ECONOMIC IMPLICATIONS OF A COMPUTERIZED TRADING SYSTEM FOR GRAINS

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ABSTRACT

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A comparison was made between the current telephone trading system (TTS) used to trade cash grain and a computerized trading system (CTS). Three steps were necessary to accomplish this task. First, the past and present TTS were explored through a historical case study and a survey of grain traders, respectively. Second, a theoretical framework based on the principle that the price discovery process is a communication process was developed to guide the comparison. Finally, a CTS for grains was conceptualized and a demonstration computer program was written to model such a system.

Using communication and functional performance criteria, the two systems were compared. It appears that a CTS is a more effective price discovery mechanism due to the explicit data bases and software inherent to it. In addition, a CTS is a global and centralized trading system as opposed to a TTS which is dyadic and decentralized.

The main implications of a CTS to the grain industry was hypothesized to be an increase in pricing and technical efficiency in the

price discovery process. The result of this increased efficiency is to increase competition and affect market structure. Continued pressure toward an oligopolistic structure could be countered by the symmetric information available over a CTS.

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INTRODUCTION

1.1 *CURRENT SITUATION*

In the United States, the grain trading system is experiencing a change in how it processes, manages, transfers, analyzes and communicates information. King notes that advances in computer hardware design and manufacturing processes have substantially reduced the real cost of storing, retrieving, and processing data and information. Software innovations have enhanced the value of the computer for symbol processing as well as numerical computation (King, p. 1).

The adoption of the computer by the grain industry has been primarily for information management. The integration of computers into communication systems and trading functions has been slower. At present, grain firms are using computerized communication almost exclusively for internal communication. Computerized communication between firms that trade grain appears to be virtually nonexistent.

Nevertheless, the evolution of the computer from a largely internal information technology to an information and communication technology with potential applications external to the firm has created possibilities and opportunities for the grain industry to increase business efficiency. One area of the grain business that has potential to utilize the emerging computer and communication technology is the trading or price discovery function. In the cash grain industry, institutions, varying structural arrangements and communication tools are combined to form a trading or price discovery mechanism. The computer and related developments in software have created the capability for providing innovative price discovery mechanisms.

One of these innovative mechanisms is a computerized trading system (CTS). A CTS is a price discovery mechanism designed to create a centralized exchange through the use of a computer, a computer network, and remote terminals. The remote terminals are linked through the network to the computer and, thus, to each other.

The first agricultural CTS began in 1975 in Lubbock, Texas under the name of TELCOT. A cooperative, the Plains Cotton Cooperative Association, developed TELCOT to trade cotton for cooperative members. This CTS has grown steadily since 1975 and today is an integral part of the U.S. cotton marketing system. Other agricultural commodities in the U.S. traded at present or in the past through a CTS include eggs, cattle, hogs, slaughter lambs, beef carcasses, and primal cuts of meat (U.S.G.A.O.).

Since alternative price discovery mechanisms evolve in response to pressure, it is important to understand the motivations behind the development of such alternative mechanisms. CTS's have evolved for two reasons. The first is the increasing array of communication and information technologies. As these technologies and industries develop and mature, they explore new applications such as a CTS. This could be referred to as supply. The second reason for the evolution of CTS's is the demand side. The demand component responds to pressure from a perceived problem in the price discovery process and/or pressure to decrease trading costs.

The perceptions of one or more groups within the total marketing system that pricing processes need improving sometimes motivates efforts to search for an alternative price discovery mechanism. The most frequently cited problem addressed by a CTS is a thin market, a market characterized by low trading volume or a small number of either buyers or sellers. In thin markets, individual offers to buy or sell can exert undue influence on price or other terms of trade (Hayenga, et al.). Other problems, such as unequal bargaining power, unequal access to information, and inadequate information, have also been cited as system shortcomings that might encourage the development of a CTS (Russell, 1981).

Any concerns related to the technical efficiency of trading is of a more subtle nature. Trading includes many functions, such as searching for trade partners, negotiating, transferring market information, mailing contracts, and cultivating relationships. Because of the multifaceted dimensions of trading, the separate functional costs of trading are hard to identify and measure. High comparative costs of performing one or more of these functions might be camouflaged in the total cost of trading. Non-delineation of these functional costs may perpetuate a certain complacency with the trading status quo. If a situation arose where there was continued pressure to cut costs, including trading costs, then these functional costs might be delineated. Thus, efforts to improve the operational efficiency of the trading process might also motivate interest in a CTS.

The motivation for development of a CTS can thus emanate from either the supply or demand dimension. For a CTS to be successful, there must be interest and activity from both dimensions.

As mentioned earlier, a CTS is a price discovery mechanism. But the price discovery process for grains in the United States entails two components, the futures and cash grain markets. (In this study, "grain" is synonymous with corn, wheat, and soybeans, an oilseed.) In the futures market, information reflects a world perspective and takes account of international situations. This information flows to a central place, or trading floor, where price is discovered and trading volume is registered. The actual process involves bids and offers for contracts in a face-to-face communication process. Behind the floor trading per se is a plethora of information that gets distilled into the discovered prices.

On the other hand, cash grain trading in the United States is decentralized with the exception of a few organized exchanges. Various communication technologies loosely connect traders, but the primary tool of communication is the telephone. Price discovery that occurs between traders of cash grain directly reflects local or regional conditions or situations.

Bids and offers are communicated by telephone with the grain described and terms of trade discussed. Calls are made to different traders until a acceptable understanding of the current situation is attained. Negotiations continue on the telephone until either a trade is made or another trader is contacted.

During a day, the two components of trading futures contracts and cash grain interact to discover prices for grain. The piece of information that ties these two markets together is the basis, which is the difference between the futures price and cash price. The feedback between these two markets is so continuous and constant that statistical tests fail to identify one component as a "leader" in discovering daily prices (Hudson).

Reacting to increased awareness of how the efficiency of the grain trading system might be improved, several studies have investigated the applicability of a CTS to grains (Heifner; Sporleder, 1980; Lowe, et al.; Makus, et al.; Tilley, et al.; Bradley et al.; Oehrtman, et al.). These studies draw from previous applications to other commodities and specify some of the characteristics and operating procedures of a CTS for grains. They generally support the presence of interest in a CTS for grains and suggest a CTS might have potential to increase efficiency in the grain trading system (Lowe, et al.; Makus, et al.; Tilley, et al.; Bradley et al.; Oehrtman, et al.).

1.2 *THE PROBLEMS*

The current situation in the grain industry, with the growing interest of applying computer technology to not only the information demands but also to the trading dimension, creates several problem areas that warrant research. These problems include lack of knowledge regarding the present price discovery process for cash grain, the absence of an operating CTS for grain, and the inadequacy of economic theory to provide a sufficient framework to compare different price discovery mechanisms ex ante. The combination of these three problems create uncertainty as to the economic implications of a CTS to the grain industry and its participants.

Effective analysis of price discovery processes starts with better understanding of the difference between price discovery and price determination. Price discovery refers to a process by which buyers and sellers arrive at a specific price. Price determination deals with the theory of pricing and the manner in which economic forces influence prices under alternative market structures and over time (Forker, p. 4). The distinction between the two needs to be clarified.

Price discovery mechanisms, in a sense, are a link between the price discovery process and price determination. These mechanisms are composed of institutions, structural arrangements and communication tools that are used by participants in a trading system to facilitate the communication of economic forces that ultimately determine prices. Institutions usually emphasize a certain type of organization, while structural arrangements guide participants in the trading process. On the other hand, communciation tools are a means to an end. The end is communication, with the means being some type of instrument or machine. An example is the telephone, a communication tool used in the current telephone private negotiation trading system for cash grains. Likewise, a computer is a tool used in a CTS to facilitate price discovery. Thus, a CTS is a mechanism that combines the tools of computer technology, the institution of a centralized exchange, and the structural arrangements of equal access to information.

Historically, price discovery mechanisms have been evaluated as related to the pricing and technical efficiency generated. This has always been an ex post methodology. For instance, with regard to pricing or allocative efficiency, price accuracy, price levels, and price variance, are criteria used to compare different price discovery mechanisms and structures. As concerns the technical efficiency of different price discovery mechanisms, evaluation of costs has been a primary criterion.

Most examples of economic analyses concerning the performance of different price discovery mechanisms have been generated from experimental economics and applications of electronic markets (a generic form of a CTS) to various commodities. But here again, in every case, the analysis was ex post. That is, criteria based on results of the price discovery mechanisms, either prices or costs, were used to compare and evaluate performance.

Perhaps the earliest attempt to evaluate the impact of a price discovery mechanism was by Chamberlin. His experiments investigated the results of decentralization and market imperfections compared to a full-information market. After giving each participant a supply or demand price, buyers and sellers bargained with each other, with a warning before the market ended. The results of this experiment, which included symmetric supply and demand curve relations, were larger quantities traded and lower prices than produced in a centralized, full-information market produced.

Smith extended the experiments of Chamberlin and changed trading rules to observe resulting impacts. He found that if only buyers could bid while sellers could only accept or reject, the result was prices more favorable to sellers. Likewise, when sellers offered and buyers accepted or rejected, price outcomes favored the buyers. If both buyers and sellers were actively engaged in negotiation, convergence toward the full-information equilibrium was found to be faster.

Vickery used experimental markets to compare English and Dutch auctions. He found that where bidders knowledge, sophistication, and desire levels varied, then the Dutch auction was relatively inefficient in producing Pareto optimal results.

Recently, Buccola studied pricing efficiency in the context of information content over time. He defined price bias as the relationship between the competitive equillibrium and an overall mean price. This price criterion joined the commonly used price criteria of price level, price accuracy, and price variance. Buccola concluded that one must know the underlying structure of a market before assessing the efficiency of its price moves.

Likewise, in most analyses of the pricing efficiency of electronic markets, the procedure is to use an ex post method of comparing prices and costs of the electronic market to the pre-existing market (Schrader; Russell, 1981; Hamm, et al.; Rhodus, et al.; Mahoney; Holder; Bessler and Schrader; Etheridge and Matthews; Purcell, 1983). As far as cost of a CTS are concerned, Turner and Epperson evaluated alternative approaches to computerized trading and found a time-sharing system to be the most cost efficient for relatively modest volumes of trading.

In the case of grain trading, there exists very little information on the actual cost of using the telephone to trade grain. In addition, it is paramount that designers of a CTS for grains know the various functions that are performed over the telephone trading system (TTS) for grains. The functions of grain trading will continue to take place over a CTS, therefore an understanding of these functions must be attained. Furthermore, the factors crucial to grain trading must be explored. Although one would hypothesize that the space, time, and form of grain would dictate the focus of most grain trading phone calls, confirmation of these detailed factors must be obtained.

Price theory and the theory of exchange do not provide much help in explaining or enhancing the understanding of the formation of price, i.e. price discovery. Furthermore, price theory does not help to estimate the impact on performance of alternative price discovery mechanisms. The reason for these inadequacies can be traced to a fundamental flaw in the development of economic theory. Consumers do have preferences and budget constraints that effectively determine demand, while producers encounter costs and production techniques that determine supply. But price theory ignores a crucial aspect in its mathematical determination of general equilibrium. Individuals and firms possess information about themselves and other situations. It is in the exchange of this information that prices are discovered.

Buchanan, in 1964, addressed this flaw in the development of economic theory as it concentrated on resource allocation and choice. He suggested an alternative route for economic theory development that placed the theory of markets at center stage and concentrated on exchange rather than choice.

Morgenstern reiterated this point when he noted that the formation of prices is not explained by current general equilibrium theory, and he included it among the great unresolved issues in contemporary economic theory (Forker, p. 4). Morgenstern wrote that bargaining is seen on all levels, whether it be wages, price contracts, etc. But a look at leading textbooks on economic theory disclosed hardly more than one page out of four hundred devoted to bargaining.

Morgenstern objected to current general equilibrium theory on two fronts. First the formation of prices (price discovery) is not explained even though explanation of price formation is a task of economic theory. In current theory, prices simply exist -- some are equilibrium prices, others are not (Morgenstern, p. 1,173). Second, general equilibrium theory treats time inconsistently. In the standard treatment of general equilibrium theory, there is nothing explicit about the speed with which processes run their course. It seems doubtful whether an economic theory can be fashioned which does not either explicitly consider time with all its complications due to its pervasiveness, or which openly abstracts from the time factor by accepting the fiction of instant adjustments to all variations. What is not satisfactory is to have a mixture of phenomena for which time is considered explicitly and with varying assumptions, and of phenomena where time is neglected though clearly and powerfully present. This is the present state (Morgenstern, p. 1,173).

Boulding has asserted that one of the main reasons the discipline of economics is sometimes unsuccessful in dealing with economic problems is its approach to the formation of prices. Prices are determined in sum by the communication system and not by the mechanics of the market (Boulding, 1977, p. 811).

Although the theme of defining price discovery in terms of communication theory and systems has long been championed by Purcell, little research in this reoriented context has been done. Furthermore, there have been major developments in communication theory since Purcell used it to analyze the beef marketing system in 1966. These developments have not been incorporated into any reexamination of the price discovery process as viewed from a communication perspective. Recently Sporleder (1984) and Buccola (1984) have re-recognized the importance of information and structure to pricing efficiency, though they have overlooked the communication process.

In mainstream agricultural economics, therefore, price discovery processes and mechanisms have been largely neglected. Evidence of this neglect can be seen in *Agricultural Product Prices*, a standard text for agricultural price analysis. Tomek and Robinson devote 88 pages to pricing institutions but only 17 pages to price discovery mechanisms (Forker, p. 4). They note:

> Unfortunately, there is little empirical evidence on which to base firm conclusions about relative performance of alternative price discovery mechanisms. (Tomek and Robinson, p. 231.)

Not surprisingly, therefore, the bid-offer private negotiation type price discovery process that is characteristic of the telephone trading system used for cash grain has not been the subject of extensive research.

Since there has been little analysis of the price discovery process in cash grain trading, an assessment of the effects of computerized communication technology on the price discovery process is difficult to perform. This is especially telling when an evolving mechanism, such as CTS, is incorporated into the price discovery process. This is the case at present in the cash grain trade.

Closely related to the above problem area is the problem of what are the functions, operations, and dynamics of a CTS for grains. A gap exists between the concept and reality since there is no computerized trading of cash grain today. This presents a problem if a CTS, as an alternative mechanism, is to be studied in terms of its impacts on the price discovery process.

Evaluating the economic implications of a change to an alternative price discovery mechanism such as a CTS therefore requires three steps. First, the current telephone trading system must be described and analyzed. The second step relates to the conceptualization of an CTS for grains. There must be a base from which implications about an CTS can be drawn in order to compare the CTS to the present telephone trading system. The third step relates to the theoretical framework used to generate the inferential base and to guide the analysis. A sound theoretical framework is a necessary condition for rigorous qualitative analysis and predates effective empirical analysis.

In summary, very little is known about the economic implications of a move to a computerized trading system in the grain trade. It is becoming increasingly apparent that price discovery mechanisms have major impacts on the economics of marketing systems. Sporleder has suggested, for example, that a computerized system has the capacity to increase the level of price competition within a given market structure or for a given level of seller concentration. But the existing theoretical framework is poorly equipped to guide conceptual development and qualitative analysis. In addition, there is little available data to facilitate testing of even limited hypotheses about the impact on pricing accuracy, the level of price competition, the level of price variability, and other attributes of the price discovery process for cash grain.

1.3 *OBJECTIVES*

The overall objective of this study is to infer the economic implications of a change from telephone to computerized trading of cash grain. This requires the development of a conceptual framework to be used as a base. The conceptual framework will evolve from the principle that the price discovery process is a communication process. An assumption is made that a CTS for cash grain will become a reality. Included in this objective are several subobjectives:

1.4.2.1 To analyze the historic and current cash grain trading system with the purpose of exposing economic dimensions important to the incorporation of communication technology into the trading process.

1.4.2.2 To develop a framework to examine the cash grain price discovery (trading) process as a communication process.

1.4.2.3 To conceptualize a CTS for cash grain and describe its functions and procedures.

1.4.2.4 To compare a telephone trading system to a computerized trading system with respect to what a change from telephone to computer does to the price discovery process.

1.4.2.5 To infer the economic implications of a change to a CTS for cash grains to the technical and pricing efficiency and to the market structure of the grain industry.

1.4 *PROCEDURES*

1.4.1 *Overall Objective*

The methodology of this research is to adapt and extend concepts, procedures, and methods from communication theory to deduce the economic implications of a change in price discovery mechanisms. The end products are the qualitative implications of a change in trading systems. The means to achieve this end include interaction with the grain industry, development of a framework, and conceptualization of a CTS for grains. These means are not mutually exclusive although the procedures related to them are distinct.

Each of the subobjectives will be addressed in a chapter. The flow of the material is to first explore the genesis and present state of the telephone trading system. Next, the price discovery process for cash grain is presented within the context of communication theory. A framework based on communication characteristics and attributes, functional performance and costs, and economic efficiency is developed to compare different price discovery mechanisms. Then, a CTS for grains will be conceptualized and modeled. Afterward, the telephone and computerized trading systems will be compared using the framework developed earlier. Finally, the economic implications of a change from a telephone to a computerized trading system will be explored. The procedure used to accomplish each of the subobjectives follows.

1.4.2 *Specific Objectives*

1.4.2.1 To analyze the historic and current cash grain trading system with the purpose of exposing economic dimensions important to the incorporation of communication technology into the trading process

The forerunner of the telephone system used today to trade cash grain was a telegraph system. Therefore, a historical case study will be used to describe the integration of the telegraph, and later the telephone, into cash grain trading in the United States. Primary emphasis will be placed on discovering when telegraphs and telephones became common in grain trading, why they were adopted, who first started using them, where were they initially used, and what exactly were they used for, i.e., what functions of grain trading were performed over the telephone.

Also to be investigated are the changing institutions that evolved to accommodate telephone trading. In other words, how did trade associations and exchanges react to the use of telegraphs and telephones to trade grain? Did their rules and regulations change to better utilize these technologies?

Source material for this case study will be the literature from: the history of the telegraph; the history of the grain trade in the United States; the history of the telephone; and records and memorabilia from trade associations.

Though the grain industry uses the telephone to trade cash grain, it does not view itself as using a "telephone trading system" per se. Furthermore, little research has been done on exploring the various components of the telephone trading system (Heifner, et al.).

To investigate how cash grain is currently traded in the United States, a questionnaire will be used to survey grain traders in the eastern United States. In addition to exploring current trade practices; computerization status, and attitudes and knowledge about computerized trading will be investigated.

Research has identified an innovator or entrepreneur type individual as being most receptive to computerized trading (Turner, et al.). With this in mind, respondents will be selected based upon (1) recommendation of university specialists, extension agents, and trade association personnel, (2) membership in various grain and feed associations, and (3) proximity to the area selected for enumeration. The interviews will be conducted by an enumerator via personal office visits after being prearranged by a telephone call.

The focus of the questionnaire for learning about the current trading system will be to (1) investigate the functions performed during a grain trade, (2) evaluate the importance of various factors in making a trade, and (3) ascertain the cost of trading over the telephone trading system.

The data drawn from the survey will be analyzed through the use of tabular analysis. Interpretation of the data will provide a base not only for evaluation of the current telephone system but also for the conceptualization of a CTS for grain. Furthermore, the survey data will provide empirically justified information to be used when the conceptual framework is applied to grain trading.

1.4.2.2 To develop a framework to examine the cash grain price discovery (trading) process as a communication process

The economic efficiency of a price discovery mechanism is a result of the communication processes and structures inherent to and encouraged by the mechanism. The functional performance and cost of a mechanism is the intermediate product of the communication system. Thus, the framework developed here is hierarchal with communication theory at the base, and functional performance and cost being the result of the communication system. When efficiency criteria are applied to the functional performance and cost of the mechanism, intraindustry pressures on market structure can be identified.

Communication has two dimensions, the microscopic and macroscopic. On the microscopic or two person level, a convergence model of communication is the explanatory tool. At the macroscopic or social level, communication network analysis is the method used to examine the connections between and among many traders. With respect to grain trading, a common denominator among pairs and the overall network of traders is information, communicated through some technological medium, i.e. telephone, computers, etc. Thus, the information and network levels of communication will be used to compare a TTS and a CTS. Criteria for each of the levels will be developed.

Evolving communication technology has an impact on trading. As the different functions of the total trading function are separated for analysis, different price discovery mechanisms can be evaluated as to their impact on these different functions. The functions and factors important to grain trading will be investigated through the use of the previously mentioned survey. Using this information and the communication perspective, hypotheses about the relationship of communication structure to the various functions will be formulated.

An important distinction is made concerning the criteria for a trade to be made. In neoclassical economic theory, the demand for a commodity is generated from utility while supply evolves out of costs. An equilibrium price is *determined* when supply and demand intersect. But in the price discovery process, intersection of known demand and supply curves is improbable. The reality of price discovery in cash grain trading is that acceptable levels of tolerance are determined with respect to information about demand and supply. Thus, probability distributions and their characteristics can be used to map the reality of price discovery to the economic theory of price determination. Furthermore, situations such as unequal bargaining power can also be accounted for within this framework.

Pricing and technical efficiency will be used as the barometer to measure the alternative price discovery mechanisms. Hypotheses about evolving market structure can then be logically deduced from the efficiency evaluations.

1.4.2.3 To conceptualize a CTS for cash grains and describe its functions and procedures

Research suggests that computerized trading systems have a greater probability of succeeding if they deviate as little as possible from previous trading practices (Henderson and Holder) and if traders are involved early in the planning and development of a CTS (Bell, et al.). For these reasons, the conceptualization of a CTS relies heavily on interaction with traders through the use of a survey and an advisory committee. Of primary importance to the conceptualization process are the designation of (1) the data sets needed to trade cash grains, (2) specific factors or variables that influence the final price of a trade, (3) the functions performed in a trade, and (4) the structure of the data bases.

A CTS for grains will be conceptualized as to the necessary data bases, functions and operating system. Computer software will be written that will serve as a demonstration model of a CTS for grains. This computer software demonstration model will be the basic system that will be used in evaluations relative to the current telephone trading system. In practice, the demonstration model can also be used to inform, educate and elicit feedback from the grain industry. An advisory committee composed of grain traders will provide confirmation as to the appropriateness of the model and suggestions for improvement.

It should be expected that an actual CTS for grains will be "re-invented" with specifications tailored by the implementor. But the prototype developed here should contain the skeleton of any CTS for grains in the United States.

1.4.2.4 To compare a telephone trading system to a computerized trading system with respect to what a change from telephone to computer does to the price discovery process

The price discovery process modeled as a communication process both in a microscopic and macroscopic sense will be used initially to make comparisons. That is, characteristics at the information and network levels of the two price discovery mechanisms will be examined and compared. The functional performance of each mechanism will be deduced. In addition, the cost of each system will be addressed.

To summarize, the communication process involved in the two different price discovery mechanisms will be portrayed. Criteria for comparisons will revolve around communication, functional performance, and costs.

1.4.2.5 To infer the economic implications of a change to a CTS for cash grains to the pricing and technical efficiency and market structure of the grain industry

Qualitative economic inferences will be drawn from the previous subobjectives. The inferences will relate to pricing efficiency, technical efficiency and market structure. Hypotheses will be generated to guide continued research in this area and to be empirically examined when a CTS is operationalized.

The impacts of a CTS on pricing efficiency emanate from the underlying communciation and functional performance of the system. These impacts concern price levels, price accuracy, price variance, and other related price characteristics.

The impacts of a CTS on technical efficiency are generated from technology and labor requirements, in addition to spacial and temporal considerations. These impacts are evident most clearly through costs and performance measures.

The impacts on market structure evolve from the pricing and technical efficiency impacts. Pressure exerted by increased efficiency within an industry is reflected through markets by increased competition. Eventually, the increased competition changes market structure.

The hypotheses presented in this chapter will relate specifically to the previous impacts and focus on the efficiency of communication, price discovery, and marketing systems. The general hypothesis of the study is that a change to a CTS will increase the efficiency of the grain trading system. One purpose of the study is to generate more detailed and testable hypotheses about the economic implications of a CTS for grains.

Recent experiences with CTS's indicate higher, short-run producer prices (Schrader). The availability and symmetry of information in a CTS implys that marketing margins will be narrower (Russell, 1981). The long run average total cost (LRATC) for trading could be lower if a CTS for grain occupies a sufficient niche in the cash grain trading system. This could improve the market position of the U.S. grain industry in the world arena.

In addition, actual costs of trading grain will be much more visible, identifiable and measurable in a CTS for grain. Technical efficiencies gained in the trading process will be distributed throughout the marketing system and contribute to lower LRATC for the industry. Opportunities for cost and price analysis of a CTS for grain will provide a testing ground for some hypotheses of neoclassical price theory as well as tenets of evolutionary economics.

Neoclassical microeconomic theory asserts that for a competitive market in equilibrium, the price of a good or service moves toward its average total cost in the long run. In a CTS where information is symmetrical, this principle should hold. No longer will traders earn a premium or economic rent for superior information. They will earn revenue for services rendered whether they be physical, such as storage, transportation, etc.; or knowledge, such as market analysis related expertise. An indirect result of the above situation is a better price discovery mechanism for the physical and knowledge services offered.

Evolutionary economics also provides some insight into the economic implications of a CTS for grains. Centralization of the price discovery process will open niches for new types of traders depending on the regiments, rules, and regulations of a CTS for grains. These new types of traders might resemble the types of traders prevalent on other centralized market centers, such as futures exchanges. For example, there could evolve "scalpers" and "floor traders" that take positions for short periods of time and seek profits from arbitrage activities.

The Matthew principle of the rich getting richer (Boulding, 1981, p. 75) with respect to information is probable. King notes this principle is already at work in the North American grainery as information and communication technology expand.

The trend toward more complex systems, which is an implication of evolutionary economics, will certainly continue in cash grain trading. A CTS for grains is a tool for dealing with the increased complexity of futures, options, forward contracts, etc.

Finally, evolutionary economics asserts the existence of niches towards more complex systems and less niches toward simpler systems. The reason for this is that the niche for the simpler system is already filled. In the United States grainery, the telephone trading system provides the service of potentially linking every grain trader. The "hardware" exists to do this. But little "software" is available to perform this function economically. When the "software" is available, it is in the form of brokers and grain merchants who use their personal communication networks to link traders. In the process they "filter" the information and are paid for the services they perform. As King has noted, computer software can perform a similar function. Whether a CTS for grains will replace grain brokers is an empirical question that cannot be tested until the niche for a CTS has been filled.

It will be shown that a CTS for grain is a more complete trading mechanism. It not only has the hardware to link all traders, but also possesses the crucial software to efficiently match traders. This is simply a continuation of the evolutionary pattern exhibited as economic systems adopt communication technology.

Chapter 2

COMMUNICATION TECHNOLOGY, TRADING PRACTICES AND THE UNITED STATES GRAIN TRADE

2.1 *INTRODUCTION*

The purpose of this chapter is to gain a clearer perspective of cash grain trading in the United States. The approach has two components. First, a historical case study examines the interaction between communication technology, methods of trading, and patterns of change beginning around 1840. The result of this case study will be to identify the forces that prompt a change in trading practices.

Second, the current state of cash grain trading in the United States is explored through data collected in personal interviews with grain traders. Here again, use of communication and information technology and the methods, practices, and costs of trading are the primary areas of investigation. In addition, trader's attitudes and preferences towards computerized trading are evaluated.

2.2 *TELEGRAPHS AND TELEPHONES*

The changing dimensions of the grain trade in America during the 1800's was caused by many factors. The goal here is to examine these changing dimensions and concentrate on two communication technologies: the telegraph and the telephone. The cash grain trading system used today in the United States has evolved primarily from these two technologies.

The genesis of the dramatic change in grain trading methods during the 1850's was provoked by technology, economic pressure, and initiative on the part of western grain merchants. But a crucial facilitating ingredient was the spreading of the telegraph.

2.2.1 *The Telegraph*

The telegraph was developed for commercial use by Samuel Morse, an artist who in 1832 turned his energy to developing both the hardware of the telegraph and the software of the Morse code. By 1837, Morse had demonstrated a system whereby he used an electro-magnet as a telegraph receiver (Morgan, p. 14). On May 24, 1844, an experimental telegraph line between Baltimore and Washington carried the message, "What hath God wrought!" From this experiment, commercial use of the telegraph exploded and by 1851 telegraph systems reached Chicago, St. Louis, and New Orleans, as well as other principal northern and southern cities. A transcontinental line to California was completed in October, 1861 (DuBoff, 1980, p. 461).

In the United States, business demand for the early telegraph came from the railroads, the press and the business and financial sectors (DuBoff, 1980, p. 465). Thus, the adoption of the telegraph by the grain trade occurred during rapid assimilation in other industries. In addition, those other industries were in close contact with the grain industry.

Thomas Oldle, is an analysis of the origin of methods used in American grain marketing, says that "by the year 1860 the basic methods of the United States system of marketing grain were in being" (Oldle, p. 439). Prior to this time, older methods of marketing, patterned on foreign trade practices, were used. The following discussion of the changing methods of grain trading during the middle 1800's is excerpted from Oldle.

The catalysts that prompted and encouraged a Great Lakes grain trade were the supply of and demand for wheat and the opening of the Erie Canal in 1825. The Erie Canal connected Lake Erie to the Hudson River and, thus, to New York City which was a center of export activity. With the appearance of the Erie Canal, the marketing system of the eastern route began to rival the Gulf system of the Mississippi River and New Orleans. In fact, in 1836 more grainstuffs were carried to Buffalo by way of the Lakes than were carried to New Orleans via the Mississippi River (Oldle, p. 441).

This burgeoning Great Lakes grain trade used marketing methods that originated in New York State. A study of grain trading in New York in 1830 revealed:

> the purchaser of produce passes his note to a bank in exchange for banknotes; pays in banknotes for the produce --- the agriculturalist pays his laborers, his mechanics, his merchants, etc. in banknotes which find their way to market in some of the commercial towns; while in the meantime the purchaser of the produce, by sale of it in the same market, is enabled to deposit the proceeds then to the credit of the bank which pays his debt and enables the banks to redeem its bills by drawing upon the deposit (New York State Assembly Document, p. 16).

The credit of the millers was used to finance the trade. A description of the method of financing was published in 1840:

> The raising of funds is accomplished mainly this way. The millers first select their agent in New York with whom they make arrangements for the raising of money. This is done by placing in the hands of the agent ample security, by mortgages on the mills, and personal security; a credit is thus established for fifty or a hundred thousand dollars from the New York merchant who comes under stipulation to accept drafts for the sum agreed upon, at usually sixty or ninety days, and this before a bushel of wheat is purchased or a barrel of flour ground. These drafts are made at the pleasure of the drawer, and the internal banks, mostly at Rochester, Buffalo, Canandaigua, Utica and Albany, discount these drafts. Their banknotes are received, with which the purchases of wheat are made by (commission marketing) agents at different points in New York, Ohio, Pennsylvania and Michigan. The commission merchants of (New York City) who receive the million barrels of flour (for sale) are confined to a very few not probably exceeding ten in number. They must necessarily be men of good credit and great means as they are during the year under acceptances, one way or another for eight or ten million dollars. Their commissions ... (are) two and a half percent (Maryland Pocket Annual for 1840, p. 75-77).

These practices prevailed until the late 1850's, when the western grain merchants changed them.

With the formation of the Buffalo Board of Trade in 1844, the grain of western merchants was purchased by eastern buyers through Buffalo commission merchants. The volume of western grain flowing to the east increased during the 1840's and was helped by the steam-powered, endless bucket belt that hoisted grain to the top of warehouses where the grain was weighed and spewed into bins.

The financing arrangements between Lake traders during the 1840's often involved drawing sight drafts (with warehouse receipts attached). Commission merchants would discount the drafts locally and receive banknotes which would enable them to make advances on consignments to local farmers and millers (Oldle, p. 446). Credit needs of producers were met by the advances on consignment, while the drafts originated by the commission merchants were forwarded to distant banks for payment. These drafts were sold by western banks as domestic exchange (Oldle, p. 446).

This system of financing grainstuffs did not work well. The communication between parties covered large distances and was slow. In addition, this acceptance system assumed relatively static economic conditions which were not the case in the American grain trade. The panic of 1857, when the credit resources of the entire nation came under pressure, magnified the inadequacy of the acceptance system. This stress created a strain on the grain marketing system of the Great Lakes that resulted in a new mode of doing business (Oldle, p. 447).

The organizations that made possible the success of a new financial and marketing system were the boards of trade in the western Lake ports. These boards of trade were organized primarily to deal with transportation problems. The birthdates of the various western boards of trades were: Detroit, 1847; Cleveland, 1848; Chicago, 1848; and Milwaukee, 1849. It was in solving transportation problems, such as harbor problems, that members of these boards began working together and cooperating. Cooperation led to discussions about the establishment of standard grades of grain and appointment of inspectors, points opposed by railroad interests. These discussions led to the abandonment of the practice of making advances on consignment (Oldle, p. 451).

As mentioned earlier, the financial situation of 1857 prompted the widespread adoption of a new trade practice known as "to arrive" contracts. These contracts enabled the sales price to be settled in advance of the actual arrival of the grain. Quality was still determined by forwarding a sample or a certificate of quality by express. But one crucial difference between the "to arrive" and previous method of trade was that the price was discovered much quicker. Thus, the price discovery process was transacted over the telegraph, instead of by mail.

"To arrive" contracts had begun as soon as telegraphic communication between locations became available in 1848, but did not become commonplace until around 1855. During this time, railroads between the east and midwest United States developed to allow commerce throughout the year. Standard grades of grain were also a requirement for the successful use of "to arrive" contracts. To facilitate this change, the Chicago Board of Trade established a system of grades in 1857. Milwaukee followed suit in 1858, and Toledo's system was set up in 1863. Standards ended the need to send samples or certificates of quality ahead to the east before a "to arrive" contract could be priced (Oldle, p. 451).

Time contracts for grain became more common during the Civil War as delivery of commodities became more uncertain. Hedge transactions became so widespread that by October 1865, the Chicago Board of Trade adopted rules and regulations for futures trading (DuBoff, 1983, p. 260). Thus, the futures market of Chicago and elsewhere helped to replace the older system of making advanced payments on consigned goods.

But the telegraph provided the tool that better enabled economic principles to infiltrate the grain industry. Institutional rigidities and resource immobilities were no match against the reductions in intermarket price differentials, in information costs, and in transaction costs encouraged by the use of the telegraph (DuBoff, 1983, p. 257). In fact, the telegraph became the dominant communication tool in the price discovery process for cash grain. As DuBoff (1983, p. 259) states:

> The telegraph was making it possible to negotiate future delivery contracts instantaneously at the very point of production. Compared to the "consignment" contract, the new forward contract permitted grains and cotton to be shipped and delivered at the moment when a manufacturer was ready to process it or when the retailer was ready to receive it. As there was less need to sell at a going price when the grain or cotton reached a commercial center, prices tended to be more stable (Chandler, p. 211).

The telegraph drastically decreased trading time which in turn, increased the volume of trading. DeBow, a leading business journalist in 1847, noted that "operations are made in one day with its aid, by repeated communication, which could not be done in from two to four weeks by mail -- enabling businessmen to make purchases and sales which otherwise would be of no benefit to them, in consequence of length of time consumed in negotiation" (DuBoff, (1983), p. 263).

Not only were transaction costs lowered by decreasing the time and increasing the area of trade. In addition, financing requirements were lowered. Uncertainty about sales prices were lowered and processors could better deal with their business risks. Thus, the credit costs of moving grain was reduced. "As credit needs decreased, and future delivery contracts tended to stabilize prices, the risk element was whittled down -- sales prices were known and shipments were insured -- so that banks were more willing to provide loans to sellers" (DuBoff, 1983, p. 263).

Another byproduct of the telegraph was with respect to centralization. The expected savings from a given market search will be higher the greater the price dispersion, the greater the number of production stages, and the higher the expenditure on the resource or service (DuBoff, 1983, p. 266). Search costs will be at a minimum with complete centralization and at a maximum with infinite decentralization.

With respect to cotton, the telegraph effectively decentralized cotton marketing away from the few southern port cities where most sales had been handled by middlemen and moved it inland towards numerous smaller markets. But at the same time, the net effect was to centralize the buying of cotton and thereby to increase the sway of cotton dealers at the premanufacturing stage of the production and distribution process (DuBoff, 1983, p. 267). There is no record of this occurring in the grain trade, yet there is reason to believe the pattern was mimicked there to a certain extent.

With respect to grain, the boards of trades were the centers of price discovery with the telegraph relaying this information to the hinterlands. In addition, the telegraph enabled traders far from the boards of trade to negotiate much quicker with other traders. This, in effect, decentralized the assembly and distribution of grain. This enabled price discovery for assembly and distribution to be separated from price discovery for the grain.

As is evident by this brief review the telegraph, economic pressures, and institutions contributed to change the price discovery mechanism for cash grain. Features of the telegraph that were important to this change were the ability to drastically reduce the space and time limitations of transmitting information at relatively low costs, and the secrecy and control capabilities inherent in the technology. The economic pressures contributing to the "American" method of trading grain were the financial panic of 1857 where the nation's credit resources were severely strained and the Civil War. Both of these events exerted pressure on a marketing system that relied heavily on credit.

The opportunity costs of the millers and merchants who acted as financiers tended to grow with increased uncertainty. Specific events, such as the Panic of 1857 and the Civil War, were the basis of uncertainty, but slow information transferral concerning these events exacerbated this problem.

Though the use of the telegraph and "to arrive" contracts were a response to economic pressure, the boards of trade institutionalized these changes and lent creditability to this new method of trading grain. It is interesting that the changing trade practices preceded institutional adoption. This pattern appears to be consistent and is further confirmed as telephones began to be used to trade grain.

2.2.2 *The Telephone*

The development and evolution of communication technology was occuring as the grain trade adopted and adapted its trading methods to the telegraph. On March 10, 1876, information in verbal form was transferred over space by electrical means. The message was "Mr. Watson, come here, I want you" (Casson, p. 32). Inventor Alexander Bell, an elocutionist, had been working on the instrument and apparatus later to be known as the telephone since 1872 (Casson, p. 7). Much of the material cited here about the telephone is from Casson's, *History of the Telephone,* published in 1910.

Bell exhibited his telephone at the Centennial Exposition in Philadelphia later in 1876, where it won a Certificate of Award. Interestingly enough, even though the telephone was becoming technologically feasible, reception in the business world was cold.

Bell invented the telephone but it took a succession of men with different talents to push the telephone into the success it was to become. Gardener Hubbard, an investor and salesman, evangelized the public as to the merits and potential of the telephone. Thomas Watson, Bell's able assistant, gave insight into the mechanics of the telephone. Thomas Sanders was the major investor in the birth and adolescence of the telephone. From 1874 to 1878, Sanders advanced nine-tenths of the money spent on the telephone. At one time, he faced $110,000 worth of debt because of the telephone.

As the demand for the telephone began to increase, the need for a business organization arose. The position of General Manager was offered to Theodore Vail. Perhaps nowhere in the evolution of the telephone is the "right principle" (the right man in the right place at the right time) displayed more vividly than in the case of Theodore Vail.

Vail's cousin, Alfred, was a friend and co-worker of Morse. In fact, Morse had lived several years at the Vail homestead in New Jersey during which he was experimenting with the telegraph. Thus, Theodore Vail grew up in the story of Morse and the telegraph. By 1876, Vail was head of the Government Mail Service in Washington. He reorganized the department, introduced the bag system in postal cars, and had a comprehensive view of all railways and telegraphs. Thus, he was inclined to think of telephones in terms of a national system.

Vail became an enthusiast of the telephone through his association with Hubbard, who had been appointed by President Hayes as the head of a commission on mail transportation. Vail left the post office to establish the telephone business just as Amos Kendall had left the post office thirty years before to establish the telegraph business. Vail introduced a greater vision of the telephone business and vanquished all ideas of selling out. In addition, he persuaded many persons to buy stock and in less than two months of his appointment the first Bell Telephone Company was formed with $450,000 capital. The telephone business was launched.

Other men joined the telephone team and continued the progress and growth of the telephone business. Eventually, the company was on sound financial ground. In 1881, twelve hundred new towns and cities were marked on the telephone map, and the first dividends were paid, $178,500. In 1882, gross earnings were more than a million dollars (Casson, p. 84-85). Thus, within six years of its invention, the telephone was on its way to becoming an integral part of American life.

2.3 *CASH GRAIN TRADING INSTITUTIONS*

As mentioned, grain trading in the United States acquired its indigenous nature around the middle of the nineteenth century, when "to arrive" contracts became common. The telegraph remained the dominant communication technology up until the twentieth century.

To gain some perspective on what was occurring with respect to grain trading and the use of telegraphs and telephones, a targeted examination of the trading rules of the National Grain and Feed Association was done. In addition, selected arbitration cases also contribute to a better understanding of grain transactions occuring over these technologies.

Some background on this trade association might prove helpful. The Grain and Feed Dealers National Association began on November 6, 1896 at the Saratoga Hotel in Chicago, Illinois. There were two problems to be dealt with; (1) a need for a uniform grain grading standard, and (2) a need for a method to settle disputes and misunderstanding among dealers. There were 80 charter members in 1896 (Smith and Prindle, p. 1).

