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# Electronic Information Systems and Commodity Marketing: Five Case Studies

by

Deborah H. Streeter

Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York 14853

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# Electronic Information Systems and Commodity Marketing:

## Five Case Studies

*Deborah H. Streeter**

Although price uncertainty has long been a fact of life for farmers, recently two factors have heightened concerns about price risk. Souring of public sentiment toward farm programs has left farmers with the prospect of less federal price support in the future. In addition, experiences such as the Soviet grain embargo have made farmers more aware of the international dimensions of the markets in which they operate.

Given the many uncontrollable influences on commodity prices, risk management strategies have become very important. Some producers have replaced risky cash marketing practices with forward pricing strategies such as forward contracting or hedging with futures and/or options. In turn, the emphasis on forward pricing has increased the importance of receiving price, outlook, and advisory information on a timely basis.

Traditionally, farm operators have relied on a wide variety of supporting information sources, including newspapers, radios, newsletters, advisory services, charting services, extension agents and brokers. However, in the increasingly face-paced world of commodity marketing, these traditional sources of information have fallen short both in terms of timeliness and in scope. Thus, when electronically delivered information became available it was an appealing source in several respects. First, it enabled farmers to receive cash and futures price information on a real-time basis, even in remote locations. Secondly, many of the electronic services provided instant access to national and international events affecting commodity markets. Thus, the technology greatly widened the scope of information available, enabling the producer to transcend the more narrow focus of local markets. However, despite the benefits offered by electronic information systems, use by farm marketers has been very limited and the high cost and sophistication of such systems have raised doubts about the costs and benefits.

The purpose of this study is to examine the impact of electronic information systems on farmers' decision-making, or more specifically, to identify factors influencing the effectiveness of such systems in supporting commodity marketing decisions. The results of in-depth interviews with four farmers and one grain processor currently receiving electronically delivered systems are used to highlight the following key issues: 1) the role of human capital, 2) the perceived costs and benefits of the system, 3) the barriers to effective use, 4) the reciprocal effects of electronic information on decision making, and 5) the relationship of the electronic system to a broader system for handling of information by the firm.

The first issue (to be called the human capital issue) addresses the effects of education and training on the effectiveness of electronic information systems. Economic theory leads us to believe that investments in human capital enhance the value of using a complex input such as an electronic information system. As an illustration, studies on

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*Assistant Professor in the Department of Agricultural Economics at Cornell University. The author would like to thank Harry Kaiser, William Lazarus, and Donald Liu for comments and suggestions on an earlier draft of this report. The author also wishes to acknowledge Mary Jo DuBrava for her assistance in preparing this report. Funding for this project came from Hatch Grant 121 - 408.

corporate management information systems[2] have shown that user experience is very important in successful use (Fuest, Alter). However, empirical studies of farmers using electronic technology (Elliot, Ettema) have not shown human capital to be a powerful in explaining successful adoption. The case studies are used to seek an explanation of this paradox.

The second issue (to be called the cost/benefit issue) concerns the perceived costs and benefits of using an electronic system to support commodity marketing decisions. Included under this heading is a discussion of the substitution of other sources of information by the electronic information system. Not much empirical evidence is available on competition among sources of market information, but previous studies have identified timeliness as one of the most desirable characteristics of electronic information (Fuerst, Elliot). The case studies offer an opportunity to further illuminate which characteristics can enhance the competitive position of electronic information. In investigating the cost/benefit issue, the identification of user goals also emerges as an important subject.

A very closely related third issue (to be called the barrier issue) is the existence of barriers to effective use of electronic information. Numerous other studies have focused on this issue. Field experiments with farmers using videotext (Ettema) and studies of the classroom applications of on-line information (Peters and Pershing) have shown that cost and complexity poser major barriers to use of computer technology. In the corporate setting, Alter identifies risk factors which can interfere with the successful implementation of a management information system (MIS), including 1) non-existent or unwilling users, 2) inability to specify a purpose or usage pattern in advance, 3) lack or loss of support, 4) lack of experience with similar systems, and 5) technical or cost effectiveness problems. The case studies present examples of these and other barriers.

