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Innovator characteristics in the adoption of an interactive,
computer-based, videotex, communications network by farmers:

The case of the Iowa Cooperative Extension Service's
EXNET computer network

by

Reid Karl Hamre

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
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Signatures have been redacted for privacy

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1987

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INTRODUCTION

Adoption Diffusion Research at
Iowa State University

Adoption/diffusion research has a long and well-known history at Iowa State University. ISU and its Cooperative Extension Service are famous in the literature of adoption/diffusion research for the 1943 hybrid corn adoption study by rural sociology professor Byrce Ryan and graduate student Neal Gross (Ryan and Gross 1943) and (Ryan and Gross 1950).

The story of the famous study begins with city-raised Gross being assigned by Ryan to interview farmers about their adoption of hybrid seed corn. Gross learned from ISU colleagues that Iowa farmers were up at 6 a.m. to do chores. So on his first day of interviewing Gross was at the first farm at daybreak. He reportedly completed 21 interviews that first day and averaged 14 per day during the course of the study. That's compared to today's expected average of four field interviews per day.

The goal of this thesis is to find and use applicable adoption/diffusion generalizations (many of which are directly descended from Ryan and Gross's famous study) to investigate the status of one of today's Extension Service innovations, the EXNET computer network.

The Iowa State University Committee on the Use of Human Subjects in Research reviewed this project and concluded that the rights and

welfare of the human subjects were adequately protected, that risks were outweighed by the potential benefits and expected value of the knowledge sought, that confidentiality of data was assured and that informed consent was obtained by appropriate procedures.

DESCRIPTION OF ISSUES AND PROBLEMS

Why is Another Study of a
Farm Innovation Valuable?

As will be demonstrated in the literature review portion of this thesis many, many studies of farm innovation adoptions already exist. There is much support in these studies for useful generalizations about the characteristics of adopters of innovations and about adopters' perceptions of innovations.

One reason to study farm innovators again is to check for change over time. The literature of adoption/diffusion that will be used in this thesis now extends for decades. Over these decades many changes have occurred in agriculture. One valuable result of any new study is to check for changes in the value of old generalizations that may be the result of new economic forces in agriculture, changes in the farm population, and general social changes having effects on farmers.

A reason more unique to this thesis and perhaps a more important addition to the literature of adoption/diffusion research is the opportunity to study an innovation earlier in the diffusion process. Many of the studies of other farm innovations begin late in the diffusion process, or actually after the diffusion is complete. Yet often one finds suggestions in the literature that studies be done at all stages of the adoption/diffusion process. Here is an opportunity to prepare an accurate portrait of a farm population that is known without doubt to be the first to adopt the innovation in question.

The most important reason for this study is this: few if any studies of farm information technology innovations exist; here is an opportunity to do a study that may reveal valuable insights into how these individuals -- business people -- farmers evaluate, then choose or reject a new method of receiving and manipulating an innovation. Information innovations ought to have unique interest to students of innovation and diffusion. After all, as we will see in the conceptual framework of this thesis, sources of information and how potential adopters use sources have powerful effects on the success or failure of all other innovations.

An important purpose of this thesis is to reveal any exceptional conditions that may exist in the case of an information technology innovation and comment on these exceptions in the conclusion to this thesis.

What Is EXNET and Who Is Using It?

EXNET is a computer communications network operated by the Iowa Cooperative Extension Service at Iowa State University. ISU created EXNET by combining telephone equipment, telephone services, a mini-computer (a Digital Equipment Corporation VAX 11/730), and computer software. EXNET was first made available to the public in May 1984 (DeWitt 1984).

Computer networks like EXNET allow individuals, businesses, and others with personal computers (microcomputers) to connect to the greater information storage and processing capacity of the network's

minicomputer. Other potential uses of EXNET and many similar networks include transferring computer programs electronically; sending field-gathered-data for central processing; allowing individual users to use the faster, more powerful minicomputer to process data; and electronic transfer of mail to and from any user's address.

Unlike some other states' Extension computer networks, EXNET is open to public subscribers. Since its beginning, EXNET's active public services are mainly of interest to farmers. These two facts combine to create the population this study is interested in examining.

The cost of a public EXNET account subscription is \$100 per year. Additional costs are the fixed costs of owning or leasing a personal computer equipped with communications hardware (a modem) and software and the cost of having telephone service. Costs that vary are long distance call charges (few of the public subscribers are in the local dialing area for Ames, Iowa) and the costs of maintaining the personal computer system.

At this time EXNET has 42 public accounts. These are all accounts other than Extension accounts, business accounts and media accounts. These 42 are mostly farmers, according to the brief information EXNET has gathered about its subscribers.

EXNET offers a menu or list of choices under the major headings of agriculture, business and community, ISU information, EXNET services, markets and weather, and newsletters.

Agriculture menu items include markets, ISU Extension economist

price outlook reports, and Integrated Pest Management reports. ISU information includes conference and seminar announcements, and lists of available publications. The list of EXNET services has messages to help find things in EXNET and "Answerback," a service that allows farmers to input information about insect outbreaks and receive a recommendation on costs and benefits of treating or not treating the outbreak with a pesticide. Markets covers both agricultural markets and financial markets that influence the agricultural market. Weather information is provided for Iowa, the United States and major agricultural regions in other parts of the world. Newsletters offered on EXNET cover crop production topics, Illinois and Missouri agriculture, agricultural policy, poultry, urban horticulture, turfgrass production, bees and honey, and alternative agricultural news (organic farming).

What Kind of Medium Is a Computer Network?

A computer network has some print media characteristics. It is edited and mediated, it is retrievable, it requires much symbolic manipulation, and it has a subscription cost like many print sources. But it has a much greater potential for timeliness and feedback than the typical print medium.

Feedback is what does the most to move a computer network like EXNET toward the personal communication end of the continuum. The information seeker can clarify his inquiry message and gain

reinforcement for his response at a rate that may even equal face to face communication if EXNET's phone utility is used.

EXNET provides diverse types of information, but some of the types offered are in the most specialized form offered to Iowa farmers -- Integrated Pest Management reports and online computing capabilities, for example.

Information source innovations such as EXNET are more likely to be adopted by rational orientation farmers to help them learn of other innovations and evaluate their risk.

EXNET with its new, unique ways of providing quick feedback on audience questions can improve the match of information supply and demand in two ways. One, it provides daily, hourly, minute by minute usage information. Two, the electronic mail feature lets farmers send requests for new or additional information directly to Extension specialists' EXNET mail boxes.

What Has the Cooperative Extension Service Done to Diffuse EXNET?

Using promotion is a common innovation/information delivery strategy. At the time of this study EXNET's diffusion is not being assisted in an organized way by Extension Service information delivery systems and change agents (Crom 1984). With the exception of some press releases when it was first introduced, EXNET has not received the same support as many other Extension innovations. These press releases did result in some coverage in the farm press. An article by Extension

communicator Joy Banyas (Banyas 1984) received a full page with a photo in Wallaces Farmer, a statewide farm magazine. EXNET also received some other farm press coverage such as a review by the farm computer columnist of the Iowa Farmer Today weekly newspaper (Fladland 1985).

The combination information brochure and subscription form used by Extension to help promote EXNET is included as an appendix to this thesis.

Diffusion can be slow. Perhaps by the time information about EXNET's existence has diffused to all farmers EXNET will be obsolete; EXNET could be replaced by direct satellite broadcasts of Extension information, Extension functions being sold to private industry, or some other innovation yet to come.

Will EXNET Ever Successfully Diffuse to Other Farmers?

The innovation of farmers subscribing to EXNET is dependent on the diffusion of the innovation of farmers using computers. Recently some delays or declines in the rate of change have occurred in the spread of the farm computer innovation.

The reasons for delays and declines are probably complex. Recent poor economic conditions have slowed purchases of machinery, real estate improvements, and even annual inputs like fertilizer and pesticides. In such a climate interest in spending money on new technologies like computers wanes.

The complexity of learning how to make farm computer use pay has become more apparent. Farmers can't justify the time and expense of

computer ownership with access to EXNET services; other benefits must be available.

There is a perception that computer programs that are easy to use and help farmers manage are not available. It is not clear at this time whether such programs actually aren't available, or if a lack of coordination among writers of programs, computer builders, and computer marketers garbles the message to farmers seeking information on the innovation.

Perhaps with time someone in the marketing of computers, in ag-business, or in communications will prepare a farm computer package that will diffuse successfully. But until computers have successfully diffused to most farmers, computer-dependent innovations like EXNET cannot have their opportunity to successfully diffuse.

If we look ahead and imagine a time when most farmers use a computer, then we can examine some other issues affecting EXNET's diffusion.

It is not clear how many farmers manage their farms in a way that makes the information supplied by EXNET useful. Farmers who manage production but who do little about marketing would find EXNET much less useful than a farmer who gathers and uses information needed to manage marketing. The future may favor the marketing manager over the production manager if commodity prices stay low. EXNET's success could depend a great deal on whether farmers' marketing skills must grow and how well EXNET continues to supply the necessary information.

Cost of EXNET is low compared to for-profit computer networks. But for-profits may be better equipped to offer the most up-to-date market information than are non-profits like EXNET. The additional income a farmer may be able to earn with accurate marketing could easily recoup the cost of a network subscription. To successfully diffuse to many farmers EXNET must be perceived as potentially recovering its cost. This perception of relative advantage could be found in some combination of marketing advice, decreased time and expense for receiving information from university research, and decreased time and expense for communicating with ag specialists and other farmers.

EXNET's successful diffusion would also require a commitment by Iowa State University to truly open the network to the public and promote at least as thoroughly as other Extension programs like swine husbandry publications, human nutrition advice, and 4-H. It is important to remember that Extension has at least a reasonably accurate idea of the audience needs in each of these examples. Extension can prepare promotional materials with some confidence they are describing benefits the audience is interested in. To successfully promote EXNET Iowa State University Extension must identify farm computer users' needs and be honestly committed to meeting the needs the university can fill in an accurate, up-to-date way.

Examples exist of promotion working with new information technologies. In England, teletext expanded greatly in the 1980s in

response to a government promotion campaign. This promotion campaign came after nearly a decade of teletext development and trial use (Schlesinger 1985).

Which Adoption/Diffusion Research
Perspective Should Be Applied to
the Study of EXNET?

What this study is interested in finding out is the applicability of adoption/diffusion research generalizations and paradigms to the EXNET situation.

Numerous adoption/diffusion research perspectives are available from which to choose generalizations. Among the disciplines that have contributed to adoption/diffusion research are anthropology, education, marketing, geography, general sociology, public health and medical sociology, rural sociology and journalism and mass communication (Rogers 1983).

Another way of separating perspectives is offered by Brown (1981). He says the adoption perspective emphasizes the individual, the communication flow to the individual and the effects the individual's characteristics have on the decision to adopt. Brown cites Rogers as a leading example of this perspective. The alternate perspective that Brown helped develop and study is the market and infrastructure perspective. This perspective emphasizes the importance of establishment of diffusion agencies (such as the Extension Service), the agencies' formation of a diffusion strategy, and then the adoption process.

Brown points out that Rogers' perspective assumes that everyone has an equal opportunity to adopt. Brown argues this is usually not the case; that the "supply" of the innovation is not equal to all potential adopters both accidentally and on purpose. It is necessary for some government, business, or other organization to make the innovation available at or near the potential adopter's location for the adoption choice to exist, according to Brown.

The choice is made available by establishing a diffusion agency. The agency can be permanent or temporary. It can be single purpose or concerned with several innovations. What must exist for Brown's diffusion perspective to apply is that the agency have a diffusion strategy at work for the innovation being studied.

A first step in this thesis is choosing between these two major adoption/diffusion perspectives. The choice is to emphasize Rogers' approach.

The first reason for this choice is that this study wants to investigate the nature of the individual farmers who have adopted EXNET, not the nature of EXNET's status in the Cooperative Extension Service. Looking at the individual farmers is most in tune with the research tradition advanced by Rogers. Examining Extension's handling of EXNET would be a more appropriate use of Brown's outlook.

The second reason for choosing Rogers' perspective is that the Extension Service's treatment of EXNET (at least as it applies to adoption by the public) does not fit Brown's perspective. Extension is

a prime model of a diffusion agency so the first step of Brown's perspective is fulfilled. But as can be seen by Extension's low amount of communication about EXNET, the second activity required by Brown's perspective is not operating. A strategy to diffuse EXNET to the public has not been created and implemented by the Cooperative Extension Service in Iowa.

Since Rogers' perspective will guide the development of this thesis, what part of that perspective applies to the EXNET situation? With fewer than 50 farmers subscribing to EXNET at this time, the answer must be one concerned with an early stage of the adoption process as identified by the research tradition Rogers is part of.

When an innovation diffuses, the adopters make the decision at different times. Usually adopters sort themselves into five categories that have been named according to the time of adoption. The first adopters are called innovators, typically about 2.5 percent of adopters. Second are early adopters, those who adopt when the rate of adoption is increasing most rapidly, about 13.5 percent. The third group is 34 percent, the first half of the middle bulk of adopters, called the early majority. Fourth is the late majority, the next 34 percent of the middle. Last are the late adopters, the last 16 percent to adopt the innovation. The late adopters have sometimes been called laggards in the literature (North Central Rural Sociology Committee 1961).

Each of these adopter categories has been identified with

particular social, economic and personal characteristics.

Are the farmers who are now using EXNET people who fit the description of innovators found in adoption/diffusion research? Do they perceive EXNET in ways similar to other innovators?

If the answers to the preceding questions are not positive, is there some other explanation outside of adoption/diffusion explanations? Checking a hypothesis about another explanation of why a few farmers have adopted EXNET will serve as a check on bias toward the traditional adoption perspective and increase the chance that the thesis results will be useful to the Extension service in any future marketing of EXNET to farmers.

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

Computer Network, Videotex,
and Teletext Technology

"The availability of electronic databases and service will probably change the way we go about our daily lives. For the first time, ordinary people like us can access and use information and services previously made available only to the select few who could afford such luxuries. Only a few years ago, what's available today wasn't available at any price" (Owen 1984:61).

United States trials and commercial offerings of videotex and teletext services are often based on technologies developed in Europe. In England, the teletext systems CEEFAX (BBC) and ORACLE (ITV) have been in operation for more than a decade. Now the British telephone system is offering a videotex service called PRESTEL (Svennevig et al. 1981/82). An even more ambitious program in France called TELETEL seeks to combine telephone service, smart cards for electronic banking and shopping, videotex, and a nationwide electronic telephone directory (Branscomb 1984).