Sixteen trade rules were enacted in the early 1900's with trade defined as including that done by wire or mail. By 1911, there was a committee on telephone and telegraph service. In this year, Angus Hibbard of America Telephone and Telegraph (AT&T) addressed the fifteenth annual meeting of the Grain Dealers National Association. Hibbard had been sent to the meeting by Theodore Vail. Edward Beatty, chairman of the telephone and telegraph committee, initiated an invitation to Vail to address the problem of AT&T discontinuing its fifty percent discount on night telephone service to develop its night letters over the newly acquired Western Union wires. This episode indicates that the grain dealers preferred the telephone to the telegraph when trading grain (Who, 1911, p. 17).

Several of the early arbitration cases handled by the Grain Dealers National Association is some way related to the communication technology used. One such case in 1911 involved a mixup due to the code used to maintain security over the telegraph. BOUNTEOUS, which represented twenty days was mistranslated as BORDER which meant immediately. Because of the mixup in delivery dates, $150 was lost due to changing prices (Decisions, p. 63).

A previous case in 1910 involved a dispute in a trade made over the telephone. The conversation was admitted to by both parties. The defendant later wired the plaintiff that the primary basis should have been Philadelphia instead of New York. The arbitration committee ruled:

> "The transaction having been made on the telephone brought both parties close together, and at that time no error was known as to any different rate basis than New York all rail. Conditions only later showed the error."

The plaintiff was awarded $50 (Decisions, p. 64).

Another case in 1914 illustrates how important time was in grain trading and what the grain trade viewed as appropriate time delays in telegraph trading. The defendant sent the original offer with no time specification given for acceptance. Two hours later the plaintiff accepted. The defendant refused to book the oats and after several wire exchanges, the oats in question were booked at one-half cent higher than the original offer. Who should absorb the difference was left to the committee to decide. Some additional facts were that of the three hours and nine minutes between the sending of the offer and receipt of the acceptance, one hour and fifty five minutes was in the transmission of the wire and one hour and fourteen minutes represented the time required to file acceptance.

The arbitration committee in this case stated:

> It is apparent from the above facts that the one point at issue in this case is whether or not the plaintiff was within his rights in waiting one hour and fourteen minutes to send acceptance of a wire offer made without any stipulation as to time of acceptance.
>
> It is a well known fact that the nature of the grain business requires that a large percentage of it be done by the exchange of wires, and while many of these wires, particularly of those making offers, do stipulate a definite time for acceptance, or contain a provision for immediate, quick, or prompt reply many do not. The same conditions that make it necessary to do much of the business by wire also make it necessary to be given prompt attention and this, regardless of whether they contain any provision as to time to reply. It is the opinion of this committee that an offer by wire need not contain any provision as to time for acceptance to make it compulsory on the part of the party receiving it to file prompt wire acceptance of such offer; and if an acceptance is not filed promptly, it becomes the privilege of the party receiving such acceptance to confirm or reject it.
>
> Under the present method of conducting a grain business, one hour and fourteen minutes between receipt of an offer and the filing of an acceptance cannot be considered a prompt acceptance, particularly so during the hours the grain exchanges of the country are in session and the markets subject to quick changes.

The committee ruled in favor of the defendant on October 3, 1914 (Decisions, p. 101).

These cases illustrate some of the problems the grain trade experienced with its use of the telegraph and also the perceived superiority of the telephone as a communication instrument. But not until 1917 was the telephone incorporated into the Association's trade rules. In 1917, 31 years after the invention of the telephone, a rule was added that, "All sales by telephone shall be confirmed by mail" (Who's, 1917). The next year at the 22nd annual meeting of the Grain and Feed Dealers Association held on September 23-25, 1918 in Milwaukee, Wisconsin, A. L. Scott of Pittsburg, Kansas addressed the convention on "Confirmation of Telephone and Telegraph Contracts" (Scott). No record exists of this paper but the title and fact that the address was made implies that this topic was of general interest and importance to the industry.

2.4 *PATTERNS AND IMPACTS OF TELEGRAPHS AND TELEPHONES ON GRAIN TRADING*

To understand why changes occurred in the basic methods of trading grain in the United States during the nineteenth century, a brief review of some of the main events have been chronicled. The causality appears to run from technological innovation to diffusion. Then as economic pressure is experienced within a marketing system, an application of the new technology takes place which in turn leads to institutional incorporation. The mail system was sufficient since no better alternative existed until the telegraph. The same situation occurred between the telegraph and telephone. From the review of the Grain and Feed Dealers National Association's trade rules, it is apparent that the technology of the telephone was adopted before the trade institution recognized it. An arbitration case involving a telephone trade occurred in 1910, seven years before the Association's trade rules were amended in 1917 to reflect telephone trading.

In a similar pattern, the use of time contracts became so common during the Civil War that the Chicago Board of Trade developed rules and regulations to govern these hedging transactions. Here again, the institution was slower than the actual traders in recognizing the significance of changing methods and technologies. Nonetheless, the institutions did respond to changes and assimilate them into their structure. Otherwise, their effectiveness would have been diminished.

Within a communication and information context, the trend is to substitute information about a physical object for the actual physical object when exchange is the goal. This principle is seen most clearly in the development of uniform grades and standards. This occurred in the United States grain trading system only when the technology (telegraph) became available to extract economic gain from a quicker trading system.

The major impacts of the telegraph and telephone on cash grain trading were ushered in under the telegraph and intensified as the telephone replaced telegraphic communication. These impacts became apparent through a change in market structure. But this change was, in part, brought about through changes in trading efficiencies, which in turn were brought about by changes in the communication structure of the marketing system.

Richard DuBoff (1983), in an article on the telegraph and the structure of markets in the United States from 1845 to 1890, discovered an economic paradox that the telegraph helped to amplify. The market perfecting impact of the telegraph was through lowering information and transaction costs and thus providing a better information network. But at the same time, increased competition led to consolidation and oligopolies. It might be the case in capitalist economic systems that industries exist at a point in time somewhere on a continuum from perfect competition to perfect monopoly (Marx). An industry's position on the continuum is dependent to a large extent on the technology being used and also where the industry is in the life cycle of the technology. With respect to communication technology in grain trading, it appears that initially as the innovative technology diffuses, competition increases. Firms become more proficient in the use of the technology and leaders appear. This process tends toward consolidation and oligopolistic behavior.

Computerized communication became a reality during the 1970's. But its widespread application did not become economically viable until an auxillary innovation, the personal computer (PC), became available. Because of the PC's capability to be a stand alone computer in addition to a remote access terminal to a mainframe computer, the market for the service of computerized communication has increased. Thus, the technology exists and is presently being diffused throughout the grain industry. Taken in the context of the pattern exhibited in the history of the changing grain trade, a CTS for grains may be viewed in this historical perspective.

2.5 *CASH GRAIN TRADING TODAY*

2.5.1 *The Survey*

The cash grain trading system in the United States currently utilizes the telephone as the main communication tool. But computers are used in the grain industry to accomplish various operations and functions of the firm. In order to better understand the telephone trading system and explore the needs of the industry with respect to a CTS, a questionnaire was developed and administered to grain traders in selected areas of the eastern United States.

The questionnaire (Appendix I) was developed in the spring and summer of 1983. The goal of the survey process was to: (1) investigate how grain is currently traded; (2) assess the present status of the grain industry with respect to computerization; and (3) explore attitudes and the existing knowledge of the grain industry towards computerized trading.

The sample of grain traders selected for this survey was not random. Research has identified an innovator and entrepreneur type of individual or firm as being most receptive to computerized trading (Turner, et al.). With this in mind, respondents were selected based upon: (1) recommendations of university specialists, extension agents, and trade association personnel; (2) membership in various grain and feed associations; and (3) proximity to the area selected for enumeration.

The actual interviews were conducted on a personal basis after being prearranged by a telephone call. All interviews were performed by the same enumerator and lasted from forty five minutes to three hours. The interviews occurred during the fall of 1983. Discussion was encouraged by the enumerator.

The target area was that part of the United States east of the Mississippi River. Concentration centered on four different regions: (1) Southeast - South Carolina, North Carolina, and Virginia; (2) Midwest - Ohio and Indiana; (3) River Delta - Tennessee and Mississippi; and (4) Northeast - New York and Pennsylvania. Resources limited the number of interviews, but it was determined that the above regions would reveal any major differences that might exist between trade arrangements in the eastern United States. In addition, the combined areas contained truck, rail, barge, and ship trades. Figure 1 shows the location of the interviews. A grain trader is defined as anyone who is involved in a grain transaction. Grain traders from the producer to the exporter were surveyed.

2.5.2 *Current Status of the Grain Trade*

The traders interviewed were categorized by business activity (Table 2.1). Each respondent may be involved in more than one activity. These specific business activities were generalized into: (1)

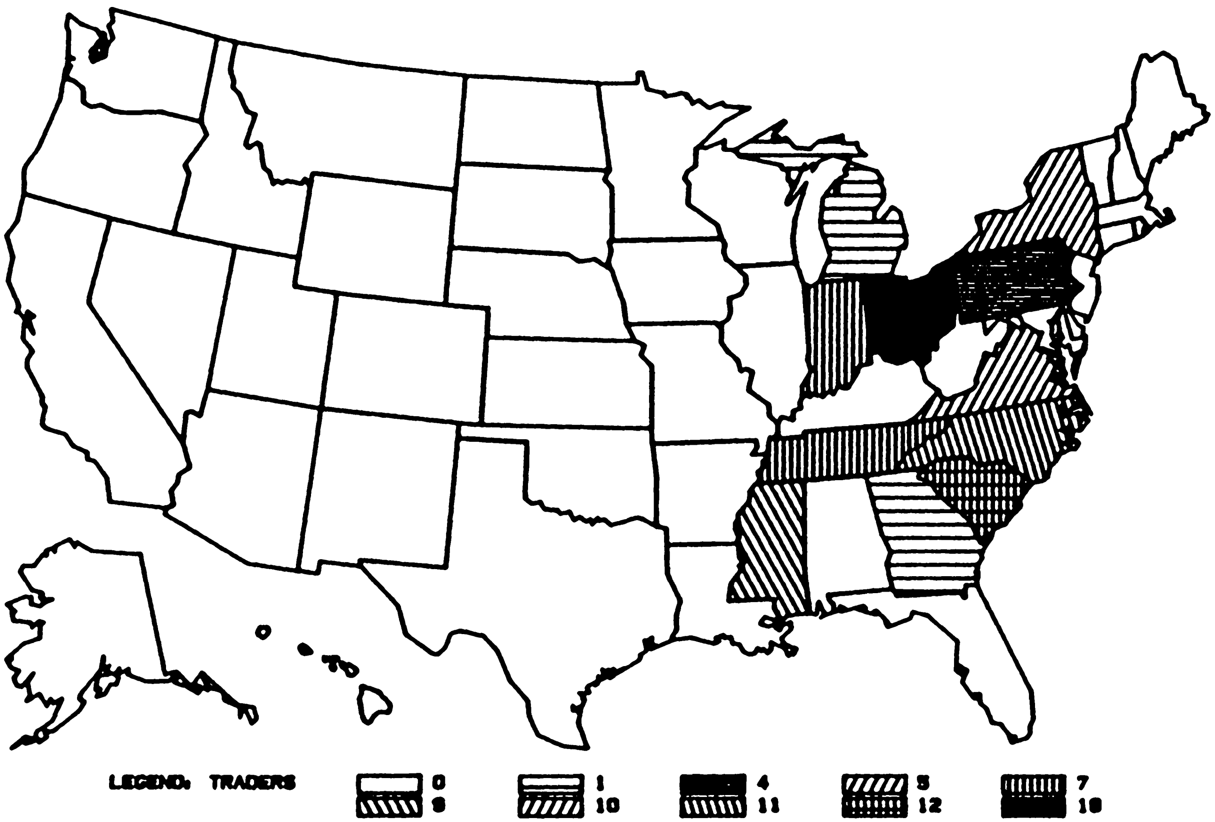

Figure 2.1 Location and Number of Grain Traders Interviewed

Table 2.1 Business Activity Profile of Grain Traders Interviewed.

Business Activity	Number	Percent of Total Business Taken up by this Activity					
		1-10	11-25	26-50	51-75	76-99	100
		Frequency					
Producer	13	2	1	0	0	2	8
Country Elev.	24	5	3	8	4	1	3
Feed Mill	17	4	4	4	0	1	4
Subterminal Elev.	7	2	0	2	1	0	2
Terminal Elev.	13	1	0	1	2	0	9
Export Elev.	3	0	0	2	0	0	1
Broker	8	1	1	1	0	1	4
Grain Merch.	3	0	0	0	0	0	3
Jobber	2	0	0	0	1	0	1
Feed Lot	3	2	0	0	0	1	0
Flour Mill	4	0	0	2	1	0	1
Processor	11	0	1	1	0	1	8
Poultry Prod.	2	0	0	2	0	0	0
Egg Prod.	2	0	0	1	0	0	1
Total	112	17	10	24	9	7	45

growers, (2) assemblers, and (3) users. Thirteen growers were interviewed. Assemblers were broken into those that actively handle the grain and those that do not. Assemblers that handle grain include: elevators; country, subterminal, terminal, export; and feed mills. In the Northeast, feed mills serve a similar function as country elevators in other parts of the United States. As is evident, a majority of those traders interviewed were involved in the assembly of grain. In fact, being an actual assembler of grains was mentioned 64 times out of the total 85 traders interviewed.

There were also assemblers that did not handle grain. These included: brokers, grain merchants, and jobbers. These activities were performed by 13 of the traders interviewed. They usually assembled information and not grain.

Users of grains were also interviewed. These included: feedlots, flour mills, processors, poultry producers, and egg producers. There were 22 users among the 85 traders interviewed. But these 85 interviewees represented at least 112 business activities relating to the grain trade. Each of these groups has a different perspective of the current grain trading system and how it might exist with the incorporation of a computerized trading system (CTS) for grains.

Two highly correlated factors were used to estimate the size of traders in 1982: amount of grain traded and grain storage. The majority of the traders sampled traded from 100,000 bushels to

10,000,000 bushels of grain and stored a corresponding amount of grain within this range (Table 2.2). Notice that there were many more respondents buying grains than selling grains. An explanation for this discrepancy lies in the way the data were collected. Many of those interviewed bought and sold grains in 1982. If the amount was equal, it was recorded under buy. Thus, the "buy category" includes grain bought and sold in some instances, while the sell category includes amounts of grain sold if it varied from the quantity bought or if it was sold exclusively.

A commonly cited benefit of computerized trading is increased competition (Henderson and Holder). This implies linking a larger number of buyers and sellers together. Table 2.3 portrays what is common knowledge in the grain industry. There are many more sellers than buyers as one moves up the marketing chain. This table shows the number of sellers required to supply 100% and 50% of an individual firm's purchases and, likewise, how many buyers are required to purchase 100% and 50% of a seller's grain.

For purchases of the three grains examined, the distribution of sellers appears normal at the 100% level with the peak appearing for all grains within the 101 to 500 supplier category. On the other hand, for sales the distribution at the 100% level appears skewed toward the lower (1 to 5 purchasers) end of the spectrum. It appears that few grain sellers have over 25 purchasers bidding on their grain. This is consistent with the concentrated nature of the grain industry as grain is moved from producer to users.

Table 2.2 Number of Traders by Size Category: 1982.

Grain	Activity	Mean Volume	1-25	26-50	51-100	101-500	501-1000	1001-10000	10001-50000	50000	Total
			Number of Traders								
	BOUGHT										
Corn		13,989	4	1	1	12	3	19	8	3	51
Wheat		3,984	4	2	3	12	3	19	5	0	48
Soybeans		8,913	6	1	3	12	5	11	11	1	50
	SOLD										
Corn		15,605	1	3	1	2	1	1	1	1	11
Wheat		3,422	5	1	0	2	1	3	0	0	12
Soybeans		12,003	6	0	0	3	1	0	3	1	14
	STORED										
Combined		5,047.826	5	6	5	15	6	23	7	1	68

Amounts of Grain (1,000 bu.)

Table 2.3. Number of Sellers and Buyers Required to Buy and Sell 50 Percent and 100 Percent of Each Grain Trader's Total Sales and Purchases in 1982.

Grain	% of Grain Traded	Sellers									Buyers								
		1-5	6-10	11-25	26-50	51-100	101-500	501-1000	>1000	Total	1-5	6-10	11-25	26-50	51-100	101-500	501-1000	>1000	Total
Transaction		Number of Responses																	
SALES																			
Corn	100%										12	5	12	7	4	3	1	0	44
	50%										23	12	5	2	0	0	0	0	42
Wheat	100%										23	7	13	6	0	1	0	0	50
	50%										37	9	2	0	0	0	0	0	48
Soybeans	100%										27	7	15	2	0	1	0	0	52
	50%										42	5	2	0	0	0	0	0	49
PURCHASES																			
Corn	100%	5	3	4	11	3	16	4	9	55									
	50%	10	4	14	9	4	5	2	3	51									
Wheat	100%	4	2	3	7	5	21	2	7	51									
	50%	5	4	9	14	2	8	2	2	46									
Soybeans	100%	4	0	3	8	4	22	2	9	52									
	50%	5	4	9	9	5	9	3	3	47									

Related to the availability of trade contacts is the spatial concentration of grain trading. Table 2.4 shows the geographic scope of the grain trade of the sample in 1982. Sales and purchases are viewed separately with the farthest and nearest trade contact in terms of miles delineating the traders' geographic scope.

For sales, the nearest purchaser was within 16 miles over 80% of the time. On the other hand, the farthest purchaser was between 50 and 1,000 miles 70% of the time. For purchases, similar percentages held. From Table 2.4, it appears that grain traders have good access to other traders. Rarely does a trader go outside a 50-mile radius to find his nearest trading contact. Of course, trade opportunities of which he is unaware may exist. Also, geographic scope of trade may change from year to year.

The great majority of grain traders interviewed cited transportation as the biggest obstacle to expanding the geographic scope of their trade (Table 2.5). Table 2.6 shows a breakdown of the grain trade, in 1982, by mode of transportation. Flexibility of the mode, along with the associated cost, determines rank, with trucks being used most often, followed by rail, by barge, and then by ship. Of those who used trucks to transport grain on purchases and sales, the majority used this mode over 75 percent of the time. Of those who utilized railroads in 1982, this mode was used less than 26 percent of the time for purchases in the majority of cases. For sales, railroads were used fairly evenly over all the percentage categories. Most

Table 2.4 The Geographic Scope of Grain Trade in 1982.

Type of Transaction:	Distance (Miles)								
	0-5	6-15	16-25	26-50	51-100	101-500	501-1000	1001-5000	5000
	Number of Respondents								
Sales:									
Farthest	1	2	7	3	16	16	20	8	0
Nearest	48	11	7	3	3	0	0	0	0
Purchases:									
Farthest	1	2	1	6	7	20	19	5	0
Nearest	30	14	5	8	1	2	0	0	0

Table 2.5 Stated Limitations to Expanding the Geographic Scope of Individual's Grain Trade.

Limitations	Frequency
Transportation	40
Competition	28
Time	4
Unfamiliar with Opposite Trader	3
Corporate Directive	5
Information Management	4
Coordinating Transfer of Commodity	3
Supply/Demand Factors	1
Limitation within the Firm	8
None	8
Total	104

Table 2.6 Mode of Transportation by Which Grain Traded in 1982 was Moved.

Mode of Transportation	Percentage of Grain Moved by this Mode									
	Purchases					Sales				
	1-10	11-25	26-50	51-75	75-100	1-10	11-25	26-50	51-75	75-100
	Number of Responses									
Truck	4	2	6	9	53	11	6	8	3	29
Rail	19	16	8	3	3	9	5	9	8	8
Barge	7	1	2	0	0	1	2	3	0	8
Ship	0	0	0	0	0	1	0	2	1	0

traders used barges to obtain supplies less than 11 percent of the time. On the sale side, the majority of barge traders used this mode over 75 percent of the time. Ships were used infrequently by traders in this sample. Only four traders used ships to transport grains in 1982 and, in all instances, sales were made.

It is important when grain is traded and transported that the trading parties understand explicitly when the title to the grain changes from seller to buyer. Misunderstanding can lead to unpleasant trades and a lowering of confidence. Within the grain trade, there appears to be general use of grain trade rules of the National Grain and Feed Association (NGFA) with respect to title transfer. When the mode of transportation was not specified, the majority of traders indicated that title transferred upon delivery of grain. When trucks were specified, "upon delivery" was cited as the point of title transfer over 80 percent of the time. Likewise, when rail, barge, or ship was specified, almost all respondents indicated that the title and bill of lading to grains transfer simultaneously.

As for problems with contract performance, nondelivery of full contracts by producers was most often cited. Also mentioned were late and no payment.

2.5.3 *Grain Trading Functions*

Spot sales, forward contract trades, delayed pricing, and deferred contracts are methods used to trade grain (Table 2.7). More traders indicated that they used forward contracts on purchases and sales than any other method of trading. Spot or cash sales were also used frequently by traders in the sample. Delayed pricing and deferred contracts were used sparingly in sales, although delayed pricing purchases were used by 19 traders. These pricing methods were used by far fewer traders than forward and spot pricing methods and at lower percentages.

Of interest to anyone trying to determine the capacity of a CTS for grain would be the maximum number of transactions the system would have to handle in any one day. The peak number of grain transactions per day for sales and purchases both at harvest and at other times of the year is shown in Table 2.8.

For purchases during harvest, the number of traders making a maximum number of trades from 5 to 500 was fairly evenly distributed across the six categories. For the rest of the year, the number of traders making over 25 purchases per day was relatively small.

On the sales side, over 70 percent of the traders made 15 or fewer trades per day on their busiest day during harvest. During the rest of the year, this percentage went up to 90 percent. Table 2.8 illustrates indirectly the assembling function of grain traders. Many purchases are made, the grain is assembled into larger quantities, and then a few large sales are made.

Table 2.7 Methods and Utilization Percentages of Grain Purchases and Sales in 1982.

Method	Number of Traders	Percentage of Total Trades						
		1-5	6-15	16-25	26-50	51-75	76-99	100
		Number of respondents						
		Purchases						
Spot (at harvest)	55	3	8	13	19	8	0	4
Spot (after harvest)	47	3	16	11	15	1	1	0
Forward contract	56	2	5	14	21	10	2	2
Delayed Pricing	19	6	7	5	1	0	0	0
Deferred Contracts	7	2	1	3	1	0	0	0
		Sales						
Spot (at harvest)	23	3	3	5	7	2	1	1
Spot (after harvest)	30	3	5	8	7	3	4	0
Forward contract	40	0	2	6	11	4	11	6
Delayed Pricing	5	1	2	1	0	0	1	0
Deferred Pricing	2	1	1	0	0	0	0	0

Table 2.8 Peak Number of Grain Transactions per Day.

Peak Number of Transactions Per Day	Sales		Purchases	
	During Harvest	Rest of Year	During Harvest	Rest of Year
		Number of Respondents		
1-5	27	23	8	16
6-15	17	4	7	17
16-25	5	1	10	11
26-50	5	2	16	6
51-100	3	0	11	3
101-500	2	0	12	2
501-1000	0	0	3	0
1000	0	0	3	0
Total	59	30	67	56

Another important piece of information to an operator of a CTS for grains would be when grain is traded. That is, the time of day that grain transactions take place. In this study, the operating hours of the futures market were used as the base time period (Table 2.9). The futures market is open from 9:30 to 1:15, Central Standard Time. Thus, in the Eastern Standard Time zone, the operating hours are 10:30 to 2:15.

Here again, a difference exists between purchases and sales of grain. For purchases, the total number of traders trading before, during, and after futures market operation is consistent at around the 45 level. Also, the percentages are generally evenly distributed, except in the case of purchases after the futures market closes. No trader made more than 50 percent of his purchases after the market closed.

On the other hand, more traders indicated they made sales during rather than before or after the futures market operation. There were 22 grain traders who made over 75 percent of their grain sales during the market session.

There are two explanations for the difference in the timing of sales and purchases. One simply has to do with the time of day. The markets are open in the middle of the day when business is being transacted. Another, and more important, reason is that on sales beyond the producer, many traders trade futures contracts in conjunction with cash sales.

Table 2.9 Timing of Grain Transactions with Respect to Futures Market Operation.

Type of Transaction	Percentage of Transaction Relative to Futures Market Operation: 1-10	11-25	26-50	51-75	76-100	Total
	Number of Respondents					
	BEFORE (9:30 C.S.T.)					
Sales	11	9	14	2	0	36
Purchases	8	12	13	4	10	47
	DURING (9:30 - 1:15 C.S.T.)					
Sales	1	2	14	8	22	47
Purchases	8	9	16	7	6	46
	AFTER (1:15 C.S.T.)					
Sales	11	16	6	0	1	34
Purchases	20	18	5	0	0	43

Table 2.10 gives a breakdown by the various business activities of the traders sampled of the percentage of grain hedged. As indicated at the onset, an attempt was made to interview sophisticated grain traders. Table 2.10 suggests that the traders interviewed were sophisticated in terms of the use of hedging.

Over 50 percent of the producers interviewed hedged. Some of these producers functioned in other activities related to grain trading. Over 70 percent of the first handlers interviewed hedged over 75 percent of their grain. As grain moves up the marketing chain, it is almost totally hedged as illustrated by all 13 terminal elevator operators hedging 100 percent of their grain.

Assemblers of grain who do not handle the actual grain were evenly divided between those hedging totally and those that hedged none. This can be explained by the fact that some brokers place hedges for their clients while others leave the actual hedging task to the individual client. Most of the large users of grain remain 100 percent hedged except for livestock and poultry feeders.

All the grain traders used United States Department of Agriculture (USDA) grade standards for corn, wheat, and soybeans. Occasionally, private standards were used. Likewise, 74 percent of the time a written discount schedule was posted and used to discount traded grain. Although the traders were not asked if they belonged to trade associations, most indicated that they traded under trade association rules, the National Grain and Feed Association being the

Table 2.10 Percentage of Grain Hedged by Type of Business Activity.

	Percentage of Grain Hedged						
Business Activity	0*	1-10	11-25	26-50	51-75	76-99	100
	Number of Responses						
Producer	5	0	2	3	1	1	1
Country Elev.	4	3	0	0	0	4	13
Feedmill	4	0	0	0	0	2	11
Subterminal Elev.	0	1	0	0	0	1	5
Terminal Elev.	0	0	0	0	0	0	13
Export Elev.	0	0	0	0	0	1	2
Broker	4	0	0	0	0	0	4
Grain Merch.	1	0	1	0	0	0	1
Jobber	1	0	0	0	0	0	1
Feedlot	2	0	1	0	0	0	0
Flour Mill	1	0	0	0	0	0	3
Processor	1	0	0	1	0	1	8
Poultry Prod.	1	0	0	0	0	0	1
Egg Prod.	2	0	0	0	0	0	0

*Included in this category are those traders who stated they used futures to price but gave no percentage.

most frequently cited (Table 2.11). Almost 20 percent of the traders interviewed were uncertain or unaware of any trading rules governing their transactions.

Information is the lubricant that makes markets work efficiently. Grain traders have access to and utilize a wealth of sources to keep informed. Table 2.12 shows what sources are being utilized and addresses traders' perceptions as to how important these sources are. Importance was ranked from no importance (1) to very important (10).

Among the wire services, Commodity News Service was cited the most and almost 60 percent of the time it was ranked as very important. Radio and television were often cited but perceived to be of minimal importance. Farm magazines, newspapers, and marketing newsletters were cited often but they were, in general, viewed as less important, important, and more important, respectively.

Telephone contact was the major source of grain trade information. Contact with country elevators was the most often cited source and such contacts were considered important. Grain merchants and brokers were mentioned frequently, and contact with them was ranked very important by more traders than telephone contact with any other source except head offices. Internal sources of information, such as head and branch offices, when mentioned were considered very important.

Computer contact with other traders was mentioned once and ranked very important. Face to face trader contact was not considered a very important source of grain marketing information.

Table 2.11 Trading Rules Used in Grain Transactions in 1982.

Trading Rules Used	Frequency
National Grain & Feed Assoc.	63
Uncertain	10
None	6
North Atlantic Grain Assoc.	1
National Soybeans Producers Assoc.	3
Total	84*

*A total of 74 traders gave these 84 answers.

Table 2.12 Importance of Sources of Marketing Information as Ranked by Grain Traders in 1982*.

Source	Importance										
	1	2	3	4	5	6	7	8	9	10	Total
	Number of Responses										
Grain Information Network	11	3	0	0	0	0	0	3	1	5	23
Reuters	12	2	0	0	0	1	0	3	1	7	26
United Press International	11	3	1	0	0	0	1	1	0	1	18
Associated Press	12	3	1	0	0	0	0	2	0	1	19
Commodity News Service	6	0	0	3	3	2	3	6	2	34	59
Radio	28	10	8	2	2	3	0	3	2	2	60
Television	28	11	7	3	2	1	2	2	1	1	58
Farm Magazine	24	9	10	5	7	5	4	0	0	1	65
Newspapers	19	11	7	4	4	6	6	4	3	2	66
Marketing Newsletters	13	2	8	4	6	5	12	5	3	4	62
Telephone Contact with:											
Head Office	3	0	0	0	0	1	0	4	4	25	37
Branch Office	0	0	0	0	0	0	0	3	2	4	9
Country Elevators	4	0	5	2	4	7	8	14	11	20	75
Terminal and/or Subterminal Elevators	4	3	4	2	6	2	4	12	10	18	65
Grain Merchants	3	2	1	2	2	5	4	14	8	23	64
Brokers	5	2	0	2	3	3	6	16	10	26	73
Processors	10	4	3	1	3	4	4	12	9	21	71
Foreign Buyers	28	0	1	0	2	3	0	1	1	5	41
Producers	6	1	3	4	7	6	5	9	11	17	69
Exporters	16	5	2	2	3	1	2	9	8	15	63
Computer Contact with buyers and sellers	15	0	0	0	0	0	0	0	0	1	16
Face to face contact with buyers and sellers	9	5	7	7	2	2	4	6	1	5	48

*Scale used to rank importance
(1 2 3 . . . . 8 9 10)
Not important — Very important

Since the telephone is relied on heavily in grain trading, information on the type of service used and costs were explored. As could be expected, regular dial-up and wide-area telephone service (WATS) were the most used (Table 2.13). It appears that OUT WATS was utilized more than IN WATS. OUT WATS calls may be placed at a fixed fee regardless of the usage rate. IN WATS lines accept calls (similar to accepting collect calls) at a fixed rate per month.

Competitors of the Bell system were used sparingly, these being MCI, Centrex, and Metrophone. This situation could change with deregulation of long-distance telephone service, as could the cost of telephone service with the accompanying increased competition. Table 2.14 shows past telephone costs of grain traders. The average monthly telephone bill was $3,653.44. By categorizing average monthly telephone bills, it is clear that a large group of traders had bills of $101 - 500, another large group had bills of $1,001 - 5,000, and a smaller group had bills in between $501 - 1,000.

Traders were also asked to report their highest and lowest monthly telephone bills. Of the traders who responded to this question, about 75% had high bills of less than $5,001, but the mean was $6,104.82. The mean of lowest monthly telephone bills was $2,719.60, with the range of cost being distributed in a similar fashion to the highest monthly telephone bills.

The phone cost per bushel of grain traded in 1982 can be seen in Table 2.15. For the overall sample, the mean phone cost per bushel of

Table 2.13 Type of Phone Lines Used in Grain Trade.

Type of Phone Line	Frequency
Regular dial up	59
WATS:	
unspecified	3
IN	27
In state IN	9
Out state IN	5
OUT	34
In state OUT	5
Out state OUT	9
Regional	1
MCI	1
Centrex	1
Metrophone	1

Table 2.14 Cost of Telephone Service for Grain Traders.

Cost of Telephone Service	Mean (Number of Traders)	Range of Cost (N/month)								
		0-50	51-100	101-500	501-1000	1001-5000	5001-10000	10001-25000	25001-50000	50000
		Number of Respondents								
Average Monthly Telephone Bill	3653.44 (74)	6	3	17	11	23	8	5	1	0
Highest Monthly Telephone Bill	6104.82 (41)	1	1	8	4	16	3	6	1	1
Lowest Monthly Monthly Telephone Bill	2719.60 (33)	2	3	7	5	10	4	2	0	0

Table 2.15 Phone Cost per Bushel of Grain Traded by Type of Business Activity (1982).

Business Activity	Phone Cost per Bushel of Grain Traded Number of Traders	Mean	Standard Deviation
		-------- cents	--------
Producers	11	1.51	2.07
Feedmills	10	0.96	1.20
Country Elev.	20	0.59	0.72
Subterminal Elev.	6	0.29	0.34
Terminal Elev.	7	0.31	0.25
Export Elev.	3	0.24	0.18
Feedlots	2	2.50	2.87
Flour mills	2	0.96	0.16
Grain Merchants	3	0.36	0.29
Jobbers	1	1.30	*
Processors	6	0.31	0.27
Poultry Prod.	1	0.13	*
Egg Prod.	1	0.36	*
Brokers	6	0.46	0.51
Overall	60	0.74	1.13

*Too few observations for computation.

grain traded was 0.74 cent. This cost appears to vary, depending on the type of business activity. Feedlots and producers have higher average phone costs per bushel traded, while the elevators have lower costs per bushel traded. Brokers and grain merchants also have lower than average phone costs per bushel traded.

As mentioned previously, the changing structure of the long distance telephone industry could dramatically affect these costs. For this reason, these figures should be used with caution if they are to be used to justify the cost advantage of a CTS for grains. Long distance telephone cost should decrease. The question is: Will telephone costs decrease as much and as rapidly as computerized communications costs? Also to be remembered is that decreased telephone costs may spur computerized communication since telephone lines are presently used to link computers.

Marketing time spent on the telephone was divided into six categories: (1) searching for buyers and sellers, (2) negotiating contracts, (3) transferring market information, (4) cultivating relationships, (5) completing trades, and (6) other. Traders were then asked to specify how much of their telephone marketing time was spent in each category. Table 2.16 contains these results and further categorizes them by business activity.

Transferring market information occupied about a third of grain traders' telephone time, both for purchases and sales. Relating this category to different business activities, some interesting differences

Table 2.16 Marketing Time Spent on Telephone Trading Grain by Type of Business Activity.

Total Telephone Activity	Total Business Activity	Purchases Mean (No.)	Purchases 1-25	Purchases 26-50	Purchases 51-100	Sales Mean (No.)	Sales 1-25	Sales 26-50	Sales 51-100
			Frequency						
Transferring market information		31.43 (67)	35	23	9	35.55 (54)	28	11	15
	Producers					47.76 (13)	4	3	6
	Country Elev.	36.73 (23)	10	7	6	33.40 (20)	10	5	5
	Feedmills	27.00 (15)	9	5	1	27.00 (9)	5	3	1
	Subterminal Elev.	47.85 (7)	2	2	3	50.00 (7)	2	2	3
	Terminal Elev.	28.41 (12)	7	5	0	26.77 (9)	6	2	1
	Export Elev.	46.66 (3)	0	3	0	50.00 (2)	0	2	0
	Broker	34.28 (7)	4	1	2	37.50 (6)	3	1	2
	Grain Merchants	28.33 (3)	1	2	0	30.00 (2)	1	1	0
	Jobber	10.00 (1)	1	0	0	10.00 (1)	1	0	0
	Feedlot	12.50 (2)	2	0	0				
	Flour Mill	22.00 (4)	3	1	0				
	Processor	28.00 (10)	5	5	0				
	Poultry Prod.	25.00 (2)	1	1	0				
	Egg Prod.	10.00 (2)	0	2	0				

Table 2.16 Marketing Time Spent on Telephone Trading Grain by Type of Business Activity (continued).

Total Telephone Activity	Total Business Activity	Purchases Mean (No.)	Purchases 1-25	Purchases 26-50	Purchases 51-100	Sales Mean (No.)	Sales 1-25	Sales 26-50	Sales 51-100
			Percentage of Time Spent on Activity						
			Frequency						
Searching for sellers/buyers		23.90 (66)	42	17	7	22.01 (53)	38	12	3
	Producers					9.53 (13)	13	0	0
	Country Elev.	20.81 (22)	16	5	1	24.63 (19)	14	3	2
	Feedmills	21.66 (15)	10	4	1	28.33 (9)	6	2	1
	Subterminal Elev.	19.16 (6)	4	2	0	16.66 (6)	4	2	0
	Terminal Elev.	27.91 (12)	7	3	2	26.87 (8)	5	2	1
	Export Elev.	17.50 (2)	1	1	0	17.50 (2)	1	1	0
	Broker	24.28 (7)	4	2	1	31.66 (6)	3	2	1
	Grain Merchants	31.66 (3)	2	0	1	27.50 (2)	1	1	0
	Jobber	36.50 (2)	0	2	0	33.00 (1)	0	1	0
	Feedlot	17.50 (2)	1	1	0				
	Flour Mill	21.25 (4)	3	1	0				
	Processor	25.50 (10)	7	1	2				
	Poultry Prod.	17.50 (2)	1	1	0				
	Egg Prod.	30.00 (2)	0	2	0				

Table 2.16 Marketing Time Spent on Telephone Trading Grain by Type of Business Activity (continued).

Total Telephone Activity	Total Business Activity	Purchases: Mean (No.)	Purchases: 1-25	Purchases: 26-50	Purchases: 51-100	Sales: Mean (No.)	Sales: 1-25	Sales: 26-50	Sales: 51-100
		Percentage of Time Spent on Activity							
		Frequency							
Negotiating contracts		17.60 (65)	54	9	2	15.22 (53)	48	3	·2
	Producers					18.08 (12)	10	0	2
	Country Elev.	18.27 (22)	19	2	1	14.65 (20)	19	1	0
	Feedmills	16.67 (15)	13	2	0	14.55 (9)	9	0	0
	Subterminal Elev.	10.00 (7)	7	0	0	10.71 (7)	7	0	0
	Terminal Elev.	11.09 (11)	11	0	0	13.55 (9)	9	0	0
	Export Elev.	13.33 (3)	3	0	0	10.00 (2)	2	0	0
	Broker	20.71 (7)	5	1	1	14.16 (6)	5	1	0
	Grain Merchants	15.00 (3)	2	1	0	15.00 (2)	2	0	0
	Jobber	37.00 (1)	0	1	0	37.00 (1)	0	1	0
	Feedlot	32.50 (2)	1	1	0				
	Flour Mill	31.75 (4)	3	0	1				
	Processor	16.50 (10)	8	2	0				
	Poultry Prod.	17.50 (2)	2	0	0				
	Egg Prod.	27.50 (2)	0	2	0				

Table 2.16 Marketing Time Spent on Telephone Trading Grain by Type of Business Activity (continued).

Total Telephone Activity	Total Business Activity	Purchases Mean (No.)	Purchases 1-25	Purchases 26-50	Purchases 51-100	Sales Mean (No.)	Sales 1-25	Sales 26-50	Sales 51-100
			Frequency						
Cultivating relationships		14.60 (63)	54	9	0	13.65 (49)	44	5	0
	Producers					13.00 (11)	10	1	0
	Country Elev.	14.18 (22)	18	4	0	14.36 (19)	15	4	0
	Feedmills	15.13 (15)	13	2	0	15.66 (9)	7	2	0
	Subterminal Elev.	12.50 (6)	5	1	0	11.66 (6)	5	1	0
	Terminal Elev.	17.45 (11)	9	2	0	19.66 (9)	8	1	0
	Export Elev.	18.33 (3)	2	1	0	17.50 (2)	1	1	0
	Broker	5.57 (7)	7	0	0	4.80 (5)	5	0	0
	Grain Merchants	10.00 (3)	3	0	0	20.00 (2)	2	0	0
	Jobber	10.00 (1)	1	0	0	10.00 (1)	1	0	0
	Feedlot	22.50 (2)	1	1	0				
	Flour Mill	11.75 (4)	4	0	0				
	Processor	20.22 (9)	7	2	0				
	Poultry Prod.	15.00 (2)	2	0	0				
	Egg Prod.	10.00 (2)	2	0	0				

(Column group heading: Percentage of Time Spent on Activity)

Table 2.16 Marketing Time Spent on Telephone Trading Grain by Type of Business Activity (continued).

Total Telephone Activity	Total Business Activity	Mean (No.)	Percentage of Time Spent on Activity: Purchases 1-25	Purchases 26-50	Purchases 51-100	Mean (No.)	Sales 1-25	Sales 26-50	Sales 51-100
			Frequency						
Completing Trades		13.87 (65)	59	4	2	12.05 (51)	47	2	1
	Producers					7.45 (11)	10	0	0
	Country Elev.	10.61 (21)	21	0	0	11.60 (20)	20	0	0
	Feedmills	16.86 (15)	13	1	1	11.88 (9)	9	0	0
	Subterminal Elev.	10.00 (7)	7	0	0	10.00 (7)	7	0	0
	Terminal Elev.	15.83 (12)	10	1	1	15.00 (9)	8	1	0
	Export Elev.	10.00 (3)	3	0	0	5.00 (2)	2	0	0
	Broker	15.16 (6)	5	0	1	15.20 (5)	4	0	1
	Grain Merchants	15.00 (3)	2	1	0	7.50 (2)	2	0	0
	Jobber	30.00 (2)	1	1	0	10.00 (1)	1	0	0
	Feedlot	15.00 (2)	2	0	0				
	Flour Mill	13.25 (4)	4	0	0				
	Processor	10.30 (10)	10	0	0				
	Poultry Prod.	20.00 (2)	2	0	0				
	Egg Prod.	20.00 (2)	1	0	0				

Table 2.16 Marketing Time Spent on Telephone Trading Grain by Type of Business Activity (continued).

