliver enough information about market situation and related company policies through many channels. The following questions ask about how effective those channels are. Please indicate what you think about the effectiveness of the following methods in your day-to-day operations. If any specific method is not available, please select “0.”

	Ineffective at all (0) ←	→ Highly effective (10)									
	(Not available)										
21) Presentations made by executives at company meetings	0	1	2	3	4	5	6	7	8	9	10
22) Directions delivered via company reports or memos.....	0	1	2	3	4	5	6	7	8	9	10
23) Directions delivered when corporate executives visit.....	0	1	2	3	4	5	6	7	8	9	10
24) E-mails from corporate executives.....	0	1	2	3	4	5	6	7	8	9	10
25) Phone calls from corporate executives.....	0	1	2	3	4	5	6	7	8	9	10
26) Conversations with corporate executives as needs occur	0	1	2	3	4	5	6	7	8	9	10
27) Directions delivered when regional managers visit.....	0	1	2	3	4	5	6	7	8	9	10
28) E-mails from regional managers.....	0	1	2	3	4	5	6	7	8	9	10
29) Phone calls from regional managers.....	0	1	2	3	4	5	6	7	8	9	10
30) Conversations with regional managers as needs occur.....	0	1	2	3	4	5	6	7	8	9	10
31) Group discussions with other unit managers at company meetings.....	0	1	2	3	4	5	6	7	8	9	10
32) Conversations with other unit managers as needs occur.....	0	1	2	3	4	5	6	7	8	9	10

IV. As a unit manager, you must make various decisions on a variety of operational details. The following questions have been designed to measure how comfortable you feel about your upper management’s perspectives and support. Please read the following questions and indicate how much you agree.

	Totally disagree (0) ←	→ Totally agree (10)									
12) The top management of my company has clear understanding of the business we are in.....	0	1	2	3	4	5	6	7	8	9	10
13) The top management has a clear vision for the future of the company.....	0	1	2	3	4	5	6	7	8	9	10
14) The upper management always supports me as a manager to make right decisions	0	1	2	3	4	5	6	7	8	9	10
15) The upper management understands the unique situations of unit operations when making company decisions	0	1	2	3	4	5	6	7	8	9	10
16) The top management evaluates unit performance from at least a few different perspectives.....	0	1	2	3	4	5	6	7	8	9	10
17) The decisions made by the top management are trustworthy..	0	1	2	3	4	5	6	7	8	9	10
18) I trust final decisions made at the corporate level have been through collaborative discussion including my opinion.....	0	1	2	3	4	5	6	7	8	9	10
19) I feel comfortable to raise my voice against decisions I view inappropriate delivered from the upper management.....	0	1	2	3	4	5	6	7	8	9	10
20) I have enough communication channels to deliver my opinion in opposition to upper management, if needed.....	0	1	2	3	4	5	6	7	8	9	10
21) I am quite confident that I am making positive progress in my career under the company’s guidance.....	0	1	2	3	4	5	6	7	8	9	10
22) Should there be a revolutionary change in the industry, my company will survive and eventually be successful.....	0	1	2	3	4	5	6	7	8	9	10

V. The following questions ask about the financial performance of your unit. Please answer to your best understanding by circling one of the descriptions and filling in the blank with the most accurate estimate.

3) What was the difference between the **sales** in your budget and actual in the last year in percentage?

* My actual sales were (**larger, smaller**) than the budget by (_____)%.

4) What was the difference between your **cost of sales** in budget and actual in the last year in percentage?

* My actual cost of sales was (**larger, smaller**) than the budget by (_____)%.

5) What was the difference between your unit's **profit (operating income before corporate overhead expenses)** in budget and actual in the last year in percentage?

* My unit's actual net profit was (**larger, smaller**) than the budget by (_____)%.

VI. Please answer the following questions.

1) How long have you been with your company? _____ years

2) How long have you been in the current position? _____ years

3) How long have you been in the restaurant (or foodservice) business? _____ years

4) Is your unit company-owned or franchised? Company owned (____) Franchised (____)

5) Please specify your educational background?

- a. Degree in Culinary Art (Certificate, Associate, Bachelor, Master, or higher)
- b. Degree in Hospitality Management (Associate, Bachelor, Master, or higher)
- c. Degree in business (or management) (Associate, Bachelor, Master, or higher)
- d. Degree in other discipline (Associate, Bachelor, Master, or higher)
- e. Other professional certificate
- f. No college degree

If you are given a chance to suggest to your top management anything about the company's information management style, please feel free to put them down in the following space. (If you need, please feel free to use additional paper and mail it together.) Thank you very much for your participation.

