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Communications technology in the land grant university setting: A focus on computer-based innovations for information dissemination to external audiences

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TABLE OF CONTENTS

PREFACE

Consider this work a seminal step: it is a qualitative study of computer-based communications technology and its effects on society, communications institutions, and the professionals who are already or soon will be caught up in these developing systems. More specifically, it is a study of change of a major "change agent," the land grant university and its information offices, which for more than 100 years has been a harbinger of agricultural science and technology.

Too often the importance of qualitative research is underestimated and only quantitative work gets the blessing of a "scientific" label from academia. The thinking is that unless one can accurately count or measure the phenomena in question and statistically test hypotheses about causal relationships between certain specified variables, it is not scientific research. If such quantitative research is to have any kind of social or theoretical relevance, however, it must relate to greater and more crucial issues than those of the limited experiment. There must be some link-up with the real world.

This kind of real-world relevance is most likely to emerge from wide exploration of the dimensions of the research topic. Furthermore, such exploratory efforts are just the beginning steps of what should be a continuous research process, one that progresses from qualitative efforts through very thorough and statistically sound quantitative research.

The major objective of any qualitative research, including this study, is the creation of new ideas and insights into the problem being addressed. The general approach will be the use of three common research methods: A review of relevant literature, presentation of information obtained from professionals and others who are involved with the new communications technology, and detailed descriptions of several land grant systems.

One of the age-old rules of good writing is that the author should have the intended readership in mind and write for it. A common criticism of many dissertations, particularly those which have been submitted to book publishers for publication, is that the author has written solely for his graduate committee; his or her goal has been to do whatever is necessary to impress the committee. Consequently, the final product is focused too narrowly, often to the point of excluding many other potential readers. This author wants to reach beyond the five persons who comprise his graduate committee. For example, there is much concern that, despite the widespread use of the computer in business and industry, many executives have very little knowledge and understanding of computer technology and application. The same can be said for public institutions including land grant universities. Yet, it is the administrator or executive who makes the final decisions about the investments in and adoption of this technology. Therefore, this work is written largely for them, but the envisioned readership also would include communications professionals, many of whom may not have much understanding of computers.

Although the title of this work has the erudite flavor of the typical dissertation, the author advises the reader to avoid an immediate case of the "willies." Realizing the potential diversiveness of the readership, the author promises to spare the reader as much "academese" and "computerese" as possible to make the reader's foray into the manuscript more pleasurable, meaningful, and of practical value.

CHAPTER I. INTRODUCTION, RESEARCH OBJECTIVES, AND METHODS

Land grant universities have had a long tradition of working with external audiences. In the beginning, the focus was on the farmer and his wife with emphasis on agriculture and home management. Soon there were programs for rural youth through 4-H Club activities. In later years, the clientele broadened to also include nonfarm rural people. Today, nearly all strata of citizens, whether rural or urban, are impacted in some way by land grant research and extension programs.

Early education and communication techniques involved demonstrations, field days, short courses, bulletins and other types of publications, and news releases. Eventually came film, audio-visual material, and radio and television programs. The newer forms of communication were adopted by extension services and experiment stations almost as soon as the technology developed. Consequently, it is very natural for the land grant system to be in the forefront and seriously considering one of the newest communication tools--computer-based communications systems.

The new computer communications technology offers considerable promise for serving external audiences, with even more timely, specialized, and personalized information than now available. But, as with anything new, there are disadvantages and dysfunctions, too. This manuscript will try to consider the many facets of this technology.

Reasons for this Research

This research project grew from an observation that there are no documents that contain an accounting and an assessment of the various computer-based communications technology now in use by some of the nation's land grant schools. There have been some brief, general articles in the literature and in-house reports on specific systems. There has been no major attempt, however, to classify, compare, and describe in detail these systems and no effort to put the trend into the perspective of overall development of computer technology. This lack of adequate documentation plus the fact there is growing interest in computer-based communication technology by land grant institutions prompted this research project.

Communications technology is changing and growing so rapidly that there is a high degree of certainty that the information reported in this manuscript may be soon out-of-date, but perhaps the trials and tribulations and the failures and the successes of the "haves" described in this document will still be useful to the "have-nots"--perhaps they will be able to avoid some of the pitfalls that the pioneering systems have sometimes experienced.

Twelve Systems Selected

This is a study of 12 innovative, computer-based communication systems which are located on the campuses of 8 land grant universities (see Table 1). These systems involve the use of some type of electronic computer to 1) deliver news releases and feature articles to media, 2) permit electronic writing and editing of text matter, 3) set type, or

Table 1. Computer-based systems, their functions, and methods of obtaining information

System	Method
University of Nebraska	
News Service Typesetting Information Utility	Personal interviews, telephone interviews, correspondence, published materials
Iowa State University	
Information Utility	Personal interviews, telephone interviews, correspondence, published materials
Oregon State University	
News Service	Telephone interviews, correspondence, published materials
University of Kentucky	
Information Utility	Telephone interviews, correspondence, published materials
Purdue University	
Information Utility News Service	Telephone interviews, correspondence, published materials
Michigan State University	
Information Utility News Service	Telephone interviews, correspondence, published materials
University of Minnesota	
Typesetting	Personal interviews, telephone interviews, correspondence, published materials
Virginia Polytechnic Institute	
Information Utility	Telephone interviews, correspondence, published materials

4) serve as an interactive educational and problem-solving device for the user, an "information utility."

Two Types of Systems

The twelve computerized systems can be classified into two distinct categories. Some of the systems were developed within and are part of the ongoing activities of the traditional university information and publication departments. Other systems, however, were developed apart from the information office and are either within the domain of other university departments or with organizations that are indirectly linked with the formal university structure. These types of organizational configurations will be explained in more detail when these particular systems are described later in this report.

The general pattern to date has been that computer-based systems which involve electronic editing, news transmission, or computerized typesetting were implemented within and remain the responsibility of the university information and publications offices. On the other hand, systems that are in the form of "information utilities" have often been created apart from the communications structure, typically an origin base with a particular discipline (or department) such as farm management or agronomy. In some cases, particularly where universities are in a planning phase for future computer-based communications systems, considerable discussion centers around integration of the various types of potential services into one, overall operation.

Selection Criteria

The computerized communication systems were chosen because they are pioneering and innovative efforts. Although some of the systems can perform financial, personal, and other kinds of record-keeping tasks, they were selected because their primary function is communication of information to the public, either through print and broadcast media or directly to more precisely targeted end users, such as farmers, agri-business persons, or extension agents.

Research Objectives

The major objectives of this study are:

1) Describe in detail each communication system: its history, purpose, objectives, administrative and operational structure, financial base, professional and technical staff, type of information processed, advantages and disadvantages, and long-term and short-term goals.

2) Consider the implications of five major concerns: sovereignty and proprietorship of information processed, economics of the system, professional standards and quality, man-machine interface problems, and technical limitations.

3) Accumulate substantially more information about computer-based communications systems and convey that information to interested persons through this report. This report could, perhaps, serve as a general "state-of-the-art" treatise for land grant administrators, communicators, and others who may be exploring potential use of such communication systems.

4) Generate new ideas and insights that might be pursued by researchers who are interested in more specifically focused qualitative or quantitative research.

Interview Procedures

Because the major emphasis of formulative or exploratory research is on the discovery of new ideas and insights into particular problems or phenomena, the research design must be flexible enough to permit the emergence and consideration of as many different aspects of the communication systems as possible. Therefore, the unstructured personal interview technique for obtaining information is used. Because these communication systems are very innovative, and no doubt the forerunners of much more sophisticated systems, it was reasoned that a formal interview "schedule" or questionnaire would be inadequate. In general, the following procedures were used to obtain information:

1) The communication systems selected for case study were chosen after analysis of information obtained from the U.S. Department of Agriculture, previous information published, and information obtained with correspondence or phone conversations with communication system administrators.

2) All interviews were conducted by the researcher.

3) Interviews were arranged in advance and were conducted in person and/or by telephone.

4) Interviews were not limited to administrators. When appropriate, other staff persons also were included as well as clientele using the systems.

5) After the interviews were obtained, all appropriate and relevant information about each communication system was written as a case study. Each case study was reviewed by the principles involved for corrections or other changes. In many cases, the review process generated additional information and clarification that was then incorporated into the case study.

The methods used for obtaining information about each system are listed in Table 1.

Organization of Material

The general flow of information will be from the general to the specific and back to the general.

Chapter II provides an overview, a review of literature, a synthesis or integration of what several prominent futurists believe is happening as a result of rapid technological changes--the envisioned impacts on society and communications. The chapter ends with a listing of five major concerns that will become the primary foci of the case studies.

Chapter III reviews the historical roots and purposes of the land grant university system and its role as educator, researcher, and communicator. Considerable consideration is given the role of the information and publications office.

Chapter IV focuses on the computer-based systems which operate as part of the university information office. Chapter V considers the "information utility" and its functions and role in the land grant institution.

Chapter VI analyzes the potential implications of these emerging communications systems and suggests several areas where further communications research could be pursued. It suggests areas of concern if certain professional communication roles and responsibilities are to either be preserved or altered as society seemingly moves from the Industrial Age to what some futurists refer to as an Information Age.

CHAPTER II. AN OVERVIEW: TECHNOLOGICAL CHANGE AND SOCIETAL DESTINY

Introduction

We have all listened to one another philosophize about our perceptions that the "world is getting faster," "every year seems shorter," "life is much more hectic," and countless similar aphorisms. Of course, astronomers and other physical scientists would say that time, as defined by the physical movements and relationships of the celestial bodies of our universe, has not changed. Social scientists would contend, however, that time is perceived to be faster by today's world populace because the pace of life is more rapid and complex. Each generation of mankind is bombarded with more change--a multitude of new phenomena that keeps our minds occupied and coping until something triggers us to stop and reflect that time has indeed slipped by unnoticed, giving us a misleading impression that time is more rapid.

This chapter is about communications technology and change. It summarizes briefly and generally what several futurists speculate will be the future of civilization, how it may differ from the past, and the implications such a future holds for communications. It is not intended to be an exhaustive, all-inclusive review. Included will be only those futurists who are contemporary and recently published, and consequently, the chapter may be open for some criticism. However, the author believes the reader needs only a small exposure to some of the futurist philosophy, just enough to acquire a sense of societal direction, so that later in the manuscript the relevance of some of the specific innovative systems that will be described will be more apparent. We begin with Alvin Toffler.

Toffler's Views on Change

It has been a decade since Toffler (1970) addressed what happens to people and their societies when they become overwhelmed by change, when society essentially goes out-of-control. He created the term "future shock" to describe the ". . .shattering stress and disorientation that we induce in individuals by subjecting them to too much change in too short a time" (Toffler, 1970:2). In explaining future shock, Toffler writes that culture shock occurs when a society is confronted with some other society much different from theirs. On the other hand, future shock is disorientation brought on by the premature arrival of the future--a superimposition of a new culture over the old culture--and caused by a greatly accelerated rate of societal change within that society. Future shock is the disease of change:

> Future shock will occur as the distress, both physical and psychological, arises from an overload of the human's physical adaptive ability to cope with change and the decision making process that is necessary. Future shock is the human response to overstimulation (Toffler, 1970:326).

Toffler contends that most futurists focus on the direction of change, the destiny toward which certain change is taking us and argued that no attempt to understand change can succeed without also considering an often overlooked distinction--the rate of change. Toffler's theory is that the rate of change is accelerating and reminds us of novelist and scientist C.P. Snow's supporting observation that until the 20th century social change was so slow that it could pass unnoticed in a person's lifetime but that change has now increased to the point that at times not even our imaginations can keep up with it. Indeed, fellow futurist Christopher Evans (1979) related that Toffler's book was criticized by many for being too sensational, yet even Toffler underestimated the rate of change:

> His book showed an astute awareness of impending technological developments, but it contains not one single reference to the most sensational instrument of change of all--the microprocessor--for the very good reason that when he wrote it the microprocessor did not exist. No clearer testimony could be offered to prove how fast things are now coming upon us (Evans, 1979:102).

Why is change accelerating? Toffler believes technology is the major force behind the increasing pace of change. He explains that technological innovation consists of three stages linked together in a self-reinforcing cycle. First is the creative idea, then its practical application, and finally diffusion or use of the idea throughout major portions of society. The technological process is completed when the loop closes--when the diffusion of technology that embraces the idea, in turn, helps create additional innovations and ideas. Toffler characterizes technology as the "mighty accelerator" or a "great engine" of change. He views knowledge--useful information that man has learned about himself--as the fuel that fires technological advancements.

The explanation Toffler presents for the acceleration of change is the shortening of the time span between the three stages of the technological cycle. Lag time between initial idea and widespread adoption is now measured in years, months, and sometimes weeks compared with intervals of generations or even centuries of mankind's early history.

Toffler has very little to say about the factors that are contributing to the reduction in time between innovation and diffusion throughout society, but we all know that one major element is mass communications and communications technology--the scientific breakthroughs that are making communication faster, easier, less costly, and more fully automated. And, much of the communications technology involves telecommunications, which permits rapid communication over great distances, not to mention communications in reaches of the world previously not served.

The type of technology also is rapidly changing according to Toffler, from the dirty, noisy, open-hearth, mechanical brand of manufacture to the almost sterile, silent, electronic type of technology of which he says the computer is the major entity and catalyist for further increases in the rate of societal change:

> . . .the computer has touched off a storm of fresh ideas about man as an interacting part of larger systems, about his physiology, the way he learns, the way he remembers, the way he makes decisions. Virtually every intellectual discipline. . .has been hit by a wave of imaginative hypotheses triggered by the invention and diffusion of the computer--and its full impact has not yet struck. And so the innovative cycle, feeding on itself, speeds up (Toffler, 1970:30).

The computer enhances the chance for future shock because of its ability to generate information at an exponential rate:

> With its unprecedented power for analysis and dissemination of extremely varied kinds of data in unbelievable quantities and at mind-staggering speeds, it (the computer) has become a major force behind the latest acceleration in knowledge-acquisition. Combined with other increasingly powerful and analytical tools for observing the invisible universe around us, it has raised the rate of knowledge-acquisition to dumbfounding speeds (Toffler, 1970:31-32).

Perhaps the most recent example of large-scale explosion in knowledge-acquisition is the Voyager I space probe. In its 1980, 500,000 mile-per-hour swing past Saturn, Voyager I probably generated more information about Saturn, its moons, rings, and clouds than mankind has accumulated about Saturn since the invention of the telescope. There was such a volume of information that the situation was described as an information overload: "Facts. . .poured in faster than they could be processed, much less understood" (Adler, 1980).

If we accept Toffler's notions about continuing accelerated change, influenced catalystically by new types of technology such as the computer and developments in communications technology, what type of world is imminent?

Future Scenarios

Depending on which futurist you read, the predicted world scenario might be called a Post-Industrial Society, an Information Age, the Electronic Age, a Super-Industrial Society, the Computer Age, or the Third Wave. But despite differences in the selected name, most futurists foresee many of the same things.

The Third Wave

In *Future Shock*, Toffler speculated a Super-Industrial Society characterized by periods of frustration and anxiety because of overstimulation and overchoice. Society would be more transient, more mobile, a nation of nomads. Society and its institutions would be more diverse, less integrated, made up of more special interest groups and sub-cults.

There would be less reliance on uniformity, simplicity, and permanence to keep the social fabric together. It would be a "throw-away" society in terms of both material things as well as social and human values. He sees the major task of communication and education to increase man's adaptive capacity to cope with change.