		Percentage of Time Spent on Activity							
			Purchases				Sales		
Total Telephone Activity	Total Business Activity	Mean (No.)	1-25	26-50	51-100	Mean (No.)	1-25	26-50	51-100
			Frequency						
Other		0	0	0	0	0	0	0	0
	Producers					20.00 (1)	1	0	0
	Country Elev.	13.00 (5)	5	0	0	11.00 (5)	5	0	0
	Feedmills	11.66 (3)	3	0	0	10.00 (2)	2	0	0
	Subterminal Elev.	15.00 (2)	2	0	0	15.00 (2)	2	0	0
	Terminal Elev.	10.00 (2)	2	0	0	10.00 (1)	1	0	0
	Export Elev.	0 (3)	0	0	0	0 (2)	0	0	0
	Broker	10.00 (1)	1	0	0	0	0	0	0
	Grain Merchants	0 (3)	0	0	0	0 (2)	0	0	0
	Jobber	0 (2)	0	0	0	0 (1)	0	0	0
	Feedlot	0 (2)	0	0	0				
	Flour Mill	0 (4)	0	0	0				
	Processor	10.00 (1)	1	0	0				
	Poultry Prod.	10.00 (1)	1	0	0				
	Egg Prod.	0	0	0	0				

occur. Producers spend a great deal of their telephone time transferring market information as do subterminal and export terminal elevators. It also appears that users spend less time in this telephone activity than do the assemblers and growers of grain.

Searching for buyers and sellers, on the average, took a fourth to a fifth of grain traders' telephone time. Producers spent considerably less time searching for buyers and sellers while information specialists, such as brokers, grain merchants, and jobbers, spent more time on this activity.

Negotiating contracts ranked third among the six activities listed with the exception of several users who spent much more time negotiating than the average. Feedlots, flour mills, and egg producers spent about thirty percent of their telephone time negotiating.

Cultivating relationships took up about 14 percent of grain traders' telephone time and this relative percentage was consistent across almost all types of business activities. Of the activities explicitly listed, completing trades was given the least amount of telephone time.

The communication system of the present grain trading system was mentioned as a weakness three times as often as being a strength (Table 2.17). Closely related to this was the flow of information through the system, which 28 traders saw as a weakness as opposed to seven traders who saw the present flow of information as a strength. The integrity of the traders, personal nature of trading, and competition were the most often cited strengths.

Table 2.17 Stated Strengths and Weaknesses of the Present Grain Trading System.

Characteristic	Frequency	
	Strength	Weakness
Integrity	22	7
Personal Nature	14	1
Efficient		6
Exciting	2	
Fluid	5	
Volume	9	
Arbitrage	2	
Standardization	5	
Stability	2	4 (lack of)
Opportunities	5	
Information Flows	7	28
Knowledge	5	7 (lack of)
Competition	14	19 (lack of)
Simplicity	2	
Futures Market	7	6
Flexibility	7	
Communication System	3	10
It Works	8	
Association	1	
Rules & grades	8	1
Complexity		2
Transportation		3
Government and Laws		9
Time Consumption		6

Other weaknesses commonly cited were lack of education or knowledge, lack of competition, and government involvement. The role of futures markets in the grain trading system was viewed by about the same number of traders as a strength and a weakness.

2.5.4 *Computerization in the Grain Trade*

As Table 2.18 shows, 55 percent of the traders surveyed currently use a computer. Producers, brokers, and grain merchants have been the slowest to computerize, while users and assemblers have been more inclined to computerize. Furthermore, assemblers of grain who do not use a computer seem to have more definite plans for computerization within five years than any other group.

Of the traders who use a computer, IBM mainframes dominate and IBM microcomputers are used more than any other (Table 2.19). Six other mainframes were utilized by different traders with Data Point being the most commonly mentioned competitor of IBM. Ten different brands of microcomputers were used with only IBM, Apple, and Radio Shack being used by more than one trader.

Various functions of grain trading are beginning to be computerized. The most commonly mentioned function being computerized was the accounting of the firm (Table 2.20). One executive said, "The computerization of accounting pulls and directs the computerization of various other functions of our grain trade; from inventory, to trading, to payment, to distribution, and back to

Table 2.18 Current and Future Plans (within 5 years) for Computerization within Grain Trade by Type of Business Activity.

Business Activity	Status of Computerization					
	Currently in Use		Plan on Computerizing within 5 years			
	Yes	No	Yes	No	Maybe	No Response
	Frequency of Responses					
Total	47	38	11	4	12	11
Producer	4	9	0	0	4	5
Country Elevator	14	10	4	2	4	0
Feedmills	12	5	3	0	2	0
Subterminal Elevators	4	3	1	2	0	0
Terminal Elevators	10	3	2	0	0	1
Export Elevators	2	1	1	0	0	0
Broker	3	5	1	2	2	0
Grain Merchants	1	2	0	0	1	1
Jobber	1	1	0	0	0	1
Feedlot	2	1	0	0	0	1
Flour mill	2	2	0	0	1	1
Processor	7	4	2	0	0	2
Poultry production	2	0				
Egg Production	2	0				

Table 2.19 Brands of Computers Used by the Grain Trade.

Brand	Type of Computer	
	Mainframe	Microcomputer
	Number of traders using	
IBM	19	8
Digital	2	
Data General	2	
Burroughs	2	
Data Point	3	
Hewlett Packard	1	1
Honeywell	1	
Televideo		1
Radio Shack		4
Apple		6
National Cash Register		1
Sanyo		1
Commodore		1
Texas Instrument		1
Sperry		1

Table 2.20 Current and Future Computerization of the Functions of Grain Trading Firms.

Function	Computerization Percentage						
	1-10	11-25	26-50	51-75	76-99	100	Total
	Number of respondents						
	PRESENT						
Word Processing	2	0	0	2	1	7	12
Accounting	1	2	3	3	7	17	33
Inventory	2	2	1	1	2	16	24
Financial Investments	0	1	0	0	1	0	2
Marketing	2	2	0	0	1	4	9
Communications	7	1	2	4	2	0	16
	PLANNED						
Word Processing	1	1	0	1	0	2	5
Accounting	0	0	0	1	3	7	11
Inventory	0	0	0	0	1	8	9
Financial Investments	0	0	0	0	0	2	2
Marketing	0	1	0	2	0	0	3
Communications	0	0	4	0	2	0	6

accounting. Thus, the progress of computerization in our firm follows a circular route with refinement occurring at each completion of the circle."

The sample here gives credence to the above statement as the accounting task had been at least partially computerized by about 40 percent of the traders. Likewise, a percentage of the inventory function had been computerized by almost 30 percent of the sample. Nineteen percent of the total sample was using computers to communicate. Most of this communication was of an internal nature, linking different offices and facilities of the same firm. Word processing was being done by 14 percent of the sample, while some aspect of the marketing function was computerized by 11 percent of the firms. Other functions of the firm, such as those relating to financial investments, were rarely computerized. Interestingly, plans for increasing the computerization percentages of the above functions followed the same general trend of accounting, inventory, communications, word processing, and marketing (Table 2.20).

From Table 2.21 it appears that computerization of various aspects of the marketing functions is of lower priority than accounting and inventory control. Yet, as the cycle of computerization within the firm is repeated, one could expect the computer to become a useful tool in marketing as well. Table 2.21 renders a static examination of where the grain trade is with respect to computers and market information. Basis information is being stored at a minimum. Quantities are being

Table 2.21 Marketing Information Stored in a Computer.

Type of Information	Frequency*
Basis:	2
by location	6
by time	7
by grade	5
Quantities	22
Price quotes:	4
by volume	9
by grades	6
by type of storage	8
Grades:	5
Moisture	9
Protein content	5
Foreign matter	8
Potential traders	8
Delivery dates	14
Transportation data	8
Truck tickets	7

*Forty-seven grain traders used computers.

stored by a quarter of the traders interviewed, but this information is used for inventory control. Of course, the delineation between all the functions of the grain trading firm becomes blurred as the total unit is examined. Price quotes and grade information are stored in a computer by 5 to 10 percent of the grain trading firms interviewed.

About 10 percent of the traders store information on potential and actual traders, while 15 percent have delivery dates retrievable at the touch of a button. Information concerning transporation is also stored in a computer by about 10 percent of the traders.

The grain trade has begun to computerize. A wide divergence currently exists in the degree of computerization between the most and least advanced firm. With respect to the marketing and trading function, the industry is definitely in the embryonic stage. But the necessary ingredients, such as hardware and trader acceptance of the machine, exist to enable the trading of grain over a CTS to become a viable alternative. Especially important are the potential advantages of a CTS for grain to reduce the search time for buyers/sellers and streamline the transfer of market information. In addition, the potential exists to increase the number of trading partners at a constant cost. Also, a CTS could offer grain traders the capacity to zero in on specific market information and to disregard irrelevant information.

Another aspect to consider is the transferral of documents such as contracts, trade confirmations, and funds between firms. Perhaps it is with respect to these post-trade details that computerized communication can offer the industry major efficiency gains. Not addressed in the questionnaire were the cost of attending to these details. Mail, clerical, and banking costs are included in this category.

2.5.5 *Computerized Trading and Grain Traders*

Since computerized trading of agricultural commodities is a relatively new development, the lack of knowledge within the grain industry about it should not be surprising (Table 2.22). Of the 85 traders interviewed, over half were completely unaware of computerized trading of agricultural commodities. The group most familiar with computerized trading were producers, and two of them had actually traded on a computerized trading system for some other commodity. Keep in mind that the sample was stratified to include the more progressive grain traders. For all other groups of grain traders, those unfamiliar with computerized trading accounted for over 50 percent of the traders in the group. Familiarity was subdivided into degrees, with the scale being very familiar, familiar, slightly familiar, and unfamiliar. Though subjective in nature, the degree of awareness of a trader toward computerized trading can be measured using this scale. Four percent of the sample was very familiar with computerized trading. These traders had used a CTS to trade livestock and eggs. Fourteen percent of the sample had read about computerized trading while 25 percent had heard about it.

Table 2.22 Familiarity with Computerized Trading of Agricultural Commodities by Type of Business Activity.

Business Activity:	Very Familiar (have used)	Familiar (read about)	Slightly Familiar (heard about)	Unfamiliar	Total
	Number of respondents (% of category)				
Producer	2 (15%)	4 (31%)	4 (31%)	3 (23%)	13 (15%)
Country Elevator	0	6 (25%)	5 (21%)	13 (54%)	24 (28%)
Feed mills	0	3 (18%)	3 (18%)	11 (64%)	17 (20%)
Subterminal elevator	0	1 (14%)	1 (14%)	5 (72%)	7 (8%)
Terminal elevator	0	1 (8%)	2 (15%)	10 (77%)	13 (15%)
Export elevator	0	0	0	3 (100%)	3 (4%)
Broker	0	2 (25%)	2 (25%)	4 (50%)	8 (9%)
Grain merchants	0	0	0	3 (100%)	3 (4%)
Jobber	0	0	0	2 (100%)	2 (2%)
Feedlot	1 (33%)	0	0	2 (67%)	3 (4%)
Flour mill	0	0	1 (25%)	3 (75%)	4 (4%)
Processor	0	0	2 (18%)	9 (82%)	11 (13%)
Poultry production	0	0	1 (50%)	1 (50%)	2 (2%)
Egg production	1 (50%)	0	0	1 (50%)	2 (2%)
Overall*	3 (4%)	12 (14%)	21 (25%)	49 (57%)	85 (100%)

*The number of respondents in the columns will not necessarily add up to the overall total. One respondent may perform more than one activity, such as producer and feedlot.

Table 2.22 reveals an interesting phenomenon concerning familiarity towards computerized trading. Those traders involved with markets such as livestock and eggs where a CTS exists are most familiar with this type of trading alternative. But also notice that those traders nearest the grower are the most familiar with CTS's. This is logical because, historically, electronic marketing has been in part a response by producer groups to a perceived thin market.

After traders were asked how familiar they were with computerized trading, a discussion of the concept ensued (Appendix I). After the traders understood the general concept of computerized trading, they were asked what dimensions of their operation would have to be improved by a CTS for them to consider adoption.

Several dimensions were mentioned as being a potential impetus for prompting adoption of a CTS for grains. The one most frequently mentioned was expanding the market (Table 2.23). Increased efficiency, an input-output concept, was also often cited with cost and time savings being frequent reasons. Improving informational flows was mentioned by several traders as a potential inducement to adopting a CTS for grains.

Grain traders were asked what limitations should be placed on who could trade on a CTS. An overwhelming majority said there should be some restrictions (Table 2.24), but no clear direction emerged as to the nature of these limitations or how they should be applied.

Table 2.23 Reasons Given for Prompting a Firm to Adopt a Computerized Trading System for Grains.

Reason	Frequency
Expand market	21
Increase cost efficiency	12
Decrease transportation confusion	2
Save time	12
Improve efficiency of transactions	4
Improve informational flows	8
Improve search process	1
Standardize trading	1
Convenience	2
Total	61

Table 2.24 Preferences of Grain Traders on Limitations as to Who can Trade on a Computerized Trading System for Grains.

Preference	Limitation	Frequency
Yes:		19
	bonded, licensed dealers	9
	fee	5
	financially responsible	5
	quantity requirement	6
	no farmers	4
	exclusive to country elevators	1
	member of National Grain & Feed	1
NO		17
Identify traders		4
Total		71

Crucial to a CTS for grains are the types of trading procedures that the system must accommodate. Preferences towards trading procedure are shown in Table 2.25. Two procedures were specified explicitly: (1) firm bids and/or offers for a time period, and (2) listing with private negotiation to complete trades. Both of these procedures are used in cash grain trading today. Of the traders expressing a preference, the majority wanted both options. When a preference towards one of the two procedures was exclusive, the number of traders preferring list/private-negotiation outnumbered firm-bid/offer almost 3 to 2. Although not asked explicitly in the questionnaire, it appears that private negotiation plays a dominant role with respect to trading procedure for grain.

Also important to a design of a CTS for grains are those factors that the trader can "search across" over the system. That is, if a trader only wants to see trade alternatives for a certain location, he can specify that area and see options only within that locality. Table 2.26 gives an idea of what grain traders perceive as factors being important in making trades with established customers on a CTS for grains. The ranking scheme for importance was from 1 to 10, a 1 signifying no importance while a 10 represented very important. It appears that location, quantity, grade, price, and delivery dates are of primary importance. Mode of transportation, method of payment, and terms of trade were mentioned as being relatively important in both sales and purchases. Several of the grade factors were of minor

Table 2.25 Preferred Trading Procedures for a Computerized Trading System for Grain by Type of Business Activity.

Business Activity	Trading Procedure: Firm bid and firm offer	List and Private Negotiation	Both	Indifferent	Total
	Number of Responses (Percent)				
Producer	3 (25%)	4 (33%)	5 (42%)	0	12
Country Elev.	5 (21%)	7 (29%)	12 (50%)	0	24
Feedmill	3 (20%)	6 (40%)	6 (40%)	0	15
Subterminal Elev.	4 (57%)	1 (14%)	2 (29%)	0	7
Terminal Elev.	1 (8%)	4 (33%)	7 (59%)	0	12
Export Elev.	2 (100%)	0	0	0	2
Broker	1 (16%)	1 (16%)	3 (50%)	1 (16%)	6
Grain Merch.	0	0	3 (100%)	0	3
Jobber	0	2 (100%)	0	0	2
Feedlot	0	0	2 (100%)	0	2
Flour Mill	1 (33%)	1 (33%)	1 (33%)	0	3
Processor	0	3 (27%)	8 (73%)	0	11
Poultry Prod.	0	0	2 (100%)	0	2
Egg Prod.	0	0	1 (100%)	0	1
Total	20	29	51	1	

Table 2.26 Factors Important in Making Trades with Established Customers on a Computerized Trading System for Grains.

Factors	Ranked 8 or greater[a]					
	Purchases			Sales		
	No.[b]	Frequency[c]	%	No.[b]	Frequency[c]	%
Location	54	42	77	53	41	77
Quantity	58	42	72	49	34	69
Grade						
Test Weight	35	26	74	25	21	84
Moisture Content	52	26	50	32	18	56
Age	51	34	67	35	29	83
Protein Content	47	14	30	29	11	38
Odor	47	18	38	30	12	40
Color	51	23	45	32	21	66
Foreign Matter	48	19	40	29	15	52
Alfatoxin	50	34	68	36	27	75
Variety	53	47	87	35	31	89
Garlic	45	7	16	31	6	19
Damage Factors	47	29	62	34	26	76
(heat)	48	32	67	32	23	72
Type of Storage	46	9	20	32	8	25
Insects, Weevils, etc.	50	38	76	34	27	79
Price	70	63	90	55	51	93
Delivery Date	72	54	75	55	41	75
Others						
Mode of Transportation	12	9	75	6	5	83
Method of payment	16	11	69	16	8	50
Terms of trade	5	2	40	9	5	55

a The scale used to rank the importance of a factor was from 1 to 10. A "1" represented no importance, while a "10" represented very important.

b Number of respondents who stated that the factor was of any importance.

c Number of respondents who ranked the factor on 8 or above.

importance. These included age and variety of the grains. Also, the type of storage used to store the grain was not regarded as very important information. The type of storage is indicative of grade and quality information, but access to direct quality information would greatly discount the need for information on type of storage.

Table 2.27 is similar to Table 2.26 but it relates to new customers, not established customers. For sales, a credit reference or some type of credit confirmation is mandatory, while for purchases a statement as to ownership or title of the grain evokes similar sentiments. Of the remaining factors, the method of payment on sales was shown to be quite important in making a decision to trade with a new buyer.

The mode of transportation and the loading or unloading system of the trader were deemed to be of average importance. Again, method of storage was seen as of minor importance as was type of handler, although type of handler was almost twice as important in purchases as it was on sales. All the factors viewed as important with established customers would also be important with new customers. As far as who should be responsible for grading, over 70 percent of the traders thought grading should be left as it is. No trader thought the firm that ran a CTS should be involved in grading. The remaining traders who expressed a preference stated that a third party should be responsible for grading.

Table 2.27 Factors Important in Making Trades with New Customers on a Computerized Trading System for Grains.

Factors	Ranked 8 or greater[a]					
	Purchases			Sales		
	No.[b]	Frequency[c]	%	No.[b]	Frequency[c]	%
Credit Reference	51	31	61	62	61	98
Title of Grain	75	68	91	24	11	46
Mode of Transportation	64	34	53	47	29	62
Type of Handler	59	20	34	46	11	24
Method of Storage	57	6	11	37	4	11
Loading/Unloading System	63	25	40	47	21	45
Method of Payment	29	12	41	26	21	81

a The scale used to rank the importance of a factor was from 1 to 10. A "1" represented no importance, while a "10" represented very important.

b Number of respondents who stated that the factor was of any importance.

c Number of respondents who ranked the factor an 8 or above.

As important as grading is to the grain trade, information about discount schedules can have a bearing on trades. Throughout the interview process, traders consistently mentioned that discount schedules were another trading tool. Table 2.28 reports on trader preferences toward a common discount schedule on a CTS for grains. Although a majority of traders said they would be willing to use a common discount schedule, 35 percent would not and about 20 percent were unresponsive to the question or had indicated previously that grading should not be changed. Of those responding in the affirmative, no clear direction was evident as to who should be responsible for adjusting a common discount schedule on a CTS. Trade and/or producer associations, buyers, a third party, and buyers and sellers were mentioned as potential adjusters of any common schedule.

Most of the traders interviewed thought availability of transportation services should be included in a CTS for grains (Table 2.28). This would be an auxillary service and would have to be taken into account when designing a CTS.

Almost half of the individuals interviewed stated that they would be willing to participate in developing and testing a CTS for grains (Table 2.29). By far the most positive group were producers. In general, assemblers of grains were positive towards a CTS for grains. Users of grain were the least receptive to a CTS for grains.

Table 2.28 Preferences of Grain Traders Towards a Common Discount Schedule and Access to Transportation Services on a Computerized Trading System for Grains.

Answer	Question		
	Would you be willing to use a common discount Schedule?	Who should be responsible for adjusting a common discount Schedule?	Should transportation services be included on a computerized trading system for grains?
		Frequency	
Yes	39		62
No	30		6
No response or not applicable	16		16
Buyers		9	
Buyers and Sellers		6	
Trade and/or Producer Association		12	
Third Party		7	
Committee		3	
Referendum			
Other		2	
Doesn't Matter			1
Total	85	39	85

Table 2.29 Willingness to Participate in Developing and Testing a Computerized Trading System for Grains by Type of Business Activity.

Business Activity	Responses					
	No	Yes	Maybe	No Response	Refused to Answer	If Okayed by Home Office
			Frequency			
Producer		11	1	1		
Country elev.	2	14	2	5		1
Feedmill	2	5	1	8	1	
Subterminal elev.		6	1			
Terminal elev.	1	5	1	6		
Export elev.		2		1		
Broker	1	5		2		
Grain merch.		1		2		
Jobber						
Feedlot		2	1			
Flour mill		2		2		
Processor	1	4		6		
Poultry prod.			1	1		
Egg prod.			1	1		

Chapter 3

A FRAMEWORK FOR COMPARING PRICE DISCOVERY MECHANISMS

3.1 *INTRODUCTION*

The framework presented here allows price discovery mechanisms to be compared ex ante. The reason for this is that unlike other frameworks used to compare price discovery mechanisms, i.e. Forker, the framework used here begins with the basic axiom that the price discovery process is a communication process. Thus, instead of focusing entirely on the results of a price discovery mechanism, the framework here focuses on the integration of theory, application, and evaluation.

Communication theory and economic theory buttress the framework. The relationship between price discovery and price determination serve to illustrate the linkages between the communication and economic perspectives. Communication and functional criteria will be important benchmarks in comparing price discovery mechanisms.

After the theory has been established, the application of the theory to grain trading will be demonstrated. Factors and functions important in any price discovery mechanism for grain must be delineated. Afterward, the mechanism must be defined and explored as to its distinguishing characteristics.

When the application is clearly defined, then the evaluation process can begin. Both communication and functional criteria for a mechanism must be analyzed. Though examined separately, these criteria are interrelated in that the functional criteria are direct results of the performance of the communication structure of a mechanism. Likewise, economic concepts such as pricing and technical efficiency are the result of the functional performance of a mechanism. Finally, the economic efficiency of a price discovery mechanism influences the structure of an industry. Identification of pressures that are products of a price discovery mechanism can serve as indicators of future problems, opportunities, and directions within an industry.

3.2 *THEORY*

Theory is a principle or body of principles used to explain phenomena. Therefore, theory underlies explanation and also guides prediction. As stated previously, economic theory is tested using results generated from various price discovery mechanisms. Yet general equilibrium theory ignores this fact. In its search for equilibrium, the structure of a market and thus the communication structure of an industry are seemingly irrelevant. This is false. In fact, the hypothesis here is that equilibrium results are to a great degree dependent on structure.

The purpose of this section is to reexamine price discovery mechanisms in light of the fact that the price discovery process is a communication process. Taking this into account, the economic theory that deals with price determination may be better understood. The flow of material is to: (a) present basic communication theory, (2) apply this theory to the price discovery process for grain, (3) conjugate price discovery to price determination, and (4) examine the relationships between communication and economics through price discovery and price determination.

3.2.1 *Communication*

3.2.1.1 Introduction

The goals of communication theory are to explain the communication process and to analyze the communication structure of a system. To accomplish these goals, three tasks are necessary. First, the concept of information must be explored. Second, a model to represent the communication process is needed. Third, a method must be devised to analyze the communication structure of a system. The theory becomes operational with these three components - substance, model, and methods. Application can then ensue and the theory may be tested.

In this study, communication theory is a means, not an end in itself. Communication theory is used to help explain an economic phenomenon, price discovery. In other words, the focus of the communication in price discovery concerns economic dimensions. These dimensions will be specified and integrated within the communication perspective. The product of this process is a richer and more powerful tool to analyze price discovery mechanisms. Much of the material on communication is from Rogers and Kincaid's *Communication Networks*.

3.2.1.2 Information

Information lies at the base of the conceptual framework developed and used in this study. But closely related concepts, such as meaning, knowledge, understanding, and value are also crucial to establishing a foundation whereby information can take its appropriate place in this framework.

The terms data and information are used interchangeably in this study. The reason for this is that information is defined as data in the context of a particular decision (Everest, p. 164). Since grain trading is the context here, data and information are synonymous.

Closely related to the above delineation is a definition of information as "a difference in matter-energy which affects uncertainty in a situation where choice exists among a set of alternatives" (Rogers and Kincaid, p. 164). Here again, context is important, yet choice implies decision making. This aspect of choice presupposes that information is viewed not only in a physical context but also a psychological context. The physical context relates to the form, structure, and shape of the matter-energy while substance relates to the psychological context.

Within the psychological context of information lies meaning. Meaning is derived from information as persons communicate and perception and interpretation are the processes that transfer meaning. Perception bridges the gap between the physical and psychological levels of reality while interpretation follows perception and is the psychological registering of information.

The interpretation that an individual attributes to specific information can be traced to personal history and expectations. Since individuals have different interpretational bases, communication serves to equilibrate interpretation and thus, meaning to a certain degree. This contributes to mutual understanding which is necessary for a social decision like an economic exchange to occur.

Writing seems to have begun with some kind of organizational accounting and inventory (Boulding, 1981, p. 128). This type of recording then grew to begin accommodating the oral information that had been handed down in the form of poetry, drama and instructions. Writing increased the quantity and quality of both information and knowledge. With an increase in quantity, complexity became a problem. But the history of mankind has seen a continued effort to deal with increasing knowledge and information and not lose the meaning of its place in the larger context of whatever purpose was at hand.

The effort to maintain meaning in a world of increasing knowledge and information has included several responses. These responses are related to four characteristics of information -- structure, organization, standardization, and completeness. Each of these characteristics have evolved from the basic problem of extracting meaning from information and knowledge.

The fundamental characteristics of information are form and substance. Beyond these characteristics, the progression is to structure, to organization, to standardization and then to completeness. This progression can be illustrated through the written recording of information and knowledge which serves to overcome time and space limitations. Scrolls were an initial effective means of copy. But because scrolls were cumbersome and delicate, memorization became a valuable skill (know-how) that enabled the information and knowledge (know-what) in the scroll to be efficiently used. With the advent of printing and the subsequent appearance of books, organizational innovations, such as numbering of pages, tables of content and indexing continued to increase the efficiency of written information transferal.

Standardization arises by consensus of some group. Often, it is encouraged by economics, culture or tradition. Standardization also contributes to increased efficiency in information transferal. Efficiency in perception relates to the form of an object being invariant over time and space (Rogers and Kincaid, p. 49). Standardization does this to information.

Completeness can be seen in the evolution of libraries where vast quantities of information and knowledge are organized and stored in a central place. This further contributes to efficiency in information and knowledge transferal. The loaning of books by libraries is another example of increased efficiency in information transferal.

The characteristics of structure, organization, standardization and completeness are related to the value of information. Of course, structure is a prerequisite to any value. Organization contributes value to information, as does standardization and completeness. Because value has meaning only in an exchange context, distribution becomes a concern once exchange is initiated. Economic distribution is determined, in part, by information possession. If information is unorganized, the organizer can profit in two ways; (1) he can sell the organized information, or (2) he can profit by using his superior information base.

As the information is diffused to more people, it loses its private value. But here again, in the context of a particular decision, the organized information set will prove superior to the unorganized. When time and space are key determinants in a decision, organization becomes even more valuable.

To speak of value outside the context of exchange is inappropriate. This is true also of information. Without some level of exchange, information has no value. The total value is dependent on various factors, but without some communication information is worthless. Likewise, the value of information is inextricably bound to knowledge and skill. Knowledge helps to supply meaning to information. When knowledge is used to interpret information, understanding may result. Understanding is action dependent on knowledge and information.

Boulding (1981) has proposed that knowledge is synonymous with know-what while skil! implies know-how. With these definitions, the efficiency of information transferal can increase drastically with an accompanying increase in knowledge and skill. A good example of this is literacy (a type of skill). Literacy drastically lowers the cost of information transferal.

Standardization also contributes to better communication and lowers uncertainty. Completeness of the information sets is important, especially in a social context where information is released voluntarily. Here, completeness is never perfectly attained. There are threshold levels which are necessary before enough information is available to make a decision. The informational requirements of economic markets function to reveal these threshold levels. The market standardizes these threshold levels of information completeness. In fact, markets are no more than structured, organized, standardized information centers where information transfer is fluid and efficient.

Associated with information transferal are costs. The most expensive form of human information transferal is face-to-face verbal communication. This entails transporting the individuals who possess the information to a place where the transfer can occur. The limits of time and space are overcome by a large application of energy to matter.

If the information is transferred separate from the individuals, the cost drops drastically.

There is a tradeoff between cost and degree of intimacy in information transferal. As stated, face-to-face communication is intimate but expensive. Telephone information transferal is less intimate but less costly. Information transferal through the mail is less expensive but even less intimate. A decision is made by the individual as to the mode of information transferal depending on the purpose at hand. A key consideration is feedback. Communication becomes important as concern shifts to information transfers.

3.2.1.3 The Process

Communication is a process. Previous models of communication such as the Shannon-Weaver model portrayed communication as an act. But with the realization that communication is a process, a new model was needed.

The convergence model was the new model developed and symbolized a shift in communication theory. Before the model itself is presented, the components and levels of reality that the model encompass will be discussed. Information and mutual udnerstanding are the dominant components of the model. Three levels of reality are used for organization; the physical, the psychological, and the social.

Figure 3.1 shows the components of the convergence model. At the individual level, information processing involves perceiving,

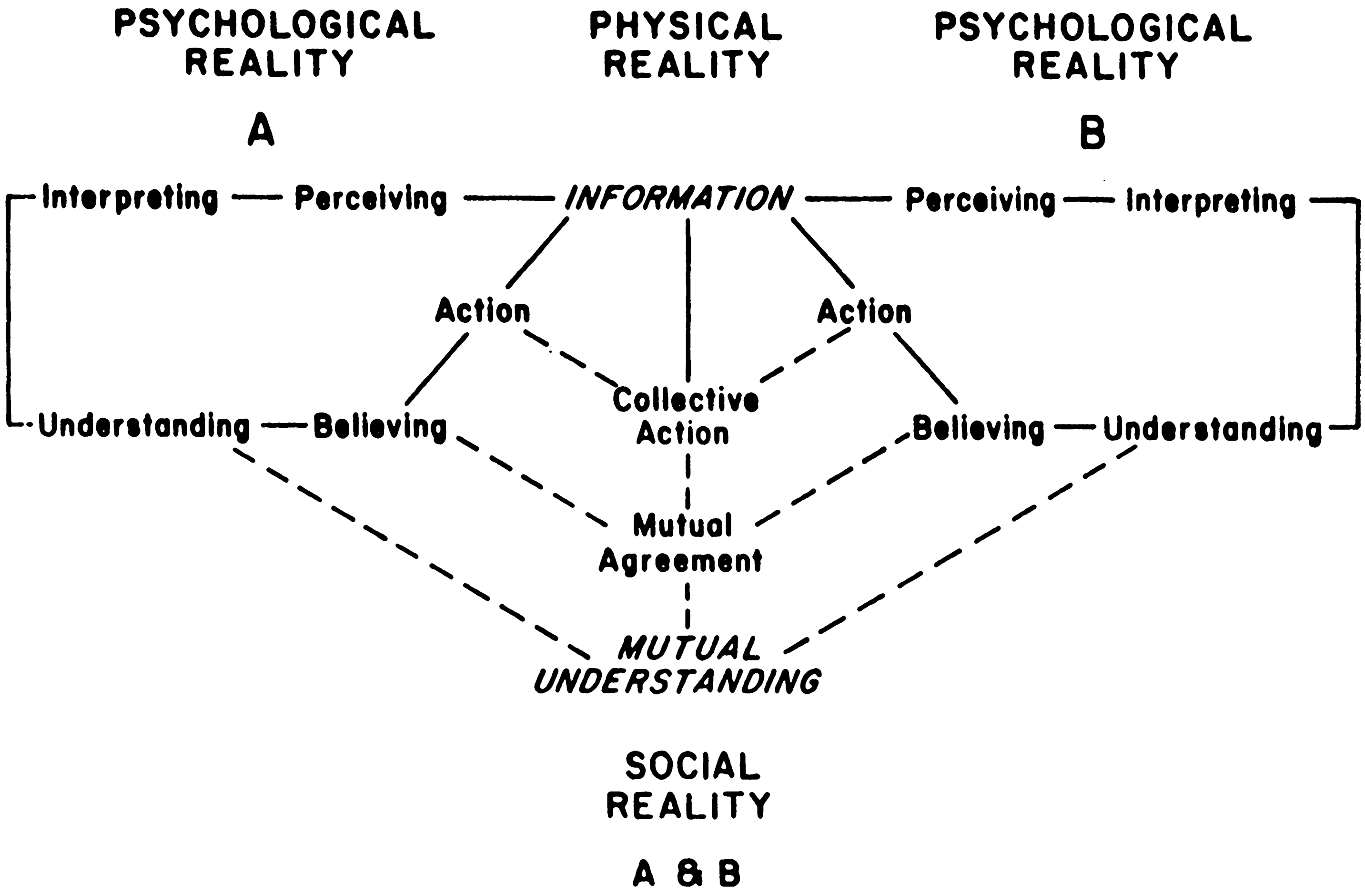

Figure 3.1 Basic components of the Convergence Model of Communication

Source: Rogers and Kincaid

interpreting, understanding, believing, and action. The process creates new information. Mutual understanding, mutual agreement, and collective action may evolve when information is shared by two or more participants. Likewise, misunderstanding, disagreement, and conflict have a probability of occurring.

Human systems are coordinated and connected by the exchange of information rather than by mechanical means or by force of matter and energy (Watzlawick, et al.). Human systems need feedback to function properly. Feedback "produces action in response to an input of information and includes the results of its own action in the new information by which it modifies its subsequent behavior" (Deutsch, p. 390).

Furthermore, feedback is a process over time when there are several cycles of information exchange and information changes. The result of a successful feedback process may be described as "a series of diminishing mistakes --- a dwindling series of under and over corrections converging on a goal" (Deutsch, p. 390). Thus, effective feedback contributes to convergence while ineffective feedback contributes to divergence.

It is with respect to the temporal aspect of feedback that the time cycle of information exchange becomes a concern. Kendrick has proposed that the evolution of economies have exhibited quickening cycle times of information exchange. This principle was exhibited clearly in the historical examination of the grain trade. The time cycle of information exchange can be extremely important when a social decision such as an economic exchange takes place. This becomes clearer as the convergence model of communication is presented in detail.

The Latin root of communication is communico, meaning "share" (Cherry, p. 2). With this in mind, communication is defined as a process in which participants create and share information with one another in order to reach a mutual understanding. Since communication is joint occurrence, it implies relationship. Through networks, interconnected individuals are linked by patterned flows of information. Mutual understanding of reality may mean physical reality but more often means information about reality.

Mutual understanding is never reached in any absolute sense due to the inherent uncertainty of information exchange, yet may be increased by several cycles of information sharing about a topic. But perfect mutual understanding is not required for most purposes. Usually when a sufficient level of shared understanding is attained for a certain task, communication ceases. Figure 3.2 depicts mutual understanding between two persons. Notice the overlapping circles, with each individual's understanding represented by his respective circle. The intersection of the circles connotes mutual understanding.

The model of convergent communication is depicted in figure 3.3 and reflects the cyclical nature of information exchange and the convergent nature of mutual understanding. The process beings with

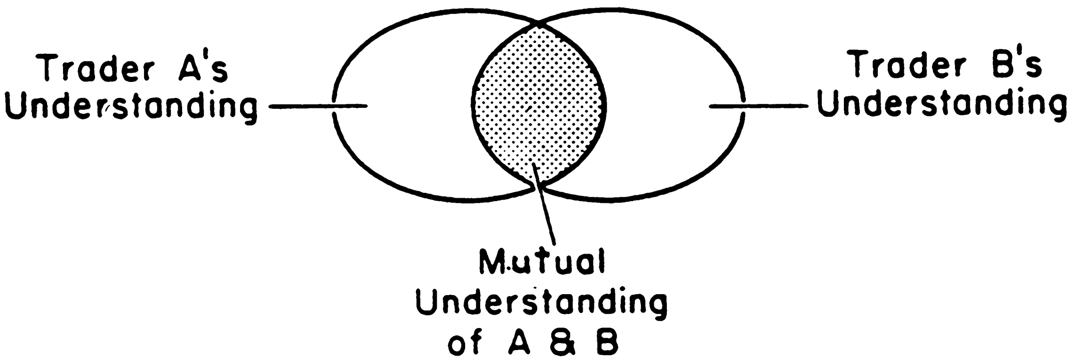

Figure 3.2 Communication as Convergence Toward Mutual Understanding

Source: Rogers and Kincaid, Kincaid and Schramm

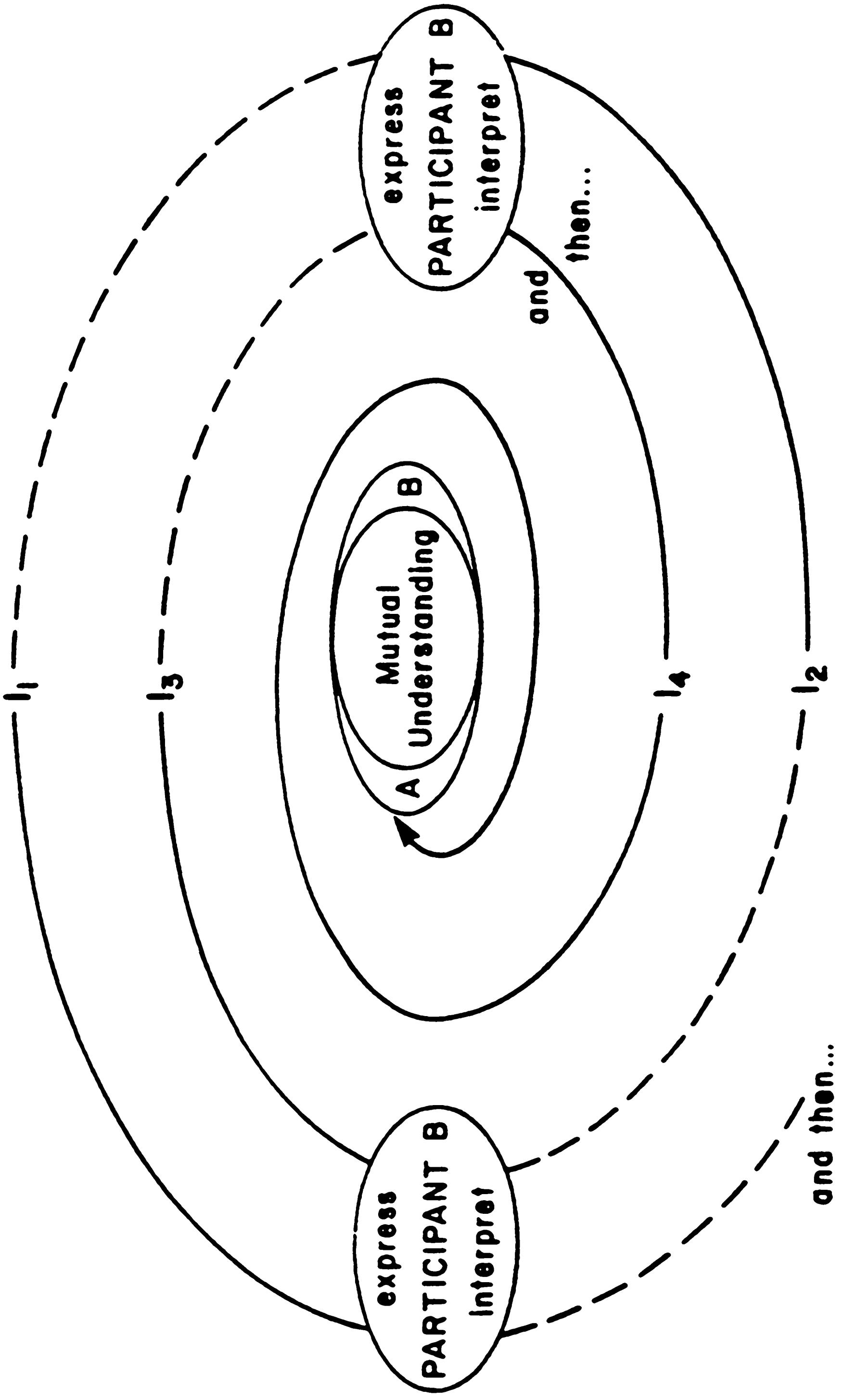

Figure 3.3 A Convergence Model of Communication

Source: Rogers and Kincaid, Kincaid and Schramm "and then" to signify a past. Person A shares information (I_1) with person B. Person B may respond by creating information (I_2) to share with A. This process continues (I_3. . . I_n) until one or both become satisfied with their understanding of the topic.