Because the telecommunications industry in Europe is government owned in most cases, different goals and motivations led to earlier developments in Europe. The United States, with its private, profit motivated telephone and broadcasting industries, lacks agencies like the European telecommunications ministries. These ministries had both the socioeconomic goals and the technical means to develop and distribute computer networks, videotex, or broadcast teletext a decade ago (Saffady 1985).

Now, some ten years after European trials began, the United States

is experiencing a range of private and public trials of both teletext (broadcast of text and graphics for viewing on converter equipped televisions (Schlesinger 1985)) and video-based, interactive videotex that requires telephone or cable TV lines for two way messages (EXNET is an example of the closely related technology of computer-based interactive information systems). The chief difference for the subscriber is that teletext systems offer color and graphics but less flexibility to search and process information. Some well known commercial examples of computer-based interactive systems are The Source owned by the Readers' Digest magazine company, and CompuServe which is owned by the H&R Block financial services company.

Will the day come when every home and office is linked by electronic information/service networks? Industry insiders like Nancy Beckman, director of public relations for a popular national network, The Source, say the day will come soon (Owen 1984). But recent cutbacks like the closing down of the Knight-Ridder newspaper company's Viewdata division that supplied the Viewtron network encourage doubt about the speed of diffusion. Viewtron was the first fully interactive commercial videotex system with graphics in the United States (Atwater et al. 1985).

Baer (1985) notes such recent disruptions in the rapid diffusion of computer-based information technologies but expresses little doubt that life-changing innovations will diffuse sooner or later. He does not predict which technologies will be chosen but that some will and

will have effects on existing information channels and they way people use their time at home. Baer argues that new information technologies like computer-based information networks will grow through providing home banking and other financial services, travel arrangements, and other 24 hour, seven days a week, transactions services. "Neither pure information nor pure transactions seem viable without the other" (Baer 1985:125). This persuasive evaluation of how computer information network innovation must be designed if they are to diffuse rapidly has ominous applications for public sponsored networks like EXNET that cannot easily offer banking, ticket purchases, and other transactions.

Durand (1983) examines the issue of information equity. His article is a good example of a concern expressed by several commentators and researchers. Their concern is the growing importance of access to information as a prerequisite of status, political influence, and opportunities to earn an adequate income. On the whole Durand sees videotex and teletext technologies as very helpful in reducing inequities in the supply of information between different economic classes and political groupings. The dangers he warns of are problems with the cost of access to videotex and teletext hardware and subscriptions.

Ettema (1984) also discusses the issue of information inequities. He points out that videotex systems tend to be designed for and marketed to economically attractive user groups. Thus the technology may compound the difference between information haves and have-nots for

the foreseeable future rather than decrease the difference. After system development the typical adoption/non-adoption choice further divides the audience for videotex technology into haves and have-nots. Finally, among the adopters there are those who recognize the value of the information and use it, and those who don't make good use of the information. Ettema found use and non-use among adopters to be positively correlated with education, innovativeness, and perception of relative advantage.

On the other hand Clearfield and Warner (1984) found a strong interest by farmers in having Extension be a major source of information on any network or videotex service they use. Clearfield and Warner said the farmers want Extension information because it has very high credibility. But the farmers did prefer that future systems cooperate with the private sector. Private sector technical operation was the case in Clearfield and Warner's study of the Green Thumb videotex pilot project in Kentucky.

Business will likely expand its efforts to offer computer networks with many transaction opportunities if it can find a way to do this profitably (Mayer 1985). The numerous attempts to enter the business described by Mayer include newspaper companies, banks, retailers, and data processing firms. But these early 1980s efforts that some thought would sweep the United States and create a new industry are closed down or still experimental in 1986. Perhaps the diffusion of the computer network/videotex innovation can find a model in the video cassette

recorder (VCR) example. The VCR innovation enjoyed rapid diffusion only after the complementary innovation of video cassette rental stores diffused widely. The complementary innovation for home computer communications might be a more thorough change by banks to electronic processing of transactions and electronic communications between banks. Mayer (1985) cites a number of examples of home banking services that permit network users to "electronically" pay bills that result in paper checks being written and mailed at the bank.

Another barrier to the addition of transaction services to videotex is something described by Ledingham (1984). His survey of research finds some evidence for a consumer predisposition to view banking, shopping, and the like as more than mere business actions. Consumers often receive valuable social interactions in the process of traveling to and making transactions at banks stores and offices.

Electronic mail, both as a network service and as a stand alone product, also faces profitability questions according to Burstyn (1985). Much of the problem with electronic mail reaching a profitable level of customers is caused by technical barriers. Even automated offices with few paper records have various difficulties using electronic mail. Internal standards and formats for electronic documents aren't accepted by the mail service, or destinations can't accept the standards of the documents mailed to them. Systems like EXNET have their electronic mail standards coordinated internally; farmers can mail to Extension employees and Extension to farmers. But

EXNET standards vary from other services so EXNET, Agri-Data, AGNET, and the others are not interconnected into a new, borderless, agricultural communications network.

Gurnsey (1983) lists several ways electronic publishing can exist in several electronic technologies like videotape and cable television. His examples include teletext and viewdata (videotex). In the case of teletext he sees electronic publishing available when cable channels and memory capabilities in the user's TV converter make longer, more attractive formats practical. In videotex, Gurnsey foresees a continued emphasis on electronic publishing that serves the needs of business. Business has the most need for costly up-to-date information and the most familiarity with the necessary computers.

"Technology is neither good nor bad, nor is it neutral" (Kranzberg 1985:36). Such is Kranzberg's proclamation of Kranzberg's First Law in his comparison of the development of an agricultural information technologies with the industrial revolution of the preceding era. More specifically, Kranzberg says agricultural technology is a major beneficiary of computer technology. Computer technology helped develop improved crops and equipment. Tomorrow computer technology will make possible biotechnology, fast and complex analysis of farm operations, and much faster, and extensive access to agricultural research findings through computer-based communications and data search.

Johnston (1984) says there are five characteristics of electronic

technology innovations to keep in mind when doing research on such innovations:

1. Remember that you are studying a moving target. All innovations are made dated, commonplace, even obsolete, as new innovations replace or change the context. This is presently happening at a very rapid pace with electronic technologies.

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change of state

This may be a concern in studying EXNET but not as much recently as a few years ago. The markets for both personal computer hardware and software have been slower paced recently and no new technology threatens to immediately replace current computers, phone systems, and related EXNET hardware.

2. Be careful of distortions in subjects' responses that come from the novelty of being an early adopter and an isolated user of the innovation. Subjects' evaluations often change when an innovation is no longer in the closely researched trial stage and as there is more interaction with other users in the subjects' social network.

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This possible distortion is very pertinent to the case of EXNET. The current subscribers are the first few to experiment with EXNET. It should be remembered they are likely to show this bias.

3. Electronic information technologies often have effects that increase the adopters' interdependency (such as farmers and the Extension Service via EXNET) and ways of processing

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information (computer based systems usually required financial data and other information be converted to one specific format if the computer is to accept, communicate and process the information)..

4. The ability of computer based systems to provide branching is unique. Branching is the ability of the computer to allow each user to pick and choose what information he sees and uses. Branching means these systems are different for each user. This is unlike other forms of communication where each reader receives an identical or very similar newspaper, each viewer sees the same television broadcast, and each filmgoer sees the same film.

For example, both the farmer specializing in crop production who uses EXNET's insect control information and the farmer specializing in livestock production who uses market reports can report EXNET is very compatible with their farm operations. Neither farmer needs to deal with the "branch" of EXNET that isn't compatible.

5. Computer-based information technology innovations have a potential for self-monitoring that researchers may want to use. The computer and/or subprocessors added to the system can record things like frequency, duration, and type of use.

EXNET's operators know from day to day, even hour to hour which menu choices are used most frequently. This could speed EXNET's success at reaching a target audience or if misused eliminate valuable

services before they find their audience.

For profit computer networks

One commercially sponsored videotex service was evaluated by Ettema in 1984. FirstHand is sponsored by First Bank System, a Minneapolis bank holding company. Ettema's evaluation had two purposes: to define social issues raised by the new technology, and to examine First Bank System's questions.

Ettema compared adopters and non-adopters of FirstHand. He said the comparisons offer few surprises to anyone familiar with the diffusion of innovations. Adopters were better educated, had larger farms, and use more innovations of other types on their farms. Ettema found non-adopters were especially concerned with the trouble of learning to use the technology and not being able to justify adoption because of small farm size and/or being close to retirement. It was found that adopters felt a much greater need, for a variety of reasons, for the market information offered on FirstHand than did non-adopters.

Other important electronic agricultural information sources are Agri-Data of Milwaukee, Wisconsin and Grassroots America of Wilmington, Delaware. These two for-profit companies are providing videotex services that can be accessed with a special terminal and a television or with a personal computer. Agri-Data says its subscribers should expect to pay about \$75 per month for average use. The base subscription rate for Agri-Data is \$33 per month or \$199 per six months. Other costs are 42 cents to 50 cents per minute connection

charges and occasional extra fees for special reports. Grassroots charges \$50 per month with a two-hour maximum connection time each month. Each additional hour over two hours is another \$9 (Degnan 1984).

Farm use of microcomputers to connect to other remotely located computers does open a new world of programs, data bases and other information (Beasley 1983). Market reports, electronic mail, and up-to-the-minute newsletters are some things farmers can reach by adopting EXNET-type innovations.

As Beasley points out, computers have evolved away from highly centralized systems with large, immobile equipment that requires operators to be close at hand. Now computer power can be distributed to many operators and each operator can use communication systems like EXNET to send and receive from distant sources of larger computer information storage and processing power like the medium-sized computer dedicated to operating EXNET.

Other non-profit computer networks

The Extension Service of the United State Department of Agriculture was among the first U.S. organizations to experiment with interactive video networks. The Green Thumb project in Kentucky was an Extension project with participation from other USDA departments, other Federal agencies (the weather service), and the private suppliers of the equipment (Saffady 1985). This trial was started in 1979. It was the subject of research that included adoption/diffusion perspective

analysis.

Green Thumb offered various frames of weather and market information, crop and livestock information, home management information, and local news (Case et al. 1981). Compared to EXNET, Green Thumb offers similar information but because it was a videotex service rather than a computer network it lacked the on-line computation and electronic mail possibilities of EXNET and other computer networks.

The AGNET system that originated in Nebraska (Kendrick, Thompson and Murray 1976) is one of the most well established computer networks for agriculture. AGNET emphasizes on-line computing as well as the internal Extension communication that EXNET emphasizes. AGNET has been adapted for use in several states including some that have Extension concerns very different from the Nebraska starting point. For example, AGNET in Washington state offers online computing for forestry management issues (Baumgartner et al. 1984). The other partner states are Montana, North Dakota, South Dakota, and Wyoming. Users from as many as 37 states have connected to AGNET (Griffith and Wright 1982). AGNET has some Extension specialists specifically assigned to AGNET duty who work with the AGNET programmers (Wright 1982). EXNET lacks this kind of detailed Extension support and this may be a vital difference between the two services.

In a study by Nieuwsma (1984) of AGNET in North Dakota, considerable variation in amount of use was found among Extension

offices. This variation in amount of use was also found among the Green Thumb users (Case et al. 1981). Nieuwsma found Extension employees' age, previous computer experience, and amount of AGNET training received were significantly related to amount of AGNET use.

Summary of videotex and teletext research concepts

No example of a successfully, widely diffused videotex or teletext system exists in the literature. This is especially true in the case of the United States. In other countries, there are cases where large numbers of system connections have been provided free or at very low cost by the government. There are indications that usage of the connections remains low in many households.

A recurring comment by researchers and subjects is that these forms of electronic communication need to do more than send the same information through a new channel. These new systems need to provide information and the ability to shop, bank, make reservations and conduct other transactions (Baer 1985, and Mayer 1985).

The continuing failure of either non-profit or for-profit networks to provide the desired combination of information and transaction services is probably only partly due to failing to accurately access users' needs and wants. Another reason is organizational: for-profit and non-profit information organizations must reach agreements with very different organizations like banks, travel agencies, and retailers' before they can offer transactions on the computer network. And the technical problems are not resolved: bank computers, travel

reservation computers, and retailers computers don't communicate with each other well yet. Many issues about communication standards and computer security must have widely accepted answers before full service computer networks are widely accepted.

The advice from researchers with experience in examining electronic communications methods is that these innovations will some day have profound effects on every day life and work. Researchers need to keep in mind that the technology is unsettled and still changing. Researchers must account for fact that current users are affected by the novelty of the technology. The fact that technology creates new interdependence and restrictions on information handling must be accounted for. Researchers should remember that computers inherently customize the message to each user. And researchers should try to find ways to use the technologies' self-monitoring ability.

Innovators and Innovativeness

The next area to examine is the description of innovators found in the literature of adoption diffusion research.

(Several bibliographies of adoption/diffusion references exist. Crano et al. (1981) was helpful in preparing this study of EXNET.)

Research confirms the common sense observation that some people adopt new ideas faster than others. It is important to know why this so. It is also important to understand how individual propensities to adopt affect an innovation's total diffusion through a social system.

Adopter categories classify adoption units (farmers for example) on the basis of when they reach the adoption stage. Those who adopt first are considered more innovative. There appear to be two major reasons some individuals are more innovative than others: 1.) they become aware of the innovation earlier, because they are tuned into the communication network that promotes the innovation, and 2.) they require less time to reach a decision.

Innovators are the first 2.5 percent to adopt new ideas. Innovators are scientific and venturesome. They have a high level of education and a consequent ability to deal with abstractions. Innovators are often leaders in county-wide or state-wide organizations, and they travel widely. They have high social status but their farming practices may not be accepted. Innovators are often operators of the largest and most specialized farms. They often reach beyond conventional sources of information such as speaking directly to scientists and reading scientific publications (Yarbrough and Klonglan 1974).

Among the strongest relationships described in the literature is the positive relationship between education and innovativeness. This appears in the earliest studies. "Not only were the earliest adopters somewhat younger than the latest acceptance group, they were much better educated. Whereas nearly two-thirds of the A group (early adopters) had education beyond eighth grade not one of the D operators (late adopters) had progressed so far" (Ryan and Gross 1950).

The differential speed with which farmers adopt new farming practices may be attributed partly to variance in their willingness to take risks. Some persons are receptive to trying new things as soon as they become available, although this may entail risk, whereas others hold back until the merits of the practices have been well demonstrated (Bultena, Hoiberg and Linnemann 1983).