The fourth issue (to be referred to as the feedback issue) concerns the relationship between the user and the system, a topic which has emerged in the literature on corporate MISs. Mohrman and Lawler characterize the effects of information technology as evolutionary, developmental and reciprocal. The hypothesis is that use of an electronic system can have reciprocal, or feedback, effects on the user. Orman suggests that feedback effects take the form of changes in the information needs of the user. Another possibility is that use of the system may actually change the structure of decision making in a business.

The final issue (to be called the MIS issue) involves the study of the electronic information system as a component of a larger system for handling information in the business.[3] King suggests that the integration of an electronic information system for commodity marketing with a larger farm information system is desirable and more efficient. The case studies offer examples of where such integration has been at least partially achieved, and also illustrate the importance of complementary products, which are components of the larger system.

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2. For the purposes of this paper the following definition of MIS, developed by Davis and Olsen, is used: "an integrated, user-machine system for providing information to support operations, management, analysis and decision-making functions in an organization."

3. In other research, the larger system may be given any of many names, such as farm information system, business information system, or management information system.

To summarize, the current study makes a contribution by using case studies to illustrate and expand upon the five issues described above, which are also themes found elsewhere in the literature. In addition, they provide direction for future research on electronic information and commodity marketing. The results are of interest to several groups. Farmers and educators can gain insight on how training plays a role in successful adoption of technology. Economists and statisticians in the public sector who disseminate their findings through electronic networks may also benefit from a better understanding of how farmers use electronic commodity information. Finally, private sector vendors can incorporate the issues raised in the case studies in planning for system design modifications and in rethinking pricing structures.

## Methodology

All subjects in the case studies selected for this research use one of two electronic information systems, either the AgriData Network (ADN) or the Farm Bureau system (ACRES). The systems allow farmers to use a microcomputer with modem hook-up to access information such as cash and futures prices, weather, commodity news, government reports, and advice on market strategies. Other services, such as electronic mail, or classified ads are also provided by the systems.

Selection was designed to include diverse cases. The farm operators surveyed range in age from about 35 to 65. Both crop and livestock operations were included, as well as one grain processor. Selected farms were located in Ohio, Illinois, and Indiana and ranged in size from 200 to 1500 acres. The farm operators owned as well as rented farmland.

On-site interviews were conducted in which the farmers were asked questions about their farm business, marketing style, sources of information, uses of electronic information, pre- and post-adoption marketing practices and perceptions of the costs and benefits of using information systems. Fictitious names are substituted to protect the anonymity of the respondents.

### Case 1

**Name:** Robert Rein
**Age:** 37
**Education:** college
**Years of Farm Experience:** 14
**Acres Farmed:** 1000
**Crops:** corn, soybeans, wheat
**Length of ACRES subscription:** 2 years
**Key Issues:** human capital issue
MIS issue
cost/benefit issue

Robert Rein's use of electronic information in commodity marketing is a success story. His case provides an opportunity to explore the characteristics of an accomplished user of information technology. Three key issues are the role of human capital, the use of his electronic system in the context of a larger MIS (including the effects of complementary products), and cost/benefit issues such as substitution effects among information sources.

Every morning, Robert Rein access an electronic information source called ACRES. The fact that the information is centralized and organized in a way that makes it

easy to transfer to his microcomputer is very important to Robert. Once on-line with ACRES, Rein retrieves futures prices from the previous day and saves them in a special file on his computer. After looking at other relevant information, such as cash prices and government reports, he logs off the electronic system, and transfers the price information into another piece of software, called Chartmaster, which produces commodity charts for trading purposes. Based on the signals he sees on the updated chart, Ronald decides whether or not to call his broker and place a hedge. Using futures markets and participating in government programs, he claims he can now sell his crop "in the top third of the range instead of the bottom third."

A graduate of Ohio State University, 37-year-old Rein has been farming on his own since 1973. First in his county to try no-till practices, and a participant in the futures markets for some years, he thinks of himself as an innovator. "Life is a series of challenges-you have got to figure out what tools you are going to use to meet them." The characterization is reinforced by the way he uses his computer to support marketing decisions. Rein is an example of a user with a substantial endowment in human capital, not just in terms of education, but also in terms of his knowledge of commodity trading and computers. He views his training in all three areas as a major factor in his success. "College taught me the importance of keeping good records," he observes. His experience trading commodities enables him to carefully articulate his information needs. Furthermore, Rein has been using computers for a few years, and he comments that by now he "feels very comfortable with the technology, even though there is always so much more to learn."