Toffler (1980) now labels his Super-Industrial Society, the Third Wave, which also is the title of his latest book. As indicated earlier, Future Shock was concerned mostly with the rate of change and not so much with the destiny toward which change might be taking us. The Third Wave, however, maps a picture of a future society, a completely new civilization that would vastly contradict the first two "waves," the agricultural revolution and the industrial revolution. The First Wave encompassed several thousand years and replaced the fishing, hunting, and foraging way of life of the earliest humans. The First Wave had not yet ended when the Second Wave, industrialization, hit Europe in the late Seventeenth Century and spread worldwide. Both waves advanced at differing rates across nations and continents. Today, the First Wave has nearly exhausted itself except for a few very isolated tribal people in remote parts of the world. The Second Wave is progressing in many undeveloped areas of the world. And even though the Second Wave has not yet spent itself, the new Third Wave--which Toffler says got underway in this country in the mid-1950s when white collar workers outnumbered blue collar workers for the first time-- has begun.

Writes Toffler:

> The Third Wave brings with it a genuinely new way of life based on diversified, renewable energy sources; on methods of production that make most factory assembly lines obsolete; on new, nonnuclear families; on a novel institution that might be called the 'electronic cottage;' and on radically changed schools and corporations of the future. The emergent civilization writes a new code of behavior for us and carries us beyond standardization, synchronization, and centralization [all characteristics of the Second Wave], beyond the concentration of energy, money, and power.
>
> This new civilization, as it challenges the old, will topple bureaucracies, reduce the role of the nation-state, and give rise to semiautonomous economies in a postimperialist world. It requires governments that are simpler, more effective, yet more democratic than any we know today. It is a civilization with its own distinctive world outlook, its own ways of dealing with time, space, logic, and causality.
>
> Above all. . . Third Wave civilization begins to heal the historic breach between producer and consumer, giving rise to the 'prosumer' economics of tomorrow. For this reason, among many, it could--with some intelligent help from us--turn out to be the first truly human civilization in recorded history (Toffler, 1980:26-27).

The outlook painted by Toffler in The Third Wave is much more optimistic compared with his stance in Future Shock. In the earlier work he feared that mankind might have to slow technological development with restrictions such as submitting new technology to mandatory tests before it is released. He suggested use of a technology ombudsman to screen technological machinery, thus establishing more social control over technological development. He argued that such a system would give more consideration to long-range economic and social impacts than our present system which heavily weights factors such as immediate needs and maximization of profits. His view was that technological development must be evaluated more humanistically, and to do this, runaway acceleration of change had to be halted in some fashion.

In The Third Wave, Toffler believes that although society faces some tough times ahead--anguish, turmoil, and uncertainties caused by scufflings between those forces trying to preserve Second Wave society and those bringing on Third Wave society--mankind can master the transition to a desirable future, one he believes will be wiser, more civilized, and more democratic.

The Post-Industrial Society

Compared to Toffler, Daniel Bell uses more precise, descriptive terminology: Pre-Industrial, Industrial, and Post-Industrial Societies as counterparts to Toffler's First, Second, and Third Waves. Bell typifies the first era of mankind as an extractive society with an economy based on agriculture, mining, fishing, and similar occupations. He describes Industrial Society as an economic system based on fabricating--the manufacture of goods with energy and machine technology. The key ingredient of the emerging Post-Industrial Society is processing--computers and communications technology being crucial tools for the generation and exchange of information and knowledge.[1]

Writes Bell:

> Theoretically, one can say that the post-industrial society is, in principle, different from the other two. As a theoretical principle, the idea of industrialism did not derive from an agrarian model. And similarly, the strategic role of theoretical knowledge as the new basis of technological innovation or the role of information in recreating social processes, does not derive from the role of energy in creating a manufacturing or fabricating society. In short, these are, analytically, independent principles.

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[1] Bell defines information as the storing, retrieving, and processing of data. Knowledge is seen as organized sets of statements, of facts or ideas, presenting a reasoned judgment or an experimental result.

> Broadly speaking, if industrial society is based on machine technology, post-industrial society is shaped by an intellectual technology. And if capital and labor are the major structural features of industrial society, information and knowledge are those of the post-industrial society. For this reason, the social organization of a post-industrial society is vastly different from an industrial sector. . . (Bell, 1973:xiii).

Bell contrasts the economic features of the Industrial Society with the Post-Industrial Society. Industrial commodities, such as cars or hair dryers are produced in discrete, identifiable units and are exchanged, sold, consumed, and eventually used up. With purchase, the buyer takes physical possession of the item and the exchange is conducted with respect to certain legal requirements. On the other hand, information and knowledge are not consumed or used up. Furthermore, while autos and hair dryers are economic goods, knowledge and information are social goods. In the Industrial Society there are theories about the value of labor and capital, but there are only incomplete theories of value pertaining to knowledge. Consequently, a serious dilemma of the Post-Industrial Society will be to devise a way to "price" information and knowledge, "goods" which, even after they are sold, still remain partially in possession of the seller. Knowledge and information are collective goods in that once created, they are available to all. Thus, there may be little incentive to produce something over which proprietary control may easily be questioned and difficult to establish.

A society needs some type of infra-structure. Bell identifies transportation as the first type of societal infra-structure. The second type was energy and its transmission networks to foster the

Industrial Age. Bell now believes the major task of the emerging Post-Industrial Society will be the development of its own infra-structure, which is likely to take the form of very large integrated communications to connect all the digital information technologies together.

> But now with the explosive growth of computers and terminals for data...and the rapid decrease in costs of computation and storage, the question of hitching together the varied ways information is transmitted in the country becomes a major issue of economic and social policy.
>
> The 'economics of information' is not the same character as the 'economics of goods,' and the social relations created by the new networks of information ... are not the older social patterns or work relations of industrial society. We have here--if this kind of society develops--the foundations of a vastly different kind of social structure than we have previously known (Bell, 1973:xv).

What will make the Post-Industrial Society different from the Industrial era? Bell predicts a number of trends but marks two important ones. First, is what he calls "centrality of theoretical knowledge," which means a greater dependence on science for innovation and organization of technological change. There will be increased sensitivity to the need for access to scientific information, organization for research, and the increasing importance of information as a strategic resource in society. He foresees computers, optics, electronics, and polymers as new and rapidly increasing industries. He points out that where once national power was measured in terms of steel production and capacity, power of future societies will be measured in terms of computer capacity. Bell's second major characteristic of the Post-Industrial Society is the continued growth of "services" as opposed to "goods" in the economic sector. Sixty-five percent of all jobs were service-oriented in 1973, and he predicted an increase to 70 percent by 1980 with higher rates to follow as we approach the next century.

Some of Bell's other predictions include increased numbers of women in the work force, the technical-professional class becoming the largest in society by the year 2000, a change in the character of work with more leisure time, a continuation of scarce resources but those resources being information and time versus the more traditional goods and natural resources. Social status will be determined more on the basis of education and skill rather than on inheritance or property. Bell also predicted that innovative ways to price information and knowledge would be developed.

> A post-industrial transformation provides no 'answers.' It only establishes new promises and new powers, new constraints and new questions--with the differences that these are now on a scale that had never been previously imagined in world history (Bell, 1973:xxii).

The Micro Millennium

Christopher Evans (1979) says the future will be ". . .largely moulded by a single, startling development in technology whose impact is just beginning to be felt. The piece of technology. . .is the computer" (Evans, 1979:9). The major thrust in computer development occurred in the early 1970s with the development of the "chip," a piece of silicon that is now somewhat smaller than a person's thumbnail and which has the electronic circuits and transistors that are needed to perform computer functions engraved on it. With current technology, as many as 64,000 individual components can be placed on one chip. Over the years, the size of the chip has become smaller because of a number of manufacturing breakthroughs. As a result, the cost of the chip has been reduced from tens of dollars to just a few dollars. This technology has brought about not only cheaper main-frame computers but also the low cost pocket calculators and other similar devices. Evans refers to the future as the Micro Millennium, an era that will see mankind convert from the "amplification and emancipation of the power of muscles to the amplification and emancipation of the power of the brain."

> As with the Industrial Revolution it [the Computer Revolution] will have an overwhelming and comprehensive impact, affecting every human being on earth in every aspect of his or her life. Again, paralleling its predecessor, it will run at a gallop, though its time course will be shorter and its force may well be spent not in 150 years, but in 25 (Evans, 1979:11).

But, Evans says, the machine age almost ran its course before most people were aware of what had happened. Mankind now has the capacity to contemplate the profound changes it is now facing and that the computer, which is at the heart of the change, can uniquely help mankind predict those forthcoming impacts on society.

Evans sees computers as essential to the survival of our increasingly complex society as housing, health services, and education were to the Industrial Age. Evans contends that one of our main problems is "information overload," and we will not be able to handle it unaided. Although many people think computers are making our society more complex, mankind will have to rely on computers to sort out that information and make it more useful. Thus, he contends computers will decrease rather than increase complexity.

> The world needs computers <u>now</u>, and it will need them more in the future; and because it needs them, it will have them (Evans, 1979:67).

Evans' Computer Revolution anticipates a number of remarkable changes. The first is death of the printed word. This is inevitable, according to Evans, for several reasons. First, is the fact that so much new knowledge is being generated each year that "storage" is becoming a very real problem, both in terms of economics as well as actual space and facilities. He cites the example of businesses as well as public services such as hospitals where the cost of housing records becomes greater than the cost of accommodating the people who use those records. Another problem is data extraction. The age-old filing systems have become antiquated.

Books or publications are storage mediums just as the computer is but the computer has the ability to store library information in the thousandfolds. Evans predicts that by the end of the 1980s it will be possible to store very large books, possibly even sets of books, on one single microchip and perhaps an entire library in a space about the size of what we know today as a paperback book.

Another factor is economics. Printing made hand-written manuscripts obsolete. Developments such as movable type, offset printing, the steam-powered printing press and countless other innovations brought down the cost of printing and allowed printed material to proliferate. The electronic chip, however, is going to be even cheaper. Evans says that by the late 1980s the computerized equivalent of the book will be available at approximately 20 cents as further progress in the productivity of computer manufacturing is made. Eventually everyone will be able to purchase every book published instead of being limited to a small number because of price.

What the book does seem to have as an advantage is the aesthetically satisfying features of the traditionally printed book. A good personal collection of books in the home library has always been somewhat of a status symbol in society. What aesthetic value will an electronic chip have? What will be so attractive about a read-out terminal? Evans explains, however, that read-out terminals will be page-size for hand-held use, wrist-size for quick reference or portability, and wall-projection size for reading in bed. There will also be automatic page turning, a variety of typefaces offered at the touch of a button, and many other unique features, all of which Evans says should counteract the traditional qualities of the printed book.

Perhaps the most unique characteristic of the "electronic book" will be the fact that it will no longer be a passive device, simply transferring information from the author to another reader. The electronic book will, of course, continue to provide this function, but it will also be able to sift and interpret information. "Dictionaries" will be able to provide information on command. You will merely type in a question or key word, the computer may probe for some clarification of your interest, search its data bank, and give you information that you requested moments before.

Also, on the horizon are "smart encyclopedias" which will have the capability to do their own research, functioning as study partners with individuals who need help in accessing complex information. Such computerized systems will know something about its contents--being able to locate on its own various concepts and be able to link related concepts together. For example, if the user needs to know information about solar energy the computer would have the capacity to also serve up information about related forms of energy without being asked per se. Evans says scanning and classification of information by the computer, itself, is too complex to program at the present time, but he foresees much development of "artificial intelligence" in a few short years. The demand will be present as well as the interest of computer scientists to spur such progress along.

The second remarkable change will be the decline of the professions. Evans says the various professions have been able to maintain their strengths because they have controlled the storage and dissemination of their specialized knowledge. They do this through limitations on entrance into their professions and insistence on rigorous training to qualify for admittance. Often, professions develop their own vocabulary, (or jargon) which also tends to restrict information and knowledge to outsiders. Evans sees computer technology and electronic communications developments as a possible threat to the professions because it may be much more difficult in the future to guard access of the general public to professional information and knowledge. Says Evans:

> Once the barriers which stand between the average person and this knowledge dissolve, the significance of the profession dwindles and the power and status of its members shrink. Characteristically, the services which the profession originally offered then become available at a very low cost (Evans, 1979:111-112).

Evans says in reality, the raw material of a profession, whether it is medicine, law, or something else, is nothing more than information and the professional expertise is simply knowing the rules for handling or processing.

Evans does not address the fact that there is still a certain amount of information and knowledge that must be mastered before one can understand the more complex professional information that he or she might encounter. Consequently, access to a profession simply by being able to more easily tap into the subject matter may not be as simple as Evans makes it seem.

Another ramification of new communications technology is that social problems may increase. Katzman (1974) contends that new communications technology will be used unequally across strata of the public. His view, backed by some research, indicates that with the adoption of new communications technology, those persons who already have high levels of information and abilities to use it will gain more than persons with lower initial levels. Furthermore, humans have varying degrees of capacity to process and store information. Consequently, new communications technology creates "information gaps" with persons who are "information rich" gaining disproportionately compared with the "information poor." This notion is much the same as research reported by Tichenor *et al.* (1970) that suggests that as mass media information about a public issue increases knowledge among segments of the population with higher socioeconomic status is acquired at a faster rate than the lower status segments. Therefore, the gap in knowledge between these two strata increases rather than decreases--despite the fact there has been greater information dissemination.

Another important impact on society, according to Evans, will be the change in the type of crime. Much of present-day crime is based on money, whether in the form of coins or checks. The future will see a continuing decline in the use of money, a trend which began with the first form of electronic money, the credit card. A cashless society will essentially mean less incentive for crime, whether it is purse snatching, misuse of credit cards, or bank robbery. The new incentive will be the challenge of tapping into computerized monetary systems to illegally transfer funds out of legitimate accounts to illegitimate ones. The new breed of crooks will have to have expertise in computer programming and other computer-oriented technology. A unique feature of this type of crime will be that it will be impersonal--illegal transactions can take place anywhere only as long as access to the computerized systems can be had via telephone lines or other such communication modes. But, Evans says technology will create safeguards against sabotage and illegal use of such computerized money systems.

Another major impact of the new computer-based communications technology that Evans isolates is the speed and ease that will be attained in message sending. And, he says, these advances will be made with both the capacity to send short messages (office memorandums, letters) as well as very long messages (such as book manuscripts or even portions of libraries). Evans believes electronic mail will be widely operational by the late 1980s or early 1990s. Such systems will allow word processors to directly communicate with other word processors. There would not even be a need to send the "floppy disks" through the mails because word processors could be linked through extensive electronic networks. A word processor operator could dial up any other word processor and transfer information, an operation that would not be any more complicated than it is to use today's telephone. A companion system such as teleconferencing, which is simply a more sophisticated video phone system, would also be another mechanism to easily and rapidly transfer information. Information transmittal with either electronic letter or teleconferencing would be instantaneous or nearly so. It could be instantaneous if the information recipient wanted the material at once; the recipient may want the message stored until he can retrieve it at his own convenience.

Ramifications of electronic mail and teleconferencing are almost unimaginable. For example, with proper communications equipment in the home, most people (at least those dealing with information) could combine home and office. Such sophisticated communications technology could also greatly decrease the need for business travel and, consequently, energy needs in getting people from location to location. Economies in terms of time saved would also be great. Business and industry could invest less in building facilities for clerical people and executives. There could be major impacts on business districts and office buildings. In fact, a worker in the Twenty-First Century may never meet his employer or supervisor in person, only over audio and video devices or via messages transmitted between word processors! And, yes, perhaps even the door-to-door postman will become a thing of the past.

Demise of print media

Anthony Smith's (1980) book, ominously entitled Goodbye Gutenberg, forecasts the demise of print media in favor of electronic dissemination of information. His book focuses mostly on the trends and developments that impact newspapering, the segment of communications which has been touched first by computerization.