Another concept relating to an actor's acceptance of new ideas is innovativeness. Adoption-diffusion researchers have traditionally defined innovativeness as an actor's general propensity to accept new ideas (Yarbrough, Klomglan, and Lutz 1970).

Research tends to indicate that innovativeness is a generalized personality characteristic. It is known that within a limited range of innovations (e.g., economically rational farm practices), an actor's early acceptance of one new idea generally indicates that he will also accept other new ideas.

Since most adoption/diffusion studies have been conducted after diffusion of the innovations considered was essentially complete, innovativeness has been operationally defined as the time at which the actor adopted (on a full scale) the use of a single innovation. Individuals who adopted early relative to other actors in the social system have been defined as more innovative (Yarbrough, Klomglan, and Lutz 1970).

Thus, this study examines the actor at only one short point in time, samples his adoption behavior, and makes inferences about his

innovative nature.

Studies of the socio-economic character of adopters to explain differences in the timing of adoption are particularly useful for development agencies and sales people. The essential concept has proved to be 'innovativeness' -- the propensity to be among the earliest adopters of innovations. Clark (1984) says this is an elusive concept but early work with this perspective was quite dogmatic in its conclusions. He cites Rogers's identification of early and late adopters as complete opposites. Early adopters had the following characteristics: a modern orientation, use of more impersonal and technical sources of information, younger, higher social status, wealthier (often indicated by a surrogate such as farm size) more specialized businesses, a more cosmopolitan outlook, and they acted as opinion leaders.

This analysis has been criticized and questioned on two grounds. First, its characterization of late adopters has been too harsh and too ready to "blame the victim;" the perjorative term "laggard" is used as frequently as "late adopter" in the literature. Late adopters include those almost too poor to afford the innovation and those for whom it is only marginally suited on technical grounds. Others may not adopt because they are not in the business (farming, for example) in order to maximize production or profits; a pleasant life, low work-load, and scenically attractive farmland may be more important for them. The methods used by Rogers and others have also been criticized because some

studies have produced contradictory results. Youthfulness, for example, and wealth tend to be positively correlated with innovativeness, yet the young tend to not be wealthy and the wealthy to not be young. Clark repeats a quotation used by Rogers as an "antidote to the tendency to in the literature to hero-worship innovators and castigate laggards" (Clark 1985:3). The quotation is from an article by Linton and Barnett on early adopters: "very frequently misfits in their societies, handicapped by atypical personalities,"..."truly marginal individuals," and "the disgruntled, the maladjusted, the frustrated or the incompetent are pre-eminently the acceptors of culture innovations and change" (Clark 1984:4).

Innovators are the first to introduce new ideas or practices, and generally have a reputation in the community for doing so. In farm practice diffusion research, they have ordinarily been defined in terms of the readiness with which they have adopted one or more new farm practices, even though the practices adopted have already been tried and tested by agricultural experiment stations and perhaps progressive farmers elsewhere. Innovators tend to have larger farms than average for the areas where they live, and have the necessary capital and willingness to take risks. They are usually not past middle age. However, young farmers who would like to deviate from locally accepted ways of farming may not find it possible to do so, either because of lack of capital or restrictions imposed by those who own the farms or furnish the capital with which to operate them (Lionberger 1960).

Some studies have shown that innovators may not enjoy the highest status in the community, particularly where norms are not favorable to substantial changes in farming methods. Frequently innovators know they are different and feel that neighbors are waiting and wondering when they will go broke.

Innovators are mentally alert, and actively seek new ideas about farming. They often go directly to college and industrial research sources for information. Although the county agent rates high on their information list, they often bypass him in favor of originating sources, and often learn about new things before the agent. Innovators sometimes obtain samples of seed or farm chemical innovations before they are released for public use. Innovators know what their neighbors are doing, but are not greatly impressed by what the neighbors think or do. They have many informal and formal contacts outside the immediate locality. They seek advice from other farmers, but primarily from those who are progressive like themselves.

Neighbors watch innovators closely even if they rarely use innovators as person to person sources of farm information. An innovator's success with an innovation is not enough. The "watchers" must see the innovation work for farmers who are more trusted for their good judgment. Whether followed or not, innovators perform an important function in the adoption process. They assume risks that others are not willing to take, and provide the local trial necessary for legitimation of the innovation (Lionberger 1960).

Beal and Bohlen (1957) add some new areas of emphasis in their descriptions of innovators. Their way of describing innovators is to first state that innovators adopt ahead of other people. A community would probably have only two or three innovators.

Innovators have larger farms, they usually have a relatively high net worth, and--probably more important--a large amount of risk capital. They can afford to take some calculated risks. Quite often these innovators come from well-established families. They are active in the community. They have power. They may not hold many offices in the community, but they may act behind the scenes. For instance, they may not be members of the school board, but they have a lot to say about who serves on the board. They are often active beyond local community boundaries. They frequently belong to county, state, regional or national organizations. More typically Beal and Bohlen describe innovators as those who go directly to college researchers, and receive the more specialized farm publications. Beal and Bohlen say, as do other researchers, that other farmers do not go to innovators for information (Beal and Bohlen 1957).

From any of several methods and perspectives, characteristics such as more education, farm size, cosmopolitan orientation, and use of communications are significantly related to earlier adoption. Abd-Ella, Hoiberg, and Warren (1981) analyzed responses on these characteristics from 844 Iowa farm families. All these characteristics were found to have a significant correlation to innovativeness.

One might ask what good it is to know the characteristics of innovators and other adopter categories. Klomglan, Beal, Bohlen, and Coward (1967) say in their study of fallout shelter adoption that while it is true change agents and communicators can't do anything to change years of schooling, wealth, or status, knowing the relation of personal attributes to adoption is useful. Using adopter categories such as the innovator category differentiates the total population into meaningful and manageable audiences for targeted change agent and communicator actions.

Innovators are independent in their thinking and have a wider range of contacts. They are known as experimenters and as people who are always trying out new things. They are seldom identified by others in the community as persons to go to for advice on farming. They are not necessarily adoption leaders in their neighborhoods and communities. Innovators may not be present in every community (North Central Rural Sociology Committee 1955).

Ogwezi (1980) found significant correlations between education, use of competent information sources, and innovativeness. This study examined these correlations for urban renters and homeowners and the adoption of energy conservation innovations. These and other studies of non-farm innovation situations show many instances of innovator description generalizations applying in non-farm situations.

Beal and Rogers (1960) found support for the standard innovator characteristic generalizations in two Iowa farm innovation cases.

Innovators of the practice of using 2,4-D herbicide had the highest rate of learning about the innovation from government agencies and commercial sources. In the case of adoption of antibiotics, innovators again show high rates of using competent information sources. Beal and Rogers also found that innovators most strongly agreed that a farmer's income and prestige would be enhanced by adopting the innovations in question.

Lutz (1971) has pointed out that innovation adoption is a complex set of relationships in which few factors have strong effects but many factors have moderate influences. Lutz says this is probably true for medical, educational, and agricultural innovation cases.

Lutz's examination of fallout shelter adoption found relations between characteristics and adoption behavior strong enough to support generalizing to other adoption cases in Lutz's analysis. Specifically, education strongly affected adoption behavior, and income affected adoption behavior moderately.

Edwards (1969) found the strongest correlation between size of the farm operation and innovativeness in his examination of Iowa farmers innovativeness. He found a significant but weaker relationship between education, cosmopolitan orientation, and media use. Moderately strong relationships were his results for scientific orientation and risk orientation.

Nji (1980) checked the correlations between some personal characteristics and adoption of soil conservation innovations as part

of his study. As in several other studies a significant positive correlation between more formal education and innovativeness was found. Nji also found a positive relationship between farm size (as measured by crop acres planted) and innovativeness.

Another Iowa-based study of farmers' adoption of soil conservation innovations was done by Moon (1982). Moon's thesis is of special interest for its examination of farmers' perceptions of the innovation. Studies of adopters' perceptions are less common than studies of adopters' socio-economic characteristics.

✓ Moon found that perceptions of compatibility and relative advantage were significantly positively related to adoption of different types of soil conservation practices among Iowa farmers.

In a free-sample-of-the-innovation situation investigated by Klonglan (1963) generalizations about the innovators' characteristics still held. Those farmers with higher gross incomes, larger farms, more education, and a more scientific orientation were more likely to try the free sample of the innovation; in this case a new herbicide.

Case et al. (1981) found that larger farms and more education were positively related to use of the Green Thumb computer network trial in Kentucky. This was true despite the fact that this was a special pilot project that provided the Green Thumb videotex equipment free to the participants.

Data gathered for a farm management study were analyzed by Hildebrand and Partenheimer (1958) to see if this group of Michigan

farmers would display the same innovator characteristics as summarized by Beal and Bohlen (1957). Hildebrand and Partenheimer found that the farmers they identified as innovators were better educated, had larger farms, and more use of competent information sources. This study also found a significant correlation between use of hired labor and innovativeness.

Innovator characteristics held true in a non-voluntary innovation situation studied by Havens (1965). Dairy farmers in this case were required to adopt refrigerated bulk tank handling of milk as a replacement for storing and shipping milk in cans. Havens compared the characteristics of the voluntary earlier adopters (who knew the required innovation was coming) with those who did not adopt until required to do so by the milk processing cooperative. Larger farm size, greater adoption of other farm innovations, and a favorable attitude toward use of credit were all positively correlated with earlier adoption.

A study of Wisconsin farmers by Fliegel (1956) supported some of generalizations about innovators' characteristics but did not find a significant positive correlation for one characteristic usually found to be positively related to innovativeness. Fliegel found use of more media and formal sources of information, a higher standard of living, and a favorable attitude toward improved and recommended farm practices all positively correlated with innovativeness. Unlike many other researchers he did not find a significant correlation between larger

farm size and innovativeness.

Coughenour (1960) studied Kentucky farmers and also found some innovator description generalizations supported and others unsupported. He found no positive correlation between innovativeness and an attitude favoring science and scientific farming and between innovativeness and more education. Higher amounts of formal information contacts and higher economic status were positively correlated with innovativeness.

The attitude toward risk characteristic was examined in detail by Cancian (1967). He divides the diffusion process into two parts when examining attitudes toward risk. Innovators and early adopters display a risk tolerant attitude by adopting early when the innovation is less understood and tested. Later adopters in a diffusion process have waited until risk has been reduced or eliminated by the testing and refinements. "At this point (late in the diffusion process) the practice is no longer an innovation, and inclination to risk is no longer a major element in the decision to adopt."

Innovators are thought to be better able to cope with abstract symbols and prefer different kinds of information at all stages of the adoption process (awareness-information-evaluation-trial-adoption). than later adopters. Innovators can better use factually intensive information sources. Later adopters prefer more how-to-do organization and presentation of information. This power to manipulate abstract symbols speeds innovators through the adoption process, even allowing them to skip stages, especially the trial stage (Bohlen 1967).

To summarize innovator characteristics, Rogers (1961) is referred to again. Innovators' personal characteristics include more education, and greater participation in formal organizations. They also tend to have larger farms, higher incomes, and more specialized farms, according to Rogers. Innovators more often have direct contact with agricultural scientists, read research literature, and read more farm magazines. In this study of Extension-agent-identified innovators in Ohio, Rogers found support for the generalizations that innovators are more cosmopolitan and are more favorable toward the use of credit.

Summary of Innovator Characteristics

To measure if EXNET-using farmers are innovators as defined by adoption/diffusion research, this study will examine some (A) socioeconomic, (B) communication behavior, and (C) personality traits found to be associated with innovativeness and early adoption.

Table 1 follows this section. This table lists which studies' results support the following generalizations about adopters' socioeconomic characteristics.

(A) Socioeconomic:

Education. Rogers (1983), Lionberger (1960) and other researchers agree on the generalization that innovators and early adopters have more years of formal schooling than others in the audience for an innovation.

Social status. The generalization that innovators have higher social status can include a number of variables such as total wealth, job prestige, and social class level. For this study only the income level will be used to examine how EXNET subscribers fit this part of the description of innovators.

Farm size. Studies in the U.S. and in other nations find a strong relationship between larger farm size and innovativeness.

Economic orientation. Innovativeness has been found to be associated with a commercial, profit-maximizing outlook, not with a traditionalist, subsistence, way-of-life view of farming.

Use of credit. Innovators generally use credit more often and in larger amounts than later adopters.

Farm specialization. Having a more specialized farm is usually associated with innovativeness according to past diffusion of innovations research.

Table 1 that follows summarizes research findings that support the generalizations about adopters' socioeconomic characteristics.

(B) Communication behavior:

Table 2 follows this section. This table lists which studies' results support the following generalizations about adopters' communication behavior.

Social participation. Past research into adopter characteristics has found innovators and early adopters to have more memberships in farm and community organizations.

Table 1. Research Findings on Socioeconomic Characteristics Related to Innovativeness

Author Year	Education	Social status	Farm size	Economic orientation	Use of credit	Farm specialization
Abd-Ella et al. 1981	S ^a		S		N ^b	
Beal and Bohlen 1957		S	S			
Case et al. 1981	S		S			
Coughenour 1960	N	S		N		
Edwards 1969			S			
Ettema 1984	S		N		N	
Fliegel 1956		S				
Havens 1965			S		S	
Hildebrand and Partenheimer 1958	S		S			
Klonglan 1963	S	S	S			
Lionberger 1960			S			
Lutz 1970	S	S	N			
Nji 1980	S		S			
Ogwezi 1980	S					
Rogers 1983	S	S	S	S	S	S
Ryan and Gross 1950	S					
Yarbrough and Klonglan 1970	S	S	S		N	S

^aS = Positive relationship is supported.

^bN = No support found.

No entry = This study did not study this characteristic.

Cosmopolitan outlook. Researchers have found a positive relationship between cosmopolitanism and innovativeness. Frequency of farmers' trips to urban centers is the most common measure of their cosmopolitanism (Rogers 1983).

Change agent' contact. Farmer-agricultural agent interactions are usually more frequent among more innovative farmers (Lionberger 1960). It would not be surprising to find that these interpersonal relationships are very important in the decision to adopt EXNET. EXNET is an Extension program so agents are often the best source of personal information available anywhere. And Extension personnel are often the best source of information about successfully connecting to EXNET and finding information in it.

Mass media use. Innovative farmers generally use mass media information sources more frequently than others according to previous research.

Awareness of innovations comes from simple surveillance of information. Adoption requires quite different information that will convince the farmer to adopt. After adoption, needs shift again to information that trains, advises, evaluates performance, and reinforces.

Personal communications. Interpersonal relationships outside the local community are often positively related to innovativeness, especially in the early stages of the process of diffusion (Lionberger 1960). Local personal relationships are very important later in the

diffusion process but innovators are often poorly connected to their local community and may even be viewed as eccentric or irresponsible.