The Rein case is also useful in exploring the MIS issue. The electronic information system used by Rein is just one component of a larger system for handling information on his farm. Record keeping and other parts of his farm operation are highly computerized. He also uses the computer to figure breakeven costs, to evaluate the government programs and to analyze land rents. In King's comments on farming information systems, he emphasizes the importance of having a system for managing information both from within the firm and from without and the ability to integrate the two sources. Rein already has many of the necessary components of a management information system, although he says there is a lack of the integration among them. One improvement he suggests for future development is an electronic information system that would provide a link between accounting and marketing functions.

Rein's case provides an example of how other components of the MIS can provide important complementary products which enhance the effectiveness of electronically delivered information. The charting software he uses transforms the information obtained via ACRES into a more powerful input in decision making. By analyzing price movement on a chart instead of as raw data, Rein is able to combine the most timely information with historical patterns. Combining the on-line access of ACRES with the diagnostic powers of the charting software leads to better decision making. Another example is his use of spreadsheets to analyze government programs. If ACRES alerts him to a sudden change in government program parameters (a familiar occurrence), he can easily and quickly make use of that information by analyzing it with his spreadsheet program. The ability to analyze quickly makes it worthwhile to have a timely source of information on government policy. Thus, the Rein case highlights the existence and importance of complementary information products, a topic which has received little attention in previous research but bears further investigation.

A third and related issue raised by the case study falls in the cost/benefit area. Rein's case illustrates how electronic information systems can supplant other sources of information. He pays a subscription cost of $585 a year for the use of his system, with no

extra access or report charges. As a direct result of his use of the electronic information system, Rein cancelled his subscriptions to the Wall Street Journal and to a chart service that used to cost him about $300. Aside from these cost savings, Rein cites time savings as a major benefit of using the system. Before subscribing to ACRES, he attempted to keep charts himself, but would frequently fall behind and become frustrated. Now he spends about 30 minutes a day making his commodity decisions. Rein sees the combined savings in time and subscription fees as more than adequate justification for the fees associated with using electronic information.

As mentioned earlier, Rein highly values the capability of receiving instantaneous price quotes, and he uses them in conjunction with another piece of software. Thus the Rein case illustrates how electronic sources may have a comparative advantage over other sources of information in any of three respects: price (i.e., cheaper when time and cost savings are considered), quality (i.e.,timeliness or content) or format (i.e., easily integrated with other parts of the MIS).

## Case 2

**Name:** David and Marjory Schmidt
**Age:** 60
**Education:** high school
**Years of Farm Experience:** 50
**Acres Farmed:** 700 acres
**Crops:** corn, soybeans, wheat, cattle, hogs
**Length of ADN subscription:** 3 years
**Key Issues:** cost/benefit issue
barrier issue
feedback issue

David and Marjory do not have a lot of spare time in their lives. Ten grandchildren, horticulture judging, community service, church activities, farming 700 acres and raising cattle and hogs keep them constantly busy. "At my age," comments David, "you just have to start making choices about how to spend your time." He and his wife identify time as the biggest stumbling block to becoming better marketers. In fact the primary motivation they had for becoming subscribers to ADN was to make more efficient use of their time.

Now that the Schmidts have used ADN for a few years, they are skeptical about whether or not it actually saves time. However, they do feel the computer-based information system has led to better use of their time spent on marketing. That is, although they now spend more time on marketing activities, they feel the advice and information they receive is worth the investment in time. The efficiency of the system is reflected in the fact that they now sell at higher prices, which "has more than paid for the system."

The Schmidt's evaluation of the efficiency benefits of using ADN is linked to their view of the pricing structure of the system. The costs associated with ADN include a base subscription fee, charges for the length of time a user is connected, and report charges which reflect which information is accessed.