Examples:

The current reporting system is so time consuming that it burns out my staff.

The system provided by the company is not sophisticated enough to handle all my daily routine.

Or, you may list specific types of information you want to have from your top management.

Thank you very much again for your cooperation. If you want to hear about the result in summary, please indicate so by putting your address below. **Again, confidentiality is completely guaranteed.**

Curricula Vita

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Education

- Ph. D. in the Hospitality and Tourism Management, Virginia Polytechnic Institute and State University (2004)
- Master of Science in the Hospitality and Tourism Management, School of Hospitality Management, Florida International University, Miami, Florida (1986)
- Bachelor of Art in English Literature and Linguistics, Kyung-Hee University, Seoul, Korea (1980)

Research Activity

Conference Proceedings:

- Hyung-il Jung & Soobum Lee (Aug., 2002) “An Empirical Study about Motivational Factors from Restaurant Franchisees’ Point of View” International CHRIE Conference, summer 2002
- Hyung-il Jung & Michael Olsen (January, 2002) “A Theoretical Approach toward The Strategic Value of Information Technology Based on The Framework of The Co-Alignment Model,” Graduate Education and Student Research Conference in Hospitality and Tourism, Houston, Texas, pp.304-309, Refereed Proceedings
- Sungpil Hahm & Hyung-il Jung (January, 2001) “The forces driving change in consumer food preferences and the emerging trends in food consumption patterns in the Quick Service Restaurant Industry,” Graduate Education and Student Research Conference in Hospitality and Tourism, Atlanta, Georgia, pp.192-196, Refereed Proceedings

Experiences

Teaching Experience:

- Assistant Professor at Manfred Steinfeld School of Hospitality & Tourism Management of Roosevelt University (Aug. 2002 to present)
 - HOSM 200: Financial Accounting for Hospitality Industry
 - HOSM 300: Managerial Accounting for Hospitality Industry
 - HOSM 340: Computer Application for Hospitality Industry
 - HOSM 345: Seminar in Hospitality Management, Techniques & Problems
 - HOSM 410: Applied Research Methodology
 - HOSM 430: Operations Analysis
 - Advising undergraduate students

- Instructor in the Department of Hospitality and Tourism Management at Virginia Polytechnic Institute and State University, teaching the following courses (Spring, 2000 – Spring 2002):
 - HTM 4414: Food and Beverage Management (Lecture & Lab Session):
 - HTM 3444: Cost Control and Financial Management for Hospitality Organizations
 - HTM 1414: Introduction to Hospitality and Tourism Management
 - Advising undergraduate students

- Graduate Teaching Assistant for the following course (Spring 1999 – Fall 999):
 - HTM 1414: Introduction to Hospitality and Tourism Management

- Graduate Assistant for Dr. Pamela Weaver for the following courses (Fall 1997 – Spring 1998):
 - HTM 1414: Introduction to Hospitality and Tourism Management
 - HTM 6444: Quantitative Analysis Technique for Hospitality and Tourism Management, Multivariate Analysis Technique

- Graduate Assistant for the Secretary General (Won Sul Lee, Ph.D.) of the International Association of University Presidents (IAUP) at Kyung-Hee University, Seoul, Korea (1980 – 1981)
 - Participated and assisted editing, publishing, and distributing books and documents for numerous international conferences including the conference of the Club of Rome in Seoul, Korea.
 - Arranged itineraries of international conferences and participants

Industry Experience:

- Concession Operations Manager of Thomas & Mack Center and Sam Boyd Stadium at the University of Nevada, Las Vegas (1995 – 1996).
- Controller and Systems Director at Americrown Corp. (a subsidiary of International Speedway Corp., a public sister company of NASCAR) for service operations analysis and network systems development (1992 – 1994).
- Regional Operations Analyst -- catering, concessions, and souvenir operations for NASCAR Winston Series Stockcar Races and College Football events – at National Food Service, Inc., a management contract company for NASCAR. (1988 – 1992).
- Controller for Food Service operations: Catering & Concessions at the Service America Corp. @ Jacob Javits Convention Center, N.Y., N.Y. (1986-1988)