Smith lists a number of economic factors contributing to the increasingly precarious situation of printing in terms of newspaper industry. Foremost is that newspaper delivery costs are skyrocketing because of high labor and gasoline prices, a particular problem for large metropolitan papers which cover extensive geographic areas. Smith does not mention the fact that most daily newspapers have a definite advantage in being able to pay sub-minimum wage rates to those persons (usually children) who deliver their product. A second serious problem is the price of newsprint, which has doubled since 1960. The average size of newspapers has been increasing, from 34 pages in 1950 to 64 pages in 1980, despite rising costs. Associated concerns pertaining to newsprint also are the depletion of forest areas, one of the nation's endangered natural resources, the possibility that environmentalists may come to view waste newspaper as an environmental threat. Smith fears the future may see "Ban the Newspaper" efforts just as we have succumbed to "Ban the Can" in several states.

Another impact on newspapers has been the tremendous growth of free shoppers which have become serious contenders for the advertising dollar. Cost of collecting news is also an important economic factor.

Only 10 percent of all the information that comes to the newspaper each day finds its way into print and only 10 percent of that amount is read by an individual reader. The question Smith poses is whether such massive collection and dissemination of news is economically justified when a reader finally utilizes only 1 percent of all information initially gathered. Of course, Smith ignores the fact that all readers will not be reading the same 1 percent of the information, but his point is well taken, that the economic situation is reaching a critical level where dissemination of news via newsprint may not be feasible. Smith says that should gasoline rise above $1.50 per gallon or the price of newspapers increase another 25 cents per copy, economics may justify going to electronic systems of news dissemination.

Smith sees the coming of computer-based communications as a third major revolution in human techniques for processing and storing information. The first revolution was writing, which replaced total reliance on human memory and verbalization to transfer knowledge from one generation to subsequent generations. Also, the introduction of writing and paper led to the creation of libraries which largely replaced the mind as the archive of information. The second revolution was printing which permitted both greater replication and increased public access to information.

Both writing and printing had considerable influence on society and its public and private institutions such as religion, commerce, education, and government. Writing and printing resulted in new divisions of labor within society. Writing antiquated the role of the orator in public communication and created such roles as the scribe. Printing created woodcutters who manufactured the wooden type, illuminists who made multiple copies of drawings for books, and many other roles as the technology of printing advanced over the next several hundred years. A major impact of writing was the fact that it changed the relationship between the information source and the receiver. Writing permitted the audience to be remote in distance and time from the information source. The writer (versus the speaker) had less control over who would use his material and how they might interpret the information. Smith relates that Socrates complained about communication ceasing to be immediate and oral and that once information is put in writing it could get into the hands of everyone, those who would not understand as well as those who would. Writing also permitted an extended identity of the writer. In other words, audiences could come to know an author and his ideas through the author's writing, not from his presence, as in the case of the speaker. Another major impact concerned the proprietorship of the information. Of course, in the age of only oral public communication, the speaker had control of his information. With writing, the keeper of the original had sole proprietorship. With printing, proprietorship transferred from the keeper of the original to the author. Thus, ownership shifted from the collator of the texts to the author. The idea of authorship was comparable to the idea of invention and, consequently, authorship led to research. The scientist, technologist, and writer were all contributing and accumulating knowledge as the result of individual effort. They were assembling older information into new orders, a major cultural change in society.

Printing also used a handier form of mass information storage--the book rather than the scroll or loose manuscript pages.

Smith believes the computer, although originally a device for calculating numbers and still largely used in this fashion, will become as important as writing and printing in terms of processing text. He thinks the interconnection between computer and text will have an impact so great that computerized information systems will be the next revolution in human communication. The computer will have as much of a long-lasting effect on communication in terms of types of professional divisions of labor, proprietorship of information, and storage capabilities as did printing and writing. Smith forecasts a shift in proprietorship of information with the coming third revolution in human communications. He predicts the sovereignty over text will transfer from the author or source of information to the controller of the technology. Our imaginations do not have to wander far to see the potential implications and complications such a change may mean for human society.

Smith explains that the communication changes have had a cumulative rather than a substitutive effect. For example, writing did not completely replace public speaking. States Smith:

> Each new technology has been summoned into being to cope with an existing and perceived inefficiency or inadequacy and has gradually released its wider potential into society, working out its own peculiar implications. What we have to observe next is the first stage of the journey of computer-based information into our culture, which is taking place more publicly in the newspaper industry than in any other area of society. There it is changing the industrial base of a medium that had already been changing its economic and financial base. It is changing relationships between all crafts, professions, and management cadres in what is the basic information industry of Western society (Smith, 1980:23).

According to Smith, the new computer-based communication systems are ushering in a cultural reversal whereby the individual is being offered individual access to large amounts of information, whereas now communications media generally supply material to large blocks of society, thus the notion of mass communication.

> The switch from stone inscription to papyrus and handwriting signaled new patterns of thought and social organization. The switch from a scribal society to a printing one changed the information in society. The transfer from paper to telecommunications systems can hardly prove to be less important, necessitating the development of new skills and new equipment, a new kind of text, and a new method of text storage (Smith, 1980:323-324).

Technological prospects

James Martin (1977) explains that the new communication techniques have the potential for both good and evil. On one hand, computer-based communications systems will improve communications between peoples, raise productivity, and made the best of man's culture available to nearly everyone. On the other hand, Martin cautions that such systems can also make the worst of man's culture available to all. Writes Martin:

> They [communications systems] provide new techniques of tyranny. They make possible Orwell's telescreen and at the same time make it naive for Orwell did not envision computers (Martin, 1977:3).

Despite the potential for negative impacts, Martin is generally optimistic about the potential of computer-based communications:

> In an era of 'Limits to Growth' in the conventional trappings of affluence and limits to growth in transportation, because of world's rapidly declining resources and rapidly growing population and pollution, there are no limits to growth in telecommunications or culture. We are entering an era of staggering growth in knowledge and the ability to disseminate it, in entertainment and nonpolluting electronic technology (Martin, 1977:7).

Martin contends that the biggest hurdle for communications technology is lack of adequate telecommunication links as well as suitably priced tariffs for the use of those links. He views electronic networks as the catalysts of the communications revolution. In fact, Martin explains that there are few better investments a nation could make than extensive development of data transmission networks and the equipment associated with such systems.

The following are some of Martin's predictions about the future of telecommunications:

1) Human talent, a scarce resource for the coming age, will become available worldwide because of the telecommunications systems.

2) International corporations will flourish with the assistance of worldwide computer networks.

3) Business and societal patterns will change as screen-to-screen communication proves more efficient than traveling.

4) Many types of workers will be able to work in home offices because they can be linked to co-workers or clients via telecommunication devices such as video phones or computer terminals.

5) The telecommunication devices will permit people to "bank," shop, take educational courses, etc., from their own home.

6) New communication links may allow the rich and developed nations to diffuse knowledge and agricultural and other technical skills to the poor undeveloped nations. Such efforts may become the best form of foreign relations.

7) There will be a great increase in industrial automation, which will remove much drudgery from work; service businesses will grow; leisure time will increase.

8) Media in the home will become interactive rather than continue to be passive.

9) Society's general concept of privacy may change once we develop a world of interconnecting computers and other communication devices.

There are two major developments taking place in telecommunications that Martin indicates are so powerful that they will cause engineers and others to rethink almost all aspects of the technology. The first is the increase in the capacity of channels to carry information. For example, in 1940 long-distance telephone lines could carry as many as 60 conversations at one time. Today's lines are capable of carrying 108,000 conversations and the helical waveguide will soon carry 250,000 conversations at the same time.[1] And, Martin says, experimental optical fibers have even greater capacity. The second major trend is the use of computers and computer-like logic.

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[1]A helical waveguide is simply a round, two-inch diameter hollow metal pipe which serves as a conduit for radio waves. The radio frequencies would not be limited to phone conversations in that they could carry television programs, videophone service, electrocardiogram or other medical information, as well as data between thousands of computers.

The factor here is that computer logic is increasing in speed, decreasing in size, and increasing in reliability, and rapidly dropping in cost, as can be observed in the decreasing price and increasing capabilities of the pocket calculator during the past 10 years.

Martin identifies 22 major inventions and/or developments that either are or will soon take place in communications technology and change many of the customary ways in which we communicate with one another (Table 2). Many of the developments pertain to communication links, networks that couple "senders" with "receivers." He says when these links are in place, services will grow and costs will drastically decrease, bringing great advances in economies of scale.

Less-than-optimistic views

Kirkpatrick Sale, a prognasticator of the future with some negative views of technological expansion, says the United States and much of the Western society is at a great turning point. We can continue a trend toward large-scale institutions, multinational corporations, centralized governments, high technology machinery, large cities, high-rise buildings, luxury cars, ". . .and all that is implied in the American ethic of unimpeded growth" (Sale, 1980b:35). The other alternative he maps is in exactly the opposite direction:

> . . .toward the decentralization of institutions and the devolution of power, with the slow dismantling of all large-scale systems that one way or another have created or perpetuated the current crisis, and their replacement by smaller, more controllable, more efficient, people-sized units, rooted in local circumstances and guided by local citizens (Sale, 1980b:37).

Table 2. Major communication inventions and developments
(Adapted from Martin, 1977:4-5)

1. Microcomputers: Miniature computers, mass produced, available at low cost, and capable of being used by most persons.

2. Large TV Screens: Television screens that can be as large as a wall if necessary.

3. Cable TV: New cable that will have a thousand times more carrying capacity than present cable. Will be used for elecronic signals other than television.

4. Video Telephones: Users will see as well as hear one another. Expansion of such systems will permit teleconferencing, whereby many persons can see and hear one another and interact, similar to the telephone conference call.

5. Communication Satellite: Already in use for several years, capacities and numbers of satellites will be increased greatly. Will be very useful to underdeveloped countries as well as to large or multinational corporations.

6. Data Banks: Electronic storage for huge quantities of information that can be indexed and accessed in seconds.

7. Low-cost Satellite Earth Stations: Satellite receiving equipment will be low enough in cost to permit widespread home use. Planar microwave circuits will make it possible to mass produce satellite receiving equipment.

8. Helical Waveguide: Metal pipe that can carry 250,000 or more simultaneous telephone calls or other types of electronic communications in digital form over long distances.

9. Laser: Still in research, this means of transmission has the potential of carrying millions of simultaneous electronic communications.

10. Optical Fibers: Thin flexible fiber manufactured from extremely pure glass which can carry several thousand times the electronic information than a copper wire pair. Many fibers can be packed into one flexible cable.

11. Large-scale Integration: A form of ultraminiaturized computer circuitry that will permit mass production of computerlike logic circuitry. Offers potential of very reliable, extremely small, and in some of its forms, extremely fast logic circuitry and memory. If large numbers can be manufactured, the circuitry can become very low in cost.

Table 2 (continued)

12. Demand-assigned Multiple Access Equipment: Satellite or high-capacity channels can be shared by multiple geographically dispersed users in a very flexible manner. Portions of channel capacity can be allocated to users according to their immediate needs. Such capabilities will greatly increase convenience of electronic communications.

13. Voice Answerback: Computers can now manufacture human-voice words and speak them. Voice answerback linked to push-button telephone systems will make every telephone a potential computer terminal.

14. Millimeter-wave Radio: Radio frequencies in the band above microwave frequencies can relay a quantity of information greater than all other radio bands combined. Chains of closely spaced antennas will distribute these signals.

15. Cellular Mobile Radio: A system which organizes radio communication services to permit many radio telephones or other mobile radio devices to operate within a city or any concentrated geographical area.

16. Packet Radio: Radio systems for computer terminals that will permit practical use of pocket terminals or other small mobile terminals.

17. Data Broadcasting: Information can be broadcast in digital form at VHF or UHF frequencies for reception on home television sets, special terminals, or portable devices.

18. Pulse Code Modulation: All signals (including telephone, videophone, music, facsimili, and television) would be converted to digital bit streams and transmitted, along with computer data, over the same digital links.

19. Codecs: Circuits which convert signals such as speech, music, or television into a bit stream and then convert such bit streams back into the original signal.

20. Computerized Switching: Computerized telephone exchanges offer many new services, and computerlike logic can be used for switching and concentrating all types of signals.

21. Packet Switching Networks: A way to build generalized switched data networks, interconnecting terminals and computers.

Table 2 (continued)

22.	On-line, Real-time Computers: Computers which can respond to many distant terminals on telecommunication lines at speeds geared to human thinking. They have the potential to bring the power and information of innumerable computers into every office and eventually every home.

Sale calls this philosophy the "human scale," one which means a future that takes the impacts and important problems of human beings into consideration. He contends that Western society has become engulfed in a philosophy of "technofix," the premise that all of our problems and crises can be solved, or at least diminished, by the development and applications of high technology. He pairs several problems with attempted solutions: world hunger, the Green Revolution; energy shortages, synthetic fuels, diseases, wonder drugs; anxiety, Valium, etc.

> I am not arguing against 'progress,' providing that it seems to be advancing human welfare in some truly substantial way without destroying it with what doctors (the pluperfect technofixers) are pleased to call 'side effects.' Only it does strike me that our current version of 'progress' is headed more the other way (Sale, 1980a:12).

Sale says we have forgotten that solutions are very much like problems in that they are rooted in people, not in technology:

> Schemes that try to devise miracles to bypass people, negate, deny, nullify, or minimize people, will not work -- or at least they will not work on a planet on which it is people who are expected to live (Sale, 1980a:12).

> Our choices, then, would seem clear: large-scale or human scale, continual technofix or ecological balance, governance by bureaucracy or governance by democracy, increasing authoritarianism or increasing libertarianism, complex mass systems or individual self-sufficiency, opportunities for chaos or opportunities for community (Sale, 1980b:42).

Although nowhere in Human Scale does Sale specifically address the technological progress in communications and the computer, he would surely argue that such would be merely more technofix, more gigantism, more growthmania running rampantly out of control unless there was extensive thought given to impacts on the human condition. Sale, as well as many other writers in recent years, have chided those of us who are living in the Industrial Age to take a hard look at our present situation which, as described by Sale, is producing inefficiency and decreased productivity, waste, added expense, and damage to the body and spirit of people allegedly for the sake of efficiency, economy, and better ways to serve human needs. And, society seemingly turns to technofix for a solution, the same technology that produced the situation in the first place.

Other views of concern

In addition to Sale, there are other voices of concern:

Lewis Branscomb, vice president and chief scientist, International Business Machines Corporation, says:

> We know from the hard lesson of television that the software that emerges never seems to live up to the promise of the new technology for distributing it. The same thing may happen again with... computer information services, although people are working harder now to prevent it (Magarrell, 1980:1).

Benjaman M. Compaine, executive director of Harvard's Media and Allied Arenas Program on Information Resources Policy states:

> Consumers are going to invest in new hardware only to the extent they preceive its ability to provide them with information that is different or in some way better than what they now have. While

> a few aficionados like to buy new gadgets, faced with the great expense and bewildering array of options, the mass market is likely to develop with less abandon. We should keep in mind that rarely have the contemporaries of technological innovations been able to accurately foresee their most popular applications. Thus, the eventual application of much of the new technology may be awaiting the innovators who see a link between a real need and a means of filling it (Magarrell, 1980:1, 10).

Issuing additional caution is John E. Bowes, School of Communication, University of Washington. He reminds us of the 1960s, for example, when there was considerable optimism about the development and expansion of cable television systems to the extent that they would be the medium for many home services, other than entertainment. But innovative cable systems are still speculative and barely operational because of many factors such as technology, governmental regulations, and public acceptance. States Bowes:

> The lesson in this recent history is caution in the quick acceptance of forecasts. Each recent wave of enthusiasm has been built largely on mass application of state-of-the-art technology, not the public's unmet needs or readiness to invest and train in the use of the new media. Adoption of sophisticated in-home information technology is almost entirely experimental and has not met either marketplace or mass use tests (Bowes, 1980:54-55).

G. M. Beaugonin, Control Data Corporation, says those who fear the death of print media should not be seriously concerned:

> Computers and electronics with their enormous ability to store, retrieve and disseminate information will not replace and dislodge the book, and they may even help in publishing and producing better books (Beaugonin, 1981:1).