On the one hand, the Schmidt's are attracted by the fact that the cost of ADN varies depending on the amount of usage. On the other hand, they feel the flexible pricing structure also discourages them from monitoring markets on a regular basis. The benefit is that the system allows them to adapt their access cost to the volatility of the

market. For example, during the last pig crop report, the Schmidts accessed the system a few times a day, in order to decide if the new report changed market conditions enough to warrant taking an options position. However, when the markets became more stable, their information needs were reduced, which in turn lowered their costs. On the negative side, the Schmidt's feel that even though it would be be a better marketing practice to use ADN on a more regular basis to monitor the market, the flexible pricing scheme discourages regular access. If more extensive research shows that other users share the Schmidt's evaluation of tradeoffs, vendors of electronic information might wish to explore alternative pricing structures, which maintain some flexibility but include smaller access fees.

In addition to expectations of efficiency gains, the Schmidts also subscribed to ADN in order to get more up-to-date price information. The importance given to timeliness is consistent with Elliot's results, in which farmers listed frequency of updated information as the most important characteristics of electronic information systems.

In regard to the barrier issue, the Schmidt case reinforces the findings of others (King, Ettema, Peters and Pershing, Elliot) that complexity is a major barrier to more extensive use of electronic information technology. Even though the Schmidts have been using ADN for 2 years, they are still not comfortable with certain technical aspects of the system, such as switching between databases, keyword searching, and electronic mail. The variable pricing structure reinforces the problems caused by complexity, since users like the Schmidts are reluctant to experiment with the more advanced features of ADN, due to the costs associated with access time.

The Schmidt case can also be used to illustrate feedback effects, a concept discussed in Mohrman and Lawler and Orman. For the Schmidts, the feedback affects have been of two types: changes in information needs, and changes in decision structure. Prior to adopting ADN, the Schmidt's marketed their corn and beans by combining feeding, cash sales, and storage under government loans. They did not forward price any of their crop. However, after attending a marketing seminar sponsored by ADN, David decided to experiment with using options contracts as a forward pricing tool for both grains and livestock. He and his wife now consult ADN not only for up to date price information and options quotes, but also for marketing advice and strategy. In other words, adoption of electronically delivered information marked a major turning point in their marketing style. The transition is an example of the reciprocal, or "feedback" effect that information technology can have on decision making.

Schmidt case confirms Orman's hypothesis that over time information systems can change the information needs of the user. For example, now that the Schmidts use options (indirectly a result of adopting ADN), they need options price quotes, information and strategy. The reciprocity between system and user emphasizes the importance of continued exploration by the user of the database. Pricing structure will effect the willingness of the user to explore, along with system design considerations such as easy searching facilities, educational content in reports, highlighting of new information.

In addition to changing the Schmidt's information needs, ADN has also had an impact on the structure of decision-making. Use of the system resulted in the inclusion of Marjory into the marketing decision-making for the first time and also led to specialization by each partner. Previously, Marjory had not had much interest in marketing decisions. "I never have understood futures," she explains. On the other hand, David refused to work on the computer, which Marjory purchased three years ago to computerize accounting for what was then a seven-enterprise operation. "I prefer my

pencil and pad," comments David. So the household ended up with two experts: one in marketing and one in computers.

As a result, Marjory became the information retriever for David, logging onto ADN whenever David was thinking about doing some selling. Even though David makes the final decision, Marjory is now more aware of the markets and has more input in the decision. Furthermore, the influence of their broker has been moderated by the fact that they have an independent source of information about commodity prices, news, and advice. Just as Mohrman and Lawler found that corporate information systems can have reciprocal or development effects on corporate users, the Schmidt case illustrates how in a farm business setting electronic systems can actually cause structural change in decision making by altering the mix and influence of decision makers and by adding an additional strategy (use of options) to the Schmidt's marketing portfolio.

Feedback effects in the structure of decision making can have both positive and negative impacts. For example, Marjory's entry into the marketing decision-making adds to the available human capital resource that can be used to make a decision. However, the segregation between tasks, with Marjory on the computer and David most knowledgeable about markets, can also cause problems. Because Marjory does not share David's "passion for the markets" she is not very adventurous in accessing information on ADN. In turn, because of David's reluctance to deal with computers, he has to rely on the availability of his wife's time to get the information he needs.