Uncertainty plays a role in mutual understanding. Decreasing uncertainty is a goal of communication. Tolerance, or the amount of variation allowed for some level of accuracy, is also an important concept in the convergence model (Bronowski). Most specific purposes require certain limits of tolerance to be attained before communication stops and the task is completed. Iterations of information exchange between participants in a communication process contribute to understanding of meaning and greater accuracy in perceiving and interpreting. Different tasks and situations require different standards of accuracy.

Therefore, an understanding of the convergence model of communication must take account the characteristics of the transferred information, the time cycles involved in the information exchange, and the tolerance levels necessary for social action. Mutual understanding, which is a goal of the communication process, results from the interaction and coordination of the above factors. Criteria for each of these factors can be devised and used to evaluate a communication system.

Criteria for information pertains to the characteristics of structure, organization, standardization, and completeness.

Quantifiable criteria can be devised for organization, standardization, and completeness. Standardization entails consistent meaning conveyed throughout a system. Terms and functions involved in a social action may be analyzed as to consistent meaning.

Likewise, completeness may be measured by how well the transferred information conveys the necessary meaning to accomplish specified goals within a system. Organization implies a structured form that decreases the time cycle required in information transferal. A criterion for organization is a measurement of the ratio between the physical information and the psychological extrapolation or meaning from the information. Information that is organized transfers more meaning with less physical energy-matter.

With the criteria for the information developed, attention may be turned to the time cycle of information exchange. A quicker time cycle is preferred to a slower time cycle given that the meaning transferred is equivalent. Thus, time cycles between dyads can be measured. The interval to be measured is from the beginning of communication until a mutual understanding is arrived at. Here again, the ratio between the time cycle required and that which occurs can be used as a measurement of efficiency in the communication process. In addition, the time cycle of information exchange throughout a network could be another measure.

After mutual understanding, several possibilities exist. One possibility is social action. In the context of this study, a trade or exchange is social action. Before social action occurs, a certain degree of tolerance must be reached before each participant agrees to the social action. Higher degrees of tolerance imply a more flexible system. Certain factors, such as credit information, might have low tolerance while other factors, such as deliver dates, might have higher tolerance levels.

3.2.1.4 The Structure

Communication between individuals follows the process represented by the convergence model. Yet, the network of communication determines the structure of a communication system. Thus, the structure of a communication system can be examined through the characteristics of the network. A method of research, communication network analysis, is used to identify the communication structure in a system. This is important because interpersonal communication flows exhibit patterns over time that are relatively stable and predictive of behavior. Furthermore, network communication is especially important when individuals are involved in exchanging information to reduce uncertainty.

A link is a communication relationship between two units in a system and is the basic datum in any type of network analysis. A direct communication link is usually operationalized by asking a question such as: "With whom in the system have you talked most frequently about topic X?" (Rogers and Kincaid, p. 97).

Random sampling is very difficult in network analysis since links cannot talk. Lacking a random sample, the use of statistical methods and inference are unjustified as an approach to network analysis. This, in turn, limits generalizations to larger populations.

There is a research tradeoff in utilizing network analysis, in that generalizations of the research results to a larger population have less basis. But on the other hand, the nature of the communication structure is better understood. A fundamental step in identifying communication structure is to measure various dimensions of the structure through the conceptual variables of connectedness, integration, diversity, and openness. These variables are operationalized by measuring proximity.

Proximity is the relative nearness of a pair of individuals to each other in a communication sense. A measure of proximity should index whether two individuals communicate directly and how closely tied they are through other individuals. That is, direct links and the overlap in personal communication networks serve as a proximity measure.

Communication data are structured in a matrix (Roistacher). Who-to-whom communication links are ordered in a matrix with each individual appearing on the row (to whom) and column (who) (Rogers and Kincaid, p. 157). In matrix form, there are two major ways to analyze network data; multiplication and manipulation. When the who-to-whom matrix is squared, the presence or absence of two-step links between each pair of individuals is indicated. Direct links appear on the diagonals. Likewise, cubing this matrix indicates a three-step link between pairs of individuals. Therefore, multiplication of the who-to-whom matrix is useful for measuring the number of links in the shortest communication path between two individuals (Rogers and Kincaid, p. 158).

On the other hand, matrix manipulation is used to measure proximity. Manipulation consists of rearranging the individuals in the rows and columns so that communication dyads, the non-zero entries in the matrix, with greater proximity are as physically adjacent in the matrix as possible. A communication proximity index for each dyad is computed in which a higher proximity score is awarded for a dyad on the basis of the degree of which the two individual's respective personal communication networks overlap.

When examining a system the two main indices of communication structure are connectedness and openness. The indices or characteristics of integration and diversity are relevant at the individual and clique levels.

Connectedness is defined as the degree to which a member of a system is linked to others in the system. To operationalize this concept in a system context, average system connectedness is measured, which is the degree to which an average member of a system is linked to others in the system.

Openness is related to the degree to which members of a system are linked to others external to the system. A more open system is expected to be ingesting more new and different information.

Integration and diversity are related to connectedness and openness, respectively and can be thought of as results of these more basic concepts. Thus, for a communication system to be analyzed, criteria for structure are connectedness and openness. These two criteria will enable communication structure to be identified and compared.

To summarize, communication theory provides criteria to evaluate both the microscopic and macroscopic aspects of communication. At the microscopic level, the convergence model, with its focus on the communication process, leads to criteria based on the characteristics of information, the time cycle of information exchange, and tolerance levels needed for social action. At the macroscopic level, communication network analysis, with it's focus on communication structure, leads to criteria based on the characteristics of the structure, which are connectedness and openness. These criteria for evaluating a communication system are more basic than the criteria used to evaluate a price discovery mechanism or system, an economic subset.

3.2.2 *Economics*

3.2.2.1 Introduction

Within economic theory, price determination is the result of economic forces that interact through markets to allocate resources. For a time period, an equilibrium price and quantity are determined by underlying fundamental economic forces that influence buyers and sellers. The markets in which prices are determined are assumed to incur no transaction costs while the available information to both buyers and sellers is assumed to be perfect.

On the other hand, the purpose of markets is to discover how resources will be allocated. In other words, price discovery becomes a goal. It is when price discovery is recognized as being the emphasis of inquiry that a shift of thinking is necessitated.

An emphasis on price determination leads to methods of analysis that focus on the results, i.e. price and quantities, of the price discovery process. This is appropriate when resource allocation is the area of interest. But as Buchanan, Morgenstern, and Boulding have stated, if the area of interest is exchange, trading, or price discovery, the use of general equilibrium theory to examine the process is inappropriate. In the case being dealt with here where price discovery mechanisms are being compared, ex ante, the domain of economic theory does not provide a complete framework. The inadequacy arises because prices in reality are not directly determined by the mechanistic intersection of known supply and demand curves. Instead, prices are discovered in the context of communication and an exchange of information. Thus, price discovery is an intermediate link between the atomistic information sets of individuals and firms and the aggregate result that economists call price determination. The result of this communication process are prices. At present, economic theory is remiss to completely *explain* the actual pricing results that emanate from the experimental economics and electronic marketing research.

But the premise of this study is that the price discovery process is a communication process. It will be shown how price discovery relates to price determination. In turn, this theoretical linkage provides an opportunity to reexamine the economic implications of different price discovery mechanisms.

3.2.2.2 Price Discovery and Price Determination

The process that occurs during an economic exchange resembles the convergence model of communication. The mutual understanding that results from the convergence process creates a sharing of information about the price of a product. Figure 3.4 illustrates this sharing of information. Notice the similarity to figure 3.2 which illustrated mutual understanding. If a montotomic transformation from information sets to understanding is assumed, then figure 3.4 would precede figure 3.2. In other words, the sharing of information predates any mutual understanding. With this in mind, a joint probability distribution may be thought to exist with respect to price. This is depicted in figure 3.5. It is hypothesized that there is a relationship between figure 3.4 and 3.5. That is, if the probability distribution is centered on the equilibrium price, then the sharing of information serves to decrease the width of the distribution. With less sharing of information, the width of the distribution would tend to widen signifying increasing uncertainty as to the accuracy of the discovered price. This principal has been empirically verified by

INFORMATION SETS

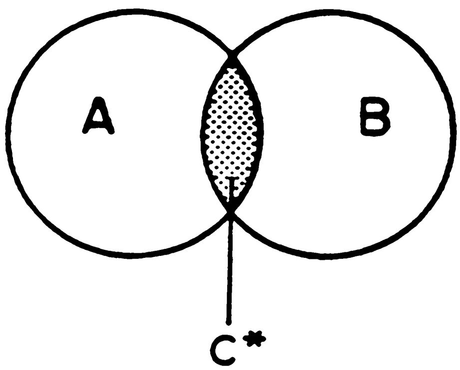

Figure 3.4 Exchange of Information Between Trader A and B Concerning Factors Involved in a Grain Trade

*C represents the level of overlap
C ranges from 0 to A=B

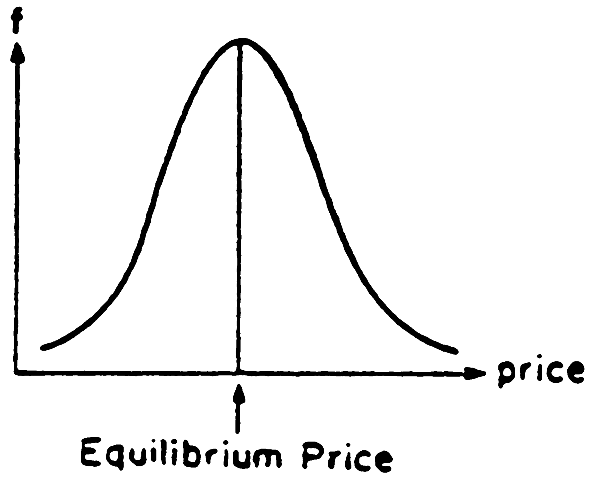

Figure 3.5 A Joint Probability Density Function Associated With the Exchange of Information Concerning Price

Buccola (1985) in his experiments with centralized and noncentralized trading. The skewness of the joint probability distribution would also be affected by the sharing of information. If one participant or group of participants (sellers) shared less information while at the same time gathered more information from their opposite participant (buyers) then one could expect the distribution to be skewed toward the participant with the informational advantage. This principle has been empirically verified by Smith in his experiments with different pricing rules and by Hamm, et al. in their evaluation of a CTS for livestock.

Price determination accommodates the communication perspective through the joint probability distribution inherent in price discovery. This is shown in figure 3.6, where there exists distributions surrounding the supply and demand curves. These distributions relate to the uncertainty associated with the price discovery information inherent in these curves. Notice that rather than an equilibrium price, there exists a range of "exchange" prices that correspond to the intersection of the probability distributions. As the probability distributions narrow, the range of "exchange" prices narrow. This is defined as price accuracy. Thus, information better understood and communicated throughout the system results in prices that more accurately reflect the economic forces at work.

Price levels fit in this framework with respect to the discovered price which may or may not be an equilibrium price. Here again circumstances or situations may bias the discovered price away from the

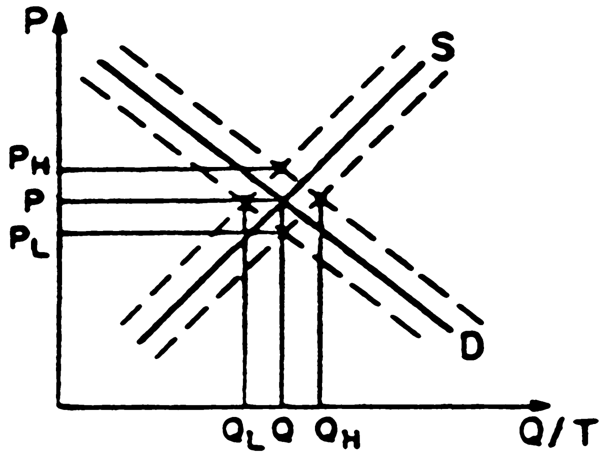

Figure 3.6 Price Determination Emanating From the Exchange of Information Considering Probability Density Functions Associated With Price

equilibrium price. Unequal sharing of information can translate into unequal mutual understanding. Table 3.1 uses a matrix to illustrate this unequal sharing of information. Trader A and B have different understandings because of unequal sharing of information about a trading situation. The off-diagonals of Table 3.1 represent the level of understanding between the two parties. Thus, trader A has a .6 understanding while trader B has a .3 level of understanding. Of course, these numerical representations of understanding are subjective, nevertheless they serve as a starting point in the progress towards a deeper examination of unequal bargaining power. Just as informational advantages can lead to a skewed distribution, another result can also be a mean price different from the equilibrium price. Buccola addresses this dimension of pricing efficiency and labels it price bias.

Essentially, price levels enamate from information possession and the capacity to use that information. Sometimes the information possession relates to physical possession of an actual commodity or service. In other words, insider information possessed by an individual or firm can translate into bargaining power. This result of this advantage, if used strategically and effectively, is an enhanced "price" to the one with the advantage. This enhanced "price" may not necessarily be an increased price. Other factors involved in the exchange may be used to make the trade advantageous to the trader with superior information.

Table 3.1 Mutual Understanding Between Traders of Unequal Bargaining Strength *

	TO WHOM	
TRADERS	A	B
WHO		
A	1	.6
B	.3	1

* Trader A has an informational advantage. A understands at a level of .6 while B understands at a .3 level.

The previous discussion on communication relates to pricing efficiency through the information and mutual understanding links. Rather than measure pricing efficiency after the fact of the price discovery process, the communication perspective offers an explanation for those results. Using the principles inherent in that explanation, the communication criteria may be used to predict the resulting pricing characteristics of a price discovery mechanism.

Pricing accuracy can be specified as the primary objective in a price discovery mechanism. With this in mind, the characteristics of information - organization, standardization, and completeness, along with the two characteristics of a network - connectedness and openness can be used as criteria in evaluating a price discovery mechanism.

3.2.2.3 Functions

Of course, pricing efficiency is incomplete in itself as an economic criterion for evaluating a price discovery mechanism. The technical or operational efficiency of the mechanism must also be evaluated and this relates to the functions the mechanism performs.

Any price discovery mechanism must perform to some degree the following functions: (1) searching, (2) transferring market information, (3) negotiating, and (4) completing trades. Other auxiliary functions may be performed but these four are necessary.

Evaluation of the performance of these functions must also be considered in the context of the cost of performing the function. Each of the functions may be examined separately as to operational efficiency and then the total trading function may be examined as to how well the different functions are coordinated in the particular price discovery mechanism. Criteria for each function and the aggregate function can be developed.

The search function is performed with respect to not only trading partners but also trading information. In fact, the search for traders can be subsumed in the search for information. A principle that will determine the amount of search is that a trader will search until his marginal cost of search (MCS) equals his expected revenue (ER) from that search (MCS = ER) (Stigler).

If the MCS decreases, the amount of search will increase. Thus, one criterion to compare price discovery mechanisms with respect to the search function is the MCS. A related concept is the marginal cost of information (MCI). Each price discovery mechanism has a MCI associated with it and this is, in part, a function of the MCS that is associated with it. Therefore, another criterion that could be used to compare the search function of price discovery mechanisms is the MCI encountered in each mechanism.

Transferring market information is a difficult function for which to develop a criterion. But one possible criterion could be the capacity of a mechanism to transfer information per unit of time. This could relate to the characteristics of information and the technical capacity of the mechanism. Of course, to be an efficiency criterion the cost of performing the function would be included. Therefore, the criterion for evaluating the transfer of market information functions would be a ratio of the technical capacity of the system to the cost. In addition, the time required to transfer information to the entire network could also be a criterion.

Negotiation is also a difficult function for which to develop a technical efficiency criterion. Negotiation relys on information transfer in a certain period of time. It is dependent on two-way communication. Therefore, a criterion could be the time cycle capacity for information exchange between two parties over a quantity of traders, taking account of cost.

Completing trades includes exchanging information such as contracts, bills of lading, payments, etc. This can be evaluated again strictly on a time cycle of exchange and cost criterion. The less time taken in the exchange and a lower cost imply a more efficient mechanism. In addition, coordination of the different tasks performed in completing the trade can also be considered. This involves examining the different communication tools and methods required to complete a trade.

The coordination aspect of a price discovery mechanism becomes important when the exchange process is viewed in total. That is, all the different functions are aggregated. Here again, the number, the coordination, and the costs of the different communication tools needed to perform the exchange function are important areas to study.

Furthermore, the labor involved in performing the different functions is crucial to the efficiency of the mechanism. Less labor required, if associated with an equal or increased level of performance, connotes greater technical efficiency.

Any additional functions performed in a price discovery mechanism should also be evaluated as to operational efficiency. But the criterion should focus on cost and performance, taking into account some type of measurement for performance. A ratio of performance to cost seems appropriate.

3.3 *APPLICATION*

3.3.1 *Introduction*

The theories that underlie the framework used to evaluate price discovery mechanisms involve communication and economics The framework can be summarized as being in the shape of a pyramid. At the base of the pyramid are information, the communication process, and the communication structure. Next comes the economic concepts of price discovery and price determination. As the price discovery mechanism is examined, the pricing and operational efficiency of the mechanism may be evaluated taking into account the functional performance and cost of the mechanism. The resulting efficiency of the price discovery mechanism will influence the market structure that evolves in an industry.

For the framework to be applied, a price discovery mechanism must either be in operation or conceptualized. Then the criteria, both communication and functional, may be used to evaluate the mechanism.

Two main areas must be explored with respect to a price discovery system. One area relates to the factors used in trading. That is, each price discovery mechanism has certain factors that are important for the mutual understanding of a trade situation. The other area relates to the functions performed by the price discovery mechanism.

3.3.2 *Grain Trading*

Grain trading fulfills several objectives. One is the actual transfer of grain from one owner to another. Another objective of trading in a market economy is to discover the value of the grain in question. The concern here is with the second objective, price discovery, and not with the physical transfer of grain per se.

In the United States, most cash grain, especially grain beyond the producer level, is traded over the telephone. In a phone call, the dynamics of the convergence model are occuring. This two-person communication process can be thought of as a microscopic look at a specific grain trade. A trade is a mutual understanding whereby a price has been discovered in conjunction with the other terms of the trade.

A general description of a telephone trade is as follows. Consider a typical grain firm. It is morning, a trader for a firm knows his current positions in both the cash and futures markets. He also knows inventory positions, transportation possibilities and other key variables that determine the parameters he will trade within for that day. His main communication tool is the telephone. He has a list of traders, at least mentally. They are making calls to him and he is calling them. The firm might also be receiving and shipping grain, thus making inventory position changes.

Assume that the trader's geographic trading range is limited to an X mile radius. He is searching and gathering information over the telephone. He is also keeping track of the futures market by telephoning his futures broker or subscribing to a wire service.

Each phone conversation deals with some aspect of a trade. The different aspects of grain trading can be decomposed into factors and functions. Factors relate to matter, energy, time or space and are symbols used to represent physical entities or actions. Functions pertain to action between traders that contribute to a trade.

3.3.3 *Factors*

The survey of grain traders revealed the important factors in making trades (Tables 2.26 and 2.27). Price was considered the most important factor, along with financial criteria, such as title or method of payment. Factors such as quantity, grade, delivery date, location and mode of transportation were also considered very important. Grain trading telephone calls and the related communication revolve around these topics.

In the context of the convergence model of communication, each individual trader possesses an information set that contains data on the above factors in addition to biographical, transportation and other data. Thus, the information sets or data bases crucial to the grain trading decision are: (1) market news, (2) futures, (3) internal firm information, (4) cash grain, (5) traders and (6) transportation. Figure 3.7 illustrates these data bases in an ideal environment. The environment is "ideal" in the sense that each data base is structured, organized, standardized, and complete for some space and time.

It is important to remember that each data base contains many variables. For instance, the futures data base is composed of current futures contract prices, volumes, and open interest along with past data on the variables contained in it.

The internal data set is unique to the individual firm. This data set contains data on accounting, financials, inventory, personnel, physical facilities, grain positions and transportation. It is changing and the firm's agility in managing this data set determines to some extent the firm's performance.

The survey revealed the functions most often computerized were accounting and inventory. Thus, it appears that the internal data sets of grain traders are increasingly becoming structured and organized.

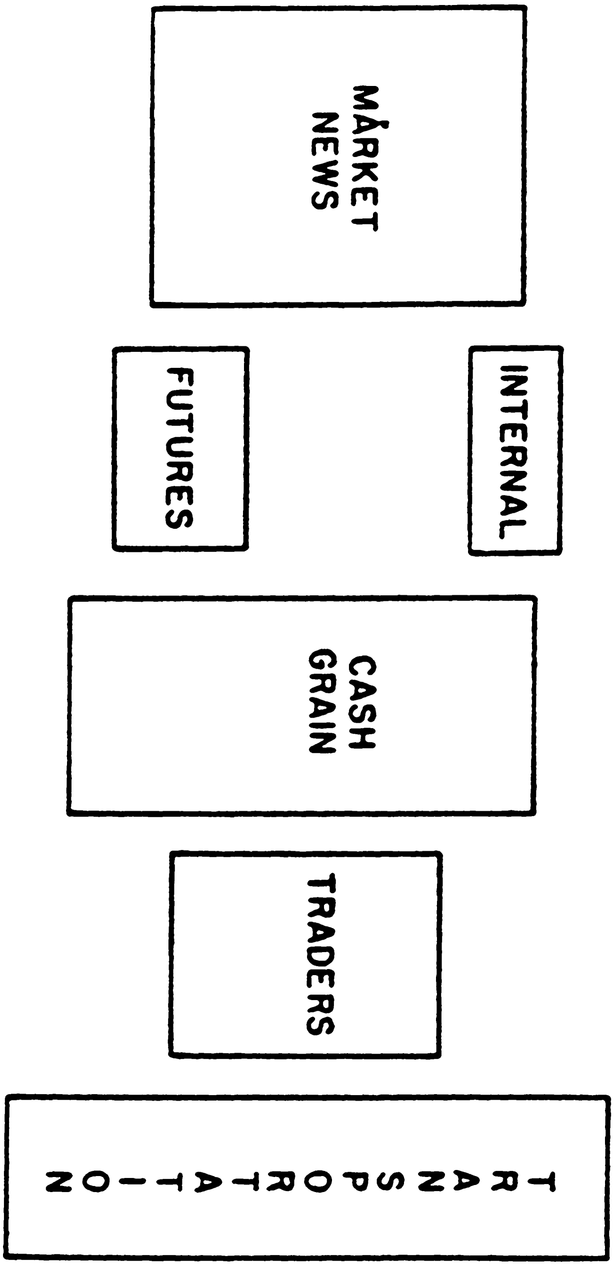

Figure 3.7 Ideal Information Sets for Trading Grain

This can be deduced from the fact that half of the grain traders interviewed were using computers in some capacity to manage data (Table 2.18).[1] This feature towards structure, organization and standardization also applies to the market news and futures data bases.

The three remaining data bases of figure 3.7 lack standardization, structure, organization and completeness. This contributes to inefficiencies in grain trading. Figure 3.8 represents the present grain trading data bases in the context of an information set. Notice the cash grain, traders and transportation data bases have irregular shapes. This is a consequence of unorganization, lack of structure, non-standardization and incompleteness.

The cash grain data base is external to the firm. A constant flow of data, sometimes fast and sometimes slow, is available to traders. The main method of tapping into the flow on a local, regional and sometimes national perspective is to telephone other traders. The market news and futures data bases also keep traders informed of grain supply and demand situations.

The remaining two data bases, traders and transportation, have characteristics similar to the cash grain data base with respect to structure, organization, standardization and completeness. Often the traders and cash grain data bases are viewed as inseparable. But the multivariable trader data base is distinct in that many of these variables

[1] The sample was biased towards sophisticated traders. A more representative sample in Iowa has shown that approximately 250 out of 1,300 elevators use computers in some capacity (Hervey, October 4, 1985, telephone conversation).

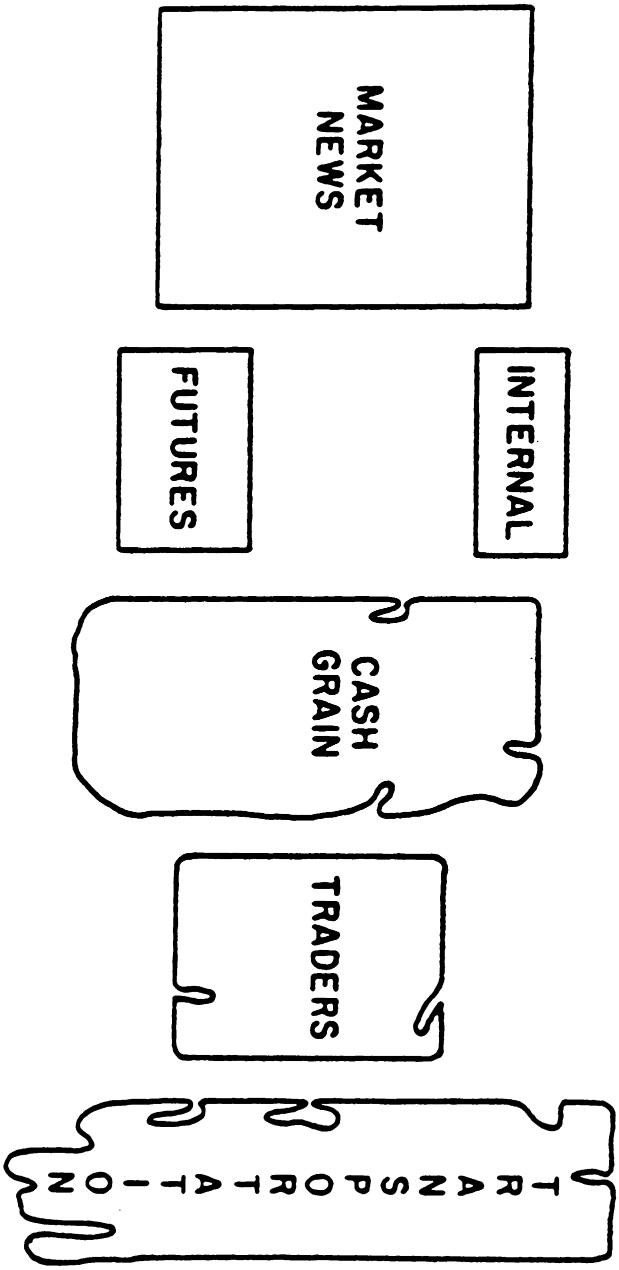

Figure 3.8 Actual Information Sets Used to Trade Grain

remain static over long periods of time. On the other hand, the dynamic nature of many of the cash grain variables necessitate a different data base.

The transportation data base, as can be seen from figure 3.8, is irregular and large. This data base, perhaps, is the greatest source of confusion in the current grain trading system. Information on transportation possibilities and alternatives differ for each trader. This information influences the terms of trade, therefore keeping track of low cost alternatives is very important.

If the data bases of figure 3.8 are enclosed (figure 3.9), the representation of an information set for an individual trader (A) can be portrayed. The purpose of trader A is to use his information set to trade grain to meet other specified goals. With the information set representation, the convergence model is a useful tool. Figure 3.3 applies to an individual grain trade, i.e. telephone call. Information/data for A's information set is shared with trader B and vice versa. This communication, in turn, changes A's perception of not only the external data base but also his perception of his own data base. Thus, the true value from A's information set is linked directly to its difference from other trader's information sets.

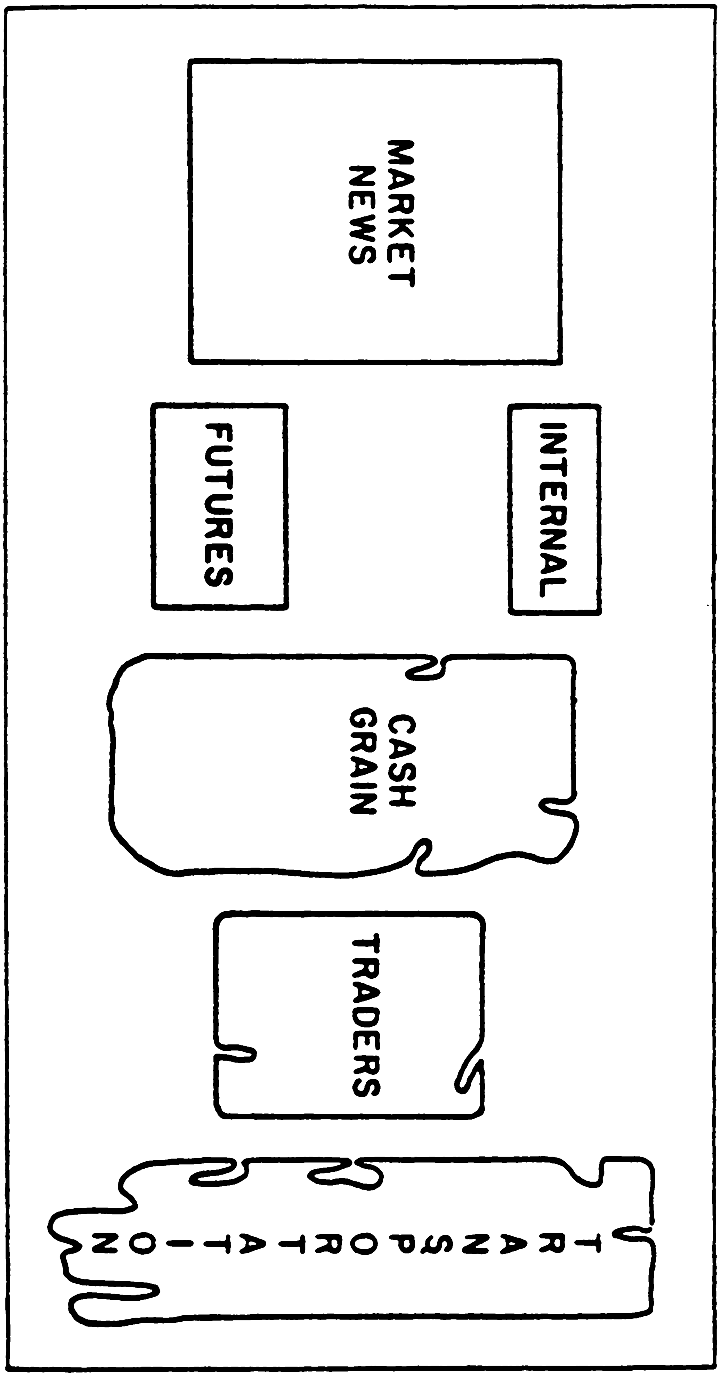

Figure 3.9 A Firm's Total Information Set Used to Trade Grain

3.3.4 *Functions*

The primary functions of a cash grain trade over the telephone are: (1) searching for buyers and sellers, (2) transferring market information, (3) negotiating, (4) cultivating relationships, and (5) completing trades. Different types of traders allocate different percentages of their total telephone trading time to these different functions (Table 2.16).

The convergence model between two traders is simultaneously being enacted by many traders in the network. Increasing the number of phone calls made and received by a trader increases the probability of improving his overall information set. In other words, for a trader "in the market," gathering more information increases awareness of alternatives. But as Stigler has pointed out, there is an economic dimension (MCS = ER) to this search or gathering procedure.

Since the telephone connects grain traders in a decentralized fashion, this MCS=ER principle applies but the optimality for the individual trader and especially the overall system is far from guaranteed. Different solutions arise to lower the cost of search. Localizing transactions in a central market, advertising, and development of specialized traders are alternative solutions to the search cost problem (Stigler, p. 216). In grain telephone trading, specialized traders such as brokers and merchants, whose sole purpose is to match buyers and sellers, have evolved. Interestingly enough, the role of central markets for cash grain has decreased as telephone technology has spread. But a CTS for grain is a response to the problem of search costs.

After the search function has been performed and traders are located, then the convergence process can take place. During this process, market information is transferred. Though trades are one result of price discovery, in grain trading they are far from the only result. It is with respect to other results of the "price" discovery process that traders are often interested. Traders commonly refer to these other results as "getting a feel for the market". These other results relate to a host of factors, all contained within the five data bases mentioned previously. The telephone enables traders to economically "get a feel for the market".

Negotiation in grain trading usually takes place after the searching and the transferring of market information functions. The reason for this is that the information sets of each trader is better understood in the context of the overall market. It is only after the two initial functions have been performed that the trader is ready to negotiate. Negotiations also follow the convergence communication process, therefore the information sets, the time cycle of information exchange, and tolerance levels are important determinants as to whether a trade ensues between traders. These are sufficient conditions. But a necessary condition is communication contact, which the search function accomplishes.

After a trade is made, the data about the trade switches data bases. It leaves the cash grain data base and goes to the internal data sets of the traders involved. The traded grain data might also travel to the market news data base. In addition, the trader data base is changed, but often in a very subtle way. If the trade is completed in a smooth fashion, that is, delivery, payment and any other details of the trade are satisfied, then the file of the opposite trader is credited with a reliability or trust increment. This aspect is especially important in trades with previously unknown traders.

Completing trades involves the transferring of contracts, the exchange of money, and monitoring of the physical exchange of the commodity. These functions utilize the mail system in addition to the telephone system. Furthermore, the firm's computer system is involved in completing trades. Thus, often the information must be "repackaged" as it enters a different communication technology.

Another function that occurs during the price discovery process in cash grain trading is cultivating relationships. Across all traders interviewed, this function took up to around 14 percent of the total telephone marketing time. This function helps in the psychological areas of perception and interpretation. It is the personal interaction that helps information to convey meaning in an enjoyable fashion.

Taken together these five functions will be performed to some degree by a price discovery system for grains. Criteria can be developed for each of the functions again based on performance and cost.

3.3.5 *Criteria*

Many of the criteria used to evaluate the factors and functions of a price discovery mechanism are communication criteria already developed. Since the different factors are pieces of information, the criteria for the characteristics of information are appropriate. But as information is aggregated into information sets (or data bases) criteria become necessary for these information sets. First, are the data bases in existence? Second, if the data base exists, is it standardized? Finally, how accessible is the data base?

With respect to the different functions, the search and transferring market information are primarily functions of the connectedness of the network. On the other hand, negotiation and cultivating relationships depend not only on connectedness but also the time cycle of information exchange. Criteria for evaluating the completing of trade function are performance and costs. Performance relates to the time cycle of information exchange and the technical efficiency of the exchange.

Criteria for the overall trade functions are: (1) how many communication technologies are used, (2) the amount of labor involved, and (3) the synchronization between the different functions.

3.4 *EVALUATION*

Each price discovery mechanism must be evaluated using the criteria associated with information, the communication process, the communication structure, data sets, functions, performance, and costs. Within the context of economic evaluation, the criteria become pricing efficiency and technical efficiency. The efficiency of a price discovery mechanism influences market structure through behavior patterns over time.

As far as pricing efficiency, the main economic criterion is pricing accuracy. But, of course, since accuracy relates to an equilibrium price and this is an elusive measurement, the distribution of prices encountered in a price discovery mechanism over a certain period of time become the empirical measurements. Examination of beginning bids and offers and the convergence process over the network of traders with resulting trades and the accompanying prices will reveal price variance and also enable the time cycle of the convergence process to be measured.

The mean of the distribution of prices over a period of time for a price discovery mechanism can also be measured and used for comparison with other mechanisms. Changing trading procedures, rules, and requirements can have a direct effect on mean price levels. Smith's experimental work shows this as does the evidence that has been forthcoming from applications of electronic marketing (Schrader).

Buccola's measurement of price bias should also be addressed when the price efficiency of a mechanism is evaluated. It could be possible that changing the operating procedure of a mechanism could affect price bias. On a CTS for grain, a counter offer or bid could appear to the entire market or only to the trader to which the counter is directed. Although the actual computerized trading system would adopt the practice desired by grain traders, experiments could be conducted using both practices and comparing the resulting mean prices and distributions. This type of experimentation is being done today to some extent (Buccola).[2] But the computerization of price discovery mechanisms will allow experimentation to be more scientific. That is, settings may be controlled is a more consistent manner.

Technical efficiency of a price discovery mechanism can be most conventionally evaluated by ratios consisting of functional performance measures and costs. The marginal cost of search (MCS) is one such measure. A related measure to the MCS is the marginal cost of information (MCI). Likewise, there could exist a marginal cost of negotiation (MCN), with the associated marginal cost of a trade (MCT). Post trade functions such as mailing contracts and bills of lading, monitoring the physical exchange of the commodity, and receiving and disbursing funds could also be monitored by marginal or average costs

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[2] Buccola's experimental methods can be questioned due to the fact that all his subjects are in a central place. Comparing centralized and decentralized price discovery mechanisms in this manner is not entirely consistent since all the subjects are connected in a communication context.

measurements.

The overall measurement for technical efficiency could be the marginal cost of the total trade function (MCTT), which would include pretrade, trade, and posttrade activities. The main idea in this case is to have a measurement that would be comparable across different price discovery mechanisms. One aspect that would be important in the MCTT will be the synchronicity that exists or does not exist in performing all the different functions within the price discovery mechanism.

3.5 *MARKET STRUCTURE*

Many operations are involved in performing the various marketing function of an industry. The price discovery or trading function is but one of those marketing functions. But the price discovery process and the mechanisms through which this process is performed has an influence on the market structure that evolves.

The market structure implications of different price discovery mechanisms are results of the pressure from changing efficiency. That is, pricing efficiency has impacts on the revenue of the firms while technical efficiency has impacts on the costs. From this it is clear that if a mechanism increases both the pricing and technical efficiency then the non-adopting firm is squeezed from both the revenue and cost side. In this case, the more efficient price discovery mechanism becomes a competitor of other price discovery mechanisms. This exerts pressure throughout the industry.

If history is a reliable predictor, it appears from the telegraph case that competition within an industry intensifies with the adoption of a more efficient price discovery mechanism. Competition over time decreases the number of firms within the industry. Where this occurs, an oligopoly type structure evolves and competition continues, but at a less intense level. Through communication networks, the remaining firms sometimes cooperate in business activities. This is done through trade associations and interindustry boards of directors (Murkirs and Sturgeon).

The average cost of trading in the long run can be used to show that if a trading mechanism is more efficient technically, ceterus paribus, then those firms not adopting the more efficient mechanism will exit the industry. Thus, for evaluating the relationship between market structure and a price discovery mechanism the key factor is efficiency. Using the economic framework of efficiency, questions concerning market structure may be asked and eventually answered given time.

3.6 *COMMENTS*

The framework developed here draws on concepts from communication and economic theory. A close examination reveals the price discovery process to be a communication process, therefore the starting point in evaluating a price discovery mechanism is to develop criteria for information, the communication process, and the communication structure prompted by the mechanism.

Next the linkages between communication theory and economic theory become clearer through the illustration of the relationship between price discovery and price determination. The pricing and operational efficiency of a price discovery mechanism are the primary evaluative techniques. The result of efficiency evaluation is to be able to examine market structure questions.

The following chapter takes account of the framework developed in this chapter and uses the framework to conceptualize a computerized trading system for grains. This is an alternative price discovery mechanism to the telephone trading system used today.

Chapter 4

A COMPUTERIZED TRADING SYSTEM FOR CASH GRAINS

4.1 *INTRODUCTION*

From Chapter 3, it is apparent that the economic efficiency of a price discovery mechanism is derived from the underlying communication structure and technical apparatus that connect the system. From an information standpoint, organization, standardization, and completeness are characteristics that improve communication efficiency. In the context of communication structure, connectedness of the total system of traders is a necessary and most important influence on communication efficiency and thus pricing efficiency.

With respect to the technical or operational efficiency of a price discovery mechanism, the performance of the various functions of price discovery, along with the associated costs, are the important considerations. With this in mind, a CTS for grains can be conceptualized and modeled to help improve price discovery for cash grain. The purpose of the model is to accommodate the trading functions and serve as a prototype for an actual operating system. In addition, the model will serve as an educational and marketing tool to increase the level of understanding concerning a CTS for grains in the industry. The education process will also enable the development of the model to better accommodate the needs of the industry through feedback. Thus, when an actual operating system is developed and implemented, much of the uncertainty surrounding the format, procedures, and operation of the system will have been addressed. This feedback could be crucial to the early success of a CTS for grains.

Two different aspects in the development of a CTS for grains will be addressed in this Chapter. The first aspect is the conceptualization process. This process is accomplished by a research team interacting with grain traders. It includes three steps: (1) socialization of the research team, (2) presentation of the information discovered by the research team to the grain traders, and (3) building a model of a CTS for grains. It is this third step of the conceptualization process that generates the second aspect in the development of a CTS for grains -- a product. This product is a model that serves as a prototype to the industry. It is to be expected that the prototype will be re-invented and changed as implementors push the concept to reality. But this model of a CTS for grains will be used in the comparison with a telephone trading system for grain.

The model is discussed with respect to the factors (included in data sets), functions, and operations associated with it. The result of the model building process is a demonstration computer program that simulates a CTS for grain.

4.2 *THE CONCEPTUALIZATION PROCESS*

Very little research has been published on the actual conceptualization of a computerized trading system (CTS). Russell and Purcell addressed some of the requirements and procedures for an electronic marketing system for livestock in 1980. Later, the system described by Russell and Purcell was implemented and in 1986 operates as the National Electronic Marketing Association (NEMA).