Innovation information seeking. Innovators have been found to be considerably more active seekers of information about innovations than others in many studies. They have greater knowledge of innovations in general than others. Innovators have been found to develop relationships with scientists and other innovators despite time, distance, and expense in order to be up to date.

Table 2 that follows summarizes research findings that support the generalizations about adopters' communication behavior.

(C) Personality traits:

Table 3 follows this section. This table lists which studies' results support the following generalizations about adopters' personality traits.

Attitude toward change. Diffusion of innovation researchers say innovators and early adopters have a more favorable attitude toward change. Farmers' attitudes toward change are usually measured by asking them how they feel about a sample list of new farm practices.

Attitude toward risk. According to Rogers (1983) and others venturesomeness and great willingness to bear risk are very characteristic of innovators. "He or she desires the hazardous, the rash, the daring and the risky" (Rogers 1983).

Attitude toward science. Innovators are usually more favorable in their attitude toward science than the rest of the population.

Table 2. Research Findings on Communication Behavior Related to Innovativeness

Author Year	Social partic- ipation	Cosmopolitan outlook	Change agent contact	Mass media use	Personal communi- cation	Innovation information
Abd-Ella et al. 1981	N ^a	S ^b	- ^c	S	N	
Beal and Bohlen 1957	S	S				S
Beal and Rogers 1960	N		S	N		S
Case et al. 1981	N		S			
Coughenour 1960				S		
Hildebrand and Partenheimer 1958	N		S		N	S
Lionberger 1960		S	S	N		S
Ogwezi 1980		N	S	S	N	S
Rogers 1983	S	S	S	S	S	S
Yarbrough and Klonglan 1970	S	S				

^aNo support found.

^bS = Positive relationship is supported.

^c- No entry = This study did not study this characteristic.

EXNET requires owning or using a computer which by itself might indicate some trust in the latest scientific advances.

Aspirations. Innovators usually have high success goals according to previous studies of adopter categories.

Fatalism. Innovators and early adopters are not fatalistic compared to later adopters. Researchers say this negative relationship says those who believe they have some control over their future are more likely to adopt innovations than those who believe they lack control over their fate.

Table 3 that follows summarizes research findings that support the generalizations about adopters' personality traits.

Yarbrough and Klonglan (1974) provide a succinct description of the adoption/diffusion literature's generalizations about innovation characteristics:

Compatibility exists when an innovation is consistent with existing values and practices. An innovation with poor compatibility conflicts with existing values and practices, and is adopted more slowly than a compatible innovation.

Complexity is the degree to which an innovation is relatively difficult to understand and use. Less complex innovations are easier to adopt and usually diffuse faster than more complex innovations.

Trialability (also known as divisibility) means an innovation can be tried on a limited basis. A trial planting of a new seed on a few acres helps the adoption process proceed.

Table 3. Research Findings on Personality Traits Related to Innovativeness

Author Year	Attitude toward change	Attitude toward risk	Attitude toward science	Aspirations	Fatalism
Bultena et al. 1983	N ^a	- ^b			
Cancian 1967		S ^c			
Case et al. 1981		S	N		N
Edwards 1969			S		
Fliegel 1956	S				
Havens 1965	S	N		N	
Klonglan 1963			S		
Lionberger 1960		S			
Rogers 1983	S	S	S	S	S
Yarbrough and Klonglan 1970			S		

^aNo support found.

^b- No entry = This study did not study this characteristic.

^cS = Positive relationship is supported.

Observability (also known as visibility) is the degree to which the results of an innovation can be seen, felt, and directly sensed. Innovations whose effects are not easily seen or understood such as preventative vaccinations or herbicides that kill weeds before they are seen are less observable. Such innovations often diffuse more slowly.

How Adopters Perceive an Innovation

Relative advantage refers to an innovation's superiority to the ideas or practices that preceded it. The purchase cost, how well the innovation meets the day-to-day needs of the adopter, and the time needed to see positive results of the innovation all affect relative advantage. Innovations with greater relative advantage are more likely to be adopted and diffuse faster.

Table 4 follows this section. This table lists which studies' results support the above generalizations about adopters' perceptions of an innovation's characteristics.

Fliegel and Kivlin (1966) studied Pennsylvania dairy farmers to see how innovation characteristics affected adoption. They found that most farmers surveyed did rate compatibility, complexity, trialability, observability, and relative advantage as important considerations in the decision to adopt. This study gave farmers a choice of ten possible characteristics.

Adoption/diffusion technique was applied to videotex itself by Bolton. He found that innovators' perceptions of the Channel 2000

field test of videotex were good predictors of adoption. Those subjects that rated the independent variables of relative advantage and compatibility highly were more likely to show inclination to adopt the innovation by their answers to the dependent variables of purchase probability and price sensitivity (Bolton 1983).

Perceptions of EXNET's characteristics

Compatibility Compatibility as perceived by farmers is associated with faster rates of adoption. Farmers perceive an innovation to be compatible if it doesn't conflict with their culture and values, if it works with existing farm technology, and if it meets a need the farmers perceive they have.

One readily apparent compatibility that would aid EXNET's adoption is its compatibility with the innovation of using a computer on the farm. EXNET is a way to add at more modest cost than some similar services the ability to receive information on the computer.

Complexity The evidence for how complexity affects adoption is not as conclusive as it is for some other innovation characteristics. But as would be expected more complexity is associated with slower rates of adoption.

When applying this generalization to EXNET the difference between the complexity of adding EXNET to an existing computer system (not a simplistic process itself) and setting up farm computer system in order to have EXNET should be kept firmly in mind.

Trialability EXNET is, through its guest account feature, readily trialable assuming the adopter has passed through the complexities of starting computer use and computer telecommunications.

Adoption/diffusion research has found in the past that this kind of character speeds adoption of an innovation.

Observability The research record indicates that innovations with easy-to-see results diffuse more quickly than innovations that are hard to describe.

EXNET has no immediately observable results like more bushels per acre gained from adopting improved seed so for this characteristic EXNET's diffusion is slowed.

As Rogers (1983) points out the "software" aspect of an innovation is usually harder to observe than the "hardware" aspect. Once you get beyond the fact that EXNET makes text flow on and off a computer screen its observability is more like software.

Relative Advantage An innovation is perceived as having relative advantage if it has more profitability, social status, convenience or similar characteristics than what it replaces.

Sometimes it is argued that farm innovations succeed or fail solely on their profitability. Rogers (1983) says both the evidence from adoption/diffusion research and more complex economic analysis refute this. Other innovation characteristics, especially observability and compatibility, have repeatedly been found to be important.

A key issue in determining EXNET's usefulness to farmers is if it reduces the net cost of a farmer having specialized personal

communication with Extension specialists. In the past the costs of this kind of personal communication included time to get together with a specialist in the field, on the university campus, or by phone; and the dollar cost of travel or business-hours phone calls. EXNET's electronic mail can shift time required to less demanding times of day and lower phone bills and eliminate travel. But at the cost of subscribing to EXNET, acquiring the equipment to use it, and learning how to use it.

Table 4. Research Findings on Adopters' Perceptions of the Innovation

Author Year	Compat- ibility	Complexity	Trialability	Observ- ability	Relative Advantage
Bolton 1983	S ^a				S
Bohlen 1967		S	S	S	S
Fliegel and Kivlin 1966	S	S	S	S	S
Havens 1965			N ^b		S
Rogers 1983	S	S	S	S	S
Yarbrough and Klonglan 1970	S	S	S	S	S

^aS = Positive relationship is supported.

^bN = No support found.

No entry = This study did not study this characteristic.

HYPOTHESES

First General Hypothesis

Farmers who subscribe to EXNET fit the generalized description of innovators found in the literature of adoption/diffusion research.

Socioeconomic specific hypotheses

1. EXNET subscribers will have above average education (Ryan and Gross, 1950; Abd-Ella et al., 1981; Nji, 1980).

2. EXNET subscribers will have above average farm income (Lutz, 1971; Klonglan, 1963).

3. EXNET subscribers will have larger farms than a comparison group of Iowa farmers (Edwards, 1969; Nji, 1980).

4. EXNET subscribers will have attitudes about farming that value growth, profit, and competitiveness ahead of family tradition, thrift, and neighboring (Coughenour, 1960; Rogers 1983).

5. EXNET subscribers' attitudes about credit should find them more in favor of using it than other farmers (Havens, 1965; Rogers, 1961).

6. EXNET subscribers receive all or most of their farm income from one or two farm enterprises (Yarbrough and Klonglan, 1974; Beal and Bohlen, 1957).

Communication behavior specific hypotheses

7. EXNET subscribers have high rates of organizational participation compared to other groups of Iowa farmers (Beal and

Bohlen, 1957; Coughenour, 1960).

8. EXNET subscribers are more frequent urban area visitors than other Iowa farmers (Edwards, 1969; Rogers, 1961).

9. EXNET subscribers will have a greater than usual number of change agent contacts either in field offices, in universities and business headquarters or both (Beal and Bohlen, 1957; Rogers 1961).

10. EXNET subscribers will (a.) use more kinds of mass media, more frequently and they will (b.) be more frequent users of technologically competent sources of information than other Iowa farmers (Beal and Rogers, 1960; Ogwezi, 1980).

11. EXNET subscribers have more interpersonal information sources beyond their local area than other farmers (Beal and Bohlen, 1957; Beal and Rogers, 1960).

12. EXNET subscribers will report that they specifically seek information on innovations (Rogers, 1983; Beal and Bohlen 1957).

Personality traits specific hypotheses

13. EXNET subscribers will have favorable attitudes toward most new farm practices (Havens, 1965; Rogers, 1983).

14. EXNET subscribers will report that they are not afraid of risk and in the right circumstances enjoy taking a risk (Bultena, Hoiberg, and Linnemann, 1983; Lionberger, 1960; Cancian, 1967).

15. EXNET subscribers will have positive attitudes towards scientists and scientific innovations other than EXNET (Edwards, 1969; Rogers, 1983).

16. EXNET subscribers will have high success goals rather than traditionalist farming goals (Fliegel, 1956).

17. EXNET subscribers will report that they feel they have significant abilities to control the outcome of their enterprises and achievement of their goals (Rogers 1983).

Second General Hypothesis

Farmers who subscribe to EXNET perceive EXNET in the way predicted by the generalizations about adopters' perceptions of innovations (compatibility, complexity, trialability, observability, and relative advantage) found in the literature of adoption/diffusion research.

Perceptions specific hypotheses

18. EXNET subscribers will report that EXNET's compatibility with their computer use and equipment and its compatibility with their information needs were significant factors in their decision to adopt (Yarbrough and Klonglan, 1974; Rogers 1983).

19. EXNET subscribers will say EXNET is not exceptionally complex for a farm innovation (Yarbrough and Klonglan, 1974; Rogers 1983).

20. EXNET subscribers will report that trying EXNET through the guest feature influenced their decision to adopt (Yarbrough and Klonglan, 1974; Rogers 1983).

21. EXNET subscribers will report that observing EXNET at another farm or at an Extension meeting influenced their decision to adopt (Yarbrough and Klonglan, 1974; Rogers 1983).

22. Farmers using EXNET will report it supplies information they need more easily than other methods of obtaining the information (Yarbrough and Klonglan, 1974; Rogers 1983).

METHODOLOGY

Survey

Data were collected for this thesis by mailing a questionnaire in booklet form to the 42 public account EXNET subscribers.

The questionnaire design, mailing, and follow-up was guided by the methods that have proven successful in earlier research at Iowa State University and elsewhere.

For example, Rubin, Rubin, and Piele (1986) provided a list of recommended techniques in their textbook on communication research techniques. They advise the researcher doing descriptive research to:

- 1.) determine what you want to learn, (this study wants to learn if EXNET subscribers match the generalizations about innovators)
- 2.) construct questions that will answer the resulting questions, (questions were included in the survey of EXNET subscribers to reveal the appropriate social, economic and communication behavior characteristics)
- 3.) identify the population that has the answers, and
- 4.) select a subgroup and ask your questions of this sample, (in the EXNET case the answer for 3 and 4 are the same)
- 5.) collect and organize the answers, (the organization of the EXNET subscribers' answers was guided by the organization of the generalizations derived from the adoption/diffusion literature)
- 6.) report the answers in a meaningful way, (the reporting of the EXNET subscribers answers was made more meaningful by comparing the answers with other groups of farmers where possible and by testing the significance of differences

in the subscribers' answers in other cases).

Other specific practices followed to improve the quality of this research are the mail questionnaire practices recommended by Dillman (1978) that have become standard practice by social science researchers at Iowa State University. These practices included using a booklet form questionnaire with a prominent graphic or picture on the cover. The length of the questionnaire is limited, and the purpose and time to complete it were clearly explained in the cover letter. The cover letters were individually typed and signed by the author. A postage paid envelope was enclosed for returning the questionnaire. Finally all mailings to the subjects had the postage applied by using the largest, most unusual stamps that could be located.

Non-responders received a post card reminder after two weeks and a re-mailing of the questionnaire after three weeks.

The resulting response rate was 34 of 42 subjects, or 81 percent.

Ogwezi's (1980) study of adoption diffusion depended on data that had been gathered for other purposes. This led to some gaps in the coverage of adoption/diffusion issues. Based on the problems uncovered by Ogwezi adoption/diffusion research should be especially careful to investigate the following topics.

To understand use of competent information sources, researchers should divide categories finely (for example, ask about several types of magazines), and include a scale for degree of dependence on each source. This study of EXNET asked specific questions about several

types of media and about use of variations of some types of media. For example, EXNET subscribers were asked about general farm magazine use, specialized farm magazine use, and use of science magazines.

Measure the perceived characteristics of the innovation (compatibility, complexity, trialability, observability, and relative advantage,) to find a complete picture of the adoption situation. This aspect of adopters' characteristics was examined with one or more questions about each perception of EXNET. The perceptions question was examined under its own general hypothesis in this study of EXNET.

Researchers need to be sure attitudes and values are adequately investigated including risk orientation, attitude toward credit, attitude toward change, attitude toward science and scientists, fatalism, and achievement orientation (aspirations). Each of these important adopter characteristics was examined through a separate four-part question or as two to four parts of a multipurpose question in the questionnaire sent to EXNET subscribers.

Measures of social participation are important for adequate measurement, so include thorough questions on participation in voluntary organizations, cosmopolite orientation, and social organization participation. The EXNET questionnaire included several questions on organization membership and leadership, and one question on visits to urban areas to measure cosmopolite orientation.