His reasons for this conclusion are that today's publishers of computerized abstracts of bibliographic material receive 80 percent or more of their revenues from the sale of hard copy documents and only about 20 percent from the sale of on-line computer access. The main reason for this is that computerized services are merely storing intermediate types of information, information which does not contain knowledge but only information artificially organized to facilitate its location. Plus, there is no guarantee of the adequacy of the knowledge located until the actual document is received and examined. Beaugonin says that this situation may change over the next decade as more sophisticated systems are developed, but he says progress in the marketplace depends on two factors: the economics of computerized information flow and the quality of the man-machine interface.

> As for the economics, we have a long way to go before on-line access to the Encyclopedia Britannica can compare adequately with the possession of a copy of it. We see some future possibilities with the continuous progress of microelectronics, the optical disk and fiber optics transmission systems. But there is certainly no threat to such books in the next ten years (Beaugonin, 1981:1).

The major challenge, according to Beaugonin, is in the area of man-machine interface: the ability to locate and display information satisfactorily. Beaugonin explains that not much progress has been made in recent years to use computers and communication to facilitate information identification. The process continues to remain almost totally with specialists who function as intermediaries, much like librarians. He says the reasons for this are that retrieval has to be done in a metalanguage that relates more to computer programming than to a natural language, we manipulate quantitative information well but the qualitative part very poorly, and we segregate retrieval from analysis in an unnatural fashion.

Even though some progress is being made, Beaugonin says the displaying of information on the computer terminal is so far from the quality of printed material that we may well wonder what technological breakthroughs might occur to close the gap. Terminal screens lack quality graphics and multi-color capacity. Furthermore, the amount of digital data to be transmitted to the terminal for the display of the images is so large that it is generally not justifiable in economic terms.

Evidence about troubles with man-machine interfacing emerges frequently. McClure reccunts the trials and tribulations of implementing a word processor-computerized typesetting linked system at the University of Minnesota in 1978. The new system allowed reductions in typesetting from $40 per page to $25 per page and a $25 page to $17. But, scheduling and management needs increased without additional staff. There was only one word processing operator, and good backup operators were difficult to find. Some of the printing jobs really did not need such an elaborate typesetting system.

> The major deterrent to our innovation is people. Maybe unions can tell members to retrain to a new technology and provide sufficient incentive to do so, but dictating objectives in a university environment is difficult. The computerized typesetting process we have established works well if all people perform their functions efficiently. So far, we are not operating as efficiently as the machinery. Consequently, I have come to resent simplistic technical approaches that look solely at what machinery can do without regard to what people involved can or will do.
>
> The best systems have to set aside 'computerese' and logic long enough to address the human aspects of technical innovations or any achievements are short lived. Unless people are emotionally prepared and intellectually equipped to handle the hardware, the

> purchase has little meaning. It becomes an expensive toy for a few 'enlightened' souls and not an efficient system (McClure, 1979:32-33).

The Minnesota system involved the assumption that each department would purchase its own word processor (the same brand) so that text could go directly from the departmental word processor to the computerized typesetting system. But, departments operated very independently, buying whatever brand they desired, with most being incompatible with the computerized typesetting system.

John W. Senders, Department of Industrial Engineering, University of Toronto, describes his experiences in trying to set up an electronic journal with the help of the National Science Foundation. The general concept of the electronic journal is that it would totally replace the "paper" aspect of the print-based system but retain the subscribers, editors, referees, and a subject-matter. The electronic journal would allow writers to compose on a computer (word processor), submit the material to an editor (computer conference), have the work refereed (computer conference), and have it published if accepted (publication would mean accessible by subscribers and other users). It was hoped that the electronic system would keep all the good things about the print-based system and eliminate most of the bad ones such as size limits; printing, binding, and mailing delays; storage of the material for each subscriber; more selective retrieval of information, plus there would be a small contribution to saving of a natural resource--trees via no requirement for paper.

The experiment was a failure for many reasons: The system would slow down during heavy use periods. The text editor used as part of the system was not adequate and users had difficulty adapting. The system was difficult to connect into unless the user was in a large city where the large Telenet network node was available. When a user was connected to the system via his phone, incoming calls were impossible. There were myriad other problems. According to Sender:

> A system must be able to do what people want it to do or it will be a failure. It had been our intention to speed up the exchange of scientific information. The system did not do what was wanted and it failed. This could be done, but the extensions of these groups into a genuine journal failed. The failure can be traced directly to the human engineering of the system, or rather, its absence. It was too hard to do things, so they were not done (Senders, 1981:9).

Somewhat of a hurdle to computerization is the phobia toward it on the part of the workforce, whether managerial or clerical. Fear comes from three classes of people: 1) persons who were previously stung by systems which were loaded with promises that didn't materialize, 2) persons who see the new technology above their level of skill and more appropriate for the next generation, and 3) persons who see computerization as a real threat to their jobs, such as the typist who must retrain for a word processor, or else, and the middle manager who faces competition from a new colleague who is a computer hotshot (Copithorne, 1980).

Also, tending to dampen some of the optimistic outlook for development of computer-based communications systems has been the fact that the central processing capacity of microcomputers (the type of computer most likely to be used in the home or office situation) has been considerably limited. In other words, the ability to store large amounts of information on-line (or within the computer, itself) has been restricted. The capacity is typically around 64k or the equivalent of about 36 manuscript pages of information. Thus, computer programs have had to be rather simple. But the second and third generation microcomputers are being built with on-line or central processing capacities of as much as 98k and in one case, 128k. A 128k capacity translates into about 71 pages of information. One microcomputer has a central processing capacity of 138k plus four additional disk drives each with 143k. Consequently, the on-line storage or memory capacity of microcomputers is now surpassing what once was thought to be the capacity of the next size larger computer, the so-called minicomputers. By adding disk, tape, and soon, video laser disk capabilities, storage capacities will likely increase considerably, adding much versatility with regard to program and operation capabilities.

Conclusions

This review, as hinted in its early paragraphs, is not an exhaustive effort. The intention was to present a sample of some of the contemporary thinking and writing about our society and the alternative futures it faces. Futurists do not always agree as to what is ahead, but they seem to all sense that we are in the beginning years of something different, a new era of mankind that will be vastly different, largely different because of changes in one of our important "change agents," communication itself. And although there are those such as Smith and Evans who are quite certain that days of the print medium are numbered, most would probably agree that no present medium is threatened with extinction. We know that the telephone did not totally replace the telegraph. Television did not replace the movies or radio, although it affected them profoundly. Television took over the family entertainment role from both movies and radio and so movies and radio were forced to seek specialized audiences. Today, both radio and movies are primarily young adult-oriented. Consequently, new mediums do leave scars on older ones; carving out some new turf from other communication media. Each new medium usually has something different to offer, and computer-based communication systems--whether in the home, office, or factory--will likely stake a claim to their own appropriate usefulness.

Figure 1, a creation of Japanese researchers, illustrates the relationships of present media and delineates a "blank" area not now being served. The vertical axis represents the time between origination and reception of the various kinds of media. The horizontal axis represents the range from person-to-person communication to mass media situations. The researchers speculate that the blank area will be served by media addressing topical information of moderately specialized and small audiences. The new computer-based information systems will fill this void. Again, it simply augments a trend that has been occurring for several years--demassification of mass media, more specialized information. The implication of Figure 1 is that there is a viable audience for large quantities of information of a semi- to fully specialist nature demanded via individual choice. Computer-based information systems of various kinds can deliver this type of information, and it is simply a matter of

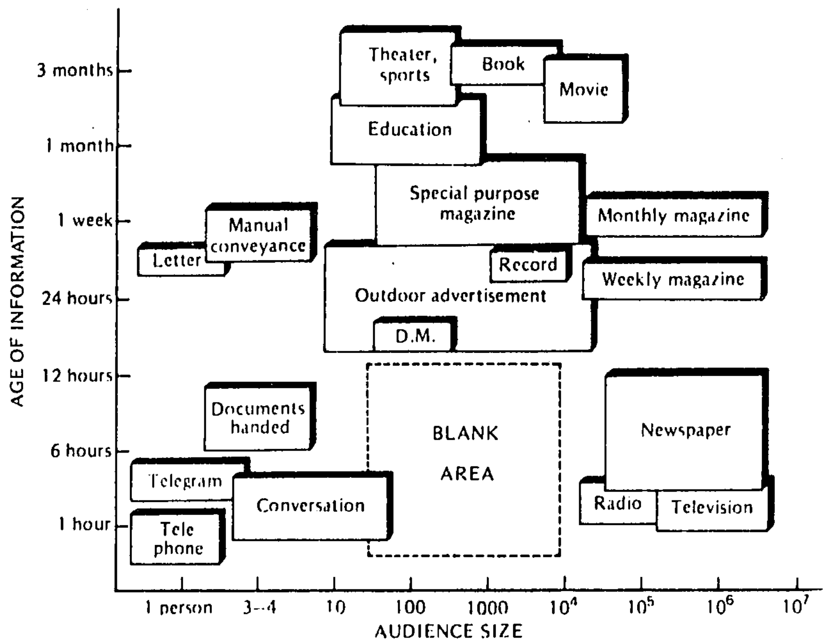

Figure 1. Relationships of type of media, audience size, and communication time (Smith, 1980:17)

time before widespread demand and practical delivery systems can be matched up and operationalized.

Five types of concern

From this review of literature, five major areas of concern emerge.

The first is the question of standards and quality. Evans, with his hypothesis about the decline of professions and professionalism, alerts us to the fact that the new electronic information systems bring more people into the act of information processing and handling and, in many instances, information may go directly from source to user, bypassing the expertise of some professional communicator, journalist, or editor. E. K. Gannett (1980) asks: "Which are we to save: keystrokes or coherence?" Gannett fears that, if the new technology greatly increases access to information indiscriminately, we might create a serious problem of information pollution.

Expressing this same fear is Carlton Rochell, dean of libraries at New York University. He believes a real danger exists for generating useless and unproductive information. Rochell says there are already symptons of communication failures based on a superabundance of information, inadequately assimilated, rather than on scarcity of information.

> The crisis of leadership can be attributed at least in part to the contemporary condition when information (or news) about near and distant crises is broadcast in a never-ending stream into almost every household well before our leaders have had time to cogitate, to plan, and to act.
>
> There is no historical analog to the information society and for this reason it raises novel and arresting questions of social policy which we as a society must explore and answer (Magarrell, 1980:1).

Marc Porat, a fellow at the Aspen Institute for Humanistic Studies, says that approximately half of the American payroll now goes for the manipulation of symbols rather than the production of things, and Rochell argues that there might be a cause and effect relationship between this trend and the fact that the nation's productivity has been declining (Porat, 1978:70-72).

Other concerns in the category of standards and quality area involve the training and expertise of the user. How much technical information does the user have to know to access and fully use the system? What "helps" are programmed into the system, itself? Are instructional materials provided? Particularly in the case of information utilities, is there any peer review of the various programs that are put into the system and what criteria are used for the evaluation? What and how much detailed information or data does the user need to have to adequately utilize problem-solving programs? If the personally-supplied data are incorrect, do the computer programs have fail-safe systems to warn the user of erroneous solutions? Are the programs written for the convenience and knowledge level of the user or are they written for the convenience of the computer people? And, do the programs represent information that is needed and demanded by the users or do they simply reflect the interests of those educators and information specialists who have a high degree of interest in computer technology and systems?

A second general area of concern is sovereignty or proprietorship of the information that will emanate from the new systems? What happens to the rights of authors and publishers, broadcasters, and, yes, computer scientists? With electronic storage and transmission of information, it may be very difficult to define and control copyright ownership. Furthermore, the new technology may make it easier to illegally obtain copyrighted material. For example, will electronic copying of data bases be easier to do and less detectable than copying printed pages? On the other hand, however, it may be easier to control access to information. Many kinds of devices, such as special codes, can be built into the computer programs to keep information from unauthorized persons. Another concern in this area is the matter of administration and organization. Do the new systems in any way change the authority structure, the chain-of-command so to speak, of the communications organization or department and, if so, what are the ramifications of this?

The third area involves economics and finance. How should information be priced? How do you recover the costs for central computer processing, the communication lines, and the programs? In the case of the land grant systems, should there be a price at all? Traditionally, most agricultural and extension material is available free of cost and the land grant institutions promote its distribution and use. Will electronically disseminated computer-based information be treated differently, and if so, why? Another concern is how much does the end user have to invest (especially in the case of information utilities) to subscribe to the communication system? Will investment and subscribing cost create a bias toward economically elite users?

The fourth concern centers on the man-machine interface problem. Will we be able to cope with the new technology? Will we be able to train (and perhaps more importantly) retrain professionals to use the new technology? And, will they adapt? Are the systems "friendly" or do they create various degrees of intimidation or threat?

And a final concern is the matter of technology limitations. Will we have greater computer processing and storage capacities and the massive electronic networks necessary to link all the developing computer systems together? What provisions are being made to allow use of any one of several kinds (brands) of computer terminals? In most instances, systems now require very specific and limited types of end user devices in order to be compatible with the central processor computer. Another critical question is at what point will the system bog down or, in other words, how many users can be on the system at any one time?

The above five concerns will be important questions about which we will seek explanations and clarifications as this research continues through the case study descriptions and analyses of selected computer-based communications innovations.

CHAPTER III. THE LAND GRANT UNIVERSITY CONCEPT

There are numerous computer-based communications systems in industry and business, particularly large corporations. But, if these systems are made available to the public, the service comes with a high cost. Perhaps, then, it is only natural that the land grant university system is developing innovative computerized communications systems. Land grant universities have a long record of providing research and education to the public at little or no cost. Dissemination of useful and practical information has been one of its major mandates since its beginning in the mid-Nineteenth Century. Before describing the specific innovative computer systems, it behooves us to review some of those basic tenents and philosophies of the land grant idea and, in general, how they are carried out.

Legislation

In 1862, the Morrill Act provided the opportunity for each state to establish at least one college to teach agriculture and the mechanic arts (engineering). In time, land grant universities were created in every state and became known as "the peoples colleges." The Morrill Act was significant for three major reasons: The land grant colleges were the first higher-education institutions to offer coursework with an emphasis on subject matter other than the "classics." For the first time, persons not in the "upper crust" of society had an opportunity for advanced education by enrolling in land grant institutions which had lower tuition rates or no tuition at all. And the land grant universities soon became the major catalysts in spawning the great technological advance of agriculture. Subsequent legislation enhanced the original goals of the Morrill Act. In 1980, a number of black land grant colleges were established in the South. The Hatch Act of 1877 established state agricultural and home economics experiment stations, which became research arms of the land grant institutions. In 1914, the Smith-Lever Act created the extension service to teach farmers and their families the new technology developed by the experiment stations. In 1917, the Smith-Hughes Act established vocational agriculture and home economics programs for rural high schools and, consequently, rural young people began to get doses of new farm and home technology at even younger ages.

Information Role

The Hatch Act was the legislative foundation that fostered the agricultural information framework that exists today in the land grant system. The Act was passed ". . .in order to aid in acquiring and diffusing among the people useful and practical information on subjects connected with agriculture" (Kellogg and Knapp, 1966:12). Information assembled and released by experiment stations is the most normal and visible output of the system (Blase and Paulsen, 1972:11-18). One of many responsibilities of the experiment station directors is that of ensuring effective communications. Stations have personnel whose daily responsibilities are communication of agricultural and home economics research information. Even before the Hatch Act was implemented, directors were concerned with the importance of communication. Meyer reports that in the first annual report of the agricultural experiment station in New York that the director, Dr. E. L. Sturtevant stated:

> The duties of an agricultural experiment station comprise dissemination as well as investigation. To bring experiments before the public, not alone through the annual report, but as well in other ways is a duty that should not be neglected (Meyer, 1963).