## Case 3

**Name**: Cathy Willard
**Age**: 41
**Education**: college
**Years of Farm Experience**: 22
**Acres Farmed**: 1000
**Crops**: corn, soybeans, wheat
**Length of ACRES subscription**: 2 years
**Key Issues**: barriers issue
human capital issue
MIS issue
feedback issue

"I know I don't use it as I should." This is Cathy Willard's first comment about her use of the electronic information system, ADN. Instead of accessing the system on a daily basis, which she says would be ideal, she uses the system primarily when a bill arrives, precipitating the need to sell some crop. Willard's case provides an opportunity to identify problems which can prevent a user from achieving benefits from an electronic information system.

Cathy and her husband have been farming together for about 22 years, but she has been the one to use the computer to obtain information on commodities. It started about two years ago, when her daughter was born and Willard quit her off-farm job. Seeking a way to expand her involvement in running the farm, she went to a computer and marketing seminar and ended up buying a computer and a subscription to AgriData Network. She has continued to attend seminars on commodity marketing,and has also made use of the on-line lessons on hedging with options that are available electronically through ADN. Nonetheless, Willard still considers herself a beginner both in marketing and in computer technology. Working with her broker, Willard has occasionally placed a hedge using futures and options, but the bulk of her selling is done in the cash markets.

The question arises: why hasn't Willard been able to achieve more success in using ADN? The answer ties in four issues: barriers to use, the role of human capital, the use of ADN in the context of a larger MIS, and the feedback effects (or lack thereof).

Cathy identifies the major barrier to more efficient use of ADN as the absence of a marketing plan for her farm. In turn, it appears that the failure to construct a strategic plan for marketing stems from certain shortcomings in human capital. Although Cathy has two years of business college training, she does not feel comfortable about her level of expertise in the area of commodity marketing. Her husband does not follow commodity markets closely and has little interest in hedging. Unlike the Schmidt case, in which the combined human capital endowment of the husband and wife included both commodity and computer skills, Willard cannot resort to other family members for help in the area of commodity markets. This may change, she comments, when her son, Tom, completes college and joins their farm full time. Because of Tom's interest in markets, Willard hopes they will be able to analyze the markets in a different way and to "make a marketing plan and stick to it." With Tom's arrival the farm business will have human capital in all three areas: general education, commodity training, and computer expertise.

If there were not a son waiting in the wings, there would still be some alternatives for Willard to cope with the shortcomings in human capital that contribute to problems in her use of ADN. Over time, the commodity seminars she regularly attends and the experience she would gain in the commodity markets would contribute to her store of human capital. The Willard case emphasizes the importance of having access to resources that build up human capital.

Another problem observed in the Willard case is the lack of integration among different types of information in the farm business. Unlike King's ideal of an integrated farm management information system, in the Willard's case, each function (production, accounting, marketing) operates in isolation. Perhaps if ADN were more closely linked to other aspects of the farm business, Willard would achieve more success in using the system. For example, if she could calculate the cost of production for each crop, that might make monitoring of the markets electronically more worthwhile, since it would provide a benchmark for pricing.

As a final point, it is interesting to note the lack of feedback effects in the Willard case. Marketing is done in much the same fashion as before ADN was adopted. There have been no significant changes in the decision structure or in information needs. Ironically, the lack of reciprocity is reinforced by the sporadic use of the system by Willard, suggesting that there might be some initial threshold of use beyond which feedback effects begin to occur. In addition, there is a constraint imposed by human capital: Willard did not change marketing styles because she did not have the training in commodity trading. One goal of further research might be to illuminate the interaction between feedback effects and system usage rates and/or human capital.

## Case 4

**Name:** Harry Wills
**Age:** late 60s
**Education:** college
**Years of Business Experience:** 50
**Crops bought:** wheat
**Length of ADN subscription:** 5 years
**Key Issues:** MIS issue
human capital issue

Harry Wills, president of a grain processing company which manufactures an industrial adhesive extender, has more than a passing interest in the price of wheat. Each year he needs half million bushels of soft winter wheat to manufacture his product. One way Wills has found to reduce the cost of his major input, soft winter wheat, is to hedge his purchases on the Chicago futures market.

It is clear that although Wills is not a farmer hedger, he is a small businessman who is vitally interested in the commodity markets and thus has much in common with the other cases. His case is included for for two specific reasons. First, it is an example of a comprehensive approach to electronic information, along the lines that King prescribes. Secondly, it shows how human capital, in terms of education, computer experience, and knowledge of commodity markets, can enhance the use of electronic information systems.