The conceptualization of a CTS for grains is a subset of the research and development process. Conceptualization lies at the beginning of development. It includes investigation, design, presentation, and modeling. The result is to bring the concept to a higher degree of reality. In many ways the resulting model of the conceptualization process is similar to a first draft of a book or a prototype of a product.

The prototype serves a basis for experimentation. In a sense, each time the prototype is presented an experiment takes place. Those who experience the prototype reject or accept it to some degree. That is, they confirm or deny that the model corresponds to their perceived reality.

This is not the same as the adoption process. That process involves an actual change of behavior. The model experiment simply confirms or rejects the technological feasibility of the product. That is, does the model accurately reflect and accommodate the necessary components of a grain trade?

Thus, the conceptualization process is similar to designing an experiment. It involves acclimating the researcher to the proper environment (socialization), organizing and presenting his observations and gathered information, and building a model. Afterward, the model is presented and evaluated.[3]

4.2.1 *Socialization*

Socialization is the process whereby the researcher becomes familiar with the subject of study. Since this study deals with grain trading, this means that the researcher must interact with those who trade cash grain. There must be observation of the grain trading activities along with questions concerning the activities to help the researcher understand the activity.

The socialization process for the researcher and the researched is a communication process. Therefore, some of the elements covered in Chapter 3 apply here. The researcher needs to learn about the activities of the researched, and the researched need to learn about the research of the researcher. Two specific ways, a survey and an advisory committee, were used to accomplish the socialization of the researcher and the researched. The first path to socialization was to develop a questionnaire and complete a survey of the researched. The results of that survey have been reported in Chapter 2.

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[3] The conceptualization process as described here borrows heavily from the participant/observer method of model building (Wilber and Harrison).

The areas of inquiry with respect to a price discovery mechanism should relate to characteristics of the sample, factors important in making trades, functions performed during the trading activities, and attitudes, preferences, and opinions about the alternative price discovery mechanism. The survey is the initial step in the socialization process. It helps the researcher to better understand and objectively evaluate the objects of study while at the same time makes the researched aware of the research and its direction. This latter aspect was confirmed because in the survey of this study over fifty percent of the respondents had never heard of a CTS of any kind.

Another avenue used to promote mutual understanding between the researcher and the researched is an advisory committee (AC). An AC performs several very valuable functions and can help the research from the beginning. First, they can inform the researcher as to the need and direction of the research. Furthermore, as the conceptualization process progresses, the AC can give the researcher valuable feedback. Finally, the AC provides a fertile and convenient environment for innovators and implementors from the industry to become involved and transform the model into an operating system.

The advisory committee associated with this study is but one case, yet it illustrates to some degree how an advisory committee performs the socialization process. On May 25, 1982, an informal meeting was held to discuss the feasibility of researching a CTS for grain. Participants at this meeting included research, industry, and government representatives. It was suggested that the research group prepare a project proposal on the development of a CTS for the grain industry.

This was done and on November 4, 1982 another AC meeting was held to review the project proposal. The AC had grown to include producers and users of grain. The concensus of the AC was to proceed with the project. This was done and government funding for the project was acquired.

After these initial meetings of the AC, several developments occured. First, the AC grew from a state to a regional, and then to a national group. Second, a core of individuals provided the nucleus of the AC, yet additions and deletions occured throughout the time of the AC. Third, the AC evaluated the questionnaire, time schedule, and the model in addition to directing the organization, financing, and operation of an operating CTS. Fourth, there were detours in that the AC advised implementing a CTS at the St. Louis Merchants Exchange. This was pursued but this organization was not a viable implementor.

4.2.2 *Information and Observations*

Most of the information from the survey was reported in Chapter 2. This structured, organized information provided an objective basis for the model building process. That is, the functions that occured during the telephone marketing of grain were documented and percentages of time spent performing the functions were collected

(Table 2.16). Furthermore, the important factors of a grain trade were thoroughly examined (Tables 2.26-2.27). Thus, the information reported in Chapter 2 was a major influence on the preliminary model.

But observations over the two month period of interviewing grain traders greatly influenced the model also. It became apparent that at least six distinct data bases were used in trading cash grain over the telephone (Figure 3.7). This was observed even though few in the grain industry noticed this. Furthermore it became apparent that the functions performed during pretrade, trade, and post trade activities were done using computers, telephones, and the mail. Often the switching of technologies involved large inputs of human labor.

A broker brought up the idea of a directory of traders (Hakim). This data base was not delineated from the cash grain data base until then.

A manager of a large flour mill in Buffalo, New York suggested that he could imagine that the idea of trading over the telephone was as foreign and awkward back in the early days of the telephone as was a CTS to him. He said that when every desk had a personal computer on it, in addition to a telephone, then a CTS for grain would be a viable alternative. This statement prompted the research in Chapter 2 on the history of the telegraph and telephone with respect to grain trading.

It was observation and discussion with cash grain traders that led to the conclusion that the price discovery process resembled a "swirling" communication process that drew in information from as many sources as possible. This prompted a search in the communication literature and the discovery of a new model, the convergence model, to explain this behavior.

So the research and conceptualization process for a CTS for grains included the standard data collection and analysis. But the success of this process relied to a great degree on off-the-record discussions with grain traders about what they do, how they do it, and why do they do it. It was in listening to grain traders talk about themselves and their activities that the total dimension of price discovery in cash grain crystallized. These discussions helped "fit the pieces" together.

Likewise it was at an advisory committee meeting in Atlanta, Georgia on July 24-25, 1984 that the crux of this study was presented to thirteen grain traders. The information (data) sets of figures 3.7-3.9 were presented. A preliminary discussion of the convergence model was undertaken. The functions and factors important to grain trading were presented. The grain traders confirmed every major thesis presented about how grain was traded. The result of that meeting was the beginning of the development of the framework of Chapter 3.

That meeting also was the stage for the first industry viewing of the computer demonstration model of a CTS for grains. The building of that model was a story in itself.

4.2.3 *Model Building*

After reviewing the information collected from the surveys in conjunction with the observations mentioned above, a computer programmer was employed to write computer software that would demonstrate how a CTS for grain would function. The first question he had concerned the data bases. It was decided that since it was important to demonstrate the price discovery mechanism of a CTS, the majority of the programming time would be spent writing software to accomplish the search and negotiation functions over the cash grain data base. The model will be described later in this Chapter.

What became important in building the demonstration model was appearance and efficiency. To have a computer screen full of information yet uncluttered became a goal. Thus, the researcher became a liaison between the grain traders and the computer programmer.

As stated, the grain traders first saw the model in Atlanta, Georgia in 1984. Suggestions were made as to how to improve the model. The model was also adapted to replicate the trading format at the St. Louis Merchant Exchange, where barges and barges of grain are traded daily. For the adaptation, one major change in the model occured that was to remain. A T-account format whereby bid and offers were separated by shipping periods was introduced. The St. Louis Merchant Exchange has very defined formats and methods of trading. Much of this definition was adapted to the present model of a CTS for grains.

This new format was shown to grain traders throughout 1985. In fact, the demonstration model was the basis of a presentation to the 1985 National Grain and Feed Association annual meeting at which over 150 traders viewed the model. Thus, the demonstration program has been "tested" before over 250 grain traders since 1984. In addition, over 100 copies of the program have been distributed throughout the grain industry.

Since there is no operational CTS for grains in the world at present, it is possible that the model developed here could serve as a standard for future CTS's involving price discovery techniques similar to the cash grain trade. Nevertheless, the conceptualization process described here is applicable to any CTS. In fact, it appears that this process could be crucial to the success of a CTS. It is very important that the users of a CTS be familiar with the concept and the actual mechanics of the system. A self-contained, microcomputer demonstration program is a cheap, reliable, and effective way to educate an entire industry.

4.3 *THE DEMONSTRATION MODEL*

4.3.1 *Introduction*

As mentioned, a computer demonstration model was developed to better describe a CTS for grains. The value in a demonstration model of a CTS is to lower development costs and risks. Henderson and Holder (p. 47) cite these costs as a major barrier to the success of a

CTS. With a demonstration model, "trial and error" becomes less expensive and the education of potential users of a CTS may be more flexible and efficient.

Another key to the success of a developing CTS is to minimize disruption of established trading practices (Henderson and Holder, p. 44). That is, to increase the probability of a CTS succeeding in a particular industry, existing trade methods and practices should be mimicked whenever possible.

This study has revealed various factors and functions crucial to trading grain. Thus, the necessary components of a CTS for grain to be discussed are: factors, which are included in data sets or bases, functions involved in the trading process; and the operation of a CTS.

4.3.2 *Data Bases*

The basic units of any CTS are its data bases, although each data base may be decomposed into sections and ultimately into variables or factors. An important consideration when designing a CTS is the cycle time of information. The concept relates directly to the convergence model of communication. Communication among and between individuals involves information exchange. The cycle time of information is the time required to exchange information. In interactive, two-way communication, the cycle time is quicker (shorter) than in static, one-way communication. In grain trading today, the cycle time of information exchange is quick since telephones, an interactive, two-way communication device, are utilized.

Investigation of the telephone trading system revealed the six data bases used in grain trades. These are; market news, futures prices, each firm's internal data base, cash grain, a "directory" of traders, and transportation rates and routes. Since these six data bases are crucial to grain trading, a CTS for grain should create or have access to these data bases. Some of the data bases, such as market news, futures prices and the firm's internal data sets, already exist. The remaining three, cash grain, a directory of traders and a transportation matrix do not exist in an organized, structured fashion and need to be created.

A CTS for grains does not need to duplicate existing services. Therefore, contracts or agreements with existing market news and futures prices data base services should be attained. Internal data bases of individual grain firms would not be directly accessed by a CTS for grain. The key relationship with respect to these internal data bases and a CTS would be compatibility.

Grain firms follow a cycle of computerization from accounting, to inventory, to other functions of the firm, to marketing and back to accounting, etc. Gains in operational efficiency occur when data do not leave a computerized environment. For example, in some firms internal data rarely exists external to a computerized environment. But, at present, data and information travel in a noncomputerized environment during the trading function. A printout of trading parameters is given to individual traders. The traders then take this information and begin their communication, i.e. price discovery, process over their telephones. Interaction with the external cash grain, trader and transportation data bases result in trades. Data is then reentered into the firm's internal data base and adjustments are made to account for the completed trades. In an operational efficiency context, this transferral of the data from one environment to another is inefficient, since it requires inputs of human labor. Human labor is probably the greatest cost in grain trading.

In a CTS for grains, because trades occur in a computerized environment, data can be more efficiently transferred. All of the components of a trade, including transmitting contracts and transferring funds, can occur over a CTS. This synchronicity can contribute to more operationally efficient grain trading.

But for the synchronicity to be realized, the remaining three data bases (cash grain, trader and transportation) must be correctly designed. Often, grain traders do not delineate between these data bases. The tendency is to combine the cash grain and trader data bases. But it is very important to separate these data bases because of the different cycle time of information exchange that they require.

4.3.2.1 The Cash Grain Data Base

The cash grain data base requires a very short cycle time. In fact, this data base must have a shorter cycle time than the current unaggregated, diffuse cash grain "data base" used in today's telephone trading system. This data base is the core of a CTS for grain. For this reason, a concentrated effort to understand it is necessary. It is also important that the organization and structure of the data base be accommodating to the grain trade.

Six factors of primary importance in trading grain are location, quantity, grade, price, delivery date and mode of transportation. Selected characteristics of the opposite traders are also important. But since these characteristics do not change as often as the aforementioned six factors, it is appropriate that trader characteristics be in a different data base. That is, the cycle time of the trader data base is longer than the cycle time of the cash grain data base.

Data sets consist of variables. Thus, "variables" must be defined for location, quantity, grade, price, delivery dates and mode of transportation. In addition, a comment variable is included to allow flexibility in communication. For each grain and oilseed (corn, wheat and soybeans) traded over the CTS, there is a section allotted in the cash grain data base.

Table 4.1 lists the variables included in the cash grain data base. Each string or horizontal piece of information (combined pieces of data) is identified by a lot number (LOT). Location (LOCATE) is defined as being either origin or destination depending on whether it is associated with a bid or offer. Offers imply an origin location while bids imply a destination location. At present, location is recorded in a six letter form. The first two letters represent the state abbreviation, while the

Table 4.1 Variables in the Cash Grain Data Base in a CTS for Grains

VARIABLE	DEFINITION	STRUCTURE	SCREEN APPEARANCE
Lot Number	Number associated w/each horizontal piece of information (combined variables)	cardinal number	LOT
Identification	Name or number identifying trader	4 letters or numbers	ID
Price	Ratio of money for quantity	Dollars per bushel or cents deviation from future price	PRICE
Location	Origin or destination	6 letters -- 2 associated with state abbreviation and 4 associated with town or city	LOCATE
Transportation	Transportation mode	1 letter associated with first letter of mode	TR
Delivery Date	Date commodity is to be delivered	Month symbolized by letters assoc. w/futures months, followed by additional instructions	DLV
Grade	A standard used to measure quality of commodity	Either PAR or NONPAR	GRADE
Comment	Additional information about lot of grain	Free format	COMMENT

next four represent the town or city. Location is an important variable in the demonstration model screen because it serves as the dividing mechanism in a T-account format separating bids and offers.

Identification of each trader who makes a bid or offer is attained through use of an ID variable. This is a four letter or number variable that is also used along with a six letter password to enter or gain access to the CTS.

Price (PRICE) as a variable can be in a flat or basis price mode. If a basis price mode is desired, the associated futures month is attached at the end of the price. The symbols used for the futures months are identical to those used by the Chicago Board of Trade (CBOT).

Quantity is represented in bushels (BU). In the demonstration model, the basic unit is one thousand bushels. That is, 1 represents 1,000 bushels while .7 represents 700 bushels. This is an arbitrary measurement. Tons or pounds could just as easily be used although use of bushels in consistent with grain trading methods used today.

A transportation variable (TR) simply connotes whether truck, rail, barge, or ship is the transportation mode. The first letter of the transportation mode is used to represent that mode.

A delivery date variable (DLV) represents the desired delivery date. Here again, the month symbols used by the CBOT are used. Additional information, such as first half of the month (F/H), may follow the month symbol.

Grade specifications are recorded in a grade and comment section. Grade in the demonstration model is simplified into a dual classification of either par or nonpar, with additional information following. Comments follow the grade information.

Time is also recorded in a CTS. Each screen has a time associated with it. Time is very important to the cash grain data base since this data base has a short time cycle of information exchange. Bids and offers are entered, trades are made, offers and bids are countered, and the data base is constantly being changed. It is for this reason that, at any moment, a trader must know for what time the screen is accurate. Further amplification of the cash grain data base will ensue as functions are discussed.

4.3.2.2 Trader Data Base

As mentioned, the trader data base was developed to incorporate a suggestion by a grain broker. He said, "If you would put a directory of traders in a CTS for grains, it might work" (Hakim). The different characteristics of the firms and traders are very important in making decisions about with whom to trade. In the telephone trading system of today, the trader and cash grain data base are often merged. Yet, a directory of traders could be maintained through one-way communication. Thus, it has a much slower time cycle of information exchange.

Access to the trader data base could exist like an electronic publication. Each individual or firm that uses the CTS would have a file in the directory. Each of the variables in the directory will not be discussed, though the major categories will.

The categories included in each file in the directory are: (F) facility/firm; (BCT) bank/credit/title; (LU) loading/unloading; (O) operating; (G) grade; (T) transportation; (C) contracts; (PDS) premiums/discount schedules; (P) personnel; and (ST) standard trading terms and procedures. Each of these categories includes variables (see Appendix III, section III.4.U.F-ST).

The trader data base enables traders to investigate other traders. The information in the directory of the CTS is voluntarily entered. The exception to this could be a category that contained a record of problem trades over the CTS. The trader data base will be further discussed when functions are addressed.

4.3.2.3 Transportation Data Base

The transportation data base in the present telephone trading system is perhaps the most disjointed, unorganized, and confusing. In an initial CTS for grains, this data base might not be included. Yet, because of the importance of transportation in grain trading, a transportation data base must be considered and eventually developed.

Much like the different grains occupying a section of the cash grain data base, the different transportation modes would occupy sections of the transportation data base. Transporters providing services between different origins and destinations would provide information concerning price, etc. This data base would also contain a directory of transporters with categories similar to the trader's directory.

The transportation data base in this study has not been explored as extensively as has the cash grain and trader data bases. Neither is it as developed in the demonstration model. The reason for this is related specifically to the nature of the study. Though trading of transportation services may someday be an indirect result of a CTS for grain, it is not a primary task at present.

4.3.2.4 Coordination of Internal Data Bases with Cash Grain Data Base

As mentioned previously, it is very important that a CTS for grains be able to coordinate with individual firm's internal data bases. The mechanism that performs this function in a CTS is a YOUR POSITION section. This section is extricated from the cash grain data base. Any bid, offer, or trade that a trader has in the cash grain data base would be listed under his position (ID). When in this mode of the operating CTS, the trader could enter a bid or offer, or change an existing bid or offer.

4.3.3 *Functions of a CTS for Grains*

Most of the time spent trading grain over the telephone entailed; (1) searching, (2) negotiating, (3) transferring market information, (4) cultivating relationships, and (5) completing trades. These activities were considered throughout the designing of the demonstration model of a CTS for grains.

Figure 4.1 represents a flow diagram of the various functions as they are performed over the telephone system. Notice that searching begins the trading process. The intersection of searching, transferring market information, and cultivating relationships indicates that these functions occur simultaneously or at least within quick time cycles of information exchange. Negotiation is usually a discreet function apart from searching. It often occurs after a host of searching has taken place. Likewise, completing trades occurs after negotiation and often takes place over a different communication mode, the mail. The search process of Figure 4.1 occurs in a network framework, while the remaining functions occur dyadically.

4.3.3.1 Searching

Perhaps the greatest value of a CTS for grains is with respect to the searching function. A CTS for grains would enable a user to create his own market depending on the parameters specified. The demonstration model has six factors (quantity, delivery date, location, price, transportation mode and grade) over which the cash grain data

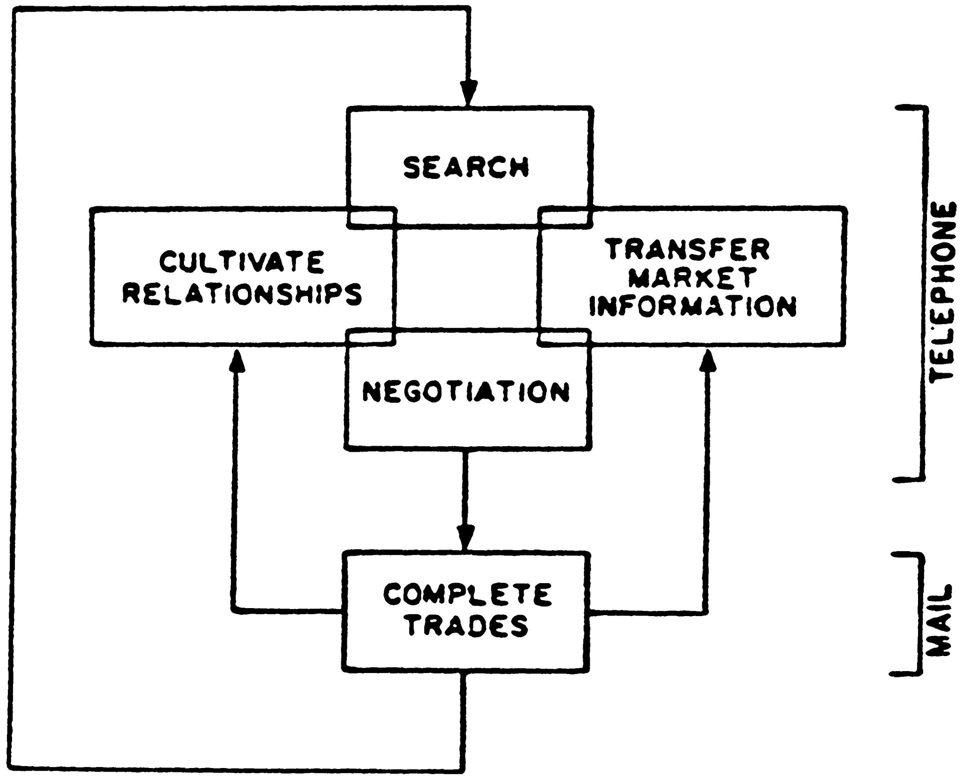

Figure 4.1 A Flow Diagram of the Functions Performed Over the Present Trading System for Cash Grain

base may be searched. Specifications for none, one, a combination, or all of the factors may be entered. The system searches the data base and presents the available lots of grain meeting the specifications.

Searching over the telephone involves making phone calls to one to 25 people (Table 2.3). This is the initial contact and seems to bring current information into the trader's information set. There is often substantial variation in the price information gathered (Lloyd), therefore the trader continues making phone calls in order to decrease his uncertainty about the market.

On a CTS, the initial contact for all available trade options can be made in one computer call. This saves a tremendous amount of time. In addition, uncertainty about the market is lowered because the trader has access to the previously disaggregated external market information in an aggregate, concise fashion.

4.3.3.2 Negotiation

The ability to negotiate is crucial if a CTS for grains is to be a price discovery mechanism. The demonstration model gives a trader the alternative of making offers and bids, countering an existing bid or offer in terms of price and quantity, and actually making or "booking" a trade. Thus, the subroutines of the negotiating function as carried on over the telephone trading system are included in a CTS.

A trader may enter offers or bids either in the YOUR POSITION section of the CTS or after he has searched. Changing one's bid or offer may be done only in YOUR POSITION. Countering someone's bid or offer is done after a search has been completed, as is the booking process.

After a trade has been made, the lot of grain leaves the cash grain data base after a brief period during which it is highlighted as a traded lot. Information on the traded lot is transferred to each trader's position statement (YOUR POSITION) as well as to a data base containing a summary of trades.

4.3.3.3 Completing Trades

After a trade is made, contracts are filled out, signed and exchanged. This is done on a CTS using contracts that are stored in each trader's directory file. Information from the completed trade is transferred to the appropriate contracts where the trader may review it. An electronic signature is made and contracts are transferred electronically over the system.

4.3.3.4 Other Functions

The directory of traders data base may be searched over much like the cash grain data base. Although this functional component is not included in the demonstration model, both a search and communication capability are choices available in a complete directory of traders routine. The directory would function much like a telephone directory or automatic dialing system to satisfy the communication requirement.

A CTS for grains would also be able to change from flat to basis pricing in either the YOUR POSITION or the SEARCH routine. Access to market information services would also be included in a CTS for grains.

4.3.4 *Operation of a CTS for Grains*

Some entity will be responsible for the business operation of a CTS for grain. Though the appearance and function of a CTS is similar to an exchange, the initial focus of a CTS for grain would be as a communication service.

The National Grain and Feed Association's (NGFA) trading rules and regulations, with a few minor amendments, could govern trades over a CTS. Likewise, disagreements or problem trades could be handled through NGFA's arbitration mechanism.

The organizational structure of the business that operates a CTS will not be addressed. The assumption again is made that a business organization will evolve to operate a CTS for grain.

Trading over a CTS could be during particular sessions or continuously throughout the day. Initially, the system would be a grain trading system but eventually transportation trading could occur over the system. This is taken into consideration in the demonstration model.

The best way to get an idea of the operating characteristics of a CTS for grain is to go through the demonstration program. This program is called GRAIN ELECTRONIC TRADING SYSTEM (GETS) and a copy of the program is on a computer disk in the pocket of Appendix II. A user manual (Appendix III) explains the program. The user manual also contains screens reprinted from the demonstration program.

It is apparent that a CTS for grain will differ in some significant ways from the current telephone trading system (TTS) used. Many of the functions that are done in a manual and disjointed fashion over the TTS will be automatically fostered and synthesized over a CTS. Search time over a CTS will decrease. Negotiation will be more structured. Information about traders and firm, for instance, credit ratings, will be explicit in a CTS rather than implicit as exists today over the TTS. The completion of trades will also be less time consuming over a CTS due to the automatic transferal of trade information to contracts and the electronic mail feature. The demonstration model is a prototype that will be used to compare the telephone trading system used today and a CTS for grain. This will be accomplished using the framework developed in Chapter 3.

Chapter 5

COMPARISONS BETWEEN A TELEPHONE TRADING SYSTEM AND A COMPUTERIZED TRADING SYSTEM APPLIED TO CASH GRAIN

5.1 *INTRODUCTION*

The evolution and present state of the telephone trading system (TTS) used in the cash grain industry was investigated in Chapter 2. A framework for comparing alternative price discovery mechanisms was developed in Chapter 3. Finally, a computerized trading system (CTS) for grain was conceptualized and modeled in Chapter 4. The model was built via integration of the methods and characteristics of the grain trade, and the conceptual framework combining communication theory and price discovery processes.

Thus, the three steps required to evaluate an alternative price discovery mechanism like a CTS are now complete. The TTS has been described. A CTS for grains has been conceptualized and modeled. Finally, a theoretical framework is in place to guide the analysis.

The progression of this Chapter will be to compare a TTS and a CTS using communication and functional performance criteria. Communication performance will be examined as concerns the information, time cycles of information exchange, tolerance levels, and networks. The functional performance of both systems will be compared using the functions found to be of primary importance to grain trading and the criteria specified for rating performance.

The assumptions inherent in this comparison of a TTS and a CTS are: (1) all traders have access to each system, (2) a CTS is operational and corresponds to the model used here, (3) the grain industry adopts a CTS and it is used as commonly as the TTS is today, and (4) a CTS functions as a communication system that centralizes price discovery and is regulated by current trade rules and regulations. The comparisons here relate to two specific points in time, one now when the TTS is the common trading mechanism and the other after a CTS has been adopted and adapted throughout the grain industry. In fact, since there is a probability that a CTS would replace, to some extent, a TTS in the grain industry, it might be more appropriate to compare the two systems at their peak periods. That is, when everybody in the industry views the respective system as the industry method of trading grain. Therefore, the comparison is one of reality (TTS) with one of probable reality (CTS). The probability associated with the reality of an industry-wide CTS in unknown but increases with studies of this type.

5.2 *COMMUNICATION PERFORMANCE*

Since communication lies at the base of all exchange and exchange mechanisms, it is appropriate to first compare a TTS and a CTS with respect to communication characteristics. The framework in Chapter 3 specifically delineates communication into microscopic and macroscopic elements. At the macroscopic level, the criteria are related to information, information sets, the time cycle of information, and tolerance levels for understanding. At the macroscopic level, the two primary criteria are connectedness and openness which are directly related to the communication structure of a system.

5.2.1 *Microscopic Level*

5.2.1.1 Information and Information Sets

In the daily workings of the cash grain trading system, changing information lies at the heart of the system. As mentioned in Chapter 3, the structure, organization, standardization and completeness of information relate a great deal to how well information is transferred. Historically, the trend has been towards structure, organization, and standardization. Each of the progressions takes energy to accomplish. But once they are accomplished, they enable the routine tasks connected with information transferal to be attained using less energy. Thus, the progression is said to be towards efficiency.

Completeness is different. Voluntary completeness of a total system is rarely attained. Even with mandatory controls to ensure completeness of conglomeration of information sets, completeness is rare. But a threshold must be reached with respect to some degree of completeness if a trading system is to work smoothly. Economic incentives may be used to encourage voluntary completeness in informations sets used in exchange.

As mentioned previously, information over a TTS is unstructured. For many firms, units of information leave a structured or packaged (computerized) environment and are exchanged by traders over the telephone, a communication medium that does not have the capacity or software to maintain the units of information in their packaged form. After a trade is made (mutual understanding and agreement) over the telephone, the exchanged units of information are repackaged (computerized). This aspect of information exchange relates to technical efficiency.

But information in a CTS is highly structured. It remains in a packaged (computerized) environment throughout the exchange process and requires very little repackaging.

Perhaps an information set or data base perspective is more appropriate when comparing the information characteristics of a TTS and a CTS. Since meaning is derived from the context of information, it is in the data base context where the differences between a TTS and a CTS become apparent.

First, do the necessary data bases exist? The cash grain, traders, and transportation data bases do not exist in a global sense except conceptually in a TTS. The three data bases may exist in a limited sense for various firms within the grain industry. For those firms, this fact gives them an information advantage that may be exploited as described in Chapter 3.

On the other hand, these three data bases are crucial components of a CTS. Within them information is highly structured and organized. This leads to the second question about the data bases of a trading system -- are they standardized?

Over the TTS, since these data bases are mostly conceptual, standardization is limited. There are common terms and language yet each firm may have peculiar methods and terms unique to them. In a CTS, standardization is inherent in the system. As the model exhibits, traders are encouraged by the system to use standardized information. This characteristic of a CTS's data bases and information directly influences the functional performance of the system.

If standardization is conducive to conveying consistent meaning throughout a system, then a CTS will encourage consistent meaning. One byproduct of this might be less arbitration cases throughout the industry.

Organization concerns the structural form of information that decreases the time cycle of information exchange. Although this is related to standardization, organization usually precedes standardization. The criterion for organization is the ratio between the physical information and the psychological extrapolation or meaning from the information. A TTS uses verbal-auditory information transferal. This is diffuse and highly perishable. A CTS using written-visual information transferal is more succinct and less perishable. It appears from these definitions and observations that the information of a CTS is much more organized.

Furthermore, the completeness of information relates to how well the transferred information conveys the necessary meaning to accomplish goals within a system. The goals of a grain trading system are understanding of the market and trades. Both a TTS and CTS have degrees of information completeness. Since the factors and functions of a CTS were derived directly from the TTS, it should be expected the completeness of a CTS will be no less than a TTS. A reason to hypothesize that a CTS would be more information complete would relate to the standardized, organized, written format of the information.

The third question concerning the data bases of a trading system is "Are the data bases accessible?". The information contained in a CTS is accessible in a much more efficient fashion than that of a TTS. Information in a CTS is also more manageable. Furthermore, information in a CTS has the capability to be more efficiently transferred. Thus, accessibility, manageability, and transferability are characteristics of information that a CTS appears to enhance as compared to a TTS. Furthermore, the cash grain, trader, and transportation data sets will, in general, be more organized, structured, standardized and complete in a CTS as compared to a TTS.

5.2.1.2 Time Cycle of Information Exchange

For research purposes, the characteristics of information, the time cycle of information exchange, and the tolerance levels necessary for a trade to be made are separated and examined. Yet, they are all related to each other. This can be seen most clearly in the relationship between the characteristics of information and the time cycle of information exchange.

As far as standardization is concerned, a TTS does not require standardization of data sets. Information must translate similar meaning when it is exchanged between traders, yet often longer time cycles of information exchange can substitute for standardized information sets. Thus, there appears to be some substitution relationship between the cycle time required to exchange information and standardization. Since a CTS for grain requires standardized information sets, this, in part, explains the quicker cycle time of information exchange.

In a TTS, dyadic communication follows the convergence model presented in Chapter 3. Information is exchanged similar to the process depicted in figure 3.3. The "swirling" dimension of this communication or price discovery process is a pictorial representation of the cycle time of information exchange.

The feedback mechanism between a dyad in the TTS is very effective. The only limits to feedback are the traders themselves. If a trader has a list of requirements that he checks off during his telephone conversation, this procedure is an approximation of a type of trading software. Yet, this type of software is not necessarily a requirement to use the TTS. Arbitration cases sometimes involve situations that might have been prevented if these approximation of software had, in fact, been utilized by both parties. In a sense, the trading rules and regulations of the NGFA are a type of software that guide the current grain trading structure.

As has been stated repeatedly, the major functions involved in a grain trade are searching, transferring market information, negotiating, cultivating relationships, and completing trades. These functions must be performed, whether over a TTS or a CTS. A major difference between the two systems lies in the software. In a TTS, the software used to perform these functions, much like the data bases, is individual and specific to each trader and firm. The software primarily exists inside the trader's head and sometimes as a firm's guidelines.

Over a CTS, software actually exists external to traders and within the system. This software imposes a structure on these different functions. Therefore, figure 3.3 is not an exactly appropriate representation of the price discovery process over a CTS.

Assume that the search procedure over a CTS has been accomplished. A trader is aware of a trade opportunity and the price discovery process can begin. In a CTS, the communication process is encouraged to be structured. In other words, the negotiation process is delineated into counter offers and bids, and finally into booking. Therefore, figure 5.1 might be a more appropriate representation of the convergence process over a CTS. Notice the information sets of trader A and B are structured and sectioned into the important factors, making identification of misunderstanding or disagreement more readily apparent. In figure 5.1, there is misunderstanding or disagreement

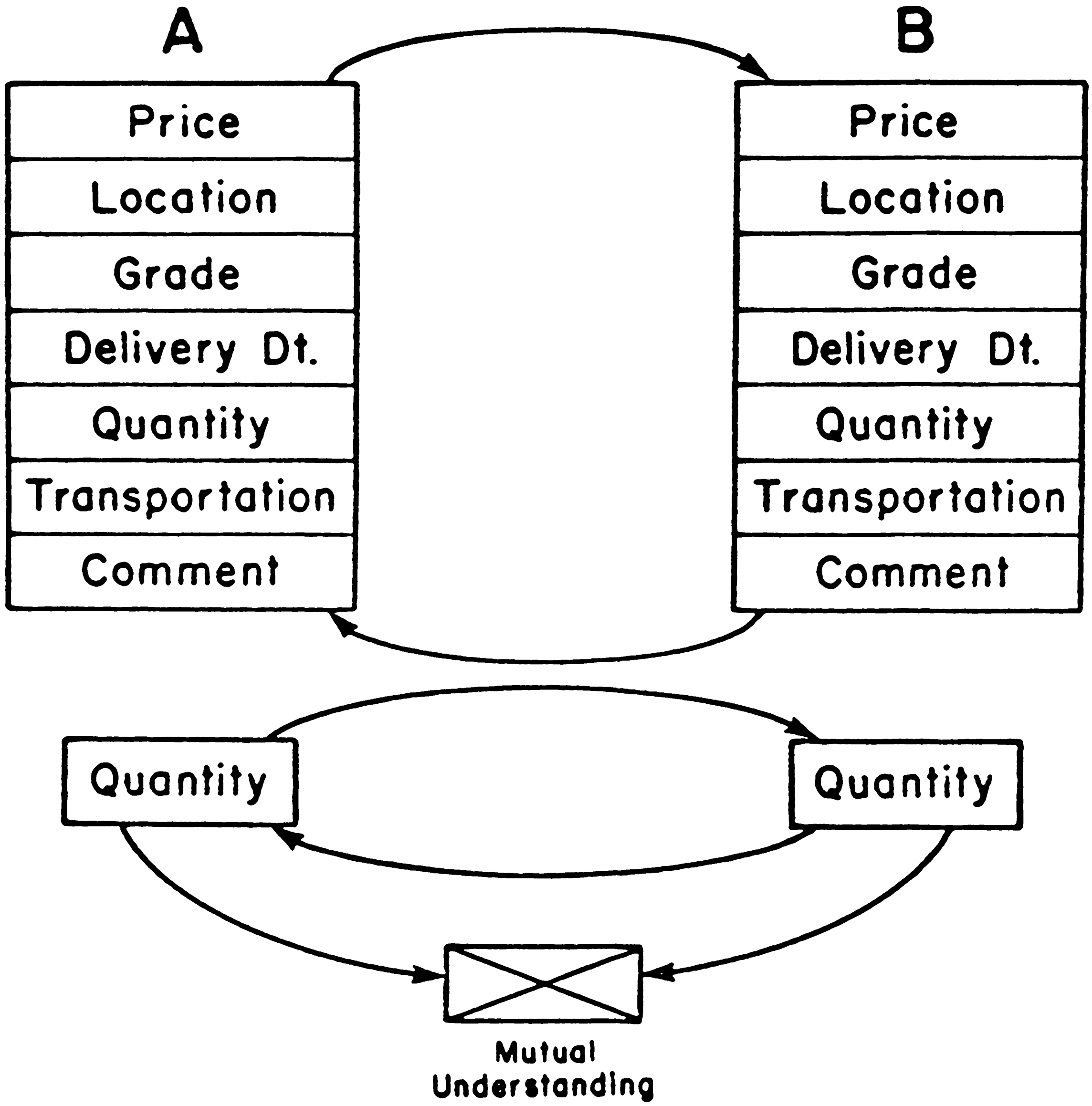

Figure 5.1 The Convergence Process Over a CTS for Grain Between Trader A and B

between A and B concerning quantity. After highly structured communication (counters), a trade ensues.

Though this same process takes place on a TTS, the main difference lies in the identification of misunderstanding and disagreements. Such identification is accomplished quicker over a CTS. The visual information of a CTS can be digested in an instant versus the seconds or minutes required to digest the auditory information of a TTS.

Because the cycle time of information exchange for the total system or even the clique or market center is quicker over a CTS than on a TTS, a premium is placed on decision-making skill as related to grain trading. That is, on a CTS one trader may replace several traders on a TTS. Thus, since there might be less diversification within the firm with respect to different traders, the risk associated with the trading function would be expected to decrease since the decisions would be in the hands of the most skilled traders.

On a global level, the cycle time between traders will be quicker. Communication concerning grain trading will be more concise. On the other hand, any advantages a trader might attain due to verbal communication skills might be better gathered over a TTS.

But here there is some hesitation in making blanket comparisons between a TTS and a CTS. This relates directly to the skill component of grain trading. The skills associated with telephone trading are similar but probably not identical to the skills needed on a CTS.

Traders often say that a CTS is not capable of providing them with a "feel for the market" like a TTS can. The hypothesis here is that this statement is incorrect. Since traders are comfortable and skilled with the TTS, they defend it. But as this study is demonstrating, logic suggests that a CTS will, in reality, give traders a much better global "feel for the market".

A criterion related to the time cycle of information exchange was the ratio between the time cycles required and those that actually occur. The survey revealed that traders, in general, spend 14 percent of their telephone marketing time cultivating relationships. Whether this activity is necessary to making a grain trade is highly dependent on individuals. Yet, a TTS is structured in such a way that this activity is part of the trading function. Though this activity can be accommodated on a CTS, it is not an integral part of the trading function. Because of this, the time cycle of grain information exchange is quicker simply because the focus of a CTS is on the exchange of cash grain.

There is a cost to this cultivation relationship activity. Since the TTS is a dyadic system, often the cost is a longer time cycle of information exchange. This, in essence, slows down the other functions necessary to grain trading.

5.2.1.3 Tolerance Levels

There is no reason to suspect the tolerance levels required to make a trade over a TTS would be any different than those required over a CTS. In fact, for any price discovery system there is reason to believe there is some necessary threshold level of understanding that is required before a trade will ensue.

The difference between a TTS and CTS will be the method of ascertaining if the threshold or tolerance level has been attained. Over a TTS, verbal communication skills are important and information is often "leaked" in small discrete doses. Often a trader will say he can tell by an opposite trader's tone of voice what his "true" situation is. Thus, the communication process of the convergence model takes place with traders trying to discover a truer picture of the various data bases.

On a CTS, since the data bases are explicit, the communication process is crisper and the information is explicit. Thus, for a certain tolerance level, a trader may explore the different data bases and investigate the factors that influence his tolerance level. For instance, for sellers a buyer's credit is an important factor. Through the directory of traders data base, this factor could be examined. Thus, the method used to investigate factors that influence trader's tolerance level will be different on a CTS, but the tolerance or threshold levels themselves should not change.

5.2.2 *Macroscopic Level*

At the macroscopic level, the global or network perspective is relevant. Here cliques or market centers and the total system are emphasized. The criteria used to compare a TTS and a CTS at this level are connectedness and openness. Other characteristics of a communication network are diversity and integration, but these emanate from connectedness and openness.

In a TTS, everyone in the total system is technically connected. Yet, the nature of a TTS contributes to the different traders not being, in reality, connected. Think of a telephone exchange. The software involved is almost solely concerned with the physical connection of different users. One must know with whom one wants to talk before entering the "system". In the exchange of a CTS, the software is much more developed and sophisticated. A trader communicates with the total system directly. He can, in a sense, enter the "exchange" of a CTS and explore trade possibilities. This is possible because of the software of the system. It also relates to the form of the information. Written and visual communication is capable of being multifaceted while at the same time being accessible between multiple and simultaneous users. Verbal and auditory communication, on the other hand, becomes cacophony if multiple and simultaneous users are exchanging different information.

A TTS has dumb software while a CTS has intelligent software. Thus, in a CTS, information is not only traveling through the exchange but it is also stored. The information, since it is "packaged," can be examined and searched over.

If all traders were on a CTS, the system would be connected operationally as well as technically. The potential for total operational connectedness has never existed before because of spacial, temporal and technical barriers. The telegraph and telephone leveled the spacial and temporal barriers. The computer has demolished the technical barrier, which was primarily one of software.

Connectedness can be measured through the use of communication network analysis. Operationally, average system connectedness is measured by how well an average member of a system is linked to others in a system. A CTS will be more connected than a TTS, given the assumptions stated at the onset of this chapter.

A communication system may be structured and have characteristics that contribute to openness. In fact, success or failure of communication systems is directly dependent, to an extent, on openness. This is the case with a CTS for grains. Secretive mechanisms, such as blocking out certain traders from seeing bids and offers, may be built into a CTS. Yet, for a CTS to survive and grow, a fairly high degree of openness on the part of the traders is necessary. Traders must be willing to broadcast serious bids and offers. In addition, they must be willing to make trades over the system. Counters could be concealed from uninvolved traders, but completed trades must be open to the system's observation if the price discovery function is to be maintained.