Making reported farm income comparable

The Internal Revenue Service (1985) publication "Farmer's Tax Guide" was used to design the question on farm income so the income figure would be readily available and as comparable between subjects as possible.

Additional Specific Hypotheses

As an additional check on the applicability of adoption/diffusion generalizations to EXNET, questions were included on the survey to examine the following hypothesis.

Farmers who subscribe to EXNET don't fit the generalizations of adoption/diffusion research. Instead they have more social and organizational connections to the Cooperative Extension Service than other farmers.

Stated another way, a check should be made to see if all the EXNET subscribers' innovativeness can be explained by change-agent contact. A high level of such contacts are significantly related to innovativeness (Lionberger 1960).

Additional hypotheses

A significant number of EXNET subscribers are current or recent former employees of the Iowa Cooperative Extension Service.

A significant number of EXNET subscribers will have a spouse, child or parent who is a current Iowa Cooperative Extension Service employee.

A significant number of EXNET subscribers will be current county,

area, or state Iowa Cooperative Extension Service committee members

Statistical Analysis

Data collected with the questionnaire were analyzed using SPSS-PC.

Several of the hypotheses will be tested by comparing the EXNET subscribers with a random sample of 260 Iowa farmers obtained in January, 1986. This sample is part of a five-year panel study of Iowa farmers' computer use.

These comparisons will be tested for statistical significance with a chi-square test. A difference will be considered significant when it has a probability of .05 or less.

Other hypotheses will be tested by comparing the EXNET subscribers' answers to each side of several two-part questions. In these two-part questions two or more items of the question would support the hypotheses if the respondents' answers are positive while the other two or more items would support the hypothesis if answered negatively.

These comparisons will be tested for statistical significance with a chi-square test. First, the most supported item of the two-part question was compared with the least supported item. If this test indicated possible support for the hypothesis then the most supported was compared to the second-to-least supported, then the second-most-supported was compared with the least supported item, the second-to-most supported with the second-to-least supported, and so on until all necessary comparisons were made. A difference will be considered

significant when it has a probability of .05 or less.

In those cases where neither a comparison with another sample of farmers or between respondents' answers was possible, a table of descriptive statistics is provided to reveal whether the EXNET subscribers' answers support or not support the specific hypothesis.

FINDINGS AND ANALYSIS

Presented here is an analysis and description of which innovator-characteristic generalizations EXNET subscribers match and which they don't match.

First general hypothesis

Farmers who subscribe to EXNET fit the generalized description of innovators found in the literature of adoption/diffusion research.

Socioeconomic specific hypotheses

The first specific hypotheses (SH) tested for support of the general hypothesis are the socioeconomic characteristics hypotheses.

Specific hypothesis 1 checks one of the strongest adoption/diffusion generalizations -- the positive correlation between more education and innovativeness.

SH-1 states: EXNET subscribers will have above average education.

The EXNET sample was compared to the random Iowa sample of farmers giving the results described in Table 5. Table 5 has no-answer responses deleted.

The EXNET sample has a significantly higher education level than the random sample of Iowa farmers. Specific hypothesis 1 supports the general hypothesis that EXNET subscribers match the description of innovators found in the literature.

Table 5. EXNET subscribers' education compared to the random Iowa sample's education

	Less than a college graduate		College graduate		Total		
	N	%	N	%	N	%	
EXNET sample	13	38.2	18	52.9	31	100	
Random Iowa sample	173	66.5	85	32.6	258	100	
		$\chi^2 = 7.61$		$p < .05$			

The second specific hypothesis could also be tested by comparison with the random sample. And again the comparison supports the specific hypothesis.

SH-2 states: EXNET subscribers will have above average farm income.

EXNET farmers have significantly greater incomes than the more representative group of Iowa farmers. EXNET subscribers match the generalization that innovators usually have higher incomes as follows.

Table 6 has no-answer responses deleted.

The results of testing the second specific hypothesis are what were expected if the general hypothesis is to be supported. EXNET subscribers have significantly greater farm income than a more random sample of farmers.

Table 6. EXNET subscribers' farm income compared to the random Iowa sample's farm income

	Less than \$100,000 farm income		\$100,000 farm income or more		Total		
	N	%	N	%	N	%	
EXNET sample	11	32.4	15	44.1	26	100	
Random Iowa sample	157	60.3	80	30.7	237	100	
		X ² = 5.82		p < .05			

The next specific hypothesis examined has a different outcome. A test of the significance of the difference between the size of EXNET subscribers' farms and the larger, more random, group of Iowa farmers finds none.

SH-3 states: EXNET subscribers will have larger farms than Iowa farmers and larger farms than most subsets of Iowa farmers such as the farmers in the random Iowa sample. Tables 7 and 8 present comparisons of farm ownership in Table 7 and farmland rental in Table 8.

Tables 7 and 8 have no-answer responses deleted.

The characteristic of innovators having larger farms is supported by the results of many studies. But the comparison between EXNET using farmers and a more general group of farmers finds no difference. Perhaps the amount of variation in farm size among full-time,

commercial farmers (which probably describes most of the farmers in both the EXNET and random Iowa studies) is not as great as it once was.

Table 7. EXNET subscribers' farm ownership compared to random Iowa sample's farm ownership

	160 acres owned or less		More than 160 acres owned		Total		
	N	%	N	%	N	%	
EXNET sample	17	50.0	17	50.0	34	100	
Farm Computer sample	143	55.0	117	45.0	260	100	
		$\chi^2 = .303$		$p > .05$			

Table 8. EXNET subscribers' farm rental compared to random Iowa sample's farm rental

	160 acres rented or less		More than 160 acres rented		Total		
	N	%	N	%	N	%	
EXNET sample	16	47.1	18	52.9	34	100	
Random Iowa sample	127	48.8	133	51.2	260	100	
		$\chi^2 = .009$		$p > .05$			

Perhaps farm size varies with amount of off-farm employment while Iowa commercial farms concentrate on corn and soybean production on farms of 450 to 1500 acres.

The results for the third specific hypothesis do not support the general hypothesis. No significant difference exists in either half of this two-part question between the EXNET sample and the random sample of Iowa farmers.

The discussion of the next specific hypothesis refers to Table 9. Table 9 describes EXNET subscribers' answers to four questions about the economic motivations that guide their farm business practices. According to the adoption/diffusion literature EXNET subscribers should be very profit motivated and less thrift and cooperation motivated.

SH-4 states: EXNET subscribers will have economic goals and attitudes about farming that value growth, profit, and competitiveness ahead of family inheritance, thrift, and cooperation.

The first two questions on Table 9 are the profit and growth oriented questions. The EXNET subscribers were asked to rate the goal of being the most up-to-date farmer it is possible to be, and the goal of being profitable and increasing net worth. This survey finds EXNET subscribers are very profit and net worth oriented (91.2 percent rated it very important or important). Considerably fewer place a high value on always being the most up to date farmer (70.5 percent rated it very important or important).

The more traditional farm economic goals did not do as well as was

predicted by the bulk of the literature reviewed. But note that more than 67 percent said cooperating with and being well-liked by neighbors rated very important or important. The other traditional goal question asked the EXNET subscribers to rate the importance of helping one's children carry on the farm operation (inheritance).

A chi-square test of the significance of the difference between the most supported goal, profit and net worth, and the least supported, inheritance, found the value to be 28.04 which is more than the 15.99 needed with 2 degrees of freedom and $p = < .05$. The EXNET subscribers support for profit and net worth orientation was also significantly different than the 67 percent support for cooperation and helping neighbors. However, being up-to-date was not significantly different than either of the traditionalist economic orientation questions. These tests were made on a collapsed table with no-answer responses deleted.

These mixed results strongly suggest that the questions about being up-to-date and being well liked by neighbors failed as valid measures of economic orientation as discussed in the adoption/diffusion literature.

Because of mixed results this study cannot say the general hypothesis is supported.

The results used to analyze specific hypothesis number five are entered in Table 10 on a separate page. This table, like Table 9, has four questions, two on one side of the issue and two on the other. The

Table 9. Responses to economic orientation questions

	VERY IMPORTANT 4		IMPORTANT 3		NOT VERY IMPORTANT 2		NOT AT ALL IMPORTANT 1		NO ANSWER 0		MEAN
	N	%	N	%	N	%	N	%	N	%	
1. To be more profitable and increase my net worth	21	61.8	10	29.4	0	0	0	0	3	8.8	3.7
2. To be the most up-to-date farmer it is possible to be.	6	17.6	18	52.9	5	14.7	1	2.9	4	11.8	3.0

3. To be well liked by the farmers in my neighborhood	3	8.8	20	58.8	7	20.6	1	2.9	3	8.8	2.8
4. To do a good job of helping my children carry on the farm.	2	5.9	16	47.1	10	29.4	1	2.9	5	14.7	2.7
<p>1. compared to 4. $X^2 = 28.04$ $p < .05$</p> <p>1. compared to 3. $X^2 = 20.33$ $p < .05$</p> <p>2. compared to 3. $X^2 = 2.05$ $p > .05$</p> <p>2. compared to 4. $X^2 = 3.57$ $p > .05$</p>											

first two questions are where agreement is expected if EXNET subscribers are to match the generalizations about innovators' economic and business attitudes and methods. The second two questions are where agreement is expected from more traditionalist and cautious farmers, not innovators.

SH-5 states: EXNET subscribers' attitudes about credit should find them more in favor of using it than in avoiding use of credit.

The results are much flatter than for most of the other items studied. But this is not surprising in light of the drastic credit crisis in agriculture in recent years. All farmers have had to rethink their use of credit. It could well be that this change is reflected in the substantial support for the more cautious credit practices (44.1 and 32.4 percent agree or strongly agree with the two statements on cautious use of credit.

A chi-square test was performed to compare the most supported attitude, using credit is necessary, with the least supported, farmers who borrow become too dependent. A value of 9.39 when 5.99 is enough for significance indicates a favorable attitude toward credit. But this is the weakest support among the comparisons in two-part questions. Furthermore, the chi square tests of the differences between the other questions gives mixed results. Support for, using credit is necessary, is also significantly different than the support for, credit causes farmers to fail. But support for, the size of debt is unimportant, was not significantly different than either of the

questions unfavorable towards use of credit side.

The generalization about innovators stated in specific hypothesis six can be checked with a comparison with the random Iowa sample of farmers.

SH-6 states: EXNET subscribers are engaged in fewer total farm enterprises than other groups of farmers and therefore depend on fewer enterprises for farm income.

A frequently listed characteristic of innovators is that they have more specialized farms than the general population where diffusion is occurring. But the results of this comparison do not support the hypothesis. EXNET farmers do not have more specialized farms than the random Iowa sample.

Communication behavior specific hypotheses

The specific hypotheses that follow examine the EXNET subscribers' use of the media and interpersonal communications. Past research has found strong links between the amount and kind of communication behavior and innovativeness. The adoption process begins with some kind of communication helping make the potential adopter aware of the innovation.

The first of these specific hypotheses checks EXNET subscribers' activity in organizations against the standard of the random Iowa sample.

SH-7 states: EXNET subscribers have high rates of organizational participation compared to other groups of Iowa farmers.

Table 11. EXNET subscribers' farm specialization score compared to the random Iowa sample's farm specialization score

	3 enterprises or less		4 or more enterprises		Total		
	N	%	N	%	N	%	
EXNET sample	15	44.1	19	55.9	34	100	
Random Iowa sample	110	48.8	133	51.2	243	100	
		$\chi^2 = .040$		$p > .05$			

This specific hypothesis was checked in two parts. A significantly different number of the EXNET subscribers said they were officers in organizations than did the farmers in the random Iowa sample.

Table 12. EXNET subscribers' organizational participation as officers compared to the random Iowa sample's organizational participation as officers

	Officer in one or no organization		Officer in two or more organizations		Total		
	N	%	N	%	N	%	
EXNET sample	31	91.2	3	8.8	34	100	
Random Iowa sample	254	97.7	6	2.3	260	100	
		$\chi^2 = 4.30$		$p < .05$			

However, the number who are members of organizations was not significantly different than the other Iowa farmers.

Table 13. EXNET subscribers' organizational participation compared to the random Iowa sample's organizational participation

	Member in one or no organization		Member in two or more organizations		Total	
	N	%	N	%	N	%
EXNET sample	16	47.1	18	52.9	34	100
Random Iowa sample	117	45.0	143	55.0	260	100
	$\chi^2 = .051$		$p > .05$			

The different results on the two parts of the test of specific hypothesis seven are somewhat contradictory. The tests of this specific hypothesis do not support the general hypothesis.

Specific hypothesis eight asks for a check of a single, simple fact as a measure of the EXNET subscribers' cosmopolitan orientation. This characteristic has a tradition in adoption/diffusion research that goes back to Ryan and Gross's original work. Table 14 contains the results of this question on number of visits to cities EXNET subscribers make.

SH-8 states: EXNET subscribers are frequent urban area visitors.

Thirty-five percent say they make more than two trips per month.

When those who make one or more trips in most months are included, 64.7 percent of the EXNET population is accounted for. The large number of urban connections for EXNET subscribers supports the hypothesis.

Another important correlation between innovativeness and communication behavior is change agent contacts. This has been shown many times to be a positive correlation although some studies have found the earliest innovators often bypass the usual local change agents like the county extension agent. In this study the subjects were asked to report the quantity of local and non-local change agent contacts. A score was also calculated for the random Iowa sample, the figures compared and a chi square calculated.

SH-9 states: EXNET subscribers will have a greater than usual number of change agent contacts either in field offices, in universities and business headquarters or both.

The results support the general hypothesis that EXNET subscribers are like other innovators. They have many more change agent contacts.

It has usually been found in previous studies that innovators use more media than most others in a population. Two kinds of media use scores were calculated to examine specific hypothesis ten. General media use was compared first in Table 16, using answers about frequency of use of farm magazines, specialized farm magazines, farm magazines provided free by agricultural businesses, publications from farm organizations, Extension bulletins and newsletters, information from farm management services, agricultural programs on television, farm

Table 14. Cosmopolite orientation as tested by number of urban visits per year

	25 or MORE	10 to 24	5 to 9	2 to 4	1 or LESS	NO ANSWER	MEAN
	5	4	3	2	1	0	
	N %	N %	N %	N %	N %	N %	
How many visits to the listed ^a Iowa cities do you make per year.	12 35.3	10 29.4	3 8.8	2 5.9	2 5.9	5 14.7	3.6

^aDes Moines, Burlington, Davenport, Clinton, Dubuque, Mason City, Spencer, Sioux City, Council Bluffs (Omaha), Cedar Rapids, Iowa City, and Ames.

radio, newspapers, and other computer networks. For the other media use score, Table 17, only the answers to what were identified as specialized media: specialized farm magazines, Extension bulletins and newsletters, information from farm management services, and other computer networks were included.