Arnon (1968) found that effectiveness of agricultural research organizations depends on maintaining adequate communications among research workers, between research and extension, and between research and the farmer. He was concerned that publications were not the most effective in influencing large numbers of farmers but did influence the leading farmers of a community who in turn set examples for others around them.

Copeland (1961) specifies the following agricultural experiment station communication responsibilities:

1) Provide materials to be disseminated through various mass media which are educational in nature and which are designed to improve the recipient's knowledge, attitude, or skills.

2) Provide materials to be disseminated through various mass media which are promotional in nature and are designed primarily to create better understanding, acceptance, and support of the institution and its components by the general public.

3) Through direct and indirect methods, establish and maintain good relations with representatives of the various mass media in order to create a favorable and receptive attitude toward materials distributed by the information office and for representatives of the institution.

4) Maintain good relations with cooperating groups, including civic, social, and religious organizations; farm organizations; and governmental agencies in order to gain acceptance and support for the institution and its component units.

5) Provide advice to administrators and personnel on public reactions and public relations in order that they may create a more harmonious atmosphere among the institution's various publics.

6) Conduct and/or be familiar with mass media research which will increase the efficiency and effectiveness of the information effort.

7) Provide training and instruction for resident students studying mass communications at the institution.

There is the notion, too, that citizens have a right to know how their tax dollars are being spent. According to Henderson (1971), the public should be kept informed regarding what land grant scientists are doing in the way of research, why the research is being done, and what benefits the taxpayers might receive from the results of that research. He believes the public should be made aware of the successes of research as well as the failures. The general situation has been that successes get more play than failures, if at all.

A study by Leidner (1976) revealed that building a good experiment station image as an end in itself does not have much priority with station editors and directors but they do recognize that station communication efforts are an aid in raising funds and obtaining legislation for the ongoing work of the stations. Both editors and directors also realize the importance of communicating with community leaders, legislators, and congressmen because of their influence in obtaining public funding. Editors and directors thought that the most important station audience was those who disseminate and diffuse information and knowledge to others and that extension was the most important audience. Leidner's research also revealed that editors and directors feel that station scientists have considerable freedom to work directly with mass media but generally mistrust mass media and are very cognizant of the fact that scientific publishing rather than publishing in the popular press brings about the advances in academia.

Tedrick (1972) also found that agricultural scientists generally view the public as a low priority audience, placing greater importance on specialists and teachers. They distrust co-workers who use mass media extensively. Tedrick's research indicated that agricultural scientists spend less than 3 percent of their time on mass media communication.

The role of the extension component of the land grant system is that of an interface agent, a linkage between the researcher and the practitioner. The notion of communication is embedded in the essence of extension work. "Extension's overall objective is to educate people" (Rincon, 1971:1). Extension is, itself, a large communication system to provide clients useful information about research and other scholarly activities. Communication is the core of extension educational activities and objectives, and is largely the responsibility of the extension information staff headed by the extension editor. The editor and staff, which usually consists of several departmental specialists (editors assigned to specific subject matter areas) and media specialists (persons assigned to functions such as radio, television, or visual aids), generally process and disseminate information by the following methods: writing, editing, and production of semi-technical publications in cooperation with the subject matter specialists; writing and editing of press releases destined for print and broadcast media; production of audio-visual presentations; communications training programs for noninformation extension personnel; promoting cooperation and good relationships (public relations) to maintain cooperation and good working relations between extension, mass media, public agencies, and other clientele; assisting extension administration in program planning and development; and helping evaluate extension programs. Rincon says communication people are particularly helpful with the last two responsibilities because they often have a broader perspective of many extension programs and are more likely to get feedback from clientele about program failures or successes than are subject matter personnel.

Rincon says extension information departmental editors have two types of roles. One is that of helper, which is characterized by giving support to people working with specific extension projects or programs. The second role is termed a professional dimension. This pertains to the editor keeping abreast of the communications field and utilizing new ideas for use in extension communication tasks or in training others in communication techniques. Essentially, this role establishes the extension editor as a specialist in his own right, in terms of communication expertise. Research by Rincon (1971) reveals that there is little consensus among extension editors about their communication roles and the same holds true for extension specialists. Both groups agree that the editor is one who works to help extension specialists. They do not agree that editors are independent professionals (the professional dimension).

Tichenor (1971) also contends that extension information (and one might argue any university information service) often acts as a gatekeeper of information, thus playing an active role in deciding what is or is not published. The concern is, of course, that no information of detrimental nature to the university or its administration should be released. Subject matter specialists and/or editors function as gatekeepers of information with varying degrees of input.

In addition to experiment station and extension information, land grant universities also have a department generally called "university information service" or something similar. This service gathers and disseminates information pertaining to such areas as sports, student activities, administrative matters, and alumni affairs. These departments often serve an administrative role over extension and experiment station information personnel, as well.

The functions and roles of information effort can be classified into two broad categories: public education and public relations. Public education involves all activities that pertain to providing useful information for the benefit of the client, whether private citizen or commercial media. Public relations pertains to all activities that tend to cast a favorable light on the university to make it easier to attract students, acquire public funding, increase private giving, or whatever. One must recognize an overlapping area between these two broad categories in that public education functions, if good, will also put the university in a complimentary position. There is often a "fine line" between what is public education or service and what is public relations.

Information dissemination carries a hefty cost. For example, at Iowa State University during the fiscal year 1980-81, the total cost of all information efforts from departmental brochures to a largely circulated alumni newsletter was estimated at $2.6 million ($1.8 million of public funds and $800,000 in contributed funds). The portions allocated to University Information Service was $561,617, Extension Information, $652,917, and the Experiment Station, $260,439 (Shannon and Horstmeyer, 1981). It is fair to note in Iowa State's case, however, that the total cost of information office efforts (public education as well as public relations) is only about 1.2 percent of the total ISU budget of $214 million.

The land grant system clearly has a responsibility and mandate to educate and inform, and university information and publication departments, regardless of vagaries in structural organization, have strategic roles to play in that effort. Furthermore, clientele for that information is diverse--the academic and scientific community, print and broadcast media, governmental leaders, and various and sundry strata of the public. Consequently, there is little doubt as to why the land grant system should have an intensive interest in pursuing new avenues in communications technology.

CHAPTER IV. USE OF COMPUTERS IN THE INFORMATION OFFICE

The structural and organizational configuration of the information and publications effort of land grant institutions varies considerably from university to university. The same basic components are usually evident, however, in the form of an information staff that processes general university information, another staff that handles the agricultural news and publications which emanate from the state extension service or the state experiment station, and other entities such as sports information or information personnel who are assigned to special research organizations within a university. Sometimes there are even separate information offices for colleges within the university, such as medicine. Also, associated with information departments are supportive staffs, which also are organized into departments. For example, there usually are departments that have printing production responsibilities or publications inventory and distribution duties. There also are the graphics personnel who are involved with art, photography, and design and layout of publications. Some land grant information efforts involve staff people who have "special projects" responsibilities. These duties frequently involve production of traveling exhibits that are used for both educational and promotional purposes.

In some of the smaller land grant universities, all of the above functions and personnel will be contained within one department while at larger institutions various functions will be assigned to several independently administered and budgeted departments. Quite often, however, each of these department heads will report to one university administrator who administers all of the information operations of the university in an attempt to maintain some overall coordination and continuity within the university.

In this chapter, an attempt will be made to take a fairly close look at five information and publication departments which are presently using computer-based systems in their day-to-day operations. We will explore the structural format of the departments, how the computer fits in and is utilized by the department, advantages and disadvantages of the systems, professional relations with media clients, and the major concerns identified earlier: standards and quality, proprietorship or ownership of information, man-machine interface, costs associated with the system, and technology limitations.

The University of Nebraska System

The University of Nebraska has several information and publications offices. The Department of Agricultural Communications, located on the agricultural campus at Lincoln, is a department within the Institute of Agriculture and Natural Resources. The agricultural communications office responsibilities include the Agricultural Experiment Station, Cooperative Extension Service, College of Agriculture, Conservation Survey Division, Water Resources Center, and the International Programs Division. Both the sports information office, which is part of the Department of Athletics, and the Office of University Information are located on the downtown Lincoln campus. There also is a university information office at the University of Nebraska-Omaha, a public information office at the University of Nebraska Medical Center in Omaha, and a director of public affairs in the central administration unit of the University of Nebraska.

Each information office has its own print and broadcast media writers and editors. The major sections of activity within the Department of Agricultural Communications are press, radio and television, visual aids, publications, educational media (slide-tape productions), technical writing, and an instructional media department which works with teaching faculty. In the downtown information office there are three people who handle press, radio, and television. At Omaha, the news writing is tied in with university relations and the University of Nebraska-Omaha's own television station, which is part of the statewide public broadcasting network.

At Nebraska, one computer-based system performs two types of services: 1) electronic transmission of news releases and feature articles and 2) computerized typesetting.

In October 1978, the Department of Agricultural Communications, the Sports Information Office, and the Office of University Information at the University of Nebraska-Lincoln established a computerized news transmission service in cooperation with the three large metropolitan newspapers in the state: the Omaha World-Herald, the Lincoln Star, and the Lincoln Journal. The Lincoln Journal, an afternoon paper, and the Lincoln Star, a morning paper, are owned independently. The Star is owned by Lee Enterprises, Inc. The Journal is the property of the

Seacrest family. A third entity, the Journal-Star Printing Company, provides the plant facilities and other services to the two newspapers. The newspapers share the same computer system but the computer has an elaborate security system to keep each paper from having access to the other paper's data file.

Each of the University's three information departments purchased a Texas Instruments "Silent 700 Series, Model 765," portable computer terminal equipped with phone modems to permit transmission of information from their offices directly to the newspaper main computers via the conventional telephone system. Two of the three computer terminals have a memory bank storage capacity of 250, 80-character lines of information. The third terminal, located in the university information office at the downtown Lincoln campus, has considerably more memory capacity. The information office at the University of Nebraska-Omaha has recently purchased a Silent 700 Series unit and is transferring material into the Omaha World-Herald. The newspapers had completely "computerized" with Hendricks and Harris systems in 1978.

Reason for the system

The computer-based system of conveying news from the university to the three newspapers was created out of some frustration of the newspaper staffs with some of the lengthy material, particularly long lists of names such as state fair 4-H results, that were being disseminated with the typical printed "handout" news release. In early summer of 1978 the Lincoln newspapers informed Dan Lutz, press section head in the agricultural communications office, that 4-H placings for that summer's state fair would not be used unless the material was put into the newspaper computer banks. This proved to be the catalyst to get the university information personnel to seriously consider the necessity and value of a computer-based system. After several weeks of research and planning, the system was implemented October 1.

There are 18 daily newspapers in Nebraska, but the three metropolitan papers are the only ones with centralized computer systems capable of receiving computer data from outside sources. Also, all internal writing, editing, and typesetting functions are computerized. For example, all news from the Associated Press and United Press International is automatically put into their systems, as well. Lutz says that although only three newspapers are involved in getting university news by computer, the three are extremely crucial in reaching the Nebraska public. The metros reach the vast majority of the state's urban audience in that the Omaha and Lincoln areas account for about 44 percent of the state's population which was estimated at 1,566,729 people in 1978. Furthermore, the Omaha World-Herald is the only daily newspaper that circulates throughout the entire state, reaching most of the rural communities as well as the Omaha metropolitan area.

According to Lutz, the fact that the newspapers allowed the university press offices to link up with the newspaper computer systems says much about the high degree of mutual respect and confidence that exists between the newspaper staffs and the university communications operations, and that the arrangement has enhanced the integrity and professionalism of the University of Nebraska operations.

User reaction

Maxine Wolf, state editor for the Lincoln Journal, says "The system really works quite well. It saves a lot of time. The material comes in to the newspaper in very good shape although sometimes it has to be shortened." Wolf says that generally only a portion of the entered material is used on a day-to-day basis simply because there is not enough of a news hole in the paper to use it all.

Ann Toner, farm editor of the Lincoln papers, says, "A lot of times the system means the difference between using and not using information from the university. It is a big help with results of things; the state fair placings, for example. Generally, our copy clerks don't have that much time to work on such material because other editorial matter has a higher priority." Toner says the computer-based system makes it easier for her to combine stories, combine leads, and edit stories down than it would be with the traditional printed news release. Essentially, having the information put into the newspaper computer saves a keystroking operation for the newspaper as well as editing time. According to Toner, nearly all of the agricultural news from the university that is put into the system gets used although some would appear in abbreviated form.

On important or extremely fast breaking stories, a call is made in advance to inform the newspaper staff that important information will be sent to their data bank. Lutz says this approach pays off well in that when this is done stories usually get more play than they might have otherwise. Pre-arrangements are sometimes made, too, for coverage of newsworthy events. In some instances there need not be both reporter from the newspaper and a university communications person covering the same news story. Therefore, a decision is made as to who will cover and report the story, saving time and money for both the newspaper as well as the information offices.

Toner indicates that the computer system has been improving with use. She says some problems such as stories being submitted in triplicate, not being sent at all, or copy from one story mixed in with copy from another sometimes happened. She attributes these as only typical "start-up" problems.

Gene Beran, state editor of the Omaha World-Herald, has much praise for the computer-based system. States Beran, "We have had very good experience with the system. We haven't had any technical problems at all." Beran says the newspaper had some early fears that they would be flooded with information from the university at about deadline time, which would bog down the newspaper computer system, but he says the university has been very cooperative to "dial-in" their information during the computer's slack periods of time. Deadline pressures are around noon and then again around 4 p.m. Consequently, if university information is submitted prior to 10 a.m. or after 4 or 5 p.m., the system works well, according to Beran.

Beran reiterates what others have said about the system being especially beneficial to the newspaper in the case of news which has an exceptionally large number of names such as 4-H placings or graduation lists. Beran says generally the university material is in adequate shape for his purposes but some editing for style has to be done.

Beran indicates that the agricultural communications office produces more material than the three other information offices. Generally, three or four stories are submitted daily from the agricultural communications department while contributions from the other communications offices are more irregular. Beran reviews all the university material that is put into the Omaha World-Herald computer and then distributes the information electronically to appropriate business writers, women's editors, farm editors, etc. Material is "purged" or eliminated from the newspaper computers every 24 hours unless it is otherwise coded.

In the case of the agricultural communications office, Lutz selects the stories that are to be transmitted to the newspaper computers. The stories are sometimes rewritten slightly from the version that is sent to other newspapers in the state primarily because the material needs to be shorter in length. Secondly, if the newspaper shortens material, it is usually edited out by trimming off the end of the article. Consequently, the stories have to be written so that the more important facts are reported early in the articles.

Generally, the stories are in final form before they are typed on the TI 765 keyboard, but some editing can be done at that point in the process. When the story has been typed, a special telephone number is dialed. No voice communication is required. As soon as the connection is made, the information is transmitted and transmission is verified by making a call to a contact at the newspaper who can immediately determine if the article is on-line in the newspaper computer system. Sometimes the newspaper computers are busy and will not accept a call-in, but this condition usually lasts only a few minutes. The Lincoln newspapers' computer is usually "down" for a short time every afternoon.

When the system was first operationalized, stories sent by computer had to be typed twice, once into the computer system and then on a conventional typewriter for duplication and mailing to the other newspapers in the state. There had been an attempt to use the same material, but newspaper editors complained about the difficult-to-edit-and-read, all-cap type style emanating from the Silent 700 equipment. Consequently, the news staff reverted to typing with conventional typewriters those news articles that were being sent as printed news releases. Therefore, the procedure still involved a second keystroking to put information into the computer.

This extra keystroking problem was resolved last year, however, with the installation of two CPT word processors. The word processors are linked to a line printer. Now, all stories are typed on the Silent 700, transmitted within the communications building to the CPT's, and are printed out on the line printer (in typewriter type). The stories also can be stored on the CPT floppy disks for later use. The line printer eliminated the second keystroking on the electric typewriter. Of course, the other option is to transmit the stories directly to the newspapers, either from the CPT word processor or through the Silent 700. The word processors also allow more flexibility in terms of editing stories, perhaps providing different leads for different newspaper destinations. Use of the CPT's also permit more careful checking of material (via screen) before the material is transmitted to the newspapers.