Thus, a CTS will be more open than a TTS. It is a characteristic of a CTS that results in a more open system. The implications of a more open system will be discussed in the next chapter.

Another definition of openness is the degree to which members of a system are linked to others external to the system. Since this definition is individual dependent, there should be no difference between a CTS and a TTS as to this type of openness, unless there is a change in the people trading grain.

Though criteria for diversity and integration were not developed, these characteristics should be discussed. Diversity of a system is dependent on heterophillic individuals being connected, or exchanging information. In theory, a CTS for grain might be more diverse since the system could be much more connected. Farmers could actually see the bids of exporters and large users of grain, in addition to their country elevators. The margins involved in moving grain from the farm to the user could be better evaluated. One goal of vertical integration is to better coordinate information flows between different levels in a marketing system. An alternative to vertical integration is a pricing system that accurately reflects not only the value of the commodity, but also the value of the services needed to move the commodity through the system. A CTS could provide such a price discovery mechanism and significantly improve the level of pricing efficiency attained by the system.

The TTS makes integration of the total system feasible but results in "filtered" integration. That is, since the software of the TTS that integrates the system resides in individuals, often brokers, the information gets filtered. This filtering can either increase or decrease the efficiency of the trading or communication process depending on whether the cycle time of information exchange is shortened or lengthened. As in figure 5.1, if there is one factor that requires negotiation, the broker can focus on this factor and intensify communication about it. The software of a CTS enables the primary trader to perform the same function. The integration involved in a TTS and a CTS might be similar but of a different nature. The difference is essentially a substitution of capital for labor. The integration is more explicit in a CTS, since there is less filtering between primary traders.

So as far as network characteristics, a CTS appears to be a superior trading mechanism. The characteristics of information and data bases suggest increased communication efficiency over a CTS. On a global or network level, a CTS becomes an even more dominant communication technology.

A TTS would appear to be more efficient in strictly dyadic communication, yet since a CTS allows for this type of communication it could be the case that a CTS could subsume a TTS. This is not that unrealistic, since this is what occurred to telegraph grain trading. Table 5.1 summarizes the comparisons between a TTS and a CTS using communication performance as a criteria for effectiveness.

Table 5.1 A Comparison of a TTS and a CTS for Grains Using Communication Performance as a Criteria for Effectiveness

Communication Performance	TTS	CTS
Criterion	--- Most Effective ---	
Information		
Structure		X
Organization		X
Standardization		X
Completeness		X
Data Bases		
Existence		X
Standardization		X
Accessibility		X
Time Cycle		
Dyadic	X	
Global		X
Tolerance Levels	=	=
Network		
Connectedness		X
Openness		X

5.3 *FUNCTIONAL PERFORMANCE*

Another set of criteria that can be used to compare a TTS and a CTS are how well each performs the functions involved in grain trading at the macroscopic or network level. On a global level, a CTS is a much more efficient system to perform the search routine. Of course, this is dependent on the completeness of participation in the system. Since the software to search is an explicit component of a CTS, a trader in a CTS could hone in rapidly on specific factors. This is in sharp contrast to the search routine over a TTS. In Figure 5.2, if Trader A is interested in only bids for a certain quantity, then after entering the CTS, he specifies his quantity parameter. The system then reveals those bids that meet his requirements (C and N).

Figure 5.3 portrays a network of traders connected over a TTS. The different data sets will be unique to each trader and not all the traders are connected. Lack of connectedness might arise out of ignorance. Furthermore, trader A must make a phone call to each of the bidders that he is aware of to gather information on quantity. If one remembers the cycle time of information exchange, it is apparent using figures 5.2 and 5.3 that the cycle time of a CTS would be quicker.

An important consideration associated with the search function is the marginal cost of information (MCI). Figure 5.4 gives a representation of a comparison between a CTS and TTS using a MCI criterion. The cost of information per unit of time is graphed against

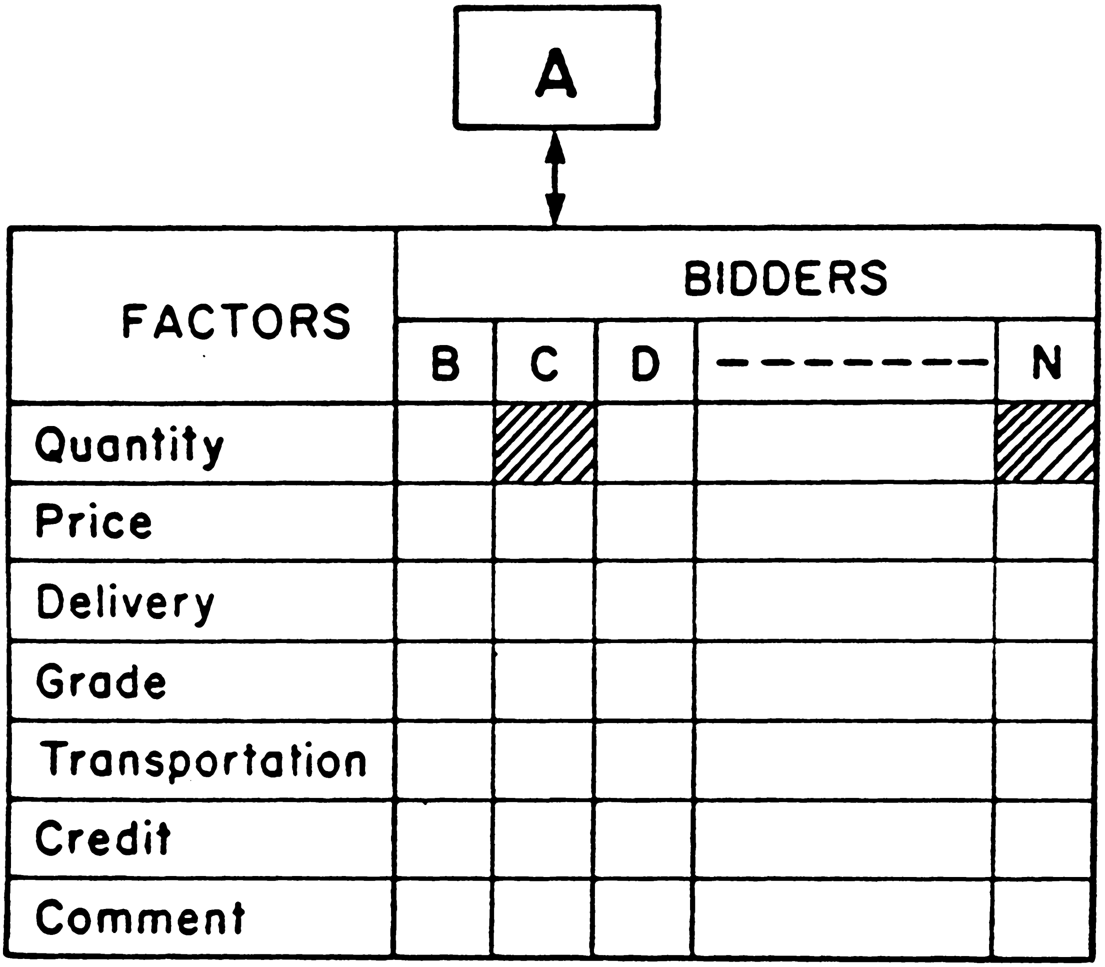

Figure 5.2 The Search Process by Trader A for Bids of a Certain Quantity Over a CTS

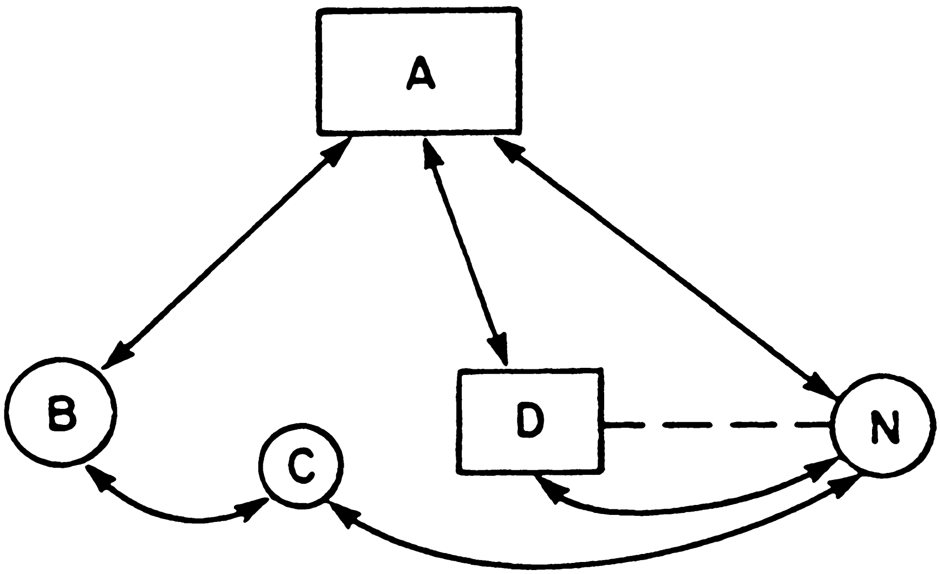

Figure 5.3 The Search Process by Trader A for Bids of a Certain Quantity Over a TTS

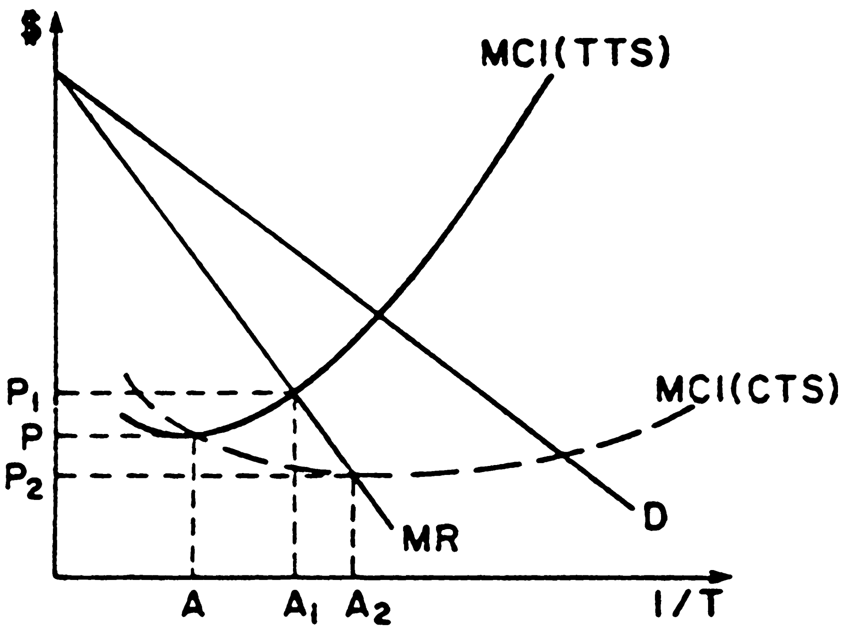

Figure 5.4 Hypothesized Marginal Cost of Information (MCI) Over a CTS Compared to a TTS

the level of information. There is a downward sloping demand curve for information since additional information has a diminishing marginal value. The MCI curve for a CTS is below the MCI curve for a TTS for a completely connected system if the amount of search is greater than A.

The marginal cost of information increases quickly on the TTS for a given set of fixed capital (number of traders, number of WATS lines, etc.) as traders are forced to turn to traders and/or market areas that are "new" to the firm. If we recognize the need is for information that integrates quickly and effectively with the firm's market or buying plan, the marginal cost function turns up also because of the deteriorating quality of information.

For the CTS, the marginal cost function will be a function of the cost of connect time and the cost per unit of data processing time. In other computerized systems (the NEMA system for livestock, for example) the aggregate costs of connect time for 15-20 traders for a 15 minute auction has been significantly below the cost of a conference telephone call. But the biggest advantage of the CTS will be in its capacity to search across large data sets quickly. Conceptually, there will be an upward slope to the function because the processing time on

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Preliminary estimates of the cost search over a CTS suggest point "A" occurs at relatively small levels. The cost of trading over a CTS assuming one hour average connect time per trader with 100 traders involved and one million bushels traded, is estimated at \$.0018 per bushel (Russell, 1986). This estimate is similar to the \$.00187 per bushel received by brokers. Furthermore, the survey revealed an average cost of \$.0076 per bushel of grain traded over the TTS.

the central computer will increase if the search is expanded incrementally to larger and larger data sets (larger markets or production areas). What is happening is a shift in the supply curve of the searching service due to a technological innovation. This is nothing more than an increase in efficiency.

The MCS is evidently lower under a CTS for a large range of the search function. This range again relates to the point A at which the MCI becomes less under a CTS than for a TTS. Clearly, the question of the level of point A and the exact shape of the cost functions will await further empirical analysis.

Transferring market information is often a major function in the TTS. On a CTS, this function might be performed better globally but not as effectively at a dyadic level because of long standing dyadic relationships. Thus, there would be a tradeoff. This tradeoff could be addressed by using a CTS to get a global picture of the market. The TTS could then be used to gain a clearer perspective of dyadic conditions, though this capacity is built into the CTS at the communication section of the directory of traders.

The first stage of a criterion for the performance of transfering marketing information is to examine the technical capacity of each system to transfer information per unit of time. Here a CTS has much greater technical capacity. Pages of information per second compare to the slow verbal transfer of information that occurs over a TTS. As for cost of the two systems, it appears that a CTS is very cost competitive. Early estimates of a CTS put the cost per bushel traded at $.0018 (Russell, 1986) versus the average cost of $00.76 per bushel over the TTS. Therefore, it appears that a CTS would perform the transfer of market information more efficiently than a TTS.

Negotiation would be more structured and organized on a CTS. Negotiation in a CTS is decomposed into making counter bids and offers, and booking a trade. A tradeoff might exist here between clarity and a shorter time cycle of information exchange. The shorter time cycle required on a CTS would enable negotiation with more individuals per unit of time although the negotiation might be considered less personal. Yet, one's perception of personal communication is subjective and subject to change. Instantaneous written communication might soon rival instantaneous auditory communication with respect to how personal it is perceived to be. In fact, in the not too distant future, traders may have both communication options available simultaneously as audio capabilities are integrated into computerized information networks.

Here again, a criterion developed earlier for comparing the negotiation function in price discovery mechanisms relates to the time cycle capacity for information exchange between two parties over a quantity of traders. A CTS would be a more effective mechanism for negotiation over a network in a short period of time. In fact, negotiation between multiple parties could occur almost simultaneously over a CTS. This is not possible over the TTS because of its dyadic nature. Yet at the dyadic level, the TTS is a more efficient mechanism for performing the negotiation function. Flexibility in negotiating is greater over a TTS and negotiation skills are better rewarded over a TTS.

Completing trades would be more efficient over a CTS. The time cycle would be much shorter due to the electronic mail feature of a CTS. The mail system used today to transfer contracts and confirmations is archaic and costly. Probably the most expensive part of completing trades is the labor involved. A CTS can drastically reduce the labor input to this function.

In addition, the time cycle of exchange would be quicker under a CTS for the completion of trade function and cost would be less than the mail system. Furthermore, since information would never have to leave a computerized environment, only one communication tool (the computer) would be used. The integrative capabilities of the computer will be most important in increasing the technical efficiency of the post trade function. For example, some railroads are already tracking their shipments using computerized communication technology to keep customers informed of railcar location. A CTS could directly "tap" into this and similar computer data bases.

Cultivating relationships was discovered to occupy about 14 percent of most trader's telephone time. This function is often thought of as a major justification for using the telephone. The telephone is an effective tool for cultivating relationships. But a well designed CTS can also be an effective tool used to perform this function. Telephone tag, the situation where phone calls are made and returned repeatedly without contact, could be a thing of the past on a CTS where messages are left in an electronic mailbox.

Furthermore, trade relationships are primarily developed out of performance. A CTS can be as efficient or inefficient as traders desire, with respect to chatter. But with respect to trading performance, a CTS has a good memory. Follow-up on trades could be tracked and reported. This could be an efficient method to encourage trade relationships.

As far as a performance measure for the cultivating relationship function, the key components are communication effectiveness and cost. In cultivating relationships a higher degree of intimacy is usually necessary for success. Personal audio stimuli is more intimate than personal written stimuli. Therefore, a TTS is probably a more efficient mechanism for cultivating relationships. For the one-to-one immediate communication necessary for the function, the TTS is more cost effective also. But, as stated, this could change and there are diminishing marginal returns to intimate communication.

For the overall trading function, which incorporates these five functions, the criteria for comparing a CTS and a TTS are: (1) how many communication technologies are used, (2) the amount of labor involved, (3) the synchronization between the different functions, and (4) costs. Each of these criteria are examined separately but they need to be remembered in the context of the whole.

A CTS involves essentially one technology, a computer. Though at present telephone lines are used for communication links, telephones are not an explicit part of a CTS. On the other hand, in the TTS of cash grain trading, three technologies are used; the telephone, the computer, and the mail. Since each technology has unique methods and characteristics, special and additional work is necessary to switch technologies.

Related to this is the amount of labor used in each system. The TTS requires more labor. Labor is required to "repackage" information so that it can travel through the three different technologies. In addition, as the information is repackaged the probability increases of its meaning being changed.

Since the TTS only allows the search routine to be performed dyadically, much labor is involved in this process. On a CTS the search time of an individual trader can be reduced drastically. This contributes to reduced labor. For example, on a TTS a firm might employ four cash grain traders as opposed to employing one or two traders over a CTS.

Synchronization relates to the various functions of grain trading coinciding perfectly. This goal can never be accomplished over a TTS due to: (1) the lack of explicit data bases, (2) the lack of explicit and universal software, and (3) the utilization of three different communication technologies. A CTS addresses each of these barriers to synchronicity.

The costs of a TTS versus a CTS cannot as yet be compared. Costs of a TTS as shown in Chapter 2 are conservative due to omission of mail and labor costs. Preliminary cost estimates of a CTS appear competitive with a TTS. The fact is that a CTS must be substantially cost effective to be adopted by the grain industry.

Table 5.2 summarizes the hypothesized comparisons between a CTS and a TTS at a network level using functional performance as criteria for effectiveness. With respect to the functions involved in grain trading, a CTS is more effective for those functions that relate to connecting a network or market (searching and transferring market information). A CTS is also more effective in completing trades due to its electronic mail component.

A TTS is more effective where dyadic communication is important (negotiation and cultivating relationships). These functions necessitate feedback and exchange of sometimes "fuzzy" information. If information is "fuzzy," then the cycle time of information exchange is longer in order to clarify meaning.

5.4 *COMMENTS*

Any comparisons between a TTS and a CTS for cash grain are unquantifiable at this point in time. The major reason for this is the nonexistence of a CTS for grain. Yet, using a model of a CTS for grain and a communication and functional framework, comparisons can be made.

Table 5.2 A Comparison of a TTS and a CTS for Grains Using Functional Performance as Criteria for Effectiveness

Functional Performance	TTS	CTS
Criterion	--- Most Effective	---
Search		X
Transferring Market Information		X
Negotiation	X	
Cultivating Relationships	X	
Completing Trades		X
In Total:		
Number of Communication Technologies Involved	3	1
Amount of Labor Involved		X
Synchronicity		X
Costs		X

*This is an assertion based on preliminary cost estimates of a CTS.

At the information set or data base level, differences between a TTS and a CTS center around organization, structure and standardization of data bases. This contributes to a quicker cycle time of information exchange on a CTS.

In addition, much of the software or know-how involved in grain trading is explicit in a CTS for grains. This allows a trader to further shrink the spacial and temporal dimensions of the total system. Thus, there is a shift from a dyadic communication perspective to a system communication perspective.

The technical features of a CTS allow the price discovery or communication process to infiltrate the system. Economic incentives, such as not charging for negotiation, (eg. countering and booking), could further encourage the price discovery dimensions of a CTS for grains. In fact, a charge structure could and should be devised to encourage trading over the system rather than observation with no trading. A CTS must be a price discovery mechanism for real impacts to accrue. These economic impacts and implications are addressed in the next chapter, taking into account the above assumption that a CTS will be a price discovering system.

Chapter 6

IMPACTS AND IMPLICATIONS OF A COMPUTERIZED TRADING SYSTEM ON GRAIN TRADING IN THE UNITED STATES

6.1 *INTRODUCTION*

A new price discovery mechanism such as a computerized trading system (CTS) will impact on the cash grain trading system in a progressive manner. The first impact will be on the communication process and overall communication structure. The impacts on communication are closely related to the impacts on the different functions of grain trading.

The gains in communication and functional efficiencies which accrue to a CTS are then reflected in gains in economic efficiency. Economic efficiency is composed of allocative or pricing efficiency and operational or technical efficiency. The effects of changes in economic efficiency, however, are ultimately exhibited in changes in market structure. As market structure changes, the basic operating environment of the industry is affected and exerts pressure for continued change.

From the theoretically derived economic implications of a CTS, hypotheses may be formulated and tested. The evaluation procedure of hypotheses testing leads to quantification of the differences between price discovery mechanisms. In the final analysis, quantification is a goal since it is crucial to verification. Verification can lead to validation which, in turn, gives direction to further research and development in the hope of economic progress.

The format of this Chapter is to concentrate on three areas: price efficiency, technical efficiency, and market structure. For each of these topics, the impacts of a CTS will be examined, followed by a discussion of the economic implications of these impacts. Then, hypotheses will be formulated for economic dimensions that will need detailed and sophisticated analysis. The Chapter will then continue with a projection statement about the key issues that will evolve in the cash grain industry in the next ten years as a CTS for grains infiltrates the marketing system. Summary and conclusions will close the Chapter.

6.2 *EFFICIENCY*

If the telephone trading system (TTS) were more efficient, then a CTS would not be a viable alternative. The two components of efficiency are pricing and technical. It is asserted here that for an alternative price discovery mechanism to replace the existing mechanism, it must be more efficient, both in a pricing and technical sense. There are exceptions to this assertion, but these exceptions take concentrated energy, effort and capital.[5] It is, in part, because of this need for

[5] Telcot, the cotton CTS, might be considered an exception to this assertion. The owners and operators of Telcot, a producer cooperative, initially encountered high costs due to dedicated communication lines and computer ownership. Sufficient trading volume must also be attained before a CTS is cost competitive with an existing price discovery mechanism (Turner and Epperson).

improvements in both pricing and technical efficiency that CTS's for agricultural commodities have not flourished. The improvement in technical efficiencies has not always been present in some of the systems designed and, where perceived to be present, has been difficult to confirm. Thus, for a CTS to succeed in a competitive environment of trading systems, the potential to improve both pricing and technical efficiencies is important.

It should be mentioned that pricing efficiency emanates from the communication structure and process that a price discovery mechanism encourages while technical efficiency is a product of the functional performance and costs of the mechanism. Therefore, the comparisons of Chapter 5 are relevant preliminary foundations for the impacts, implications, and hypotheses of this Chapter.

6.2.1 *Pricing Efficiency*

6.2.1.1 Introduction

Much of this study has been directed towards price discovery and, in particular, price discovery mechanisms. But price discovery is not synonymous with pricing efficiency. A good question is, "How are they related?" Furthermore, if price discovery is related to price determination as asserted in Chapter 3 (figures 3.4-3.6), then where does pricing efficiency come into this picture?

Pricing efficiency is often thought of in the context of how well prices travel through a marketing system to reflect changes in a primary demand (supply) at lower (higher) levels. In other words, do prices send signals that reflect situations important but far removed from individuals in a marketing system? Pricing efficiency thus often relates to the effectiveness of the system in communicating economic incentives back to the producer in order to prompt changes in quantity and/or quality of what is produced.

Figure 6.1 shows retail demand and the derived demands at the wholesale and farm level. Often, the product demanded at the retail level has changed form, place, or time from its original state at the farm level. Pricing efficiency relates to how well the price P_f signals to producers the retail price P_r. The margins between P_f and P_r include all the services added to the product as it moves from farm to retail.

An example might help to clarify. If demand at the feedlot is greater for high-protein grain, then the grain marketing system has a high degree of pricing efficiency if this preference is relayed to farmers through prices. That is, high-protein grain is priced at a premium.

There is often price discovery taking place at the different levels. If there is at least two party negotiation, then there is a probability distribution around the price being negotiated because of the imprecise estimates of market demand (figure 6.1). This coincides with figure 3.6. A major contributor to characteristics of the probability distribution around price, especially the level of dispersion and skewness, is information uncertainty.

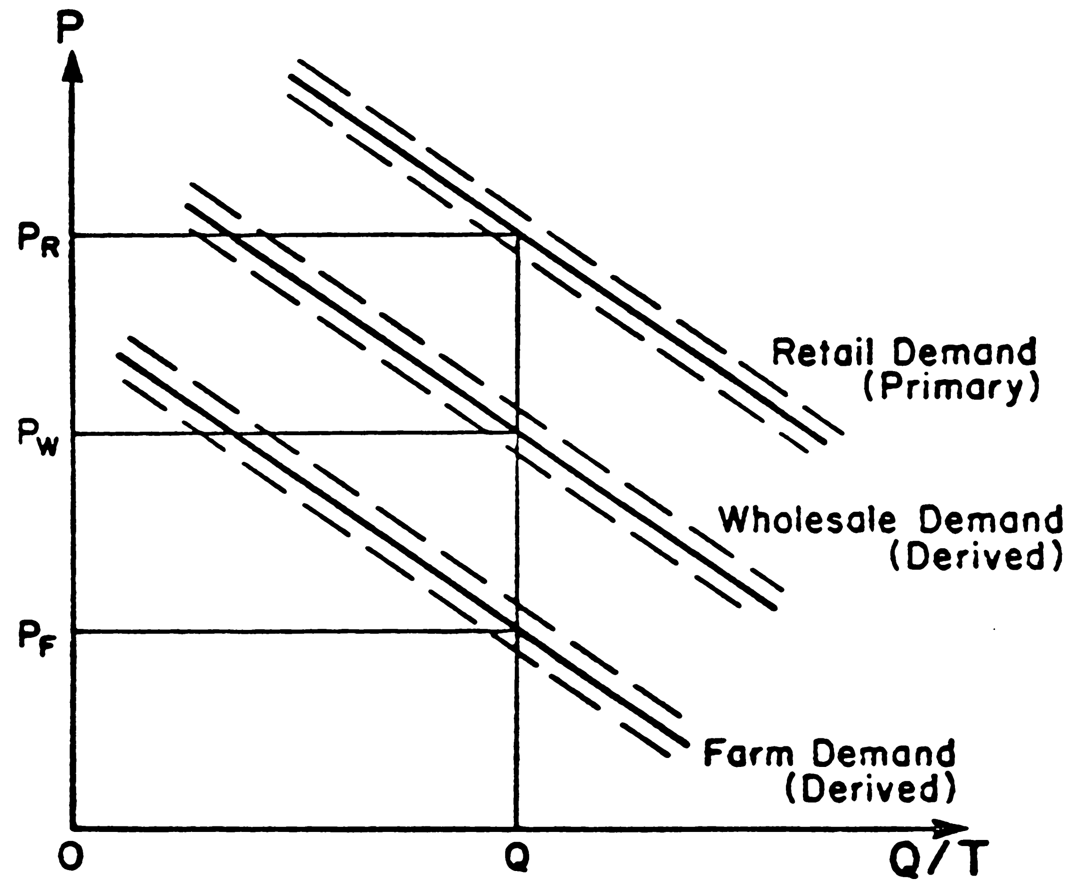

Figure 6.1 Primary (Retail) and Derived (Wholesale and Farm) Demand Taking Into Account the Uncertainty of Price Discovery

Therefore, the probability distributions surrounding the demand and supply curves of figure 3.6 are the link between the price discovery mechanism and pricing efficiency. A price discovery mechanism that contributes to narrower probability bands around these curves is said to be more price efficient than a price discovery mechanism that contributes to wider bands around the curves.

In a TTS, this relates to exchanging information dyadically in the quest for a global picture of the surrounding market. There is a pricing efficiency component to price discovery mechanisms and likewise, price discovery mechanisms have an impact on pricing efficiency.

6.2.1.2 Impacts

The joint probability distributions associated with price are results of the price discovery process. These results are evident in impacts on four characteristics of price; price level, price variance, price bias, and price accuracy. Impacts of a CTS on each of these characteristics of price are explored.

Schrader and Sporleder (1984) have reported, in general, what occurs when a CTS infiltrates a marketing system. Increased price levels in the short run appear and then diminish over time. The difference in price levels are between the CTS and some existing price discovery mechanism. Schrader suggests that perhaps as others learn that electronic markets are more accurate, the lag in price in the existing price discovery mechanism becomes too short to identify. This explanation would certainly fit into the communication framework presented here. If, for instance, two traders were aware of trade prices over a CTS, this information would be part of their information sets. If CTS prices were viewed as accurate, then the probability distribution around price would be narrower and price level differences would tend to disappear.

Furthermore, within a CTS for grain, information is accessible by the global population; therefore, price levels for those in the grain marketing system with access to less information will increase relative to those who have better access to global information over a TTS. This could mean that producers who use a CTS would be able to increase their price levels. The main reason for this is that they would be able to have access to prices farther up the marketing chain. Of course, this assumes that those producers can provide the physical services, such as transportation, etc. needed to supply grain to these users.

When a CTS is the dominant price discovery mechanism in the cash grain trading system, price levels should almost perfectly reflect the value of grain. Since the futures markets functions to accurately reflect the international influences on grain prices, a CTS will provide a very accurate mechanism for arbitration of local conditions. Differences in time, space, form, and quality will be arbitrated very quickly over a CTS due to its quick global time cycle of information exchange.

Thus, in the long run, price level differences will reflect time, space, form, or quality differences. Since a CTS comes close to representing a perfect market, the value of grain is determined in a centralized exchange context. Price levels throughout the grain marketing system will more accurately reflect the value of the services added to the grain because of the increased communication connectedness and openness of a CTS for grains.

Price variance can be viewed in the context of the framework used here as the variation of prices from the mean for a period of time. The most recent experiment comparing centralized and decentralized markets concludes that variability of unpredictable price deviations is lower in centralized markets (Buccola, 1985). This would suggest that a CTS would encounter less price deviations than the current TTS.

Analysis of price variance relates to the information openness and communication connectedness of the system and the quick global time cycle of information exchange. Of course, shocks to the system would be registered quickly just as when shocks are encountered in the futures markets.

The impact on price variance of a CTS for grain in the long run would be to lower the variability of transaction prices about the competitive equilibrium price. Buccola states that price discovery would be perfectly efficient if every price transacted were equal to the competitive equilibrium price. The move to a CTS for grains is a move to a more perfectly efficient price discovery mechanism. Although each transacted price will not be a competitive equilibrium price (CEP), the transaction prices will be closer to CEP's. This assertion flows from the framework of Chapter 3 and figures 3.4 -3.6.

Average price bias is the average difference between expected transaction prices and a competitive equilibrium price (Buccola,1985). This price characteristic also is explained through the framework of Chapter 3. Price bias will decrease over time as traders search for the competitive equilibrium. The efficiency of the search routine of a price discovery mechanism therefore greatly influences the price bias associated with that mechanism.

Buccola (1985) found that centralized markets exhibited more price bias than a decentralized market. But this finding is an aberration and will not be consistent on a CTS for grains. Buccola's (1985) experiment in which the above result was displayed was set up such that in the centralized trading session buyers and sellers were only allowed, after being recognized by a monitor, to publicly offer bids or publicly accept bids offered by others. For the decentralized trading session, traders were permitted to negotiate only on a one-buyer, one-seller basis. Negotiations could be broken off at any time and begun with another party. A key consideration ignored by Buccola was that in each market, the traders were in the same room, thus the potential for connectedness, in a communication sense, was high in both cases.

If a population of traders is connected in a communication sense, the rules imposed on them (centralized or decentralized) will influence price bias. We have seen this both in the experimental economics and electronic marketing literature (Chamberlin; Smith, V.; Buccola; Hamm, et al.). Yet, the key factor in reality is getting traders connected in a communication sense. This is a first and necessary condition. In fact, if Buccola's inferences are universally applicable, then a CTS for grains should not allow counter offers and bids to be viewed globally if decreased price bias is a goal. On the other hand, if decreased price variation is the goal, then open counter bids and offers should be available globally.

But here again there is a high probability that isolated trader dyads will have transaction prices biased from the competitive equilibrium. The bias will be in the direction and favor of the trader who has an asymmetric information advantage.

Since in Buccola's experiment the centralized traders were limited, in the sense that they had to be recognized by a monitor, his was not a true test of a centralized market. The futures markets have no such limitation nor would a CTS for grain. Thus, the price bias exhibited in those tests of centralized markets is, in part, due to this restriction to communication connectedness and to prolonging the time cycle of information exchange. The monitor functions to some extent as a barrier and a filter, thus contributing to inefficiencies in the communication process.

A CTS for grain would have no such intermediary or filter, thus one could expect any price bias exhibited to be attributable to either rules imposed by the system or insider information as concerns internal information private to a firm. These causes of price bias could be tested.

The three previous price characteristics can be subsumed under the "price accuracy". If prices were completely accurate, the price levels would be perfectly associated with the competitive equilibrium price for that level, price variance would reflect asymmetric information and differences in knowledge or skill and price bias would not exist. Schrader's argument for enhanced pricing accuracy through a CTS is based on better quality information and the distribution of information being more uniform among traders. This view is consistent with the characteristics of information and the communication structure used to compare a CTS and a TTS. Schrader also notes that accuracy implies that changed conditions translate into price change more often. This is also consistent with the time cycle of information exchange criterion used to compare price discovery mechanisms.

Thus, the ultimate impact on cash grain prices over a CTS is to increase price accuracy. Over a CTS, perspective changes from dyadic to global. This strikes at the essence of a competitive equilibrium price and at the core of price efficiency. A system, such as CTS, that can supply unfiltered information to buyers and sellers is more efficient than a system that filters information through intermediaries.

More efficient price discovery contributes to increased pricing efficiency in a marketing system. The link is through information sets, uncertainty, and communication. It appears that price discovery mechanisms that expand and structure information sets, decrease uncertainty, and increase global communication are more price efficient.

6.2.1.3 Implications

The economic implications of the impacts of a CTS on the pricing efficiency of the cash grain trading system relate to distribution, uncertainty, and exchange efficiency. Implications to distribution and uncertainty are common economic topics, while exchange efficiency is a new concept.

Increased pricing efficiency translates into marketing margins more perfectly reflecting the values of the services added to a product. A CTS puts information in a more symmetric conduit which results in information being redistributed. Ultimately, this redistribution of information is reflected in prices.

The ultimate benefactors of a change to a CTS will be the user and the producer of grain. This statement is based on Gardner's analysis of the farm retail price spread in a competitive food industry. In the study he showed how the retail farm price ratio changed when the supply function of a marketing service shifted. Gardner states, "Events that increase the supply of marketing inputs will decrease the retail farm price ratio" (Gardner, p. 407). It should be noted that his model was limited in that it assumed competition and it aggregated all marketing activities into one production function and all nonfarm marketing inputs into one quantity. Thus, the user of grain will benefit by paying less for the price discovery service.

The producer will benefit to the extent a more efficient marketing system protects or enhances domestic and export markets. In the setting of 1986 with export markets shrinking, this dimension could prove to be very important.

The search process that grain traders currently perform over the TTS is a method to deal with the uncertainty of a market. In a sense, all communication addresses uncertainty. The convergence model of communication illustrates the process whereby feedback functions to increase mutual understanding and decrease uncertainty.

A CTS is a perfect centralized communication network. Its data bases and software focus on the exchange function. Uncertainty is lower over a CTS because of the global nature of the system. Prices are viewed in the context which the traders desire. That is, through the search procedure a trader may compare prices using six different parameters. He can shape his market and make decisions based on superior information.

The progression of grain trading from the telegraph to the telephone also lowered uncertainty. Traders could communicate directly with others bypassing the intermediary of the telegraph operator. It is possible that in a CTS, the decision maker within a grain firm may bypass his current grain trader and trade grain himself. For today, a grain merchant to a great extent is a searcher for grain.

It is conceivable that on a CTS a different perspective might evolve. Instead of concentrating solely on pricing efficiency, interest might expand to exchange efficiency. That is, any of the factors that can change could be examined as to their impact on the overall efficiency of the trade. Delivery dates, for instance, can change. Instead of changing price to encourage a trade, delivery dates can change to encourage a trade. Though this occurs today over the TTS, there is little tractability. On a CTS, this could be better monitored.

This type of capability would render a better idea of the contribution of different factors to price. This would, in effect, provide a price discovery mechanism for the services that are applied to the grain as it moves through the marketing system.

For example, drying corn adds value to it. Some buyers pay a premium for dry corn. Naturally, the sellers of dry corn want to find the highest price for their product. Yet, often their corn is simply not discounted rather than given a premium. When dry corn gets mixed with wet corn, it loses part of its value. But if the seller of dry corn could "discover" a buyer of premium corn, both the seller and buyer would be better serviced. A CTS can easily match up these traders. The result is a price discovered for premium corn and exhibited globally. This example can be repeated in many variations over a CTS.

6.2.1.4 Hypotheses

The hypotheses relating to pricing efficiency are concerned with testing the results of price discovery mechanisms. They mostly deal with price accuracy and the time cycle of information exchange.

Perhaps the most important hypothesis to be tested from this study concerns the theoretical framework presented.

HYPOTHESIS 1: The Characteristics of the Communication Network are Directly Related to the Pricing Efficiency of a Marketing System.

Connectedness and openness are characteristics of a communication network that can be discovered through research. Changes in price for a certain type of price discovery mechanism may be analyzed relative to prices generated by other price discovery mechanisms. This relationship between the communication network and the resulting prices can be established through the use of computerized communication network analysis and statistical analysis.

The other hypotheses to be tested concerning the pricing efficiency of a CTS for grains concern the effect on prices of rules, regulations, and other institutional arrangements. Because of the controllable nature of a CTS, specific hypotheses can be tested. For example:

HYPOTHESIS 2: Allowing counter bids and offers to be viewed globally will tend to decrease price variance.

Many other hypotheses can be tested in this area with the evolution of a CTS.

6.2.2 *Technical Efficiency*

6.2.2.1 Introduction

It is perhaps with respect to technical efficiency that the advantages of a CTS are most apparent. Each of the functions of a grain trade have an operation component that is subject to technical inefficiencies.

6.2.2.2 Impacts

There will be less traders per firm over a CTS for grain. If a firm employs several people to cover their actual trading, with a CTS there will be need for less labor. Trading skill will be at a premium because of this. In a sense, the firm will be more dependent on fewer traders, thus its trading activity will be in the hands of fewer and, presumably, better trained people.

There will be more searching over a CTS since the function is built automatically into the system. Furthermore, the expanded potential to search will be technically supplied at a lower cost. Since searching takes up a large portion of a grain trader's time over the TTS, this component has a higher cost over a TTS.[6] Hence, there is a dramatic increase in searching efficiency over a CTS as compared to a TTS. Here again this relates to the CTS's data bases and software.

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[6] This study discovered an average cost of .74 cents per bushel of grain traded over the TTS. A preliminary study by Russell (1986) estimates costs of a CTS at .18 cents per bushel of grain traded for 100 users trading a million bushels per hour.

Another area where the technial efficiency of trade will increase is in completing trades. Electronic mail will enable the cycle time of this information exchange to be slashed. Since data never leaves a computerized environment, less labor is required, thus further reducing office labor.

Since information in a CTS is computerized, there will be gains in technical efficiency due to the ability to integrate the internal data sets of firms with the external data sets of the CTS. The data sets of a TTS, since they exist only conceptually, prevent any move in this direction.

Ultimately, the effects of a CTS would be to lower the long run average total cost of trading grain for the entire industry. This is the effect of technical innovation. The impact here is to increase the efficiency of the trading function.

6.2.2.3 Implications

Because the impacts of a CTS for grain may be more apparent on the technical efficiency of the cash grain trading system, the implications might be more significant. A CTS for grains will continue the progression to a more sophisticated grain trading system. Because of the existence of data sets in a CTS, development of software can continue. Software can be written to further decrease the time cycle of information exchange between cash and futures market activities. When a cash trade is made over a CTS, a hedge could be placed immediately.

This decrease in time between cash transactions and hedging could reduce firms exposure to risk.

Though margins between farmers and consumers would be less over a CTS for grain, returns on investment for individual firms could increase. This is because there would be less investment. Labor would be reduced and this is a major cost in trading grain. Less resources would be needed to perform better services.

The impact of a lower average total cost of trading will put pressure on the grain trading system, both domestically and internationally. In the United States, firms will be able to expand the markets they service. Transportation will be the major barrier to expansion, as it is today, but the information barrier will be leveled. With a CTS, the increased technical efficiency of the United States grain trade will exert pressure on other countries' trading system. With a CTS, a certain quality or kind of grain could be searched for throughout the United States. This is done now either through a multinational corporation or several information intermediaries. This relates directly back to distribution. If the U.S. can capture more of the grain export market, then income distribution will be shifted into the U.S. This relates directly to the U.S.'s competitive posture in the world's grain markets.

A CTS will also tend to make cash grain exchanges extinct. The volume of grain traded on these exchanges is already decreasing but a CTS will deliver the death blow to these exchanges as a place for physical proximity of grain traders.