Table 15 has no-answer responses deleted.

Table 15. EXNET subscribers' score for change agents contacts compared to the random Iowa sample's change agent contact score

	LOW 4 times or less per year		HIGH 5 or more times per year		Total	
	N	%	N	%	N	%
EXNET sample	17	56.7	13	43.3	30	100
Random Iowa sample	254	99.2	2	.8	256	100
	$\chi^2 = 97.8$		$p < .05$			

Media use scores were calculated by adding the respondents answers to each media use question where 0 equaled light use and 3 equaled heavy use. The resulting maximum possible score is 30 for Table 16 and 12 for Table 17.

The first part of SH-10 states: EXNET subscribers will use more kinds of mass media, more frequently.

Table 16 has no-answer responses deleted.

Table 16. EXNET subscribers' general media use score compared to the random Iowa sample's general media use score

	LIGHT Score of 15 or less		HEAVY Score of 16 or more		Total		
	N	%	N	%	N	%	
EXNET sample	13	44.8	16	55.2	29	100	
Random Iowa sample	194	79.5	50	20.5	244	100	
		$X^2 = 17.01$		$p < .05$			

The second part of SH-10 states: EXNET subscribers will be more frequent users of specialized sources of information than other Iowa farmers.

Table 17 has no-answer responses deleted.

Table 17. EXNET subscribers' specialized media use score compared to the random Iowa sample's specialized media use score

	LIGHT Score of 3 or less		HEAVY Score of 4 or more		Total		
	N	%	N	%	N	%	
EXNET sample	17	50.0	17	50.0	34	100	
Random Iowa sample	141	52.4	128	47.6	269	100	
		$X^2 = .429$		$p > .05$			

The general hypothesis is supported by the results in the first part of specific hypothesis ten but not the second part. The number of specialized media used by EXNET subscribers is not significantly different.

Mixed results require the conclusion that the general hypothesis is not supported by the test of this specific hypothesis.

To test specific hypothesis eleven a score was calculated from several questions about face to face talks, telephone calls, and letters to and from people outside the subject's immediate community and family.

SH-11 states: EXNET subscribers have more interpersonal information sources beyond their local area than other farmers.

Table 18 has no-answer responses deleted.

Table 18. EXNET subscribers' use of interpersonal information sources outside their local area compared to the random Iowa sample's use of such sources

	LOW Score of 6 or less		HIGH Score of 7 or more		Total	
	N	%	N	%	N	%
EXNET sample	19	65.5	10	34.5	29	100
Random Iowa sample	237	93.7	16	6.3	253	100
	$\chi^2 = 24.65$		$p < .05$			

Table 19. Innovation-seeking media use by EXNET subscribers

	VERY OFTEN 4	OFTEN 3	SOMETIMES 2	NEVER 1	NO ANSWER 0	MEAN
	N %	N %	N %	N %	N %	
Farm newspapers and magazines	20 58.8	7 20.6	3 8.8	0 0	4 11.8	4.0
Private information and management services	10 29.4	6 17.6	8 23.5	6 17.6	4 11.8	2.7
Science magazines and other nonfarm publications	3 8.8	5 14.7	15 44.1	7 20.6	4 11.8	2.1
Visits, calls, and letters to other people	9 26.5	15 44.1	6 17.6	0 0	4 11.8	3.1

Results show the EXNET sample has significantly more interpersonal contacts away from the nearby community. This finding supports the general hypothesis that EXNET subscribers match the description of innovators found in the literature.

The next communication behavior specific hypothesis does not have a comparison population available. The results gathered for specific hypothesis twelve are in Table 19.

SH-12 states: EXNET subscribers will report that they specifically seek information on innovations.

These results will be used to see if EXNET subscribers use more and different media to learn specifically about innovations (new things and new ideas). The EXNET subscribers were asked to rate how often they use farm magazines and newspapers; information from farm management services; science magazines; and contacts with other farmers, Extension workers, salesman, researchers, suppliers, and dealers.

The results indicate EXNET subscribers do use many media frequently to learn about innovations. More than 79 percent use farm publications to learn about innovations. Even the least-used type of information source, science magazines, is read at least sometimes by 44 percent.

Personality traits specific hypotheses

Table 20 contains results gathered to examine specific hypothesis thirteen. Like the preceding table, these results are simply

Table 20. Responses to attitude toward new farm practices questions

	STRONGLY AGREE 5	AGREE 4	NEUTRAL 3	DISAGREE 2	STRONGLY DISAGREE 1	NO ANSWER 0	MEAN
	N %	N %	N %	N %	N %	N %	
No-till farming	14 41.6	9 26.5	7 20.6	1 2.9	0 0	3 8.88	3.1
Integrated Pest Management	10 29.4	14 41.2	6 17.6	0 0	1 2.9	3 8.8	4.0
Radial tractor tires	3 8.8	17 50.0	7 20.6	2 5.9	1 2.9	4 11.8	3.6
Computers and farm software	15 44.1	10 29.4	2 5.9	4 11.8	0 0	3 8.8	4.1
Organic farming and regenerative agriculture	3 8.8	10 29.4	13 38.2	4 11.8	1 2.9	3 8.8	3.3
Genetic engineering and biotechnology	14 41.2	13 38.2	4 11.8	0 0	0 0	3 8.8	4.3

descriptive. No comparison group was available.

SH-13 states: EXNET subscribers will have favorable attitudes toward most new farm practices.

Subjects were asked to rate their agreement with six new farm practices. The six were: no-till farming, integrated pest management, radial tractor tires, farm computers, organic farming, and genetic engineering.

For example, subjects were asked to rate their agreement with this statement: no-till farming is often a better way to farm that reduces soil erosion and reduces fuel use.

The EXNET sample appeared to like no till farming, computers and genetic engineering. The more controversial innovation of organic farming was least well-liked but was agreed with by 38.3 percent.

The EXNET subscribers' strong agreement that the listed new farm practices are beneficial supports the general hypothesis that EXNET subscribers match the usual description of innovators.

The adoption/diffusion literature often identifies innovators with a greater willingness to accept risk. To check this trait in the EXNET sample four questions were asked: two oriented toward accepting risk and two toward avoiding risk.

SH-14 states: EXNET subscribers will report that they are not afraid of risk and accept risks in order to succeed and be profitable.

A chi-square calculation of the difference between the most supported statement favoring risk, risk is necessary, and the question

Table 21. Responses to attitude toward risk questions

	STRONGLY AGREE 5	AGREE 4	NEUTRAL 3	DISAGREE 2	STRONGLY DISAGREE 1	NO ANSWER 0	MEAN
	N %	N %	N %	N %	N %	N %	
1. Risk is necessary	7 20.6	19 55.9	2 5.9	2 5.9	0 0	4 11.8	4.0
2. Farmers must take risks	1 2.9	19 55.9	6 17.6	3 8.8	1 2.9	4 11.8	3.5
3. Farming is too risky already	1 2.9	10 29.4	4 11.8	12 35.3	2 5.9	5 14.7	2.9
4. Some farmers have trouble with schemes and deals	4 11.8	8 23.5	3 8.8	12 35.3	3 8.8	4 11.8	2.9
				1. compared to 4. $\chi^2 = 14.24$			$p < .05$
				1. compared to 3. $\chi^2 = 7.96$			$p < .05$
				2. compared to 3. $\chi^2 = 5.06$			$p > .05$
				2. compared to 4. $\chi^2 = 8.57$			$p < .05$

that most supports avoiding risk, some farmers have trouble with schemes and deals, found significantly more support for accepting some risk. Chi-square equaled 14.2 which is more than the 5.99 needed with 2 degrees of freedom. The other three chi-square tests found a significant difference in two of the three. These tests were done on a collapsed table with no-answer responses deleted. A significant difference three out of four times supports the general hypothesis.

Table 21 contains the results for specific hypothesis 14.

Innovators have long been recognized as favoring science in several studies. In one of the strongest cases in this study EXNET subscribers strongly supported science and scientists.

SH-15 states: EXNET subscribers will have positive attitudes towards scientific innovations other than EXNET.

The chi-square calculation of the difference between the most-supported opinion, science makes peoples lives better, and the least-supported opinion, scientists don't work on things that matter, indicates a significantly favorable attitude toward science and scientists. Chi-square equaled 54.0 which is more than the 5.99 needed with 2 degrees of freedom. The other three tests for significant difference all found signifigance. The general hypothesis is strongly supported. The test was done on a collapsed table with no-answer responses deleted.

Table 22 lists the frequencies and percentages for specific hypothesis 15.

Table 22. Responses to attitude toward science questions

	STRONGLY AGREE 5	AGREE 4	NEUTRAL 3	DISAGREE 2	STRONGLY DISAGREE 1	NO ANSWER 0	MEAN
	N %	N %	N %	N %	N %	N %	
1. Science makes peoples' lives better	19 55.9	11 32.4	0 0	0 0	0 0	4 11.8	4.6
2. Scientists are usually trying to help	5 14.7	16 47.1	6 17.6	2 5.9	1 2.9	4 11.8	3.7

3. Scientists don't work on things that matter	0 0	0 0	3 8.8	19 55.9	8 23.5	4 11.8	1.8
4. Science has created dangerous, uncontrolled things	2 5.9	2 5.9	6 17.6	17 50.0	3 8.8	4 11.8	2.4
		1. compared to 3	$X^2 = 54.00$				$P < .05$
		1. compared to 4.	$X^2 = 45.88$				$P < .05$
		2. compared to 3.	$X^2 = 41.20$				$P < .05$
		2. compared to 4.	$X^2 = 24.13$				$P < .05$

Although it is not measured as frequently as some other adopter characteristics Rogers (1983) lists high socioeconomic aspirations as an innovator characteristic. This study of EXNET finds support for the following specific hypothesis.

SH-16 states: EXNET subscribers will have high success goals rather than traditionalist farming goals.

The chi-square calculation of the difference between the most-supported opinion, growth is important, and the least-supported opinion, passing the farm to the children equals success, indicates a significantly favorable attitude toward high success goals compared to traditionalist goals. Chi-square equaled 21.3 which is more than the 5.99 needed with 2 degrees of freedom.

However, the remaining eight chi-square tests deliver mixed results. Three of the eight find no significant difference. Three more find significant differences in support for high success goals. But two find being a good neighbor is significantly more supported than the high success goals. Mixed results require a finding of no support for the general hypothesis. The test was done on a collapsed table with no-answer responses deleted.

An innovator characteristic not always examined by other studies stands out sharply in this study of EXNET as another strong identification of the EXNET sample with the generalizations about innovators' characteristics.

SH-17 states: EXNET subscribers will report that they feel they

have significant abilities to control the outcome of their enterprises and achievement of their goals.

The results for SH-17 are in Table 24.

The chi-square calculation of the difference between between the most supported opinion, I determine my life, and the least supported opinion, much of my life is controlled by accidental happenings, indicates a significant rejection of fatalism. Chi-square equaled 33.55 which is more than the 5.99 needed with 2 degrees of freedom. The other three chi-square tests found a significant difference in two of the three. A significant difference three out of four times supports the general hypothesis. The test was done on a collapsed table with no-answer responses deleted.

The following results describe to what extent EXNET subscribers' perceptions of EXNET match or don't match adoption/diffusion generalizations about adopters' perceptions of innovations.

Second general hypothesis

Farmers who subscribe to EXNET perceive EXNET in the way predicted by the generalizations about adopters' perceptions of an innovation's compatibility, complexity, trialability, observability, and relative advantage.

Perceptions specific hypotheses

The first specific hypotheses (SH) about the subscribers' perceptions of EXNET as an innovation is specific hypothesis 18. SH-18 states: EXNET subscribers will report that EXNET's compatibility with their computer use and equipment and its compatibility with their

Table 23. Responses to farming goal questions

	STRONGLY AGREE 5	AGREE 4	NEUTRAL 3	DISAGREE 2	STRONGLY DISAGREE 1	NO ANSWER 0	MEAN
	N %	N %	N %	N %	N %	N %	
1. Growth is important	1 2.9	13 38.2	6 17.6	10 29.4	0 0	4 11.8	4.6
2. Profits best measure of success	5 14.7	17 50.0	3 8.8	5 14.7	0 0.0	4 11.8	3.7
3. Farming is a competitive business	3 8.8	11 32.4	9 26.5	6 17.6	1 2.9	4 11.8	3.3

information needs were significant factors in their decision to adopt.

The first two rows in Table 25 list the results gathered from two compatibility questions. One is about EXNET's compatibility with the innovator's computer system. The other is about EXNET's compatibility with the subscriber's farm operation.

On this innovation perception question the EXNET subscribers match the expectations provided by the literature. They do view EXNET as compatible.

SH-19 states: EXNET subscribers will say EXNET is not exceptionally complex for a farm innovation.

The third row in Table 25 is the results from asking EXNET users to describe if they think EXNET is or is not too complex for someone considering adopting the innovation. Although somewhat less strongly than on the compatibility questions, EXNET subscribers mostly agree that EXNET is not too complex. This supports the second general hypothesis. The literature predicts the adopters will say they adopted once they determine the innovation was not too complex.

The question of EXNET's trialability is detailed in the fourth row of Table 25. Here there is not enough agreement among EXNET subscribers to say specific hypothesis 20 is supported. Although it is predicted by the literature to be important in the adoption decision a perception of trialability was not rated highly by EXNET subscribers. The significance of this result is discussed in the conclusion of this thesis.

Table 24. Responses to questions measuring fatalism

	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	NO ANSWER	MEAN
	N	N	N	N	N	N	
	%	%	%	%	%	%	
I determine my life	5	19	3	1	2	0	3.8
	14.7	55.9	8.8	2.9	5.9	11.8	
I can protect my interests	3	24	3	0	0	4	4.0
	8.8	70.6	8.8	0	0	11.8	
My interests lose to interests of powerful groups	3	14	6	4	3	4	3.3
	8.8	41.2	17.6	11.8	8.8	11.8	
Much of my life is controlled by accidental happenings	0	2	5	14	8	4	3.0
	0	5.9	14.7	41.2	23.5	11.8	

2. compared to 4. $\chi^2 = 44.04$ $p < .05$
2. compared to 3. $\chi^2 = 10.27$ $p < .05$
1. compared to 3. $\chi^2 = 3.80$ $p > .05$
1. compared to 4. $\chi^2 = 33.55$ $p < .05$

SH-20 states: EXNET subscribers will report that trying EXNET through the guest feature influenced their decision to adopt.