One of the unique features of the Silent 700 terminal is its portability. The unit can be taken by communications staff persons to meetings, conferences, and sports events. The communications person can write the story on the Silent 700 and then transmit it directly by phone line to the newspaper computers or to the CPT word processors in the communications office, where the story can be edited and checked before transmitting to the newspapers.

The three metro newspapers do not necessarily get the jump on the other dailies in the state because of the computerized news service. If it is important that all the dailies in the state get the story the same day, the printed news release will be mailed the day before the story is put into the computer system. Lutz says there have never been any complaints about this procedure from either the metro papers or the smaller Nebraska dailies.

Lutz says that use of the computer-based system and the fact that it is working out well has prompted the Lincoln and Omaha newspapers to ask for more copy, the first time in years that this has happened. One week a Lincoln Journal newswoman asked if the computer was down because she had not seen much material from the agricultural communications office. Another time, the state editor of the Lincoln Star complained to the press section for not submitting a large volume of placings from the state vocational agriculture judging contests. A large bundle of printed releases had arrived on Saturday and had to be sorted out and put into shape for the Monday morning edition. Putting the material into the computer system would have saved considerable time for the newspaper and would have more likely guaranteed use of the material by the newspaper.

<u>More cooperation</u>

According to Lutz, the computer system has definitely brought about more cooperation between the university communications people and the newspapers. The relationship with the papers has been strengthened and communications opened up as a result of the computer, which in itself is very impersonal. Lutz feels that in the Nebraska situation the present arrangement is highly desirable because the agricultural editorial office as well as the other information offices are in control of what stories are transmitted by the system to the newspapers, when they are transmitted, and how they are promoted or lobbied with the newspaper editors. Lutz says that conferences with the newspaper people so far do not indicate any concern by the newspaper people that their computers are being clogged with outside (university) material nor is there any concern about the nature or kind of material that is being provided. Lutz says that after nearly three full years of operating the computer-based system, the overall process has become a very natural and integral part of the University of Nebraska communications effort.

One of the biggest problems was an internal one, according to Lutz. It merely involved transferring some of the office work load to accommodate the new system. Most of the news processing and transmitting duties were given to the head secretary (Mrs. Ruthann Steuding) of the press section. According to Mrs. Steuding, the fact that the keyboard of the portable computer terminal was the same as a standard typewriter made the learning process rather easy. The computer terminal weighs no more than six pounds; thus, she took it home several times during the training period where there were fewer office distractions and less pressure from the typical office routine. She indicates that it took only a few days to become familiar with the system and that now nearly everyone in the office is fairly comfortable with the equipment. She produced some basic instructional guidelines for those persons in the office who might need help with the system, particularly those persons who may have weekend news assignments and must use the portable terminals at times when the office is closed or when they are out in the field. Mrs. Steuding says she spends an average of three to four hours a day processing and transmitting information to the newspapers but when there are campus conferences or other events which require a considerable number of news releases, six or seven hours can be devoted to processing material on the computer system.

Richard Fleming, head of the agricultural communications department, has only one small disappointment with the system. The Texas Instruments 765 that is in the downtown university information office does not produce copy suitable enough for reproduction for mailing out to to media. Consequently, material tagged to go onto the computerized news service as well as through the traditional news release channels must be typed twice. Fleming says the School of Journalism is installing a new computerized editing system and the downtown campus information office will then be able to interface with that system so that suitable, distinct, hard copy can be produced. But even then, the material will have be hand carried back to the information office. The ideal situation would be to buy a printer for the TI 765 that would produce readable copy, but Fleming says at this point it would be too expensive to do so. In the agricultural communications office, however, material put into the portable computer can be transferred to one of the CPT's and then converted to typewriter type with use of the line printer.

Fleming says the computerized news service actually introduced the TI 765 to the three metro papers and now each of the newspapers has a number of them for reporters to use in their regular work. They write the stories on the terminals and then "call-in" the stories to the newspaper computers. The calls do not take long, less than a minute to transfer the equivalent of one, double-spaced typed page. Fleming says this is a much shorter time span than the 8 to 12 minutes required to transmit the same length story by the Xerox telecopier or similar device previously used and it greatly beats the old practice of dictating a story by phone.

Storage problem

Fleming also would like to see the memory capacity of the system increased. He said the TI 765 unit in the downtown information office does have more capacity than the terminals in the other offices. It has a 20K capacity but can be increased up to 80K, which is the equivalent of a 30-page, double-spaced news release. The capacity was increased so that several long news releases, such as graduation lists, could be processed. Fleming desires to add comparable memory capacity in the agricultural communications office so that information there would not have to be purged as often.

Many smaller dailies in the state also have computerized systems but Fleming says the cost is such that they usually cannot buy enough memory capacity. In other words, they are already having trouble handling the quantity of information they are now getting from the wire services. He sees this problem as a temporary thing that is obviously tied to dollars.

Fleming says he is expecting to finalize an agreement with the Associated Press very soon to permit the computerized news service to tie in directly with the AP computer system. When this happens, the University of Nebraska will have direct access to all of the state's daily newspapers as well as most of the radio and television stations. Efforts to link up with the United Press International computer system also are underway. Fleming expects to have both of these arrangements completed by the end of 1981. Printed news releases would still have to be mailed to weekly newspapers and to radio and television stations not getting either AP or UPI wires.

To compete for news space in the metro papers, Fleming says Nebraska had to devise this system. "Once newspapers computerize, they acquire a greater aversion toward printed releases. Now, the Nebraska news releases appear on the newspaper editor's video display screen in the same fashion as his own reporter's material," states Fleming. The Lincoln Journal, in fact, has only one person keyboarding in general, current information, such as weather, births, deaths, etc. All other information is entered directly by the reporters and other writers. There are no typesetters. Fleming related how the Lincoln papers agreed to run a lengthy schedule of summer events for the city parks and recreation department but only if the department would send someone down to keyboard the information. Fleming calls this an excellent illustration that newspapers with computer systems are sensitive about the form of incoming information--printed or electronic--and electronic will win out.

Future is electronic

Fleming predicts that by 1990 Nebraska will not be sending out printed news releases; it will be done electronically. "More and more of our weeklies are being printed in central plants and one plant in Nebraska is printing 46 papers." Says Fleming, "I feel that the central printing plants will also become the data banks for editorial material. Each weekly office will have a terminal to put in their advertising and local copy and to call-up appropriate information in the main computer for selection in their own paper. Then the editors will simply come to the central printing plant on press day and pick-up their papers." Information would be transmitted by conventional phone wires or perhaps by a satellite network whereby each newspaper and broadcasting station would have its own receiving "dish" for information. Fleming says the wire services will also be transmitting by satellite instead of by wire before very long.

Computerized typesetting

A second computerized operation at Nebraska is typesetting, which utilizes the same CPT word processors that are used with the computerized news service. As Figure 2 illustrates, copy keyboarded into the CPT word processors can be processed and transmitted directly to the metro newspaper computers, retained on the CPT floppy discs for storage and later use, transferred to the line printer for duplication and mailing to media, or entered into the computerized typesetting system, a Compugraphic Editwriter 700. The new system was installed in mid-1979 and replaces an IBM MTST typesetter.

With the former system, manuscripts were typeset and then proofed. The new system allows editorial changes to be made from CPT output, either electronically with the video screen or on copy from the line printer. Once the manuscript is ready, the typesetting and format commands are entered and the material is transferred to the Editwriter. When the material leaves the Editwriter there are generally no further

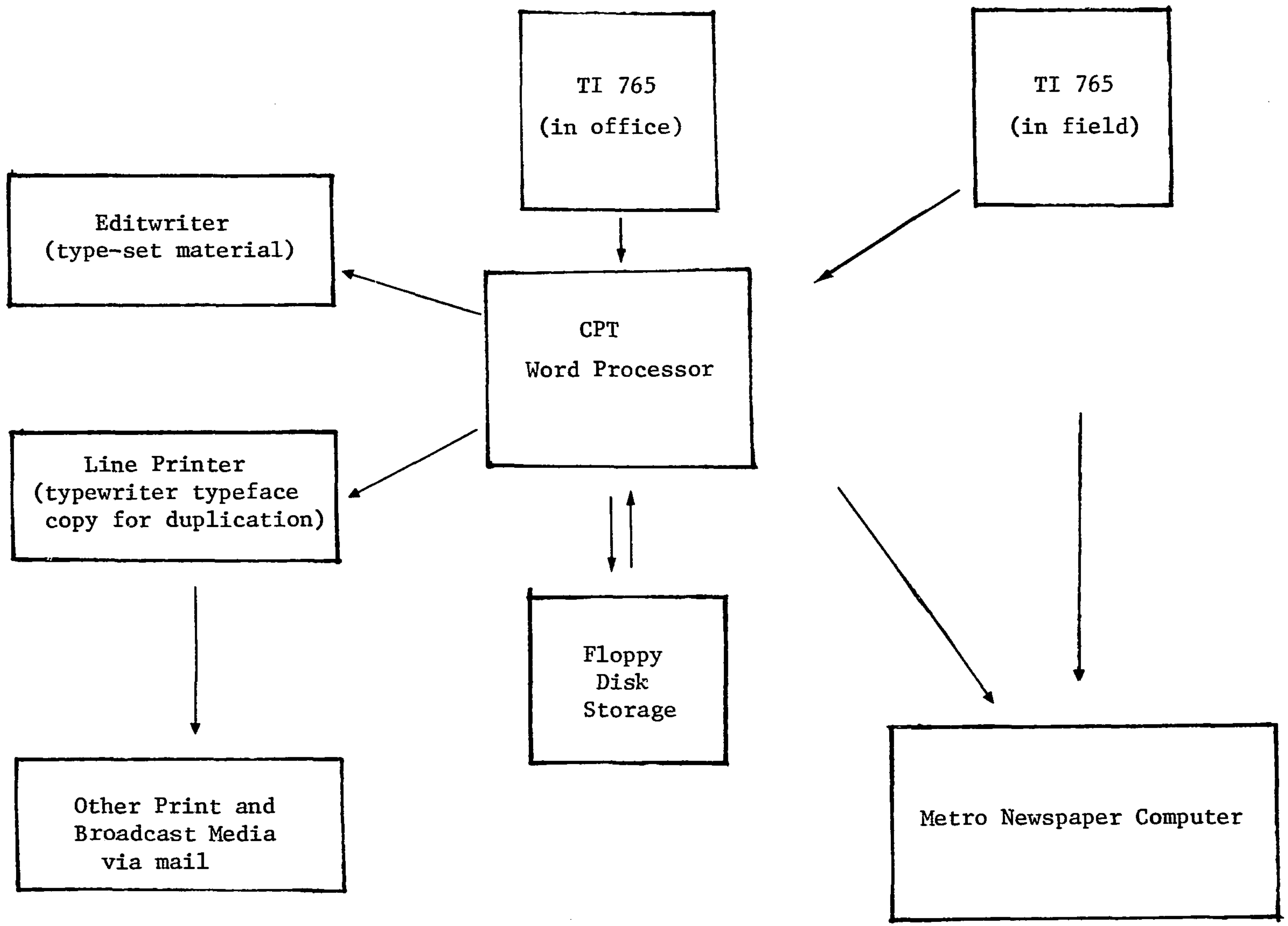

Figure 2. General flow of news through Nebraska computerized news service

alterations necessary and the material will be in camera ready form in appropriate page and column formats.

The Editwriter 700 has a large range of type styles and type sizes. Elroy Frank, manager of printing and distribution, indicates there are only a couple of disadvantages with the news system compared to the former. The IBM system had strike-on typing which would allow putting a map or some other type of figure into the typesetter and information could be typed right on the illustration. This cannot be done with phototypesetting. Also, the Editwriter does not have the capability to use down rules (vertical rules) for tabular material. Although some of the tabular material is entered at the word processing stage of manuscript production, most of the tables are keyboarded directly into the Editwriter. Frank says that considerable time is saved in keyboarding tables directly into the typesetter but once greater levels of proficiency are achieved in terms of the CPT word processors, tabular material will probably be keyboarded on the word processors.

Frank says one of the important essentials of computerized systems is the caliber of the operators. "We are blessed with two fine CPT operators. If you have highly trained and efficient people operating the word processors, half the battle is won. We haven't had the problem with operators that some systems have experienced," explained Frank.

With the new system, Nebraska is doing almost all of its own typesetting and printing and contracting less out because of two reasons: 1) the new system is so much more efficient that a greater work load can be handled, and 2) the new system has such a variety of type styles that almost all composing needs can be met within the shop. Frank says some jobs that once took three days can now be done in three hours.

The Editwriter also has standby capability in that it can be programmed to receive information called-in from the field during times when the offices are closed. The system can also be programmed so that typesetting can be done during lunch hours even though the operators are not present.

Computerized addressing

The printing department is presently installing a $42,000 Bell and Howell Ink Jet addressing machine. The price includes a CPT 8000 with disk sorting capabilities to "drive" the system. The unit will permit handling of a large number of lengthy mailing lists. The system will initially have 40 disks with mailing lists from several university departments stored on them.

Record keeping

The CPT word processors are also used for maintaining several publications catalogs and some office records, such as personnel. The CPT's have not been used for budget purposes although the system does have a complete math package.

Publications ordering

A program that will permit extension offices to order publications electronically is being planned. The system will use AGNET (an information utility that will be described later in this report) to access the CPT word processors in the printing office. AGNET is being used because this particular system has computer terminals in every Nebraska county.

Electronic editing

At the present time copy is in the final, typed form when it is given to the TI 765 computer terminal operator in the case of the news service or to the CPT operators in the case of typeset publications. In other words, news or publication writers and editors are not keystroking their own material into either the news system or the typesetting system. Frank says some material does come into the printing department on floppy disks direct from departments. Printing personnel then add the special typesetting codes to the material. He says only a very small percentage of material for publication production is handled in this way, however.

Fleming says the long-term goal at Nebraska is to have all material, publications as well as news releases, computerized so that all editors will be editing electronically on video screens. He says the technology is already here to completely computerize the process from initial draft of a publication, through revision, review, typesetting, layout and design, and printing. All of this would be done with only one keystroking operation. "The editor will not be replaced, as some people fear, by these computerized systems," states Fleming. "The editor's role will continue to be to improve the readability of material and the editor will also continue to follow the material through the whole publication process. The main difference will be that he will be pushing electronic controls instead of the blue pencil. The process won't be changing: it will be more of a matter of expediting the overall operation and eliminating paper." Fleming says electronic editing gives the editor greater freedom to make changes in copy. However, Fleming believes the editor must maintain complete control of processing and disseminating information.

Lutz does not object to department specialists keyboarding basic information or preliminary drafts of material into word processors located in other departments, but care must be taken that the information office maintains control so that unedited material does not flow into the public domain. "We are very cognizant of our gatekeeping role and we are not overly anxious to have 'little information services' springing up all over the campus. Perhaps a system of departmental word processing inputs would operate more efficiently, but I think we might be risking loss of control and I don't think we would gain unless editors continue to service communications material. Communications professionals should continue to push the buttons and turn the dials in terms of information dissemination," Lutz contends.

Lutz says there has been some thought of putting a CPT word processor in the press section whereby writers could keyboard their own material into the system. "Again, I think a model that allows editors to handle their own copy is a viable model, but I don't think Nebraska is quite ready for that yet. I could see that our full-time writers could possibly work into that, the feasibility of it is there, but I guess I would just have to say that we aren't quite ready for that yet. Perhaps after we attain a direct connection with the Associated Press, whereby we would be putting more material into the computer system, we might have to take this step."