At one time, one of Wills' brothers watched a price quote screen all day long and was the primary family member involved in trading futures. When his brother died, Harry took responsibility for hedging wheat purchases. However, did not want to continue paying $400 a month for the price screen service, since he had no intention of watching a screen all day, given his many other company responsibilities. Nonetheless, Wills did need accurate, up-to-date price information and that is what motivated him to subscribe to ADN five years ago. Since his employees had already been using computers for some time, Wills felt that adopting the electronic system would be easy.

In fact, Wills' employees have grown quite accustomed to handling information electronically, and ADN simply become another component in what could be called a management information system. Another component is electronic mail, which replaced the company's telex service in 1983. The computer is used routinely to transmit information between offices and to clients using the computer. Future plans include communicating via the computer with the sales people on the road about assignments and travel schedules. The company chemist routinely uses the computer to search remote databases for technical and scientific information.

The activities described above, as well as Wills' use of ADN, reflect the philosophy held by Will that information can be a strategic resource and that timeliness is essential. On a daily basis, he accesses ADN futures and case price quotes and commodity news information. When interacting with a client by phone, he can get an updated printout of the market within minutes. Actual hedging decisions are made jointly with his business partners, but Harry's in the decision has been enhanced by his immediate access to timely information.

King suggests that management information systems should evolve toward a comprehensive and integrated approach. Wills' use of ADN and other MIS components appears to be a first step in the right direction. Information from without and within the

firm is collected, organized and used to support decision making by the managers. The next step would be to more fully integrate the components. For example, provide for data to be shared directly among the functional areas of management, marketing, and purchasing.

Another issue raised by the Wills case is the importance of human capital in the successful adoption of electronic information systems. Aside from general education, human capital of two other types has had an impact on the use of ADN by the Wills firm. The first is knowledge of the commodity markets, which is provided by Wills himself. The second is computer expertise, provided by several members of his staff, including one employee who has graduate training in the area of data processing. In addition, the secretary in charge of accessing the system has always been encouraged to attend classes at a nearby university in a variety of topics relating to computers.

The endowment of human capital observed in this case has had a direct impact on the success of using ADN. For example, as a result of the computer expertise of the staff, the actual operation of ADN is carried out with great efficiency, using automatic log-on sequences and preprogrammed access routines. At the same time, Wills' knowledge of the markets helps him to focus carefully on what information is important to access and how it it can be used.

Case 5

**Name:** Michael Kenner
**Age:** 59
**Education:** high school
**Years of Farm Experience:** 43
**Acres Farmed:** 200
**Crops:** corn, soybeans, wheat
**Length of ADN subscription:** 2 years
**Key Issues:** barriers issue

Michael Kenner has not had success using electronic information. His portrait can provide insight into the stumbling blocks encountered by producers in using systems like ADN. Some difficulties emanate from the user himself and but others have their origin in system characteristics. The internal problems have to do with Michael's failure to articulate his information needs and his unwillingness to accept the demands of learning a new technology (i.e., developing his human capital). System related problems include the fact that the characteristics considered most important by Kenner are not strong points of electronic information systems, the pricing structure discourages exploration, technical difficulties cause frustration, and support materials are not adequate.

Kenner's problems can be seen as specific examples of the more generally stated barriers to information technology identified by previous research (Alter, Fuerst). Thus, the case study can be used not only to identify specific difficulties encountered by Kenner but also to show the applicability of principles developed in MIS research to farm business situations.

Michael Kenner originally became interested in ADN because he had an interest in using the commodities market to enhance his crop prices and income. In particular, he would like to earn a return of $1000 a month as a result of buying and selling commodity futures. Since his crop sales are modest (he farms only about 200 acres now that he is older), the implication is that he wishes not only to hedge but also to speculate.

At first glance, Michael Kenner appears to have several key characteristics that would lead to a successful use of ADN. He attends marketing seminars put on by local organizations, reads several commodity newsletters, and has even been studying a book on options trading. In addition, Kenner can be considered a risk taker. Over the past three decades, he has farmed, done custom work, dabbled in real estate, run a modest agricultural chemicals business and had interest in some orange groves in Florida. However, despite his prior experiences, Kenner feels a sense of helplessness when dealing with commodity trading, which he attributes principally to a lack of information. In addition to market manipulation, which he is sure exists, there is a definite "information edge" held by the traders in Chicago, which he is determined to eliminate.