The second general hypothesis that EXNET subscribers will have perceptions of EXNET that match the generalizations about innovators perceptions is not supported in the case of trialability.

In the next case of innovators' perceptions of the innovation, observability, EXNET subscribers' answers do not support the specific hypothesis.

SH-21 states: EXNET subscribers will report that observing EXNET at another farm or at an Extension meeting influenced their decision to adopt.

Only 35.3 percent of the EXNET subscribers who rated observability's importance agreed it was important in their adoption decision. Those who disagreed or were neutral totaled 44.1 percent of the subscribers who answered this question. The significance of this result is discussed in the conclusion of this thesis.

The last, but very important, perception adopters usually hold about an innovation is that it has relative advantage. The innovation with relative advantage will pay off in time saved, money saved or earned or other benefits. This survey's question about relative advantage dealt with its relative advantage as a source of information. EXNET subscribers were, as predicted, in strong agreement with this specific hypothesis. More than 60 percent of the responding EXNET subscribers agreed or strongly agreed that EXNET had advantages over

Table 25. Adopters' perceptions of EXNET's innovation characteristics

	STRONGLY AGREE		AGREE		NEUTRAL		DISAGREE		STRONGLY DISAGREE		NO ANSWER		MEAN
	N	%	N	%	N	%	N	%	N	%	N	%	
<u>Perceptions of EXNET's compatibility.</u>													
1. Compatible with computer	16	47.1	14	41.2	1	2.9	1	2.9	0	0	2	5.9	4.4
2. Compatible with farm	3	8.8	21	61.8	5	14.7	1	2.9	0	0	4	11.8	3.9
<u>Perceptions of EXNET's complexity.</u>													
3. EXNET is not too complex	6	17.6	17	50.0	4	11.8	5	14.7	0	0	2	5.9	3.8
<u>Perceptions of EXNET's trialability.</u>													
4. A trial run of EXNET helped	8	23.5	7	20.6	7	20.6	5	14.7	2	5.9	5	14.7	3.5
<u>Perceptions of EXNET's observability.</u>													
5. Seeing EXNET operate helped	2	5.9	10	29.4	5	14.7	7	20.6	3	8.8	7	20.6	3.0
<u>Perceptions of EXNET's relative advantage.</u>													
6. EXNET provides information more easily	6	17.6	15	44.1	8	23.57	2	5.9	0	0	3	8.8	3.8
N	%	N	%	N	%	N	%	N	%	N	%	N	%
5		4		3		2		1		0			
<u>STRONGLY AGREE</u>													
<u>AGREE</u>													
<u>NEUTRAL</u>													
<u>DISAGREE</u>													
<u>STRONGLY DISAGREE</u>													
<u>NO ANSWER</u>													
<u>MEAN</u>													

any other source for some kinds of information.

SH-22 states: Farmers using EXNET will report it supplies information they need more easily than other methods of obtaining the information.

Other tests of the applicability of the adoption perspective

In order to further test that the adoption perspective was the correct approach to analyzing the case of EXNET, some additional specific hypotheses, as described in the methodology chapter, were tested.

These tests helped examine the possibility that farmers who subscribe to EXNET don't fit the generalizations of adoption/diffusion research. Instead they have more social and organizational connections to the Cooperative Extension Service than other farmers.

The first of these additional specific hypotheses checks whether or not a significant number of EXNET subscribers are current or recent former employees of the Iowa Cooperative Extension Service.

NONE of the respondents answered yes to this question. ALL of the respondents who answered the question answered no. Use of the adoption perspective is supported.

The next hypothesis tests whether or not a significant number of EXNET subscribers will have a spouse, child or parent who is a current Iowa Cooperative Extension Service employee.

Only one of the respondents answered yes to this question. ALL of the other respondents who answered the question answered no. Use of

the adoption perspective is supported.

The last specific hypothesis checks whether or not a significant number of EXNET subscribers will be current county, area, or state Iowa Cooperative Extension Service committee members.

Six (6) of the respondents answered yes to this question. All of the other respondents who answered the question answered no. This result is much higher than what is expected in a random sample of farmers. The result at least keeps alive the question that EXNET subscribers have some significant organizational ties to Extension influencing their adoption of EXNET. But the immediate question is whether or not there is grounds to completely reject use of the adoption perspective. In light of the complete lack of support for this test from the other two questions, and the fact that less than a fifth of the respondents indicated past or present Extension committee membership it is not necessary to reject use of the adoption perspective.

CONCLUSIONS

This study has examined 22 specific hypotheses about the innovator characteristics of a group of farmers who were the very first to try a innovative service offered by Iowa State University and the Cooperative Extension Service. In the majority of cases in the EXNET situation, the people using EXNET match the description of innovators found in the adoption diffusion literature.

Table 26. Summary of Support, Mix Results, and Non-support Findings For Specific Hypothesis

Description of Specific Hypothesis	Supported	Mixed Results	Not supported
1. Subscribers will have above average education.	XXX		
2. Subscribers will have above average income.	XXX		
3. Subscribers will have larger farms.			XXX
4. Subscribers will value profit more than thrift.		XXX	
5. Subscribers will favor using credit.		XXX	
6. Subscribers will have specialized farms.			XXX
7. Subscribers will have high participation.		XXX	
8. Subscribers will be frequent urban visitors.	XXX		
9. Subscribers will visit change agents often.	XXX		

Table 26. (Continued)

Description of Specific Hypothesis	Supported	Mixed Results	Not supported
10. Subscribers will use more mass media.		XXX	
11. Subscribers will have sources outside their area .	XXX		
12. Subscribers will seek innovation information.	XXX		
13. Subscribers will favor farm innovations.	XXX		
14. Subscribers will accept risk.	XXX		
15. Subscribers will be favorable to science.	XXX		
16. Subscribers will have high aspirations.		XXX	
17. Subscribers will not be fatalistic.	XXX		
18. Subscribers will feel EXNET is compatible.	XXX		
19. Subscribers will feel EXNET is not too complex.	XXX		
20. Subscribers will feel EXNET is readily trialable.			XXX
21. Subscribers will feel EXNET is observable.			XXX
22. Subscribers will feel EXNET has relative advantage	XXX		

These results support the continued use of adoption/diffusion generalizations by innovation-promoting organizations like the Cooperative Extension Service. These generalizations have enough validity according to these results to be used by organizations to understand their audiences for innovations. They can continue to use the adoption/diffusion perspective as one guide in designing their communication plans.

Note that many items that provide no support or mixed results were economic in nature. This implies that some generalizations that operated during the years of growth and profits in agriculture may not be operating today. At a minimum, this group of innovators holds some contradictory attitudes about credit, economic aspirations and business goals. This study was done in a time many farmers experienced or were threatened with an involuntary end to their farm business. Plus, these forced out or threatened farmers would enter an off-farm economy that had fewer and lower-paying new careers.

The times may have made it innovative to hold values and practice methods once considered old-fashioned and miserly.

These results indicate the diffusion process is working with EXNET in the expected way. But when the literature on videotex and network adoptions is reviewed, the halting, slow diffusion found there calls for caution. Familiar adoption processes may be operating with EXNET but some time has passed with no growth in EXNET's public subscriber list.

A repeated theme in the existing literature on videotex and

computer-network technology adoption is that the technologies are not operating in an environment where they can grow and find profits or good cost-to-benefit ratios. The literature suggests these technologies will stay in the hands of enthusiast innovators until the day arrives when equipment, software, communication, and social changes create an environment where such services are needed, demanded, and can grow.

The results of this study, were the sample strongly matches the expected description of the earliest 2.5 percent to try an innovation, lends further support to this theme in the literature. Anyone promoting any of these technologies should be cautious. The innovators may appear as expected, but many other conditions, the diffusion of personal computers, high fidelity phone lines, and thorough training in computers, are not right for successful diffusion.

My recommendation to the Extension Service is to preserve EXNET as a trial and testing area. Experiment with varied features and help families and businesses sign on during the trial of services they can use. Stay ready for the day when the proper mix of conditions will make EXNET or its successor(s) something in demand, not something that would raise false expectations and create public relations problems if it was ever promoted and oversold before conditions are correct.

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APPENDIX A. QUESTIONNAIRE

Who Uses EXNET 1986 Survey



The purpose of this survey is to determine whether or not farmers who subscribe to EXNET have similar attitudes, opinions, and characteristics to other farmers who have tried a new method, tool or service and to give EXNET subscribers a chance to comment on the quality of the service they receive from EXNET.

Conducted by
The Department of Journalism and Mass Communication
Iowa State University
Ames, Iowa 50011

First we will give you an opportunity to tell us why you decided to try EXNET and comment on the quality of the service you've received from EXNET.

1. Farmers may have a wide variety of reasons why they decide to give the new service called EXNET a try. Listed below are some considerations that might have gone into your decision to subscribe to EXNET. Please tell us how much you agree or disagree with each reason for trying EXNET.

HOW STRONGLY DO YOU AGREE OR DISAGREE?
(Please circle your answer.)

- a. EXNET was easy to add to the computer system I am already using. It adds another use for my computer.....

	STRONGLY					STRONGLY
	AGREE	AGREE	NEUTRAL	DISAGREE	DISAGREE	DISAGREE
- b. EXNET provides information that is really important in properly managing my farm operation.....

	STRONGLY					STRONGLY
	AGREE	AGREE	NEUTRAL	DISAGREE	DISAGREE	DISAGREE
- c. EXNET is not too difficult to learn how to use compared to its value to me.....

	STRONGLY					STRONGLY
	AGREE	AGREE	NEUTRAL	DISAGREE	DISAGREE	DISAGREE
- d. A trial run on EXNET's guest account feature was important in my decision to subscribe to EXNET.....

	STRONGLY					STRONGLY
	AGREE	AGREE	NEUTRAL	DISAGREE	DISAGREE	DISAGREE
- e. A chance to see how EXNET operated and what it contained (at another farm, Extension meeting, computer user group, etc.) was important in my decision.....

	STRONGLY					STRONGLY
	AGREE	AGREE	NEUTRAL	DISAGREE	DISAGREE	DISAGREE
- f. EXNET's ability to provide needed information with less total trouble and expense than other methods was important in my decision.....

	STRONGLY					STRONGLY
	AGREE	AGREE	NEUTRAL	DISAGREE	DISAGREE	DISAGREE

2. What EXNET service did you expect to use most often when you decided to subscribe to EXNET?

- (Please circle one number.) (Please circle your current favorite below.)
- | | | |
|---|-----|-------|
| 1. Current farm commodity market news. | 1 | |
| 2. Current agricultural weather reports. | 2. | |
| 3. Current crop condition report. | 3. | |
| 4. Current integrated pest management reports. | 4. | |
| 5. Other management information from ISU Extension. | 5. | |
| 6. "Answerback" pest management advice. | 6. | |
| 7. Continuing education information. | 7. | |
| 8. ISU publications list. | 8. | |
| 9. Newsletters. | 9. | |
| 10. Electronic mail. | 10. | |
| 11. Other (please describe) _____ | 11. | _____ |

Farmers, you can help us learn why farmers accept or reject a new tool, method, or service like EXNET by answering the following questions about opinions and attitudes that may or may not have affected your decision to try EXNET.

11. Listed below are several farm practices which--like EXNET--have been introduced in recent years or might move from labs or experiment stations to the farm in the near future. Please tell us how much you agree or disagree that the item is a worthwhile new farming practice.

HOW STRONGLY DO YOU AGREE OR DISAGREE
THE FOLLOWING ARE WORTHWHILE NEW PRACTICES
(Please circle your answers.)

- | | | | | | |
|--|-------------------|-------|---------|----------|----------------------|
| a. No-till farming is often a better way to farm that reduces soil erosion and reduces fuel use..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| b. Integrated Pest Management (IPM) is a good way to save unnecessary applications of pesticides..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| c. Radial tractor tires cost more but have given worthwhile improvements in traction and fuel use..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| d. Computers and farm management software are valuable on most farms and help farmers be better farmers..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| e. Organic farming or regenerative agriculture has advantages such as a healthier environment and reduced costs..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| f. Genetic engineering and biotechnology will give farmers many improved crops and animals..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |

12. How important, to you personally, are the following farm business goals?

HOW IMPORTANT TO YOU IS EACH GOAL?
(Please circle your answers.)

- | | | | | |
|---|-------------------|-----------|-----------------------|-------------------------|
| a. To be the most up to date farmer it's possible to be..... | VERY
IMPORTANT | IMPORTANT | NOT VERY
IMPORTANT | NOT AT ALL
IMPORTANT |
| b. To be well liked by the farmers in my neighborhood..... | VERY
IMPORTANT | IMPORTANT | NOT VERY
IMPORTANT | NOT AT ALL
IMPORTANT |
| c. To do a good job of helping my children carry on the farm operation..... | VERY
IMPORTANT | IMPORTANT | NOT VERY
IMPORTANT | NOT AT ALL
IMPORTANT |
| d. To be more profitable and increase my net worth..... | VERY
IMPORTANT | IMPORTANT | NOT VERY
IMPORTANT | NOT AT ALL
IMPORTANT |

13. Below are several opinions EXNET using farmers may agree or disagree with. Please indicate how much you agree or disagree with each statement.

HOW STRONGLY DO YOU AGREE OR DISAGREE?
(Please circle your answers.)

- | | | | | | |
|--|-------------------|-------|---------|----------|----------------------|
| a. People like myself have very little chance of protecting our personal interests when they are in conflict with those of strong interest groups..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| b. It's foolish to take unnecessary risks when farming because farming is very risky without gambling on something new..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| c. To a great extent my life is controlled by accidental happenings..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| d. Risk is a necessary part of any business, and it's necessary to take risks to be successful and profitable..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| e. I can pretty much determine what happens in my life..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| f. Many farmers get in trouble because they take too many chances and get involved in too many schemes and deals..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| g. I am usually able to protect my personal interests..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| h. Today farmers must risk trying new things if they want to stay profitable and competitive..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |

14. Listed below are some statements about science and scientists that users of EXNET may agree or disagree with. Please indicate to what extent you agree or disagree with each statement.

HOW STRONGLY DO YOU AGREE OR DISAGREE?
(Please circle your answers.)

- | | | | | | |
|--|-------------------|-------|---------|----------|----------------------|
| a. Science has developed many things that have made people better off and made their lives easier and more productive..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| b. Scientists are only interested in exotic things and usually don't study what matters to most people... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| c. Science has opened the door to many dangerous and uncontrolled things and we would be off if scientists were more cautious..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| d. Scientists usually have helping people as an important goal of their research..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |

15. One of the reasons some farmers use a variety of information sources is to learn all they can about new tools, new machines, new methods, and new ideas like EXNET.