As Frank indicated earlier, some printing jobs are submitted from various departments without benefit of the usual editorial channels. Lutz says the editorial staff isn't large enough now to edit every piece of printing that goes through the plant. But, he says there has been some concern that there needs to be some type of quality control on that material even if the material is not part of the regular publications effort because it still reflects upon the university.

Cost of the systems

In terms of the investment in the computerized news service, the four TI 765 portable computer terminals cost approximately $3,000. The cost of the two CPT word processors, the line printer, and the Editwriter was $52,000. Cost of the new ink jet addressing system is $42,000. Lutz says the computerized news system only takes up about 5 percent of the total time the CPT's are in use. Consequently, he says only that portion of the total system's cost should be assigned to the computerized news service. He puts a $6,500 price tag on the news service. Total cost of the entire system would be approximately

$98,000 with the costs shared across several information and publication departments.

No one in Nebraska can come up with a specific figure as to how much money the computer-based systems have saved the university. The greatest savings are with the computerized typesetting system. Lutz says the news service probably only saves a few hundred dollars a year because of being able to use less paper for news releases and less postage for mailing. However, he values more highly the nonmonetary benefits such as greater use of university news by the metro newspapers and the added flexibility and diversity the computerized news service has added to the Nebraska communications operation.

Oregon State University News Service

In 1980, the Department of Information at Oregon State University established a computer-based news transmission service that feeds news and feature articles directly to the Oregon Associated Press operation in Portland. This is the only computerized news service now operating that has been permitted to electronically link up with a wire service.

Wally Johnson, news editor and assistant director of the Department of Information at Oregon State, says the news system was begun at the invitation of the Associated Press. Johnson and Steve Graham, news editor for the Associated Press in Oregon, worked together during the planning and implementation stage and continue to cooperate and expand the system.

Equipment

Oregon State uses a Compugraphic MDT 350 minicomputer terminal. The terminal has a video screen that displays 14 to 16 lines of material. Information is put on floppy disks for storage. Oregon State invested about $5,000 for the MDT 350 and an interface unit to give it transmission capability. A phone modem for transmitting into the Associated Press's central processing computer is leased from the local phone company at a cost of $58 per month. The storage disks used by the MTD hold about 90,000 words each. Johnson says there have been no technical problems or breakdowns with the equipment. After a story is keyboarded and checked, a phone call is placed to the AP bureau and transmittal time takes only 20 to 25 seconds per page of double-spaced text.

There are no direct phone line charges to the Associated Press because several existing university WATS lines are available. The only request made by the university in allowing use of these phone lines is that no data be transmitted on those lines. This is because other university entities, such as computer science or data processing, might get the notion they could use the same free lines for data uses. However, the university gave the Department of Information permission to use the WATS lines if the lines are used primarily in the mornings and late afternoon.

Johnson recalls that it took him about eight months of research before deciding what equipment to buy. Many of the Oregon newspapers have compatible equipment, but a number do not. Oregon State's system is not compatible with United Press International's system, but Johnson says UPI is making a switch in its computer system, presumably to a system that can be used with Oregon State's computer-based news service. The Associated Press serves 18 of the 25 daily newspapers in the state. The other 7 daily papers are UPI members. The United Press International office in Portland has indicated it would like to receive Oregon State information through the computerized system once their equipment is compatible. Sixty-five radio stations and 13 television stations also get the computer-based news.

<u>More stories desired</u>

According to Johnson, an average of seven news stories are put into the system weekly. These stories are selected by him for their broad, statewide interest. Since implementation of the system, the only major feedback from the Associated Press has been an urgent request for more information from the department. "AP would like more sports, agricultural news, and consumer items," states Johnson, "and we are working on ways to get more of this type of information entered into the system." A problem with sports news is that the sports information staff is physically apart from the Department of Information so, consequently, some means to connect these efforts, either moving offices or some type of electronic linkage for transferring information between offices, are being considered. "AP is really pushing us to increase our output," Johnson states.

Johnson indicates that several Oregon weeklies are installing computer systems in their plants and also have shown considerable interest in having the information department provide news directly to their systems.

The Department of Information continues to send out the printed news releases even though newspapers may be getting the same material from the AP computer system. "One of the interesting things we have noticed," explains Johnson, "is that when the newspapers have a choice between processing the news release or using the AP material, AP usually wins out. We don't have a clipping service to carefully monitor this, but casual observation alerted us to this trend. Using the AP material rather than the printed news releases means the papers save a keystroking operation."

Greater credibility

In addition to the fact that the Oregon State news material is ready to immediately go into a newspaper page, Johnson says there is one other important reason why he thinks the Associated Press stories get more use. That is, the fact that there is a bit more credibility or legitimacy involved when the story comes from the AP system. "We have a great amount of respect among newspapers in the state," states Johnson, "but the fact that our material comes from the Associated Press gives it an extra edge. The local newspaper editors perceive that someone at AP has made a news judgement that the material is newsworthy, and so the odds are more favorable for its use rather than a news item from our mailed, news packet." Recalling one particular story, Johnson said 13 papers used the AP version and three used the printed news release.

Stories selected to be transmitted into the AP system are delayed one day so that the mailed news releases get to their destinations at about the same time.

Johnson indicates that there are many communications people, particularly in Oregon state agencies, who have a great interest in computerized systems but he thinks there is some fear about dealing with computers, terminals, and electronics that really scares off some people.

Johnson said the computerization system has had no impact on the role of the communications personnel except that he believes there is much more eagerness among both communicators in his department as well as other university staff, particularly Extension personnel. "Staff members are saying that with our information now going out over AP, we can do many different kinds of things. Staff people are showing more enthusiasm because of the possibilities the system has created for greater dissemination of university information and news," says Johnson.

Oregon has an Extension person who for 20 years has authored a weekly "market basket" column that discusses the best consumer buys of the week. It was mailed out regularly to about five or six daily newspapers. The Associated Press requested that this column be put on the computer system and almost immediately 100 percent usage was achieved by all dailies in the state. Johnson says the Associated Press believes this column is the best read column now appearing in Oregon dailies.

Views of Associated Press

"For us, there are no disadvantages with this computerized system," states Steve Graham, news editor for the Associated Press in Oregon. "We have nothing but good to say about it, and of course, we are happy that UPI can't do anything like it. I am trying to convince Oregon State to send more farm-related items and sports."

Graham doesn't like Oregon State's Compugraphic computer because apparently it is more complicated than some other makes. "It insists on putting a 'quad left' character at the end of every paragraph and we have to spend a lot of time taking it out. It drives us crazy," explains Graham. "Whenever people ask me about the Oregon State system, I say its fine but I don't like their Compugraphic. That is the only equipment compatibility problem we have."

Furthermore, Graham states, "We have always thought a lot of people at Oregon State; they have done some good stuff. But, the problem, in the general area of frenzy which we always seem to be caught up in at the AP office, is that when we received a printed news release from them we always knew that our member newspapers also got it. Therefore, if we had other things to do, there was never a lot of urgency to rewrite the material and type it up. With the computerized system linkage that we now have, we don't have to do a big typing job to get material on the wire and to the newspapers."

Computerized typesetting planned

The computerized news service is presently the only computer-based operation that has been undertaken by Oregon State's Department of Information. Johnson has plans, however, to eventually link the Compugraphic to a phototypesetter and set up a completely computerized typesetting system for publications work. The Oregon State department handles news and some publications work. He hopes to tie in the publications activities of the Oregon State Cooperative Extension Service and the Oregon Agriculture Experiment Station.

The Michigan State University System

COMNET is the name of a new large scale, computer-based communications system that is now being installed at Michigan State University. The system represents a nearly complete revamping and expansion of what had been called the Michigan State University Information Services (MSUIFS), a computerized news transmission service that has been serving participating Michigan media and extension offices since April 1979. COMNET, which stands for "computerized communications network," will be fully operational by mid-1981. According to Steve Harsh, coordinator of communications system development and head of COMNET, the system is simply an information transfer network based on a shared logic computer system that will permit extensive text processing. The system will also have other features such as computerized news transmission, phototypesetting, a computerized inventory system for extension and experiment station publications, and an archiving feature whereby some of these publications will be electronically accessed by extension field staff and Michigan State faculty.

COMNET is a program of the Michigan State University College of Agriculture and Natural Resources, Agriculture Experiment Station, and the Cooperative Extension Service. The total investment in the system will exceed $300,000, one of the largest financial commitment of the land grant systems being reviewed.

The Department of Information Services processes news and publications for the Michigan Cooperative Extension Service, the Michigan Agriculture Experiment Station, and the College of Agriculture and Natural Resources. News from the sports information department, the College of Medicine, and the university general information office also is processed with the news transmission service.

Before discussing the new COMNET system further, a review of the original computerized news system (MSUIFS) would provide some useful background information and help clarify why the new system is in the making. The original system is still in use and will remain so until COMNET is operational.

Computerized news

The Michigan State computer-based news system was the result of the efforts of four key people, Eldon Fredericks, Extension Research Information Services; Stephen Harsh, coordinator of communications systems development and agricultural economist; Edward Rister, a graduate assistant; and Deb Vergeson, Information Services secretary. These individuals were given administrative support and encouragement to investigate and develop a system to permit the transfer of information by computer. Twenty-five of the 80 Michigan county Extension offices were provided terminals. The Booth newspaper chain, which consists of eight Michigan dailies (combined circulation of 553,839), was the first newspaper client. The second media user was the Michigan Farm Radio Network, headquartered in Milan, Michigan, which serves 50 radio stations with agricultural and sports news coverage.

Michigan State University news releases are entered with a standard computer terminal along with additional coded information such as topical categories and subcategories, entry data, release date, kill date (day when information will be purged or eliminated from the system) and a key word or slug line to distinguish the material from other items. The final version of the news article or feature story is then transmitted with a phone modem by conventional phone lines to the main MSU computer. Subsequently, users can call up the MSU computer using their own computer terminals and select from the complete menu of information those news items they wish to have for their own media operation or Extension office.

When a user logs onto the the system, he is faced with several options. He is shown a display (SALT--Survey of Articles on File, Abstract retrieval, List Article, Terminate Job) of options. If the user asks to survey articles on file (S), the computer will prompt another decision, either to survey all articles since a certain date (A) or survey articles by subject categories (C). These options give users a chance to get the titles, length in words, and the date the article was entered. Users can search the file daily for current news items or search the file for material pertaining to a specific subject over a longer period of time, usually over several months. When the user locates the information, he has the option to request an abstract, which consists of either the first or both first and second paragraphs of the article, or a printout of the entire article. When the user is finished obtaining the desired information, he simply selects the option "terminate job" (T).

Any Michigan media outlet with compatible editorial terminals or a portable computer terminal can participate in the news transmission system. Users are given a telephone number and their own specific code or password.

Unlike the Nebraska situation, whereby university news is permitted to be "dumped" into the newspaper computers, Michigan media expressed a reluctance to this type of system. Consequently, the Michigan system was designed to provide a directory, index, or menu of available information on the MSU computer from which media could make their selection. A major disadvantage of this type of system was recognized early, the fact that initiative must come from the media for participating in the system. Michigan communications people try to overcome this disadvantage by making sure they maintain a commitment to and provide high quality information that will be sought and used by the media. The news releases used are selected for variety, timeliness, or because of their potential for later retrieval and use.

The sales message that MSU communicators try to convey to potential media users is that university news is available immediately via the electronic system and thus is more timely. News can be readily found and retrieved from storage for use as background information for articles. Electronically delivered copy will save a keystroking operation at the newspaper providing the newspaper has its own computer system and if it is compatible with the MSU equipment.

The reason for Michigan State's entry into computer-based communications was much the same as for the University of Nebraska--demands from the newspaper industry because of converting to all-computer editorial (and in some cases printing) operations. In general, it is a "pull" rather than a "push" situation with the communications industry demanding that the agencies which supply information to it convert to the electronic, computerized modes of entering information.

The computerized news system never quite achieved the initial expectations of the planners, expectations that the system would be widely used by Michigan media. To date most of the use comes from county Extension offices and media use is not much greater than the initial clients who signed on at the beginning. Several reasons are attributed for the lack of interest:

First, news stories which were selected to be used with the computerized system had to be keystroked twice, once for the computerized news service and once for the traditional duplicated, printed news release disseminated through the mails. Therefore, not much material got on the computer-based system. With COMNET, editors will be able to enter the material with one keystroking operation (on terminals with video screens) and line printers will use stencils to prepare the same news material for duplication and mailing to media. Harsh is hoping there will be more news and feature material in the computer system because of the change.

Another factor, according to Harsh, is that it now seems that newspaper editors don't like the bother of calling up the computer, querying the index, deciding what news to select, and then extracting it. Apparently, they would now rather have news material transmitted directly to their computers. COMNET will permit both options: access to the computer or direct transmission to the newspaper computer, and will be the first instance of this type of arrangement in the nation.

Harsh also explains that the system records what news items are being used, and sometimes this was more information than university editors wanted to know. In other words, the computer was recording low usage of university material. Harsh says COMNET will not only keep tabs on what is used but by whom. "Usage should be much better with the new system and communicators happier," notes Harsh.

But undoubtedly the biggest problem with getting the computerized news service going has been education and promotion. Fredericks, Harsh, and Ferris all admit that this is the major reason why more newspapers haven't yet utilized the system. "With this type of system you have to cultivate the newspaper editors," contends Harsh. "It is a completely new system for them. They need to know how it operates and how it can benefit them." Ferris reports that a member of the staff will be working directly with potential media clients to explain the system and to generally massage the system so that use increases. She adds, "We have been reluctant to provide intensive training at this stage simply because in a few weeks the old system will be replaced by COMNET which will have some new procedures and will require additional and different training."

States Ferris, "The computerized news service has real promise. The feedback we get from the newspapers that have been accessing our system is that they think it is a great idea. The only problem with that is that once you build up expectations, the need must be met; otherwise, credibility declines. This has been difficult for us during the transition period. At this point we are working to make the transition to COMNET and at the same time, except for a pilot program in family living, are continuing to send out printed releases. This, of course, requires a duplicate effort; with a small staff, that puts a lot of stress on the system." Currently, from four to seven news releases are put into the computerized news system weekly; the expectation is that perhaps a dozen news releases will be entered each week once COMNET is fully functioning.

Harsh says he does not know for sure if electronic transmission or news is the right approach for the future but he is sure, after meeting with many newspaper people, that the 8 1/2 x 11-inch printed news release is definitely not the right approach. Notes Harsh, "The time is fast approaching where newspapers may not use anything that comes to them in printed release form." A recent Michigan survey of daily newspapers in Michigan revealed that 90 percent of them plan to have computer systems by 1985.

Concept of COMNET

The COMNET system is being built around a shared-logic word processing system software package called UNIX which will operate on a DEC 11/70 computer. The concept involved is "intelligent networking," which means the system will have the capacity to electronically link with other computer systems and data bases elsewhere. Examples would be such systems as Nebraska's AGNET, Virginia's CMN, Michigan's own TELPLAN and TELFARM information utilities, various USDA data bases, or any other data sources that Michigan research and extension staffs believe would be helpful.

When fully operational, COMNET will have computer terminals in every Michigan county extension office. Sixty-five of the 80 offices already have terminals. Counties are responsible for purchasing their own equipment. Fifty-five terminals will be located on campus, distributed among the information service, extension subject matter specialists, and some departments.

Major uses

The major uses of the system will be for text processing and electronic mail. The system will have its own dictionary and even a package that will evaluate the text matter in terms of the reading level to which it was written. Full text processing capability will not be available to field staff, however. Harsh says if field offices wish that type of service it is recommended that they acquire stand-alone word processors. The reason for this is that communication costs (phone charges) for transmission of lengthy text matter between the county offices and the campus computer would be prohibitively high. On campus, the system will work something like this: An editor types a rough draft of an extension service news release using his own video screen terminal. He will then transmit that draft to the appropriate extension specialist for checking. The specialist will be able to make any changes he deems necessary on his own video screen terminal. Once the editor and the specialist reach agreement on a final version of the news release, the information can be entered into the computerized news system for statewide dissemination. Lengthy extension or research bulletins publications will also be written and edited in the same fashion with the final version transmitted to a proposed computerized typesetting system.