Although Kenner's trading goals appear explicit, his information needs are vague. He claims he would trade more and would be more successful if he just had the appropriate information. "I've got the guts," he hastens to explain, "but I just don't have the knowledge I need." Thus it is not the risks involved in commodities that are holding him back, but rather the feeling that he is not as well informed as other players in the market.

Kenner's comments are surprising, since for two years he has subscribed to, an electronic marketing service (ADN) that provides price, news, and weather. Even so, Kenner feels that no matter how fast he can get the information, "it is always old by the time I get it." Kenner claims that "out of every week, there is about a half hour when it is worth it to be in the market." He is seeking an information source which will assist him in identifying the key period and provide the relevant information. He does not feel his use of ADN has been successful in this regard.

Dissatisfied and disillusioned with what he thought would be the answer to his information needs, he is now considering replacing ADN with a satellite system that would cost 2 or 3 times the annual $1000 he has been spending on ADN, all in the name of timeliness. "I need more useful information more quickly." Up to this point, he comments, there have been few benefits from his ADN subscription.

Kenner's comments provide the first clue about the lack of success he has experienced with ADN. He simply does not know what information he wants. He readily identifies timeliness as the key characteristic, but cannot articulate the content he is seeking. Given this vague desire for "just the right information," it is not surprising that ADN has not been the panacea he expected for his information needs. In fact, one wonders if Kenner will have any better luck with the more expensive alternatives he is proposing. This information identification problem serves as a reminder of one of Alter's so-called "risk factors" which endanger the adoption of an MIS: the inability to identify the purpose of the system ahead of time. In Kenner's case, it is not so much the purpose that is in question as what specific information will serve the purpose.

Another hurdle facing Kenner is the fact that he is uncomfortable with computer technology and he is unwilling to further develop his endowment of human capital by becoming more well versed in computers. Although Kenner calls himself an "innovator", he is not a fan of computers. His farm records and the accounting for his small agrichemical business are kept manually. Instead of using a microcomputer to receive ADN on line, he purchased a small dumb terminal and printer. Again, this reluctance to build on his store of human capital finds a parallel in two of Alter's risk factors: "unwilling user" and "lack of experience with similar systems."

In addition to the internal barriers to successful adoption of electronic technology, there are system design considerations which also block Kenner from effective use of

ADN. Specifically, electronic delivery systems like ADN lack some of the characteristics that are most important to Kenner. Of course, in terms of timeliness, ADN is very competitive. However, Kenner also places substantial emphasis on the characteristic of credibility, which he strongly links to human beings.

For example, when asked his major sources of commodity information other than ADN, he replies that he calls friends out west for a weather update and talks to his broker, who is the major influence over whether or not he places a position. It is difficult for an electronic system to convey the same personal touch. "I'm not sure whether to believe in what I read on the screen. I can't ask questions and hear answers." Sometimes use of jargon in the reports further alienates him by accentuating his feelings of inadequacy. In the oil industry, Fuerst found accuracy and relevancy of output to be key factors for acceptance of an information system. In Kenner's case, the point can be expanded by placing an emphasis on the users' perception of accuracy and relevancy as important characteristics.

There are additional elements of system design that reinforce the barriers created by Kenner's characteristics as a user. The premium placed by the vendor on on-line charges discourages exploration of the various databases within the system. Technical problems (another one of Alter's risk factors), such as missing reports or poor updating procedures, have added to the difficulties and subtracted from the feelings of trust and confidence that are so important to Kenner. Support materials, such as indices, characterized by Kenner as unwieldy, contain jargon that accentuates his feelings of alienation.

To summarize, the case illustrates the importance of articulating information needs in response to user goals. In addition, users must be willing to remedying whatever deficiencies they may have in the area of human capital. The case provides specific examples of general principles developed by Alter and Fuest. Finally, the Kenner case illuminates how aspects of system design can reinforce difficulties created by user characteristics.

## Conclusions

The purpose of the case studies was to explore the success (or lack of success) of producers using electronic information to support their commodity marketing decisions. The findings were that the most successful users had articulated information needs, had an adequate store of human capital, used electronic information to either save time or become more efficient with time, and had at least an informal overall management information system in their business. Thus, successful users found that use of an electronic information system improved decision-making.