HOW OFTEN DO YOU SPECIFICALLY SEEK OUT INFORMATION ON NEW THINGS AND NEW IDEAS FROM THE FOLLOWING SOURCES OF INFORMATION?
(Please circle your answers.)

- | | | | | |
|--|------------|-------|-----------|-------|
| a. Farm magazines and newspapers (such as Farm Show, Farm Industry News, the Des Moines Sunday Register's Farm and Business section, Iowa Farmer Today, Wallaces Farmer, Farm Journal, the Furrow, Farm Bureau Spokesman, Successful Farming, etc.)..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| b. Private information and management services (such as Doane's and Pro Farmer)..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| c. Other magazines (such as Popular Science, Discover, Science86, Scientific American, Omni, etc.)..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| d. Visits, calls, or letters to other farmers, Extension employees, salesmen, researchers, suppliers, and dealers..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |

16. Now that we have some idea where you look for information on what's NEW we would like to know what sources of general farm information you use in addition to EXNET. Below is a list of information sources that you may use for information about farming practices, management, weather, and marketing. Please indicate how frequently you use each source to obtain information that helps you do a better job of farming.

HOW OFTEN DO YOU USE THIS SOURCE TO
OBTAIN HELPFUL INFORMATION ABOUT FARMING?
(Please circle your answers.)

- | | | | | |
|--|------------|-------|-----------|-------|
| a. General farm magazines (such as Wallace Farmer, Farm Journal, Successful Farming, etc.)..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| b. Specialized farm magazines (such as Feed Stuffs, Hog Farm Management, Crops and Soils, etc.)..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| c. Dealers' magazines (such as the Furrow, Ford Farming, Farm Profit, etc.)..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| d. Farm organization publications (such as Farm Bureau Spokesman, MFO Reporter, Farmer's Union etc.)..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| e. University Extension Bulletins and newsletters..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| f. Private information and management services (such as Doane's and Pro Farmer)... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| g. Television programs about farming..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| h. Radio programs about farming..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| i. Newspapers..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |
| j. Computer services networks other than EXNET (such as The Source, Agri-Data Network, or Instant Update)..... | VERY OFTEN | OFTEN | SOMETIMES | NEVER |

17. To help us understand what source or sources of information were important in your decision to subscribe to EXNET please tell us how much you agree or disagree with the following statements.

HOW STRONGLY DO YOU AGREE OR DISAGREE?
(Please circle your answers.)

- | | | | | | |
|--|-------------------|-------|---------|----------|----------------------|
| a. Reading about EXNET in an Extension brochure made me want to subscribe to EXNET..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| b. I used the free guest account and liked EXNET enough to pay for a subscription..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| c. I decided to subscribe after reading a story or farm-computer-column-review about EXNET in a newspaper or magazine..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| d. After talking to another farmer about EXNET I wanted to subscribe..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| e. After talking to another computer user who is not a farmer I wanted to subscribe..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| f. A talk about EXNET with an Extension agent made me decide to subscribe..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |

18. Another source of information about farming practices and things like EXNET is face to face talks, telephone talks, and mailed letters and memos with other farmers and people who know things that can help farmers but who aren't farmers themselves. In an average year about how many times do you use one of these methods to talk to the following types of people?

TIMES EACH YEAR YOU TALK FACE TO FACE, PHONE, OR WRITE TO THE FOLLOWING PEOPLE ABOUT FARMING?

(Please circle your answers.)

a. Farmers who live outside your county.....	15 OR MORE	7 to 14 TIMES	3 to 6 TIMES	1 to 2 TIMES	ALMOST NEVER
b. Farmers who live in your county.....	15 OR MORE	7 to 14 TIMES	3 to 6 TIMES	1 to 2 TIMES	ALMOST NEVER
c. Farmers who live close to you in the neighborhood where you live.....	15 OR MORE	7 to 14 TIMES	3 to 6 TIMES	1 to 2 TIMES	ALMOST NEVER
d. Extension personnel in your county.....	15 OR MORE	7 to 14 TIMES	3 to 6 TIMES	1 to 2 TIMES	ALMOST NEVER
e. Extension personnel outside your county.....	15 OR MORE	7 to 14 TIMES	3 to 6 TIMES	1 to 2 TIMES	ALMOST NEVER
f. Farm equipment or supply dealers, elevator personnel, salesmen or buyers....	15 OR MORE	7 to 14 TIMES	3 to 6 TIMES	1 to 2 TIMES	ALMOST NEVER
g. Professionals such as farm management consultants, veterinarians, or bankers....	15 OR MORE	7 to 14 TIMES	3 to 6 TIMES	1 to 2 TIMES	ALMOST NEVER
h. Researchers at a university or in a private business.....	15 OR MORE	7 to 14 TIMES	3 to 6 TIMES	1 to 2 TIMES	ALMOST NEVER

19. How often do you travel to any of the following Iowa cities: Des Moines, Ames, Cedar Rapids, Waterloo/Cedar Falls, Dubuque, Mason City, Spencer, Sioux City, Council Bluffs(Omaha), Ottumwa, Burlington, Iowa City? (Please circle one answer)

- | | |
|--------------------------------|----------------------------|
| 1. 1 time per year or less | 2. 2 to 4 times each year |
| 3. 5 to 10 times each year | 4. 11 to 25 times per year |
| 5. more than 25 times per year | |

20. Below are several opinions about farm business practices with which some farmers agree and others disagree. These opinions may or may not have an effect on a farmer's decision to subscribe to EXNET. Please indicate to what extent you agree or disagree with each statement.

HOW STRONGLY DO YOU AGREE OR DISAGREE?

(Please circle your answers.)

- | | | | | | |
|--|-------------------|-------|---------|----------|----------------------|
| a. Using credit is not only necessary, but is a smart way to improve and expand your farm business..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| b. The size of a farmer's debt is not important, only the farm business's ability to pay the debt is important..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| c. Use of credit is the chief cause of farmers failing, so good farmers use no more credit than absolutely necessary..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| d. Use of credit leads to farmers becoming too dependent on their lenders, and the lenders end up telling the farmer what to do..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| e. Farmers must make their farm businesses grow and expand if they are to survive and prosper..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| f. The most important measure of farmers' success is whether or not they have profitable farm businesses..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| g. Farming is a very competitive business and it's good for each farmer to compete for land, capital, and profits... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| h. The best measure of farmers' success is whether or not they continue their families' farms and pass the operation on to their children..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| i. Truly successful farmers are those who care for their farms and families without spending a lot of money or using a lot of resources..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |
| j. Being a good neighbor to other farmers and taking time to help other farmers is just as important as any other farming goal..... | STRONGLY
AGREE | AGREE | NEUTRAL | DISAGREE | STRONGLY
DISAGREE |

21. Within the past two years have you been, or are you now, a member or an officer of any of the following types of organizations?

(Please circle ALL that apply)

- a. Farm or commodity organization such as
Iowa Corn Growers or Farm Bureau.....MEMBER OFFICER
- b. Civic or service group such as
JC's, Rotary or Lions.....MEMBER OFFICER
- c. Farm cooperative.....MEMBER OFFICER
- d. Are you active in a computer users group
or another organization with a primary
objective of discussing or learning about
computers?.....MEMBER OFFICER

Finally, we need to know a little about you and your farm operation. This information will help determine what kinds of farmers are trying EXNET.

22. Approximately how many of each of the following types of livestock did you sell in 1985?

Fed cattle.. ___ head sold Market hogs.. ___ head sold Feeder pigs.. ___ head sold

23. Approximately how many of each of following types of livestock did you have in your herd during 1985?

Dairy cows.. ___ head in herd Beef cows.. ___ head in herd Sows.. ___ head in herd

24. Did you use a formalized record keeping system for your 1985 farm financial information? (This might have been a record book, such as Iowa State's Better Farm Accounting, or a service such as PCA's "AGRIFAX" OR Iowa Farm Bureau's Farm Record Service.)

- 1. No
- 2. Yes----- Who kept those records? (Please circle all that apply.)
 - 1. I did
 - 2. Spouse did
 - 3. Other family member
 - 4. Professional
 - 5. Other (Please describe.) _____

25. How important are the following reasons for keeping farm records?

HOW IMPORTANT IS EACH REASON FOR KEEPING RECORDS?
(Please circle your answers.)

	VERY	IMPORTANT	NOT VERY	NOT AT ALL
a. To apply for loans.....	VERY	IMPORTANT	NOT VERY	NOT AT ALL
b. To do my taxes.....	VERY	IMPORTANT	NOT VERY	NOT AT ALL
c. To keep track of production costs....	VERY	IMPORTANT	NOT VERY	NOT AT ALL
d. To make decisions about production...	VERY	IMPORTANT	NOT VERY	NOT AT ALL
e. To know when to market.....	VERY	IMPORTANT	NOT VERY	NOT AT ALL

26. How frequently do you make, or have made for you, a cash flow analysis for your farm operation? (Please circle one answer.)

- 1. Never
- 2. Less than once each year
- 3. At least once each year
- 4. 2 to 4 times each year
- 5. More than 4 times each year

27. How often do you make forward contracts? (Forward contracting is when you agree to sell a commodity ahead of time, but don't take the risk that you would on the futures market.) (Please circle one please.)

- 0. Never
- 1. Occasionally
- 2. Often
- 3. Very often

28. How often do you use hedging? (Hedging involves making multiple transactions on the futures market so as to minimize your risks.) (Please circle one answer.)

- 0. Never
- 1. Occasionally
- 2. Often
- 3. Very often

29. Do you practice enterprise accounting? That is, do you maintain separate records on different farm operations? Such records might include a swine enterprise record book, a beef feedlot record book, or records on specific crops such as corn or soybeans.

- 1. No
- 2. Yes----- I keep enterprise records on:

(Circle the numbers of ALL that apply.)

- 1. beef
- 2. dairy
- 3. swine
- 4. corn
- 5. soybeans
- 6. other (Please describe) _____

30. Please answer the following questions about the size of your farm.

How many tillable acres did you own and rent in 1985?

_____ tillable acres owned _____ tillable acres rented

Approximately how many acres of each of the following crops did you have in 1985?

Corn.... _____ acres Soybeans.... _____ acres Other grains... _____ acres

31. Which of the income categories below best estimate your average gross income from the sale of farm products during the past three years--that is, the average for 1983, 1984, and 1985? (this is the figure called "gross profit" on line 31, Schedule F of the 1983 and 1984 IRS 1040 forms and "gross income" on line 12 of the 1985 Schedule F.)

- 1. Under \$20,000
- 2. \$20,000 to 39,999
- 3. \$40,000 to 99,999
- 4. \$100,000 to 199,999
- 5. \$200,000 or more

32. How many years of formal schooling did you complete?

(Please circle one answer.)

- 1. 1-8 years (elementary school)
- 2. 9-11 years (attended some high school)
- 3. 12 years (graduated from high school)
- 4. 13-15 years (attended college)
- 5. 16 or more years (graduated from college)

33. In what county do you reside? _____

34. How old were you on your last birthday? _____ years old.

35. Are you: _____ Male _____ Female

PLEASE RETURN YOUR COMPLETED QUESTIONNAIRE IN THE ENCLOSED POSTAGE PAID ENVELOPE.

Thank you for your time and cooperation.

APPENDIX B. EXNET THE EXTENSION COMPUTER NETWORK

Cost

The 1984 annual subscription fee for EXNET is \$100. This allows unlimited use. The user pays only for the cost of the telephone toll charge to ISU.

Hours

EXNET is available at least 22 hours per day.

How to Sign Up

Contact your local county extension office or return the enclosed application form to EXNET, 103 Bessey Hall, Iowa State University, Ames, Iowa 50011.

For More Information

Contact Jerry DeWitt, 103 Bessey Hall, Iowa State University, Ames, Iowa 50011, (515) 294-8352 or Elwyn Taylor, 117 Agronomy, Iowa State University, Ames, Iowa 50011, (515) 294-1923.

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EXNET

The
Extension Computer
Network

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from the . . .



*Last name, initials or other meaningful code is acceptable. Please include check for \$100 made payable to Iowa State University and return completed form to EXNET, 103 Bessey Hall, Iowa State University, Ames, Iowa 50011.

EXNET Computer Account Application Form (please print)

Name _____
City _____
Phone _____
Address _____
State _____
County _____
Zip _____

Type of Account Requested (circle one):
A. Public (farm/home)
B. Government
C. Extension
D. Business/Industry
E. Media
F. Education

User Identification Code: # _____
Initial Password: _____
Number of people with access to this account (estimated): _____
Type of computer you plan to use with EXNET: _____

What is it?

EXNET is the new Extension Computer Network for personal computer users. It is located on the campus of Iowa State University and provides easy access for computer users across Iowa and the nation.

EXNET has been developed for use by the family, homeowners, growers, teachers, ag-business personnel, media, and others interested in current information on a wide variety of topics.

What is available?

EXNET is a source of real-time data--information that changes daily or even hourly. It has market information, crop conditions, weather reports, pest problems and other important information compiled by ISU Extension specialists.

EXNET is also a source of other information for your family or farm--listings of Extension programs, various newsletters, news releases, calendars, on-line computing, new extension publications, computer software, and much more.

EXNET is rapidly growing! Users can now receive current crop, pest, weather, and market information. Also available are the Agricultural Infodata Service (AIDS) reports, degree day totals, and newsletters. EXNET is changing weekly. Agriculturalists will soon be able to receive soil fertility recommendations, herbicide recommendations and crop scouting schedules for their fields.

Bulletin Board/

Mail Service

EXNET also allows users to receive electronic mail. Soon, users will be able to communicate with any or all Extension staff (on or off campus) or other private users on the system. Businesses or organizations can use EXNET to communicate within their group--a private, electronic mail service. Users will also be able to access and contribute to public or private bulletin boards through EXNET.

Who will be contributing to EXNET?

EXNET will serve as a computer network for Extension information in areas of Agriculture, Home Economics, 4-H and Youth, Community and Resource Development, the Office of Continuing Education, Extension Information Service, plus more than 22 other individual departments or units.

And, specialists will compile other information from non-university sources such as state, regional and federal groups and organizations.

When is it available?

EXNET is now available to all personal computer users.

What do you need?

Communicating with EXNET is easy. Users need the following: a personal computer or terminal, a modem (300 or 1200 baud), and a software package that contains 7 bit word, 1 stop bit, even parity, and full duplex capabilities.