Since in a CTS there is a record of all offers, bids, counters, trades, etc., the arbitration process should be smoother. Yet, it is surely the case that CTS trades will discover new types of disagreements and misunderstandings to go to arbitration.

6.2.2.4 Hypothesis

The hypothesis associated with the technical efficiency component of a CTS is the following.

HYPOTHESIS 3: A CTS for Grain Will Lower the Average Industry Cost of Trading Grain.

Several areas of research are needed here. First, the total trading costs of a representation sample of grain traders using the TTS must be analyzed. These costs include telephone, labor, mail, etc. Next, costs of a CTS must be known. This necessitates an operating CTS. These two costs can be compared and differences cited over time. Brokerage costs may also be analyzed to gain a better understanding of comparative trading costs.

6.3 *MARKET STRUCTURE*

6.3.1 *Introduction*

Any impacts of a CTS on market structure of the grain trading industry in the United States will be dependent on how complete a CTS is. That is, how many traders use the CTS. If a CTS reaches a certain threshold of completeness, then impacts on market structure will ensue. These impacts are derived, in part, from the efficiencies mentioned in the previous sections.

6.3.2 *Impacts and Implications*

Since the long run average total cost of trading (LRATC) will be lower under a CTS, this translates into a narrower marketing margin. This is demonstrated in figure 6.2. The impact of a CTS on the marketing margin is to lower price and increase quantity at the retail level. Likewise at the farm level, the impact of a CTS is to raise price and increase quantity. Thus, the non-adopters of a CTS will be squeezed from both the cost and revenue side. Either they adopt the technology, exit the industry, or find a niche where they can function.

The early adopters will reap benefits. The size of the benefits will be dependent on the number of early adopters. But the crux of a CTS is to shift downward the supply curve of information. This is demonstrated graphically (figure 5.4) in the MCI comparison between a TTS and CTS. This downward shift is a result of technical innovation.

The open nature of a CTS enhances competition for a given market structure (Sporleder, 1984). The connectedness of a CTS also increases the coordination of the total marketing system. There is less need for vertical integration. Yet, there might be a tendency for horizontal integration. Control of physical facilities will enable firms to gather returns on the physical services they apply to the grain. Management will be the key ingredient to success in the grain trade.

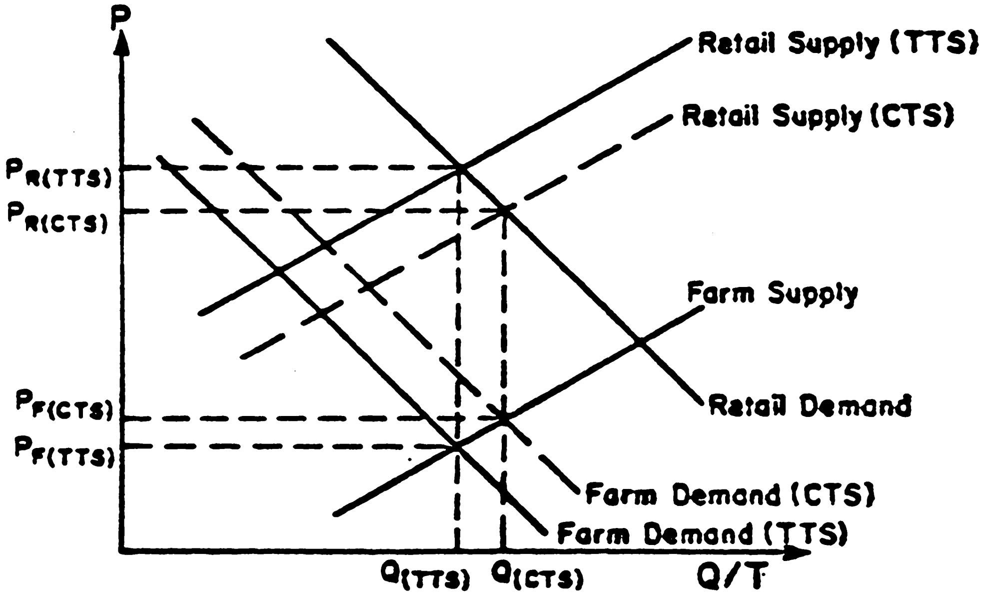

Figure 6.2 The Effect of a CTS on Marketing Margins

Efficiency in the physical services associated with moving grain through the system will be very important.

If the pattern exhibited during the telegraph to telephone shift in grain trading remains, oligopolistic behavior and market structures will intensify. Yet, a counter argument can be made that a CTS for grain will start the pendulum of the monopoly - competitive continuum back towards a more atomistic, competitive environment in the cash grain market. Sporleder (1984) states that when information is costly and economies of size exist in information collection, oligopsonistically structured markets protect asymmetrically held information and vice versa. He argues that a CTS might simply produce a more contestable market without changing industry concentration.

Evolutionary economics asserts that niches are created by situations and pressure. There appears to be pressure being exerted on the grain trading system today. Grain buyers for poultry firms speak with some concern of being supplied by one firm. They express suspicion of the prices they pay for the grain and services associated with getting grain delivered when there are few or no viable alternative suppliers (Lloyd).

The natural reaction to pressure is to search for alternatives. When an appropriate alternative is found, energy moves to that alternative, thus leaving the previous alternative. The old way loses significance and power and market structure changes to reflect adoption of the new alternative.

If a CTS for grains is to succeed, it must give a viable alternative to those who feel as though they are being squeezed. If it can do this, market share of moving grain through the system will be redistributed away from those with power to those will less power under the current system. Those who maintain superior information sets and exploit these to the detriment of those without power should expect reaction. But to maintain their power position, market leaders can react in at least three ways.

They can use the CTS and probably, because of their control of physical facilities, maintain market share and power. Or they can resist the innovation. Or they can try to make it their own. That is, they can continue using a TTS to interact with other firms and create an internal CTS. This route will prove expensive as they encounter higher LRATC for their trading. This higher cost of trading will have to be absorbed somewhere else in their operation.

If a CTS for grain gets a foothold in the grain marketing system, it will eventually become the dominant price discovery mechanism in cash grain. There will be some displacement within the industry. Though the logical displacement would be information assemblers, such as brokers, this might not necessarily be the case. If a broker is providing marketing expertise (a skill) in addition to information, he can still offer this service over a CTS. In fact, this skill will be even more valuable over a CTS, thus he can remain solvent. But if a broker is offering only information of the type a producer, for example, could gather but chooses not to do so, a CTS can replace this service. Some brokers will use a CTS, while others will not. Whom will necessarily be displaced is far from certain.

Innovations, such as a CTS for grain, tend to act as mutations in systems. As such, they destroy certain niches and open up other niches. With respect to niche creation and destruction, some hypotheses can be made.

Because a CTS is a centralized market and the cycle time of information exchange is so short, there might arise types of traders that are evident on futures markets. Scalpers and floor traders in a futures market environment could be analogous to screen traders on a CTS. These screen traders would take position for brief periods of time. They would lend liquidity to a CTS.

The brokers that do operate on a CTS could function like an account executive in the futures market. They would take and fill orders for smaller traders. In other words, they would function much like they do today but their client's bids or offers would be available to a greater audience.

Users of grain could witness the offers of many suppliers, thus decreasing their trading time. The niche of information intermediaries will decrease under price discovery on a CTS.

The Matthew Principle of *Evolutionary Economics* states that the rich get richer (Boulding, 1981, p. 75). This should apply with respect to a CTS. Since it requires computerization of the firm to a certain degree, those firms trading over a CTS will already probably have more structured and organized data bases. Thus, these firms will already be innovators and early adopters. A CTS will further enhance these firms organizational, management, and trading skills.

A CTS for grain will fill a niche in the grain marketing system. Evolution appears to exhibit a trend toward more complex systems. In other words, niches are open towards complexity and not toward simplicity. This is because the simple niches are already occupied. A CTS is definitely a more complex system than a TTS. The software and data bases enable the increasing complexity of the grain marketing system to be somewhat simplified. Thus, the characteristics of a CTS will enable the grain trade to jump to a new level of complexity.

6.3.3 *Hypotheses*

The two hypotheses presented here are indirectly related to market structure.

HYPOTHESIS 4: Competition Between Grain Trading Firms Will Increase as a CTS Infiltrates the Grain Trading System.

Since most grain trading exists above the producer and below the user of grain, one would expect margins between the producer and user level to narrow as competition increases. Basis trading will extend to the producer level on a much broader scale as information becomes more readily available to them.

Increased competition also has implications to market structure. Concentration in the grain industry will increase in the early years of a CTS as firms continue to increase trading efficiency. But as a CTS evolves and becomes the standard price discovery mechanism, concentration will stabilize.

HYPOTHESIS 5: A CTS for Grain Will Decrease Information Assymetries that Exist in the Grain Trade.

Information assymetries often arise out of scale economies that are derived from control of physical facilities. These facilities act as nodes in the market network, and thus, contribute to the controlling firm more nearly "learning" the conditions of the total market. They, in a sense, are more certain of an equilibrium price and use this information in areas where this information might be obscure. A firm trading over a CTS can easily find out at what prices other firms are trading. This contributes to symmetric information, which has an impact on distribution. Local oligoposonists will most likely arise on a CTS, yet the competition between these firms will be intense.

6.4 *PROJECTION STATEMENT*

There are some key issues that will evolve as a CTS for grain is adopted in the cash grain trade. This projection statement deals with these key issues and is based on the historical and conceptual developments along with the economic inferences generated in this study.

With the use of the telegraph to trade grain, a code (the Robinson code) evolved specific to grain trading. Likewise, with a CTS, security will be a key issue. Any CTS that is acceptable to the grain industry will have to maintain a high degree of security for its traders.

The rules and regulations of a CTS will also greatly influence both the adoption and the efficiency of a CTS. It appears that a CTS should be as close as possible to the current TTS, which is regulated and ruled by the National Grain and Feed Association (NGFA). Not only would the continuation of this type of industry regulation and ruling be most convenient to a CTS, but having the NGFA arbitrate disagreements over a CTS would lend institutional credibility to the mechanism.

Another key area to the continued success and growth of a CTS for grains is continued research and development. A transportation module that enables grain traders to either trade or contract transportation services will further increase the efficiency of grain trading.

Likewise, an electronic banking component and an agricultural credit check component would expand the base of users of a CTS for grains. With the transportation and banking entities, the number of auxillary participants on a CTS would further spread out the fixed costs of the system.

It will be necessary to investigate, conceptualize, and educate with respect to the transportation and banking modes. This research and development can be accomplished in a similar manner to the research process accomplished here. Computer demonstration models can be developed to better convey how a CTS for grain could integrate with other electronic services, such as transportation and banking services.

If computerized trading is going to become an accepted and standard method of trading agricultural commodities, it is crucial that a very successful model develop over the next few years. Telcot, the cotton CTS, is successful but is limited by its geographic region. On the other hand, a CTS for grain has the potential to be a leader in computerized trading. It is interesting that the grain trade was a leader in adopting the telegraph and telephone to trade. Once a CTS for grains is operational, this pattern could repeat itself.

With a CTS for cash grain, another key issue will be the relationship between the cash and futures markets. What happens to price discovery when cash trades are immediately hedged in the futures markets? Will the role of futures markets change as a CTS adopts forward contracting of cash grain?

If a CTS is as efficient as proposed here, what will be the necessary steps to internationalize a CTS for grains? Surely the banking and tranportation components of a CTS must be completely operational. To accomodate foreign cultures and traders, much research will be needed. The world economy is linked today by high-speed communication technology. This has transformed domestic economies into parts of a world economy. The time cycle of information exchanges on a world scale is reduced to seconds. In order for the world to smoothly and efficiently trade grain, a better mechanism must evolve. A CTS for grain could be one solution.

6.5 *SUMMARY AND CONCLUSIONS*

This study has compared two price discovery mechanisms for cash grain, a telephone trading system (TTS) and a computerized trading system (CTS). Three steps were necessary in order to make the comparison. First, the TTS was examined in a historical fashion in addition to surveying grain traders to gain an understanding of the current TTS. Next, a framework was developed using communication theory to explain the price discovery process. Finally, a prototype of a CTS was developed resulting in a demonstration computer model.

A main difference between a CTS and a TTS pertains to data sets and software. The data sets of a TTS are conceptual while the data sets of a CTS exist and are structured, organized and standardized. The software of a TTS is again mostly conceptual and internal to each firm. The trading rules and regulations of the National Grain and Feed Association act as a type of network guideline for the TTS. On the other hand, the software of a CTS is explicit and designed to provide a packaged or computerized environment for information as it rotates through the trading process.

A CTS substitutes capital and technology for labor. If a certain degree of completeness exists on a CTS, the cost of performing the trading functions will be below that of a TTS.

The economics of information that brought about telegraph and telephone trading will be the same impetus behind the progress of a CTS for grain. The cycle time of information exchange cannot be decreased much further over the TTS but can be decreased still further over a CTS. Consequently, the networking potential of a CTS is unparralled by TTS. This is due to explicit data bases and software versus only conceptual data bases and software.

As a result of the framework used to guide the comparison, the linking mechanism between information sets of individual firms, and the supply and demand curves of price determination was shown to be the price discovery process. Due to imperfect information, a probability distribution surrounds prices. With more accurate price discovery mechanism, these probability distributions become narrower and, thus, price accuracy is increased. High levels of price accuracy are necessary conditions for high levels of pricing efficiency.

Quantification of the conceptual results presented here remains. A device that should prove helpful is communication network analysis. This method enables the researcher to compare different communication systems in order to discover structure. Furthermore, the attributes of connectedness and openness of the different systems can be compared.

Once a CTS for grains becomes operational, cost comparisons may be made and evaluated. The comparisons will confirm or reject the assertion that a CTS is cost effective.

If a CTS for grain has a sufficient volume of grain traded on it, tests may be carried out to ascertain its efficiency as a price discovery mechanism. Causality tests could be used to compare a CTS with a TTS, or other price discovery mechanisms. Because of the records that a CTS retains, research on price discovery should enter a new era of conciseness. No longer will days or weeks be the time between prices. Trade prices over a CTS will be time stamped to allow changes to be evaluated more concisely. Furthermore, the effects of other factors on prices can be monitored on a CTS for grains.

But perhaps the greatest hope that a CTS for grains offers concerns users and their access to information. Perfect competition is a theoretical concept that is often used as a barometer. The assumption of well informed traders underlies the construct of perfect competition which is often used in operationalizing price theory. Though the assumption of perfect information is not attainable, it is worth striving for. Ultimately a CTS for grain is no more than that, a striving for complete, open, symmetric, and accessible information.

Table 6.1 summarizes some major ways a CTS would differ from the present TTS and the impact on efficiency of these differences. Pricing efficiency will be increased by a lower cost of information and a more connected network of traders. Technical efficiency will be

Table 6.1 Major Ways in Which a CTS Differs From a TTS and the Impacts of Those Differences on Efficiency

CTS Differs In:	Impact on Efficiency:
Decreased Cost of Information Through Centralizing the Search Process	Increase in Technical Efficiency and an Increase in Pricing Efficiency Via Better Approximation of True Equilibrium Price
A More Connected Network of Traders	Increased Pricing Efficiency Via Greater Opportunity for Arbitration Between Primary Traders
A More Open Communication System Between Traders	Increased Technical Efficiency Through Better Coordination Between Different Levels of Grain Marketing System
Increased Structure of Information	Increase in Technical Efficiency Due to Decrease Cycle Time of Information Exchange

increased by a decreased cost of information, a more open communication system, and the increased structure of information.

It remains to be shown empirically how important different price discovery mechanisms are to an economic system. Yet this study lays a necessary foundation that will enable alternative price discovery mechanisms to be evaluated as concerns communication attributes and functional performance.

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Appendix I

QUESTIONNAIRE USED TO INTERVIEW GRAIN TRADERS IN THE EASTERN UNITED STATES, 1983

Respondent # ________________
Date ________________

Questionnaire for Designing Computerized
Trading System (CTS) for Grain

This information is confidential. No information on individual respondents will be released. Information released will apply only to the overall sample.

I. General Information

1. Name of firm: ________________________________

2. Address: ________________________________
Rt. or St. City State Zip

3. Name and title of person completing questionnaire:

____

4. Phone Number: ________________

5. How familiar are you with computerized trading of commodities?

_______ Very familiar (have used)
_______ Familiar (read about)
_______ Unfamiliar

Comments ________________________________
____

Explain computerized trading. See sheet on back.

II. Trading Practices, Methods, and Costs

6. During 1982, approximately what percent of your grain transactions were made using the following methods?

	Purchases	Sales
	-----------------%	-----------------
a) cash at harvest (no contract)	______	______
b) forward contract	______	______
c) deferred contract	______	______
d) cash after harvest	______	______
e) other	______	______
______	______	______
______	______	______

7. On average, how many buying/selling transactions were you involved with per week?
<u>What is the peak number of transactions per day</u>?
<u>What days are your peak transaction days</u>?

	# of transactions per week	peak # of transactions per day	peak transaction days
Sales:			
During harvest	______	______	______
Rest of year	______	______	______
Purchases:			
During harvest	______	______	______
Rest of year	______	______	______

____

____

8. Approximately what percent of all grain transactions were made during these time intervals:

	Futures markets Operations		
	Before	During	After
	----------------	%	----------------
Transactions:			
Sales	______	______	______
Purchases	______	______	______

Does this vary by season of year? If so, how?

____

____

Does this vary by commodity? If so, how?

9. On a computerized trading system for grains, how important would the following factors be in making trades with established customers. For instance, suppose you could get a complete listing of the available supply or demand simply by typing the appropriate work on your terminal. The scale used to rank importance is from 1-10. A 1 representing no importance, a 10 representing very important. Thus,

(1 2 3 4 5 6 7 8 9 10)
no importance ... very important

	Importance Purchases	Importance Sales
Location	____	____
Quantity	____	____
Grade:	____	____
Test Weight	____	____
Moisture Content	____	____
Age	____	____
Protein Content	____	____
Odor	____	____
Color	____	____
Foreign Matter	____	____
Alfotoxin	____	____
Variety	____	____
Garlic	____	____
Damage factors (heat)	____	____
Type of Storage	____	____
Insects, Weevils, etc.	____	____
Loading System	____	____
Other (with respect to specific grains)	____	____
Price (asking)	____	____
Delivery Dates	____	____
Other ____	____	____
____	____	____

Comments: ______________________________
____
____

10. On a computerized trading system, how important would the following factors be in making trades with NEW CUSTOMERS. The scale used to rank importance is 1-10.

(1 2 3 4 5 6 7 8 9 10)

no importance — very important

	Importance Purchases	Importance Sales
Credit Reference	______	______
Title of grain (ownership)	______	______
Mode of Transportation	______	______
Type of handler	______	______
Method of Storage	______	______
Loading System	______	______
Other	______	______
______	______	______
______	______	______

Comments: ______________________________

____

____

Is there any other information you would like to have before you start negotiation with someone unknown to you?

____

____

11. What type of phone lines do you use?

12. What is your average monthly telephone bill? ______

Range	High	Low
for year	______	______
Month occurs	______	______

13. Of the marketing time spent on the telephone what percent of the total time is spent:

	Purchases --- %	Sales ---
(1) Searching for buyers/sellers	______	______
(2) Negotiating contract (price, etc.)	______	______
(3) Transferring market info.	______	______
(4) Cultivating relationships	______	______
(5) Completing trades (delivery, spec., etc.)	______	______
(6) Other	______	______

14. What percent of your grain transactions are made using the following grade standards?

	Corn	Wheat	Soybeans	Sorghum
		%		
F.D.A.	____	____	____	____
U.S.D.A.	____	____	____	____
Private	____	____	____	____
Other ____	____	____	____	____
____	____	____	____	____

15. What trading rules do you use? ________________________

____

16. Do you use a written schedule to discount and give premiums for grains? If yes, obtain a copy. If no, why not?

17. For grains of the same grade (U.S.D.A.) there are differences in sales price that reflects uncertainty regarding various factors such as grade, delivery, etc. Approximately how much difference in price can there be between lots of the apparent same grain?

	Difference	Range
CORN (US #2 yellow)	$______ bu.	______
Wheat (SRW/HRW US #2)	$______ bu.	______
Soybeans (US #2 yellow)	$______ bu.	______
Other		
____________	$______	______
____________	$______	______

18. Would you be willing to use a common schedule to price grain if it was accepted by all traders? If no, why not?

19. Suppose a general schedule was developed to trade grains on a CTS, who should be responsible for adjusting the schedule? (Circle)

Sellers Buyers Sellers & Buyers

Trade and/or Producer Association

Third Party Government Other__________

20. In terms of geographic scope, what is the distance in miles between you and your farthest/closest trading contact?

	Farthest	Closest
	-------miles---------	
Seller	________	______
Buyer	________	______

21. What do you see as the greatest limitations in terms of expanding the geographic scope of your grain trading?

22. Should access to transportation services be included in a CTS for grains? If no, why not?

23. What should be the process by which one gets cleared to have access to a CTS for grain?

_____ Payment of fee
_____ Approval by committee of buyers
_____ Approval by committee of sellers
_____ Approval by electronic grain marketing committee
_____ Other

24. Should the market organization that runs the CTS be involved in grading or should grading be left to some third party?

Do you forsee any problems in this area?

25. In a CTS for grains, which of the following trading procedures would you prefer?

Firm bid/offer ____
List/private negotiation ____
Both ____
Other ____________ ____
____________ ____
____________ ____

26. What is your policy toward hedging or forward contracting in terms of percentage of grain hedged and how quickly you hedge it?

	Hedge	Forward Contract
Percent	____	____
When do you	____	____
Other policy	____	____

Do you treat grains differently with respect to hedging strategy? If so, how?

____

27. Do you weigh and grade grain?

28. Do your grain contracts specify where and by whom weights and grades are determined?

Is this negotiable?

29. When you discount (are discounted) grain, what percent of time do you discount (get discounted) grain price because of:

	Sales	Purchases
(1) Concern with accurate grading	____%	____%
(2) Concern with performance of opposite trader	____%	____%
(3) Delivery Time	____%	____%

(4) Area grain is coming from ______% ______%
(5) Other ____________________ ______% ______%
____________________ ______% ______%

Does this vary by grain? If yes, how so?

30. What do you see as the strengths and weaknesses of the present grain trading system?

Strengths:

Weaknesses:

31. What type of business organization is your firm? (circle)

Single Owner Partnership Cooperative Corporation

Other ______________________________

32. Approximately what percentage of your business in 1982 did you do as a:

	- % -		- % -
Producer	______	Poultry Production	______
Feedlot	______	Broker	______
Country Elevator	______	Feed mill	______
Subterminal Elevator	______	Flour mill	______
Terminal Elevator	______	Processor	______
Export Elevator	______	Cooperative	______
Exporter	______		
Other	______	Other	______
	______		______

33. How much grain did this firm buy/sell in 1982?

	Corn (bu.)	Wheat (bu.)	Soybeans (bu.)
Buy	____	_____	________
Sell	____	_____	________

34. What type of storage does the firm use and what is the grain storage capacity of the firm?

Type		Capacity
____________		______________
____________		______________
____________		______________
____________		______________
	Total	________________

35. How many sellers/buyers handle 100%, 50% of your grain purchases/sales?

Purchases	Corn	Wheat	Soybeans
Number of Sellers:			
100%			
50%			
Sales			
Number of Buyers:			
100%			
50%			

36. Approximately what percent of purchases/sales of grain in 1982 were received/shipped by:

	Purchases	Sales
	-----------%-----------	
Truck	_________	_________
Rail	_________	_________
Barge or ship	_________	_________
Other	_________	_________

37. What percent of your firm's annual budget was devoted to grain marketing in 1982?

38. Please rate each of the following sources of market information as to importance in making pricing decisions and/or assessing market trends. Same scale as in question 14, 1-10. (1 2 .... 9 10)
no importance very important

Source	Importance
a) Commercial wire news service:	
(1) GIN__________	
(2) Reuters	__________
(3) U.P.I.	__________
(4) A.P.	__________
(5) C.N.S. (other)	__________
(6) L.F.M.	__________
(7) Other	__________
b) Radio__________	
c) Television	__________
d) Farm magazine	__________
e) Newspapers	__________
f) Marketing newsletter	__________
g) Telephone contact with:	
(1) Head office	__________
(2) Country elevators	__________
(3) Terminal & subterminal elevators	__________
(4) Grain merchants	__________
(5) Brokers	__________
(6) Processors	__________
(7) Foreign buyers	__________
(8) Producers	__________
(9) Exporters	__________
(10) Others (specify)	__________
______________	__________
______________	__________
h) Computer contact with buyers and sellers	__________
i) Face-to-face contact with buyers and sellers	__________
j) Other (specify)	
____________________	__________

III. Computerization

39. What type of computer does your firm use? If none, do you plan on computerizing your operation within 5 years?

YES NO MAYBE

	Brand	#
Main Frame	________	________
Minicomputer	________	________
Microcomputer	________	________
Timesharing	________	________
Terminal	________	________
Printers	________	________
Communication System	________	________
Other ________	________	________
________	________	________

40. What functions of your firm are (you planning to be) computerized and by what percent?

Functions	Present %	Plan %
Word Processing		
Accounting		
Inventory		
Financial Investments		
Marketing		
Communications		
Other ________		
________		
________		

41. What marketing or inventory information is stored in a computer? Check where appropriate. (Request copy)

Marketing Information	Corn	Wheat	Soybean	Sorghum
Basis Information:				
by location				
by time				
by grade				
by ________				
Quantities				
Price Quotes:				
by volume				
by grade				
by type of storage				
by ________				
Grades:				
moisture				
protein level				
foreign matter				
Other ________				
Potential traders				
Delivery date				
Transporation data				
Other ________				

IV. Performance Guarantees

42. What problems do you have in non-performance of contracts? (For example, late delivery)

43. At present, when a trade is made, when does title transfer from seller to buyer?

44. Assuming a computerized network for grain trading is established, should there be any limitations on who can trade on the system?___________

Why? ____

____

____

If yes, how?
How or by whom should these limitations be imposed?

____

____

_____ Approval by committee of buyers
_____ Approval by committee of sellers
_____ Approval by electronic grain marketing committee
_____ Other

45. Along what dimensions would a CTS for grains have to improve your operation to get you interested in using it?

46. Would you be willing to participate in developing and testing a CTS for grains? If no, why not?

General Explanation of Computerized Trading of Grains

Computerized trading of grains matches buyers and sellers over a computerized system. To participate, a buyer or seller needs a terminal and a printer.

The system would work like this:

1. Sellers describe the grain they have for sale giving volume, grade, location, loading, conditions, etc.

2. Buyers would request a listing of grain available in a particular geographical area which meets certain grade, quantity, and other conditions.

3. Trades could then be negotiated over the telephone or over the computerized system.

4. As an alternative, sellers could offer grain at a price and/or buyers could submit bids and the transactions would be completed over the computerized system.

Some advantages of a computerized system:

1. Sellers would have more buyers considering their grain.

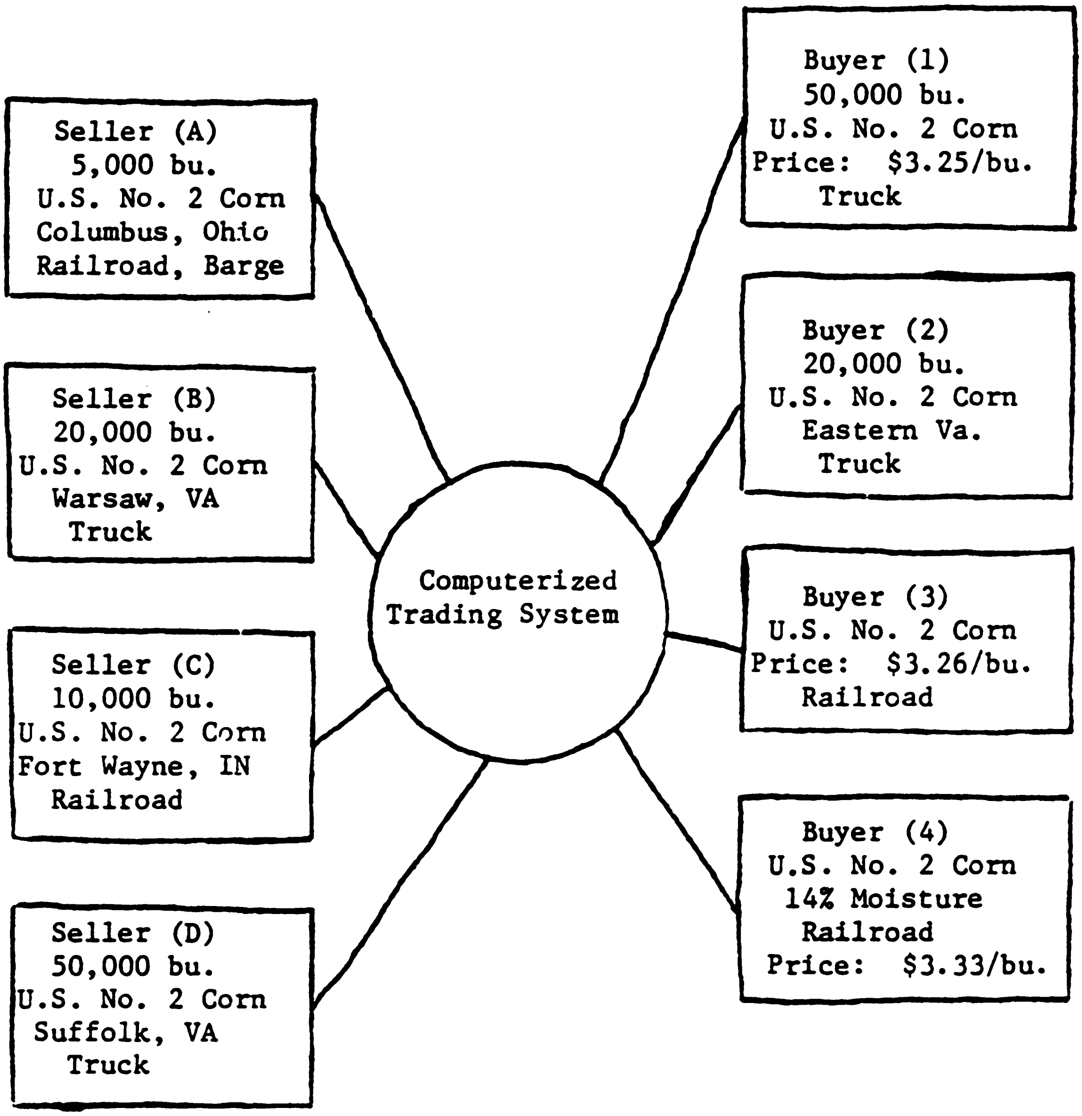
2. Buyers would have more information on the availability of grain that meets grade requirements, handling conditions, etc.

3. Costs of trade should be reduced in terms of time and communication costs.

4. Buyers' procurement costs could be reduced by the increased information on the location of available supplies.

5. Sellers' prices could be increased due to reduced costs and increased access to buyers.

Figure 1. A Schematic of Computerized Trading of Grains



For example, Buyer (2) would see listings from Seller (B) and Seller (D). Likewise, Seller (B) would initially see the bids of Buyers (1) and (2).

Appendix II

A DEMONSTRATION MODEL OF A COMPUTERIZED TRADING SYSTEM

Appendix III

USER MANUAL FOR A DEMONSTRATION OF A COMPUTER TRADING SYSTEM

I. Introduction

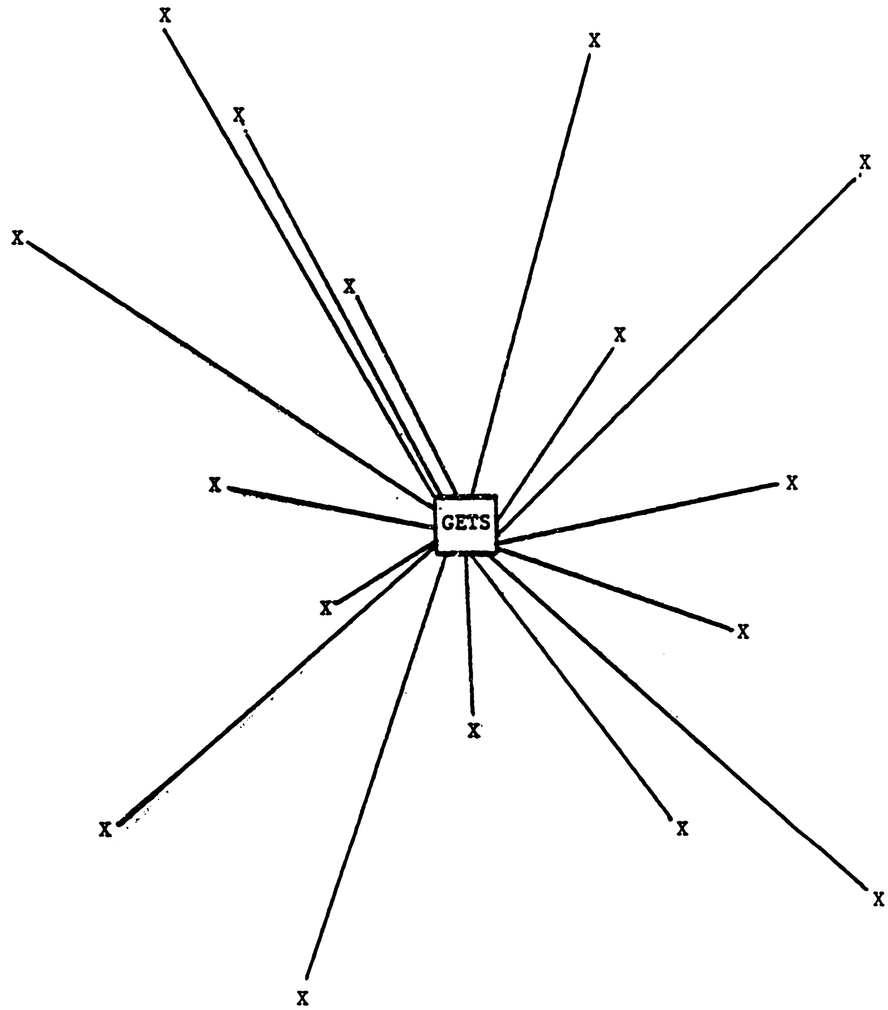
This demonstration program is designed to familiarize you with the idea of using computers to trade grain. The purpose of the manual is to help you to work through the program in its current level of development. Once you become familiar with the program, you are encouraged to experiment with different options, thus allowing you to better see the potential of computerized trading.

1. The Concept

The concept of a computerized trading system is a simple one. As you sit at your microcomputer you are linked to a central computer, which in turn is linked to the microcomputers of other traders. If every grain trader in the United States had a microcomputer and were linked to GETS, the only difference from the present telephone trading system would be that communication would be directed through a central computer (figure 1).

If you were a seller, your grain would be exposed to all interested buyers. If you were a grain buyer, you would see total supply given the parameters you specify. This will become clearer as you work through the program.

Figure 1. A diagramatic view of the GETS concept.



2. <u>The Program</u>

The GETS demonstration model is designed for use on an IBM-PC with a color monitor, although it can be used with a monochrome (non-color) monitor as well. The program should also run on IBM-PC compatible microcomputers such as COMPAQ.

3. <u>The Goal</u>

Keep in mind as you work through this program that you are working with a prototype --- a working model. If you have any suggestions on how this program can be improved, please contact us at Virginia Tech. If you would like a copy (a printout) of the actual computer program, that also can be accommodated. The goal is to expand and tailor the GETS demonstration as much as is needed to help implementers of an interactive system better meet the demands of grain traders.

II. Getting Started

The GETS Program and this instruction manual are written assuming the user has little computer expertise. The program is written so as to make choices available from different menus. There is a main menu and auxillary menus.

The program can be thought of as a tree with the main menu being the trunk with each choice being a branch with different branches (choices) growing from it (see figure 2).

1. <u>Steps to Booting up GETS</u>

You will need to have your disk operating system (DOS) disk to boot up your computer. For GETS to run, you must have a DOS 2.1 or higher version. Now proceed through the following steps:

1. Place your DOS disk in the A drive and boot up your computer.

Figure 2. A tree diagram of the GETS program.

```
                 !--- Your Position -!-----------!     !--- Bid
                 !                   ! Bids      !     !
                 !                   ! Offers    !     !--- Offer
                 !                   ! Trades    !-----!
                 !                   ! All Three !     !--- Change a
                 !                   !-----------!     !    Lot
                 !                                     !
                 !                                     !--- Convert to
                 !                                          Flat Price
                 !                  !------------!
                 !                  ! Bids       !     !--- Help
                 !--- Search for ---! Offers     !-----!                !-Quantity
                 !    Bids or       ! Both       !     !--- Counter     !
                 !    Offers        !------------!     !                !-Delivery Date
                 !                                     !--- Trade       !
                 !                                     !                !-Location
                 !                                     !--- Flat Price  !
                 !                                     !                !-Price
                 !                                     !--- Futures     !
                 !                                     !                !-Transportation
                 !                                     !--- Search -----!
                 !                                                      !-Grade
                 !--- Summary of ---! --Commodity
                 !    Trades        !
                 !                  ! --Transportation
Main Menu ---!
                 !                  ! --Time
                 !
                 !
                 !--- Directory of ---! --Update
                 !    Trades          !
                 !                    ! --Search
                 !                    !
                 !                    ! --Communicate
                 !
                 !
                 !                 ! --Truck
                 !--- Transport ---!
                 !    Services     ! --Rail
                 !                 !
                 !                 ! --Barge
                 !                 !
                 !                 ! --Ship
                 !                 !
                 !                 ! --Directory
                 !
                 !                   ! --Commodity News Service
                 !--- Market News ---!
                 !    & Futures      ! --Reuters
                 !                   !
                 !                   ! --Agridata
                 !                   !
                 !                   ! --Grassroots
                 !
                 !--- Quit
```

2. Insert the GETS disk in the B drive and type copy B:config.sys and press return (the key with the ↵ symbol). Copying the file config.sys onto your DOS disk is a one time operation. Once your DOS disk contains this file you may skip step 2.

3. Re-boot your computer. If your DOS disk has config.sys on it you may skip step 3.

4. Insert the GETS disk in the A drive. Type GETS.

The first time you work with GETS you must proceed from step 1 to step 4. The second time you run the GETS program (if you use the same DOS disk) you only need to do step 1 and step 4.

2. Choosing a Data Base

After proceeding through the above steps the following screen will appear:

```
Pick database
1. Same database - the same one that was used last time
2. Practice database - the one to play with, it has some info in it.
3. Empty database - to start a new session, no info in it.
4. Beginner's data base - to learn how it works.
Enter choice
```

There are two data bases in the original program. They are BEGINNER'S and PRACTICE. A data base is simply a structured set of information about particular lots of grains. You may change these data bases by entering a lot or trading a lot of grain. But, each time you re-boot and start the GETS program, the original BEGINNER'S and PRACTICE (new) data base will be in effect. If the GETS program malfunctions (bombs) the BEGINNER'S or PRACTICE data base should be used when restarting the GETS program.

The SAME data base is a "used" data base. That is, if you have used a data base and made changes in it, then that data base is now called SAME. SAME is the most recent <u>used</u> data base with the changes intact.

The EMPTY data base has no bids or offers in it. All information or bids and offers would have to be entered. First, select the BEGINNER'S data base. Enter a 4 in the ENTER CHOICE space and press return. The following screen will appear:

The first time you use this system you need to enter a four letter ID.
Do you want to enter a new ID? (Yes/No) N

Now enter a four letter identification (ID). The first four letters of your last name is a good choice. This ID will appear throughout the program whenever you have a bid or offer outstanding. Now press return. Next, enter a password. The first six letters of your first name is a good choice. If you make a typographical error, simply use the ↑ , ↓ , → , ← keys to the right of your keyboard to move the cursor over the mistyped word. Then retype the correct word. Now press return. The following screen appears.

Welcome
to

GRAIN
ELECTRONIC
TRADING
SYSTEM

Copyright 1985
Virginia Tech

Please enter your I.D.

This is the "Welcome" screen. Enter your ID and password and press return twice to gain clearance to GETS.

The next screen will prompt you to enter the date numerically. Then press return. On the same screen will appear choices for pricing method desired. Choose one. If you do not choose a price method, the system automatically uses BASIS pricing. So enter 2 and press return.

III. Main Menu

The screen below is the main menu. It consists of seven choices.

```
Grain
  Electronic
    Trading
      System

1. Your position
2. Search for bids or offers
3. Summary of Trades
4. Directory of traders
5. Transport - Services
6. Market News & Futures
7. Quit using this system

   Enter your choice
```

1. Your position. This gives you information on all cash positions you are holding in the GETS market. You are also able to enter and change bids and offers in this section.
2. Search for bids or offers. This allows you to specify the scope of your market depending on the factors you specify such as location, quantity, price, and transportation mode. You can search for bids and/or offers, enter bids and/or offers, and complete trades.
3. Summary of trades. This will allow you to examine a summary of trades made over the GETS system by the commodity, transportation mode, and time period you specify.
4. Directory of traders. This lists all traders in the GETS market. It will allow each trader to update his file, search for information about other traders, and communicate with other traders.