In addition to the generalized findings described above, the findings of the case studies and previous research can be synthesized to explore the five key issues outlined in the introduction. Furthermore, the analysis yields prescriptive suggestions for vendors, users, and educators, as well as recommending directions for future research.

The human capital issue proved to be very important in all of the case studies. This finding is contrary to the results of previous studies, in which human capital proved to have little explanatory value in the successful use of electronic technology (Warner and Clearfield, Elliot). The case study results suggest that the measurement of human capital (level of general education) used in other studies may have been too narrow, and should be broadened to include knowledge of computers and commodity marketing. If future empirical findings using a broader definition of human capital confirm the

evidence presented by the case studies, it will imply that users and vendors should seek to remedy incomplete endowments of human capital. Users may either seek complementary human capital in another family member (like the Schmidts) or employee (like Wills), or choose to pursue educational opportunities to build up their own store of human capital (like Willard). Vendors and educators who wish to encourage use of electronic information in commodity marketing should encourage programs and products (such as seminars, on-line lessons, support materials) which enhance the knowledge of the user about both computers and commodity marketing.

In regard to the cost/benefit issue, the major advantage of electronic information identified by users in the case studies was the timeliness, which confirms the findings of previous studies . Aside from timeliness, efficiency was also labeled as an important characteristic of system use. Further studies on this topic should seek a more detailed analysis of the efficiency effects, since the findings of the case studies were limited to the statement by users that higher output prices resulted, without exploring the costs and benefits at the margin. Another observed comparative advantage of the electronic information system over other sources of commodity information was format, as it relates to the integration of information into other aspects of the farm business. An additional finding of the case study was that the pricing structure of the system can affect whether potential benefits reach the user. In other words, few users took advantage of the broad scope of the system, since exploration was discouraged by the high access prices charged. Vendors would greatly benefit from more research in the area of pricing structure and its effect on usage.

A related issue, the barrier issue, also emerged in the case studies. It was found that barriers can be both user generated or system generated. If users do not articulate their information needs and are unwilling to add to their store of human capital (Kenner case), it can keep them from becoming successful users. Alternately, when users seek to remedy shortcomings in human capital (Willard) and are able to define their information needs (Rein) there is a greater chance at successful use. On the system side, the pricing structure, technical difficulties or poor quality support materials can deter efficient use of the system. Alter's risk factors encompass both sides of the user-system interface and may be useful in examining this issue with a large sample.

The case studies presented some very interesting evidence on the feedback issue. Reciprocal effects took two forms: changes in decision structures and changes in decision needs. In this respect, direction is given to future research, which should consider both dimensions of the feedback issue. Furthermore, it was interesting to see that an insufficient endowment of human capital (Willard, Kenner) blocked feedback effects from occurring. The implications are that users should be open to the possible reciprocal effects that can occur when using electronic information, and vendors should structure their systems to encourage experimentation (through pricing structure and system design).

The case studies also resulted in findings on the MIS issue. Where a broader system existed for handling inter- and extra-firm information, the benefits of the electronic information system were enhanced. The MIS setting helped in two ways: by providing complementary products (Rein), and by making it worthwhile to receive information on a very timely basis (Wills). For the user, the lesson is that the impact of electronic information may be heightened if it can be integrated into other parts of the farm business. For the vendor, the implication is that it is important for electronic information to be produced in a format which encourages integration. For researchers and extension concerns, the case studies point to the importance of providing an integrated framework for the use and development of electronic information to occur.

The value of the case study approach to achieve the goals set out by this study lies in the ability to scrutinize in detail actual practices of producers in order to better understand the issues that deserve further research. Cases studies provide an opportunity to seek explanations for seeming paradoxes produced by earlier research (such as the lack of explanatory value with regard to human capital) and to identify important new areas of research (such as feedback effects). Especially valuable is the opportunity to observe interaction among the various issues (e.g., human capital and barriers). The cases also provide an environment to test out approaches used in corporate MIS of research. The findings suggest that borrowings of this nature could prove very fruitful. Finally, although the findings of the case studies cannot be generalized, they still can suggest possible strategies for users and vendors and provide direction for future research.

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