5. Transport-Services. This will provide a listing of transporters who provide services between different locations.
6. Market News and Futures. This section will link GETS to existing market news services and to futures prices.
7. Quit using this system. This choice enables you to exit the program.

First, you should work through the program in a structured, straightforward approach. Then you will be able to explore alternative choices.

III 1. Your position

Enter a 1 in the blank provided for Enter your choice. Now press return. The screen below appears:

```
                 :   1. Corn     :
Choose commodity :   2. Wheat    :
                 :   3. Soybeans :
                 : Enter choice  :
```

At present, only the corn option is operational. Enter a 1 and press return. Now the following appears on your screen:

```
                  :  1. Bids      :
Would you like    :  2. Offers    :
to look at your   :  3. Trades    :
                  :  4. All three :
                  :  Choice       :
```

Enter a 4 to see your bids, offers, and trades.

Next, the following screen appears:

```
COMMODITY: CORN                                    TIME: 00:15:23
LOT       BIDS          LOCATE      OFFERS          DLV   GRADE & COMMENTS
      ID  PRICE   BU         TR  BU  PRICE    ID




1.Bid  2.Offer  3.Change in a lot  4.Convert to flat price  5.More  6.Menu
                                   Enter choice
```

This screen provides information to you on every position, whether bid, offer, or completed trade, that you have in the GETS market. Notice that this screen essentially is a T-account with bids and offers separated by location.

Each bid or offer has a lot number for identification. ID symbolizes identification and is the four letter ID entered when the trader enters GETS. Your ID will be associated with every lot number appearing in your position.

PRICE can be in a basis or flat pricing format. Either way, a futures month symbol appears at the end of the price linking it to the specified futures month. Plus basis do not have a + symbol before the basis price, while negative basis has a - symbol before the basis price.

Quantity is listed in 1,000 bushel units and is signified by BU. For example, 0.7 corresponds to 700 bushels, while 2 corresponds to 2,000 bushels.

The LOCATE column is the location column and this is the place where destinations and origins appear. A state abbreviation appears in the first two spaces, while the city or town appears in the last four. For example, GAATLA refers to Atlanta, Georgia. If a river is the location (barge traffic) then RV appears in the first two spaces and four letters of the specific river appear in the remaining four spaces. For example, entry for the Mississippi River would be RVMISS.

TR represents desired transportation mode. Truck, rail, barge, or ship may be specified by the first letter of each word.

DLV stands for delivery date. The first space is allotted to month and the letter corresponds to the symbols used by the futures markets to represent month. After skipping a space, the next five spaces give further information on delivery date. For example, X 20-30 would mean November 20 to November 30.

The far right hand section of the screen covers grade and any additional comment about the grain. Any elaboration on grade is entered here. After you have entered grade and comment information the system will ask you for any "Instructions". You can specify market instructions here (e.g., Alert if offer within 25¢). Only you will see the instruction.

This completes a description of the upper part of the screen. The bottom part of the screen is a menu, although it is horizontal. There are six choices available: (1) BID, (2) OFFER, (3) CHANGE IN A LOT, (4) CONVERT TO FLAT (BASIS) PRICE, (5) MORE, (6) MENU.

III 1.1 Your position - Bid

Enter 1 in the ENTER CHOICE blank and press return. A LOCATE (DESTINATION) prompt appears. Enter two letters for the state and four letters for the town or city of your choice. Now press return.

A TRANSPORTATION prompt appears. Enter a T, B, R, or S, for truck, barge, rail, or ship, in the transportation blank and press return. A FUTURES MONTH prompt appears. Enter the desired futures month letter in the blank and press return. The symbols for the futures months are shown at the bottom of the screen. You must enter a month if you are in basis pricing. If you are in flat pricing you do not enter a month. When the flat price is changed to a basis price, the date you entered as today's date is used to convert the flat price to a basis price. That is, the futures contract month nearest to today's date will be used to make the price conversion.

An ENTER PRICE and ENTER QUANTITY prompt appears. Enter the price at which you would like to place your bid remembering that you are basis pricing using the previously entered futures month. Press return after you have entered price. Move the cursor to the ENTER QUANTITY blank and enter the quantity you wish to bid for and press return.

A DELIVERY MONTH prompt appears. Enter the month you want the grain delivered and press return. Now enter any other delivery date information and press return. You are allowed five letters here. If you need additional space for delivery date information, it may be entered under the GRADE & COMMENT section.

The cursor is now blinking after the GRADE & COMMENT prompt. Enter grade information first, such as PAR, and then other comments. After you have finished entering grade and comment information press return.

An INSTRUCTION prompt appears and you may enter market instructions. After doing this press return. Your new bid now appears on the screen along with the menu. More bids can be entered by pressing 1, hitting return, and repeating the above steps for each bid entered.

III 1.2 Your Position - Offer

Enter a 2 and press return. A LOCATE (ORIGIN) prompt appears. Enter two letters for the state and up to four letters for the town or city of your choice. Now press return.

A TRANSPORTATION prompt appears. Enter a T, B, R, or S, for truck, barge, rail, or ship, in the transportation blank and press return. A FUTURES MONTH prompt appears. Enter the desired futures month letter in the blank and press return. The symbols for the futures months are shown at the bottom of the screen. You must enter a month if you are in basis pricing. If you are in flat pricing you do not enter a month. When the flat price is changed to a basis price, the date you entered as today's date is used to convert the flat price to a basis price. That is, the futures contract month nearest to today's date will be used to make the price conversion.

An ENTER PRICE and ENTER QUANTITY prompt appears. Enter the price at which you would like to offer your lot remembering that you are basis pricing using the previously entered futures month. Press return after you have entered price. Move the cursor to the ENTER QUANTITY blank and enter the quantity you wish to offer and press return.

A DELIVERY MONTH prompt appears. Enter the month you will deliver or have your grain picked up and press return. Now enter any other delivery date information and press return. You are allowed five letters here. If you need additional space for delivery date information, it may be entered under the GRADE & COMMENT section.

The cursor is now blinking after the GRADE & COMMENT prompt. Enter grade information first, such as PAR, and then other comments. After you have finished entering grade and comment information press return.

An INSTRUCTION prompt appears and you may enter market instructions. After doing this press return. Your new offer now appears on the screen along with the menu. More offers can be entered by pressing 2, hitting return and repeating the above steps for each offer entered.

III 1.3 Your Position - Change in a lot

Enter a 3 and press return. Next, enter the lot number you want to work with. The program asks you if this is the right lot. If you answer Y for yes or by hitting return (a no answer by entering N will return you to the menu), the current information on that lot number appears and you may change information by moving the cursor to the desired place using the ↑ , ↓ , → and ← keys to the right side of your keyboard. Try the arrows. If you want to change quantity from 5 to 10, put the cursor over 5 and enter 10. Press return until all the items have been covered and the screen with the changed lot will appear.

III 1.4 Your Position - Convert to flat (basis) price

Enter a 4 and press return. All the prices on the screen will be converted to flat prices and the menu reappears.

III 1.5 Your Position - More

If you have more bids and offers in the system than can be shown on the screen, enter a 5 and press return. Your other bids and offers will appear.

III 1.6 Your Position - Menu

Enter a 6 and press return. This returns you to the main menu.

III 2. Search for bids or offers

Enter a 2 in the blank provided for ENTER YOUR CHOICE on the Main Menu and press return.

The screen below appears:

```
                    INNNNNNNNNNNNNNNNN;
                    :  1. Corn       :
Choose commodity    :  2. Wheat      :
                    :  3. Soybeans   :
                    LJNNNNNNNNNNNNNNNJ;
                    : Enter choice 1 :
                    HNNNNNNNNNNNNNNNNK
```

At present, only the corn option is operational. Enter a 1 in the blank for commodity choice and press return. The following screen appears:

```
                 INNNNNNNNNNNNNNNN;
                 :  1. Bids      :
Would you like   :  2. Offers    :
to search for    :  3. Both      :
                 HNINNNNNNNNNNNN;<
                  : Choice       :
                  HNNNNNNNNNNNNNK
```

You are given a choice to search for bids, offers, or both. Enter a 3 to see both bids and offers. Press return. The screen below appears:

```
                       SEARCHING FOR CORN OFFERS AND BIDS

                        ZDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD?
ZDDDDDDDDDD?            3      Quantity - in 1000's of bls.            3
3Press the 3  DD Q DDDD 3        max             min                   3
3letter on 3            CDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD4
3the level 3  DD D DDDD 3  Delivery - month     period                 3
3you want  3            3DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD3
3to work   3  DD L DDDD 3 Location - State    City          ZIP        3
3with.     3            CDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD4
3          3  DD P DDDD 3  Price -        month       max              3
3You can   3            3DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD3
3search    3  DD T DDDD 3 Transportation - Truck Rail Barge Ship  ?    3
3for offers3            3DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD3
3on one    3  DD G DDDD 3            Grade - Par (Y/N)                 3
3level or  3            @DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDY
3on all    3
3levels.   3  DD S DDDDD   Let's search for offers and bids.
@DDDDDDDDDDY
              DD R DDDDD   Return to menu    ENTER CHOICE
```

This screen enables you to search for offers and bids by any of six factors: quantity, delivery date, location, price, transportation, and grade. This capability allows you to build your own market specifications within GETS. If you do not choose to restrict the corn offers and bids for which you are searching then you will see all the bids and offers on GETS. For a more detailed description, see section III 2.7 Q-G.

First, enter an S and press return. A screen appears almost identical to the Your Position Screen, but with a different menu at the bottom with nine choices: (1) HELP, (2) COUNTER, (3) TRADE, (4) BASIS (FLAT) PRICE, (5) MORE, (6) FUTURES, (7) SEARCH, (8) MENU, and (9) QUIT.

```
COMMODITY: CORN                                  TIME: 00:16:27
LOT      BIDS          LOCATE      OFFERS            DLV   GRADE & COMMENTS
    ID   PRICE    BU          TR  BU  PRICE    ID
  4GLDK  0.0300Z    77 ALDOTH R                      X L/H  PAR ALL MULTICAR SEL
                                                            LERS PLEASE CONTACT
                                                            HARRIMAN
  5MCCY -0.0300Z   0.7 GADAVB T                      U L/H  PAR
 12CARG Z          0.7 IADSMO T                      V 3RDWKPAR
 18                    IASTLK T  0.7 -0.0350H GALV F        PAR
 20     .              ILCHPN R  150  0.0900H ANDS F F/H    PAR
 19CARG -0.0275Z     2 INWHTN T                      X 4THWKPAR
 15                    LABTRG B   55  0.1600H CARG G L/H    PAR
  7PERD  0.2500Z   0.7 MDSALB T                      U L/H  PAR
  8                    MI[illegible]S R   55  0.0925H LANG F F/H    PAR
 17                    MOSTLU B  100  0.1200H AMBG F L/H    PAR
 16FMGC -0.0450H     1 MSGRNV T                      Z      PAR
  6                    NCFAYE T   96  0.0850H CAMR Z L/H    PAR
  9LDMK -0.0575Z   0.7 OHCOLB T                      V 1STWKPAR
 11                    OHMAUM B  100  0.1800H ANDS G F/H    PAR
 13            -       OKKGFH R   35  0.0875H KFCP Z        PAR
 10ADM   0.1000Z    65 TNMEPH R                      X F/H  PAR
 14TXCF -0.0350Z   0.7 TXAMRL T                      X 2NDWKPAR
         THERE IS MORE INFO....... PRESS #5 TO SEE IT.
1.Help 2.Counter 3.Trade 4.Flat price 5.More 6.Futures 7.Search 8.Menu 9.Quit
```

An explanation of the first lot of grain on this screen is as follows: Lot number 4 is a bid being put out by Goldkist with the destination (LOCATE) being Dothan, Alabama. The bid price is 3 cents above the December corn futures contract. The desired quantity is 77,000 bushels and rail is the desired transportation mode. Delivery of the corn is specified for the last half of November. Par grain is the grade specified. All multicar sellers are directed to contact Harriman of Goldkist.

III 2.1 SEARCH - HELP

Enter a 1 and press return. At present, the only help you may receive is with futures month symbols. Enter a 1 in the blank box at the bottom of the screen and press return. The code for future month symbols appears at the bottom of the screen and the search menu reappears.

III 2.2 SEARCH - COUNTER

Enter a 2 and press return. Enter the number of the lot you wish to make a counter offer or bid against. Next you are prompted to enter either a P (price) or Q (quantity) for the factor you wish to counter against. Select P if you want to counter on price and enter it in the blank and press return. Now enter your counter price and press return. Your counter will appear under the original lot with a bracket signifying it as a counter. Counters appear in sequence as to order of entry, the first counter entered being directly below the original lot and so on. After you have entered your counter and it appears on the screen the horizontal menu reappears.

III 2,3 SEARCH - TRADE

Enter a 3 and press return. You now have the choice of entering a bid or offer, or booking (making) a trade. Enter a K in the blank box after the below to illustrate booking:

ENTER a B to BID, an O to MAKE an OFFER, a K to BOOK

Next enter the lot number you wish to book. The screen reappears with the indicated lot appearing as the first entry on the screen as a traded lot (notice the astericks). The search menu also reappears at the bottom of the screen.

If you wish to make a bid or offer in the trade mode of the search menu, you enter a B or O in the blank box after:

ENTER a B to BID, an O to MAKE an OFFER, a K to BOOK

This will ellicit prompts identical to the BID and OFFER routine of the Your Position section (see III 1.1 and III 1.2).

III 2.4 SEARCH - FLAT (BASIS) PRICE

Enter a 4 and press return. All the prices on the screen are converted to a flat (basis) price and the menu reappears.

III 2.5 SEARCH - MORE

This choice enables you to see more bids and offers than are on the present screen. After a screen is filled, the menu appears at the bottom of the screen. A note will appear above the menu at the bottom: THERE IS MORE INFORMATION... PRESS No. 5 to SEE IT

If this note appears and you wish to see more information, enter a 5 and press return. A screen with more bids and offers appears.

III 2.6 SEARCH - FUTURES

This choice enables you to see an update on futures prices corresponding to a specific time. Enter a 6 and press return. A row of CORN FUTURES prices appears at the bottom of the screen with today's time for which these prices are appropriate in the far right corner.

III 2.7 SEARCH - SEARCH

Enter a 7 and press return. The search screen appears. You may search over the data base in GETS on any of the six parameters specified on the search screen. If, after specifying your restrictions, the display screen of bids and/or offers appears with no bids/or offers this means that your restrictions eliminated all bids or offers as exist in the data base. If you are less restrictive with respect to the chosen parameters, the probability increases that the data base will include a bid or offer that meets your criteria.

III 2.7Q SEARCH - SEARCH - QUANTITY

Enter a Q and press return. You may specify the maximum quantity and minimum quantity you wish to see. For example, enter 100 in the max blank and press return and enter 10 in the min blank and press return. Now enter S in the ENTER CHOICE blank and press return to search. Only bids and offers that are less than or equal to 100,000 bushels and greater than or equal to 10,000 bushels appear on the COMMODITY:CORN bids/offers screen. Now enter a 7 and press return to get back to the search screen.

III 2.7 D - SEARCH - SEARCH - DELIVERY DATE

Enter D in the ENTER CHOICE blank and press return. You may specify the month (see code at bottom of screen) and the period within the month. For example, enter X for November in the blank after Month and press return. Now enter L/H for last half in the blank after PERIOD and press return. Now enter S in the ENTER CHOICE blank and press return to search. Only bids and offers that specify delivery dates as the last half of November (X L/H) appear on the COMMODITY:CORN bids/offers screen. Now enter 7 and press return to get back to the search screen.

III 2.7 L SEARCH - SEARCH - LOCATION

Enter L in the ENTER CHOICE blank and press return. You may specify the state by abbreviation, MO (Missouri) for instance, and press return. Next enter up to four letters representing the city or town, STLU (St. Louis) for example, and press return. The ZIP blank is operational only in the sense of bringing a zip code map of Missouri. To see this map enter a Y in the ZIP blank and press return. Then press return until you return to the search screen.

If you do not choose to see the zip code map, after entering the state and city and pressing return, enter a S in the ENTER CHOICE blank and press return to search. You will see information on bids and/or offers in the location specified. Now enter 7 and press return to get back to the search screen.

III 2.7 P SEARCH - SEARCH - PRICE

Enter P in the ENTER CHOICE blank and press return. If you are using basis pricing, BASIS will appear in the price block. If you are using flat pricing, FLAT will appear in the price block.

If you are in the basis pricing mode, a futures contract month prompt will appear along with the price prompt. Futures contract months with corresponding prices appear at the bottom of the screen. If you wish to search for bids a minimum price prompt appears. Every bid greater than the specified minimum price will appear on your screen. If you wish to search for offers a maximum price prompt appears. Every offer less than the specified maximum price will appear.

If you are in the flat pricing mode, a month prompt will not appear. If you are searching for bids, a minimum price prompt will appear. If you are searching for offers, a maximum price prompt will appear.

For example, enter a Z in the MONTH blank and press return. Next, enter the maximum price you wish to search on. For example, for BASIS MONTH Z MAX

-0.03 enter -0.03 and press return. Now enter S in the ENTER CHOICE blank to search. You will see all bids and/or offers for corn priced at -.03 or less under the December contract. Now enter 7 and press return to get back to the search screen.

III 2.7 T SEARCH - SEARCH - TRANSPORTATION

Enter a T in the ENTER CHOICE blank and press return. Now enter either T for truck, R for rail, B for barge, or S for ship and press return. Now enter S in the ENTER CHOICE blank to search. You will see all bids and/or offers for corn where the transportation mode is the choice you wish to see. Now enter 7 and press return to get back to the search screen.

III 2.7 SEARCH - SEARCH - GRADE

Enter a G in the ENTER CHOICE blank and press return. If you wish to search for par grade corn enter a Y in the blank after GRADE - PAR (Y/N) and press return. If you wish to search for nonpar grade corn enter a N in the above blank and press return. Now enter a S in the ENTER CHOICE blank and press return. You will see bids and/or offers that meet the grade criterion specified. Now enter 7 and press return to get back to the search screen.

III 2.7 S SEARCH - SEARCH - SEARCH

As indicated by the block at the left hand side of the search screen, you may specify none, one, or several of the six factors (levels) so as to personalize your search for bids and offers. A combination of restrictions will eliminate bids and offers from your CORN:COMMODITY screen. Enter S in the ENTER CHOICE blank and press return to search and to return to the search menu. Now enter 7 and press return to get back to the search screen.

III 2.7 R SEARCH - SEARCH - RETURN

Enter an R in the ENTER CHOICE blank and press return to return to the main menu.

III 2.8 SEARCH - MENU

Enter an 8 and press return to return to the main menu.

III 2.9 SEARCH - QUIT

Enter a 9 and press return. This will exit you from the GETS program to your disk operating system (DOS).

III 3. SUMMARY OF TRADES

Enter a 3 in the blank after ENTER YOUR CHOICE on the main menu and press return. The screen below appears:

```
                 ZDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD?
                 3      SUMMARY OF TRADES       3
                 @DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDY

Commodity: A. Corn
           B. Wheat
           C. Soybean
    Enter choice

                  Transportation: D. Truck
                                  E. Rail
                                  F. Barge
                                  G. Ship
                      Enter choice

                                        Time: H. Today
                                              I. Yesterday
                                              J. Past 5 days
                                              K. Other
                                          Enter choice
```

At present, only the corn, transportation, yesterday options are operational. Enter an A after ENTER CHOICE under COMMODITY: and press return.

Enter a D after ENTER CHOICE under TRANSPORTATION: and press return. Enter an I after ENTER CHOICE under TIME: and press return. The following screen appears:

AT THIS POINT, YOU WOULD SEE THE TERMS OF TRADE FOR

YESTERDAY'S CORN, TRUCK TRADES.

FOR EXAMPLE :

GETS TRADES

CORN / TRUCK

WEDNESDAY 4/10/85

TIME CST	QUANTITY (1000BU)	PRICE	DELIVERY DATE	ORIGIN	DESTINATION	GRADE
9:36	7	0.35K	4/15/85	OHCOLM	PALANC	PAR

Press any key to continue...

The resulting screen is self-explanatory. Press return to return to the main menu.

III 4. DIRECTORY OF TRADERS

Enter a 4 in the blank after ENTER YOUR CHOICE on the main menu and press return.

The screen below appears with four alternatives: (U) update your current file, (S) search for traders, (C) communicate with traders, and (R) return to menu.

Each person that trades on Gets has a file in this directory.
You may update your file, search for traders, or communicate with
a specific trader by choosing one of the following alternatives.

U - Update your current file

S - Search for traders

C - Communicate with traders

R - Return to menu

Choose the letter of the alternative you wish to work with. :

The directory of traders section of the GETS program is illustrative and you can not enter or change the information. The update, search, and communication functions of the directory are not operative at this time.

III 4. U: DIRECTORY - UPDATE YOUR CURRENT FILE

Enter a U in the blank after CHOOSE THE LETTER OF THE ALTERNATIVE YOU WISH TO WORK WITH and press return. The following screen will appear:

```
This is your current file. Choose the field within which you
wish to change information.

F    Facility/Firm Information
BCT  Bank/Credit/Title Information
LU   Loading/Unloading Information
O    Operating Information
G    Grade Information
T    Transportation Information
C    Contracts Information
PDS  Premium/Discount Schedule Information
P    Personnel Information
ST   Standard Trading Term and Procedures Information

 R    GO BACK TO MENU

      Press the key of your selection.
```

III 4. U.F: DIRECTORY - UPDATE - FACILITY/FIRM INFORMATION

Enter an F in the blank after PRESS THE KEY OF YOUR SELECTION and press return to look at facility and firm information. The following screen appears:

```
        Facility/Firm Information
        Long Branch Elevator
        AAA Grain Corporation
        4662 Devonshire Road
        Dahlonega, GA  30384
        (404) 865-5632
        Country Elevator - Corn, wheat, soybeans
        Member of:  Southeastern Grain and Feed Association
                    National Grain and Feed Association
        Storage Capacity - 250,000 bushels
        Government certified warehouse:  yes
        Comments
   Press any key to continue.
```

Press return to return to update screen.

III 4. U.BCT: DIRECTORY - UPDATE - BANK/CREDIT/TITLE INFORMATION

Enter BCT in the blank after PRESS THE KEY OF YOUR SELECTION and press return to look at bank, credit and title information. The following screen appears:

```
Bank/Credit/Title Information
Lumpkin County Bank                     John Thomas
16 North Main Street
Dahlonega, GA                           AA Rating
(404) 382 5555
Press any key to continue.
```

Press return to return to the update menu.

III 4. U.LU: DIRECTORY - UPDATE - LOADING/UNLOADING INFORMATION

Enter LU in the blank after PRESS THE KEY OF YOUR SELECTION and press return. The following screen appears:

```
LOADING AND UNLOADING INFORMATION

INFORMATION WOULD APPEAR CONCERNING THE PHYSICAL CAPACITY OF

YOUR FACILITIES. IN ADDITION,AVERAGE TIME REQUIRED TO TRANSFER

GRAIN WOULD BE AVAILABLE.


Press any key to continue...
```

Press return to return to the update menu.

III 4. U.O: DIRECTORY - UPDATE - OPERATING INFORMATION

Enter O in the blank after PRESS THE KEY OF YOUR SELECTION and press return. The following screen appears:

```
                    OPERATING INFORMATION

   OFFICE HOURS -  8:00 A.M.- 5:00 P.M.

   DOCK HOURS - 7:00 A.M.- 9:00 P.M.

   ANY OTHER INFORMATION YOU WISH TO RELEASE ABOUT YOUR OPERATION
   COULD BE ENTERED.

 Press any key to continue...
```

Press return to return to the update menu.

III 4. U.G: DIRECTORY - UPDATE - GRADING INFORMATION

Enter G in the blank after PRESS THE KEY OF YOUR SELECTION and press return. The following screen appears:

```
                    GRADING INFORMATION

   ANY INFORMATION YOU WISH TO RELEASE CONCERNING YOUR GRADING

   PROCEDURE WOULD BE ENTERED HERE. SEE PREMIUM/DISCOUNT SCHEDULE

   SECTION ALSO.

 Press any key to continue...
```

Press return to return to the update menu.

III 4. U.T: DIRECTORY - UPDATE - TRANSPORTATION INFORMATION

Enter a T in the blank after PRESS THE KEY OF YOUR SELECTION and press return. The following screen appears:

```
                    TRANSPORTATION INFORMATION

     ANY INFORMATION RELATING TO TRANSPORTATION QUESTIONS COULD

     BE ADDRESSED HERE.

     Press any key to continue...
```

Press return to return to the update menu.

III 4. U.C: DIRECTORY - UPDATE - CONTRACT INFORMATION

Enter a C in the blank after PRESS THE KEY OF YOUR SELECTION and press return. The following screen appears:

```
CONTRACTS

CORN:
                                CONTRACT NO. _____

   YOUR FIRM,INC                TIME:__________
   YOUR ADDRESS                 DATE:__________
______________________________________________________
CONFIRMATION OF / SALE / PURCH. / DEFER. PRIC. / BROKER
               /      /        /              /
______________________________________________________
NAME:_____________________________ TELEPHONE__________

ADDRESS:__________________________ COMPUTER____ - _____

CITY:____________________ STATE:____________________

Press any key to continue...
```

A sample contract is shown. When corn trades are made over GETS, information from the trade would be transferred automatically to your contract and contracts between traders could be transferred electronically. Each GETS trader could store their contracts on the system and standard contracts could be used when appropriate. Press return to view the entire sample contract. Press return to return to the update menu.

III 4. U.PDS: DIRECTORY - UPDATE - PREMIUM/DISCOUNT SCHEDULE INFORMATION

Enter PDS in the blank after PRESS THE KEY OF YOUR SELECTION and press return. The following screen appears:

PREMIUM AND DISCOUNT SCHEDULES

APRIL 16,1985

CORN BUYING BASIS:

#2 YELLOW CORN
54#/BU 15.5 MOISTURE 5% DAMAGE 3% F.M.

DISCOUNT SCHEDULE

MOISTURE	TEST WEIGHT	DAMAGE	F.M.
1% OF CONTRACT	UNDER 54-$.01/BU	5.1-6.0 -$.005/BU	3.1-4.0-$.005/BU
PRICE FOR EACH	UNDER 53- .02/BU	6.1-7.0 - .010/BU	4.1-5.0- .010/BU
.5% OVER 15.5%	UNDER 52- .03/BU	7.1-8.0 - .015/BU	5.1-6.0- .020/BU
UP TO MAX OF	UNDER 51- .04/BU		6.1-7.0- .030/BU
16.5%			

NO CORN ACCEPTED WITH OVER 20 PPB OF ALFATOXIN.

A sample premium and discount schedule is shown. Each buyer would "post" his own schedule if he desired. You could adjust your schedule any time you so desired. Press return to return to the update menu.

III 4. U.P: DIRECTORY - UPDATE - PERSONNEL INFORMATION

Enter a P in the blank after PRESS THE KEY OF YOUR SELECTION and press enter. The following screen appears:

PERSONNEL

YOU COULD ENTER INFORMATION ON PERSONNEL IN YOUR FIRM.

OWNER:

MANAGER:

MERCHANDISER:

BUYER:

GRADER:

COMPTROLLER:

SECRETARY:

Press any key to continue...

You could enter any information about the people who work with your firm. Press return to return to update menu.

III 4. U.ST: DIRECTORY - UPDATE - STANDARD TRADING TERM AND PROCEDURES INFORMATION

Enter ST in the blank after PRESS THE KEY OF YOUR SELECTION and press return. The following screen appears:

STANDARD TRADING TERMS AND PROCEDURES

THIS SECTION WOULD ALLOW YOU TO SET UP STANDARD TRADING PROCEDURES.

Press any key to continue...

You could specify what standard trading terms and procedures you adhere to. These procedures could be incorporated into your file in GETS to check all your grain trades to assure confirmation of the specified procedures. If, on a particular trade, one of your specified procedures was violated, the GETS system would delay the trade and notify you. Press return to return to the update menu.

III 4. U.R: DIRECTORY - UPDATE - RETURN

Enter R in the blank after PRESS THE KEY OF YOUR SELECTION and press return. This will return you to the directory menu.

III 4.S: DIRECTORY - SEARCH

Enter S in the blank after CHOOSE THE LETTER OF THE ALTERNATIVE YOU WISH TO WORK WITH and press return. The following screen appears:

AT THIS POINT, YOU WOULD BE ABLE TO SEARCH
THROUGH THE DIRECTORY BY NAME OF FIRM,
LOCATION, COMMODITY TRADED, ECT.

In the actual system a screen similar to the "searching for corn offers and bids" screen would appear with you selecting the parameters, such as name, location, commodity traded, etc., that you wish to search over. Press return to return to the directory menu.

III 4.C: DIRECTORY - COMMUNICATE

Enter a C in the blank after CHOOSE THE LETTER OF THE ALTERNATIVE YOU WISH TO WORK WITH and press return. The following screen appears:

AT THIS POINT, YOU WOULD BE ABLE TO COMMUNICATE
WITH OTHER TRADERS. THIS COULD BE DONE USING
COMPUTUTERIZED COMMUNICATION, EITHER ONLINE
ELECTRONIC MAIL, OR TELEPHONIC COMMUNICATION,
WHERE THE TELEPHONE NUMBER IS DIALED AUTOMATICALLY.

Press any key to continue...

In the actual system a communication menu would give you the option of different types of communication with anyone on the GETS system. Now press return to return to the directory menu.

III 4. R: DIRECTORY - RETURN

Enter R in the blank after CHOOSE THE LETTER OF THE ALTERNATIVE YOU WISH TO WORK WITH and press return. This will return you to the main menu.

III 5. TRANSPORT - SERVICES

Enter a 5 in the blank after ENTER YOUR CHOICE on the main menu and press return. The screen below appears:

```
: Transportation - Services :

        1. Truck
        2. Rail
        3. Barge
        4. Ship
        5. Directory

            Enter choice
```

There are five choices available to you. Enter any of the five choices. If you enter 1, 2, 3, or 4 in the ENTER CHOICE blank the following will appear on the bottom half of the screen:

```
ZDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD?
3              STATE   CITY                  3
3       Origin:                              3
3  Destination:                              3
@DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDY
```

Enter the desired origin and/or destination and press return. If you select 1 the screen below appears:

AT THIS POINT, A LIST OF TRUCKERS
WOULD APPEAR THAT PROVIDE SERVICE
BETWEEN THE POINTS SPECIFIED.

Now press return to return to the main menu.

If you enter 5 in the ENTER CHOICE blank and choose to work with the transportation service directory, then the following screen appears:

A DIRECTORY OF FIRMS SUPPLYING TRANSPORTATION
SERVICES TO USERS OF GETS WOULD BE AVAILABLE.
YOU WOULD BE ABLE TO SEARCH OVER THE
DIRECTORY AND COMMUNICATE WITH INDIVIDUAL
FIRMS.

Press any key to continue...

A directory of transportation firms would be available on an actual system. This directory would be similar to the directory of traders in section III 4. Press return to return to the main menu.

III 6. MARKET NEWS AND FUTURES

Enter a 6 in the blank after ENTER YOUR CHOICE on the main menu and press return. The screen below appears:

```
: Market News & Futures :

1. Commodity News Service

2. Reuters

3. Agridata

4. Grassroots

        Enter choice
```

The choices available are illustrative of the services available. The GETS system would not duplicate existing services. Choose one of the four choices available and enter the appropriate number in the ENTER CHOICE blank and press return. The following screen appears:

```
AT THIS POINT, YOU WOULD ACCESS THE
REQUESTED SERVICE.



Press any key to continue...
```

In any actual GETS system, you would access and use the available services. Press return to return to the main menu.

III 7. Quit Using the System

Enter 7 in the blank after ENTER YOUR CHOICE and press return. This will exit you from the GETS program. You are now in the DISK OPERATING SYSTEM (DOS) and should have an A> on your screen.

IV SUMMARY

The GETS demonstration program is designed to help you develop a firmer grasp of what trading grain over a computer network might be like. The program is written so as to provide a base for discussion and ideas for a computerized trading system that might better serve the needs of the grain industry.

You are encouraged to show and demonstrate this program to anyone. You may copy the GETS program onto a blank disk (see Glossary) or contact personnel at Virginia Tech for more copies and/or user manuals. You are also encouraged to think of ways the concept of a computerized trading system for grains could fit into your grain trading operation. The future of a computerized trading system for grains might evolve along several fronts. Pieces of the concept might evolve initially, such as listing of grains, and then other pieces, such as trading and transportation services, later.

Appendix I: Menus and Screens

1. Main Menu

```
Grain
  Electronic
    Trading
      System

  1. Your position
  2. Search for bids or offers
  3. Summary of Trades
  4. Directory of traders
  5. Transport - Services
  6. Market News & Futures
  7. Quit using this system

     Enter your choice
```

2. Your Position

```
COMMODITY: CORN                                        TIME: 10:15:23
LOT       BIDS          LOCATE        OFFERS           DLV   GRADE & COMMENTS
      ID  PRICE   BU          TR  BU  PRICE   ID





1.Bid  2.Offer  3.Change in a lot  4.Convert to flat price  5.More   6.Menu
                                 Enter choice
```

3. Search for Bids and Offers

```
                               SEARCHING FOR CORN OFFERS AND BIDS

                            ZDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD?
ZDDDDDDDDDD?                3        Quantity - in 1000's of bls.          3
3Press the 3    DD Q DDDD   3        max                min                3
3letter on 3                CDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD4
3the level 3    DD D DDDD   3   Delivery - month      period               3
3you want  3                3DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD3
3to work   3    DD L DDDD   3 Location - State    City          ZIP        3
3with.     3                CDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD4
3          3    DD P DDDD   3   Price -          month     max             3
3You can   3                3DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD3
3search    3    DD T DDDD   3 Transportation - Truck Rail Barge Ship  ?    3
3for offers3                3DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD3
3on one    3    DD G DDDD   3            Grade - Par (Y/N)                 3
3level or  3                3DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDY
3on all    3
3levels.   3    DD S DDDDD     Let's search for offers and bids.
@DDDDDDDDDDY
                DD R DDDDD     Return to menu    ENTER CHOICE
```

4. Trading

```
 COMMODITY: CORN                                        TIME: 00:16:27
LOT        BIDS           LOCATE        OFFERS            DLV   GRADE & COMMENTS
     ID    PRICE     BU          TR   BU  PRICE      ID
   4GLDK  0.0300Z    77 ALDOTH R                      X L/H  PAR ALL MULTICAR SEL
                                                             LERS PLEASE CONTACT
                                                             HARRIMAN
   5MCCY -0.0300Z   0.7 GADAVB T                      U L/H  PAR
  12CARG Z          0.7 IADSMO T                      V 3RDWKPAR
  18                    IASTLK T  0.7 -0.0350H GALV F        PAR
  20                    ILCHPN R  150  0.0900H ANDS F F/H    PAR
  13CARG -0.0275Z     2 INWHTN T                      X 4THWKPAR
  15                    LABTRG B   55  0.1600H CARG G L/H    PAR
   7PERD  0.2500Z   0.7 MOSHLB T                      U L/H  PAR
   8                    MILANS R   55  0.0925H LANG F F/H    PAR
  17                    MOSTLU B  100  0.120?H HMBG F L/H    PAR
  16FMGC -0.0450H     1 MSGRNV T                      Z      PAR
   6                    NCFAYE T   96  0.0850H CAMR Z L/H    PAR
   9LDMK -0.0575Z   0.7 OHCCLB T                      V 1STWKPAR
  11                    OHMAUM B  100  0.1800H ANDS G F/H    PAR
  13                    OKKGFH R   35  0.0875H KFCP Z        PAR
  10ADM   0.1000Z    65 TNMEPH R                      X F/H  PAR
  14TXCF -0.0350Z   0.7 TXAMRL T                      X 2NDWKPAR
          THERE IS MORE INFO....... PRESS #5 TO SEE IT.
1.Help 2.Counter 3.Trade 4.Flat price 5.More 6.Futures 7.Search 8.Menu 9.Quit
```

5. Directory of Traders

Each person that trades on Gets has a file in this directory. You may update your file, search for traders, or communicate with a specific trader by choosing one of the following alternatives.

U - Update your current file

S - Search for traders

C - Communicate with traders

R - Return to menu

Choose the letter of the alternative you wish to work with.

6. Update of Trader File

This is your current file. Choose the field within which you wish to change information.

F Facility/Firm Information
BCT Bank/Credit/Title Information
LU Loading/Unloading Information
O Operating Information
G Grade Information
T Transportation Information
C Contracts Information
PDS Premium/Discount Schedule Information
P Personnel Information
ST Standard Trading Term and Procedures Information

R GO BACK TO MENU

Press the key of your selection.

7. **Summary of Trades**

```
ZDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD?
3      SUMMARY OF TRADES       3
@DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDY

Commodity: A. Corn
           B. Wheat
           C. Soybean
    Enter choice

        Transportation: D. Truck
                        E. Rail
                        F. Barge
                        G. Ship
            Enter choice

                  Time: H. Today
                        I. Yesterday
                        J. Past 5 days
                        K. Other
                 Enter choice
```

8. **Transport - Services**

```
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:  Transportation - Services   :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
        1. Truck
        2. Rail
        3. Barge
        4. Ship
        5. Directory

             Enter choice 1

ZDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDD?
3              STATE   CITY                3
3      Origin:                             3
3 Destination:                             3
@DDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDDY
```

9. Market News and Update

Market News & Futures

1. Commodity News Service

2. Reuters

3. Agridata

4. Grassroots

Enter choice

Appendix II. Glossary of Grain and Computer Terms and Examples

Grain Terms

1. BASIS PRICE - A price derived from a futures contract month price and a cash price. Basis = cash price - futures price.

2. BIDS - Statements of what one will give for grain as specified.

3. BOOK - To make a trade.

4. BU - Bushels.

5. DLV - Delivery Date.

6. FLAT PRICE - A price expressed in dollars per bushel. Another term for flat price is cash price.

7. FUTURES CONTRACTS MONTH - Months of the year for which there are futures contracts. Each month has a one letter symbol. For example, the corn futures contract months and symbols are:

   Present Year:
   - H = March
   - K = May
   - N = July
   - U = September
   - Z = December

   Next Year:
   - C = March
   - E = May
   - L = July
   - P = September
   - T = December

8. GRADE & COMMENT - "PAR" connotes a standard USDA grade for specified grain. If this is not the case, then nonpar and details on differences are specified. Any additional comment concerning grade, transportation,

delivery date, method of payment, person to contact, etc., may also be entered under this heading.

9. ID - Identification. Each trader on GETS has an identification name or number which is four characters long.

10. INSTRUCTION - Market instructions. A trader may enter instructions which are activated by changes in the market. For example, the instruction - "Alert if offer is within 0.25 cents" would activate a bell to ring your computer if anyone countered your bid with an offer price within 0.25 cents of your bid price.

11. LOT - A bid, offer, counter, or trade that has an identification number.

12. OFFERS - Statements of what one will take for grain as specified.

13. PRICE - The amount of money that is exchanged for a specified lot of grain.

14. STANDARD TRADING TERMS AND PROCEDURES - Terms and/or procedures that are common to your trading behavior. For instance, to book is a term that means to make a trade. A standard procedure might be never to accept an unidentified offer or bid.

15. TR - Transportation. There are four modes of transportation used in GETS trading:

    T = truck
    B = barge
    R = rail
    S = ship

Computer Terms

1. Alt C - Alternate C. Press key marked Alt and press C if you get stuck in the GETS program. Pressing Alt-C causes program execution to halt and the following prompt to appear:

QUIT? (Q/A/I)

"Q" (Quit) and "A" (Abort) returns control immediately to the disk operating system (DOS). "I" (Ignore) returns you to the program.

2. BOMB - When a computer program fails to function in the correct manner. If this occurs, press simultaneously the control (CNTL) and C key. This will return you to the DOS. If this does not work, insert the DOS disk in the A drive, reboot, and restart the GETS program.
3. BOOT - To activate DOS (disk operating system). To boot a computer insert the DOS disk, press simultaneously the control (CNTL), alternative (Alt), and delete (Del) keys. An A> will appear.
4. CONFIG.SYS - A computer program which modifies the original DOS so that the GETS program will operate. See page 5.
5. COPY - 1. To copy the GETS program onto a blank disk. The instructions for doing this are as follows: After booting the computer, an A> will appear. Type DISKCOPY A: B: and press return. Insert the GETS disk into the A drive and a formatted blank disk into the B drive.

   For example, A>DISKCOPY A: B:

   This will copy the entire contents of the GETS disk onto the blank disk.

   2. To copy the config.sys file onto your DOS disk, insert the DOS disk in the A drive and the GETS disk in the B drive. After booting the computer, an A> will appear. Type copy B:config.sys and press return. The config.sys file is now copied onto your DOS disk. If you use the same DOS disk with the GETS disk, you will not need to copy config.sys again.
6. DOS - Disk Operating System. Software that controls the operation of a data processing system.

7. ID - A four character (letters or numbers) word that identifies the user and enables him to enter the GETS if used in conjunction with the correct password.
8. PASSWORD - A six character (letters or numbers) word which enables the user to enter the GETS program if used in conjunction with the correct ID. This password must contain six characters.
9. PROMPT - A question, statement, or words that urges the user to make a choice or press a key.

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