Computerized typesetting

In a year or two, COMNET may have a computerized phototypesetting system of its own. The system would permit transmitting of copy entered on the CRT terminals directly to a computerized phototypesetter. "These systems cost from $20,000 on up," explains Harsh, "We plan to hold off on this for awhile longer." COMNET has the software to electronically transmit coded text to off-campus firms who have the typesetting capability. "It may be that letting outside firms invest in and maintain the equipment would be more economical for us than owning such a system ourselves at the moment."

Communication costs

With the present computerized news service, newspapers accessing the system pay the line charges if there are any. Harsh says, however, that there are a number of local telephone numbers in the state linked to the computer network so that in many cases local rather than long distance calls can be made by newspapers or other media. With COMNET, which will feature the option of transmitting university news directly to the newspaper computers, communication costs will be paid by the university. Fredericks says the general philosophy is that we typically do not charge for news releases on paper, therefore, why charge for news delivered electronically.

Equipment costs

Harsh says the initial investment of the COMNET system will be from $240,000 to $250,000. The DEC 11/70 purchase price was $140,000. The software package was around $10,000. Fifty-five terminals, of which eight are presently in the information offices, total $82,520. Three interface units and three line printers cost around $10,000.

Ferris says the computerization of communication is a new venture for not only Michigan State University and the state's media, but it is "new ground" for everyone who is in the information business. She says much trial and error will occur as these innovative systems, including Michigan's COMNET, are developed and expanded.

The Purdue University System

The dream of Ed Ferringer, head, Department of Agricultural Communications at Purdue University, is to have a typewriter-free office, indeed, a typewriter-free College of Agriculture. "I would like to see computer terminals in every office and hardware so compatible that a manuscript could be keyboarded only once with all editing and additional production done electronically," explains Ferringer. "Over the next few years, I see nothing but expansion of computer systems in information offices."

The Department of Agricultural Information has responsibility for all communications from the Indiana Cooperative Extension Service, the Agriculture Experiment Station, and the College of Agriculture. Services also extend to the College of Veterinary Medicine and the College of Consumer and Family Science because these colleges have extension and research components.

Purdue has made a formidable beginning in computer-based communications systems. The system features electronic editing, computerized news transmission, computerized typesetting, and a computer-based ink jet addressing system. All of the systems operate with one computer, a DEC PDP 11/70 unit that is owned jointly with the Department of Agricultural Engineering and housed in its facilities. "What our department did was essentially buy into the agricultural engineering operation," explains Ferringer. "We brought more memory capacity for that computer and, in turn, we were permitted to link into their system with a maximum of 12 terminals. We are not yet up to full capacity in that we presently have six terminals, but three more are on order.

<u>The computerized news service</u>

The computerized news service is called PENS, an acronym that represents Purdue Electronic News Service. The system is the sole creation of Ferringer's department in that it came up with the money for the equipment and the lines to get the operation started. "Media would not have understood it if we would have limited the operation to just agricultural news," says Ferringer, "so we allowed the Office of Sports Information and the Purdue Office of Information to contribute news and feature material, too." These offices each purchased a computer terminal (Texas Instrument Silent 700 Series) so that selected news releases could be entered from their own headquarters.

The PENS system, which has been in operation since September 1980, is using the same software package as Michigan State University's operation. "We borrowed their program and modified and, perhaps, refined it to some extent," notes Ferringer. "Basically, we are operating the same way Michigan State is."

Two or three of the department news stories and several from the other information offices are put into the system each day, and the stories are kept in the system for one week. The news items are selected by the department's chief news editor. The Associated Press and United Press International wire services and five daily newspapers are regular users. Ferringer says the fact that more of the state's media are not using the system is the department's fault. "We just haven't traveled the state to sell it," Ferringer comments. "We had a demonstration of the system at the Hoosier Press Association meeting and there was considerable interest, but we haven't done enough follow-up work."

With the Michigan system, media must access the computer by phone line. Ferringer says a program is now being written, however, that will permit "dumping" the news releases into the media computers if that is their wish. "We wanted the media to have the choice; we didn't want to shove anything down their throats," explains Ferringer. The Associated Press has already stated its preference for having Purdue automatically enter the material into the AP system on a daily basis.

Text processing

An exciting feature of the Department of Agricultural Information's operation is the computer-based text processing that is being done. Approximately 1,200 news releases and feature articles are written and disseminated by the department each year. All of these are now being written and edited on the computer terminals by the editors. "The editors have taken to electronic editing very well," contends Ferringer, "The staff keeps yelling at me for more terminals. Each of them would like one for himself. I have one editor who has completely done away with his electric typewriter and is doing all his office work on the terminal."

Once news releases are written, edited, and approved for release, the material selected for the computerized news service is entered electronically into that system. These stories, as well as those not selected, also are printed out as hard copy on a line printer. These are duplicated and mailed as standard printed news releases. The CRT terminals are Ann Arbor and ACT 5A brands.

One of the interesting aspects about the Purdue operation is that all of the news material is permanently archived electronically. In other words, all paper files have been eliminated. Stories are filed on computer disks. When the disks become full, the material is transferred to magnetic tapes. Each story is replicated three times on each tape and then three tapes are made, according to Ferringer. Each tape is stored at a different campus location: the Department of Agricultural Engineering, the agricultural communications office, and in a film vault in the graphics department.

The agricultural information department also has a computer terminal that is linked to Purdue's FACTS system, (an information utility that will be described in the next chapter). The FACTS system has a text processing program. Consequently, some publications editing and production is done with this system in that the FACTS terminal is connected to a line printer that produces camera-ready copy. Other departments on campus can bring over their floppy disks and the information staff can then electronically edit the material and print it out on the line printer.

Phototypesetting

The department has a CompSet 500 phototypesetter, one of the early and somewhat inexpensive photocompositors. "We have been real gutsy. We developed our own interface so that we could drive the typesetter with the computer," explains Ferringer. "The manufacture of the typesetter was not very cooperative. In fact, we had to sign an agreement with them that we would not hold them responsible for any kind of problems with their phototypesetter once we attached the interface devices." The typesetting operation became totally computerized at a cost of only $4,000 for building the interface unit. "Even though it is sort of a jerry-rig, we are able to do about 75 percent of our own typesetting," notes Ferringer. "We still send out big jobs to commercial houses on a bid basis."

Several times a year the Department of Agricultural Information produces a large packet of stories all related to a special theme which is mailed to most media in the state. A spring packet pertaining to home, garden, and lawn topics usually consists of about 35 pages of doubled-spaced typed news releases. This year, the material was run through the computerized phototypesetting system. The 35 pages were converted to 7 sheets of column-width, camera-ready copy. According to Ferringer, the department saved $730 in postage with this one campaign. Ferringer says he has not had much reaction from the newspapers. He is sure comments from the weeklies will be favorable. The dailies may have some problems with the column widths but they can access the Purdue computer and get the same material printed out in the dimensions they need. Ferringer said one farm broadcaster liked the camera-ready material because he did not have to wrestle with 35 pages while on the air.

Other computer operations

The department is installing a Bell and Howell Ink Jet addressing system much like the unit that Nebraska has. Ferringer also says their computer will eventually be used for office management and publications inventory tasks but the department is presently concentrating on its news and publications programs.

Cost

Ferringer says it is difficult to separate costs for each of the operations because they all share portions of the computer hardware. The department's cost for expanding the memory capacity of the computer was $20,000 plus it contributes $7,500 per year for technical assistance. The six computer terminals cost approximately $6,000. The interface unit and other additional equipment to computerize the phototypesetter was about $4,000. The new ink jet addressing system cost $34,500, which includes an interface unit to connect it to the computer. Ferringer says the overall cost to date would be from $75,000 to $80,000.

The University of Minnesota System

This case study involves two departments at the University of Minnesota. One is the Minnesota Printing and Graphic Arts department, a recognized national leader in the field of typesetting and which has been the recipient of numerous awards and recognition in trade and business publications. The department has been a pioneer in designing systems which connect word processing hardware to phototypesetting equipment. The other department is a major customer of Minnesota Printing and

Graphic Arts--the University of Minnesota Department of Information and Agricultural Journalism.

Computerized phototypesetting

Minnesota Printing and Graphic Arts can produce typeset material from almost any type of word processor from any department that is either part of the University of Minnesota or other state government agency. Typeset material can be produced from either floppy disks, cassettes, magnetic computer tapes, or from a word processor or computer located anywhere in the state via electronic transmission utilizing phone modems and conventional phone lines. The department can also produce typeset material directly from the university's Administrative Data Processing computers or from various computers at the university's Computer Center. Information coming from these two sources usually are long data bases, such as student directories. Minnesota Printing and Graphic Arts is presently working with more than two dozen clients and has an annual printing volume that is approaching five million dollars.

There are now between 90 and 100 word processors at the University of Minnesota, mostly located in departments within the Institute of Agriculture, Forestry, and Home Economics, particularly the Cooperative Extension Service. Some of the word processors have phone modums so that they can communicate directly with the printing department. Most of the word processors are CPT 8000 models with floppy disk drives. Six or seven older models, CPT 4200s, are still in use but are being phased out. They have quarter-inch magnetic tape memory storage systems. The departments purchase their own word processing equipment. The university recommends the CPT 8000, but some other brands or word processing systems have been purchased. So far, there has not been much difficulty in being able to interface any of the equipment with the computerized typesetting system if information is entered by phone modum.

The major objectives of the computerized typesetting system are to eliminate redundant keystroking operations so that once copy for a publication is typed, it will never have to be retyped as it progresses through the various stages of editing and typesetting.

The system works in this way: The floppy disks, with information in storage, are either hand carried to the printing department from the submitting department, or information is electronically transferred by phone modem and conventional phone lines from the word processor to an Imlac composer and the information is transferred to a fixed disk in the Imlac system. If material should come in on magnetic tape, it too, can be read into the Imlac system with a special tape reader. The CPT operator can call up the information on the video screen page by page and then keyboard special typesetting commands or codes into the copy. Such codes determine line length, type font, column width, leading, and many other typographical variables. Users can also pre-code the material before they submit it to printing if they desire. The department has developed a program so that, as codes are put into the system, they are "expanded."

For example, a vertical slash mark followed by a number or letter in lower case could mean anything a user wanted it to mean. In other words, CPT operators can begin their keyboarding by putting in a slash mark and a lower case "a" and the typesetting software will expand that command throughout the whole manuscript to mean 10 point type, 11 points of lead, Times Roman type face, 21 pica width, or whatever purpose the symbol is selected to mean. When using the symbols, the CPT operators must only be consistent in their use of the codes they create. The department tailor-makes their codes to fit the user's job, rather than forcing the clients to tailor their jobs to the system's codes. "If the user does this, it saves a tremendous amount of money because production time is drastically reduced," says Dennis Coleman, director of typesetting. "You cannot train a CPT operator to set type; it takes many years to understand the ins and outs of it. So we take the copy and mark it as to where to put the 'slash a,' 'slash b,' or whatever. That way the CPT operator does not have to understand printing terms and functions. We do, and it is our job. Our goal is to make coding a simple operation that anyone can handle even without much knowledge of printing terminology."

When the coding or formatting is complete, the material moves into a Mergenthaler 202 computerized phototypesetter which produces galleys. Proofs (or copies) are made for the authors and editors. Editorial corrections can be made on the typesetting system; corrections do not go back to the CPT word processor. "Once we have the information captured on the computerized typesetting system, all further changes can be made there," according to Coleman. After all final changes are made, the system will go into a pagination routine and produce page proofs.

Space allowances for photographs or other illustrations also are formatted into the pagination program.

Says Coleman, "We can usually turn galleys around in 24 hours. Because keystroking is completed before the jobs come to us, straight text matter can come into the plant one day and be out the next." Three operators are keyboarding material into the system simultaneously.

Coleman answered with an emphatic "no" when asked if there have been any major problems. The system has been in use about six years and the hardware has now become fairly well-known in the printing industry. Coleman would like a new software package that would allow slightly faster production and a better pagination program. The Minnesota system now has a 10 megabyte disk storage system interface with three separate computers. Coleman would like to have an 80 megabyte disk system with a central processing unit (one computer). The total investment in the present system is approximately $300,000.

The human factor

Gail McClure, coordinator of publications in the Department of Information and Agricultural Journalism, is very high on computerized typesetting and computer technology, in general, but has experienced some frustrations involving the man-machine interface problem. "I am very committed to new computer technology because I don't think computers will disappear any more than television of any other kind of new technology," states McClure, "but there are technocrats who offer a 'quick fix' with new technology, and they irritate me. I know the technology will perform, but it is only as good as the people who operate it."

McClure's anxiety stems from the fact that she has had to train four different operators since the department installed its CPT word processor less than a year ago. The problem is that after the operators have been trained, Minneapolis and St. Paul business and industry, which are very computer-oriented because major computer manufacturers are located there, hire the operators away from the department. The state civil service system does not recognize the special qualifications that it takes to operate word processing equipment. McClure contends word processing opeartors must have some understanding of publications work and computer technology, in addition to keyboard typing. "When most offices install a word processor, usually the person selected to operate it is one of the low seniority secretaries," explains McClure. "Whenever managers see a keyboard, they automatically think 'typist' or 'secretary' when, in fact, the technology demands something beyond the stereotyped typist duties."

Throughout the whole technology explosion, McClure thinks there are some obvious things to monitor. "Technology is way ahead of the people, so the overall problem is to get people to grow with the machinery. Training and human development programs are needed. People can become very negative about new technology, and the hardware will just sit there, unused. I am delighted with technology, but I have been frequently frustrated with the human factor, a situation that is largely unanticipated by technocrats," notes McClure. "New computer-based communications technology will change the way information offices do business and there will be considerable paranoia with it."

Observes McClure, "Many people demand the latest thing in technology, the new trick, the new electronic 'gee whiz' things. The problem is we have had slide-tape equipment for a long time and yet staff people still do not know how to use it. Look at the Telelecture system in Minnesota. It was a fine idea, but few staff are using it because a couple of bad experiences tainted the whole system. We have a Typereader 2 optical scanner in the department. The theory was that secretaries in other departments would use a special typewriter typeface, typed manuscripts could then be put through the scanner and copy would be automatically entered into the CPT word processor for electronic editing and then sent to typesetting. But convincing departments and secretaries to use the special font is extremely difficult. Technically, the equipment is good, the idea is simple, and the operation is very cost efficient. But, we have trouble getting cooperation because people are reluctant to change their work habits plus the institutions are reluctant to change job descriptions or other rules, too."

Minnesota's Extension Service is seeking $4.5 million from the state legislature to establish a statewide computer-based information and communications system. Ultimately, every county and area extension office will have a computer terminal. Software will include electronic mail, decision aids, tutorial programs, text processing, and office management functions. "Attitudes developing in anticipation of this is that county agents want emphasis on office management functions, specialists want decision aids and tutorial programs, and county agents fear they may succumb to area extension specialists," states McClure.

"Furthermore, specialists want to learn computer language and develop their own software when these functions may be best left to computer programmers. Everyone wants to be in control of the system. This is where staff development and training is needed to bring people along with the technology. A crucial need is for some type of technology assessment so that at least some of the negative impacts of the new technology can be anticipated and perhaps resolved."

Text processing

In the information department, manuscripts can be keyboarded directly onto the CPT system. Manuscripts also can come into the department typed with the required typewriter font for reading by the Typereader 2, which enters the text onto the CPT word processor. The CPT operator can then make further editorial changes and enter the special codes for the computerized typesetter system at the printing department. After material has been given editorial approval, it can then be transferred by phone modum to printing. A third option is that publications material from other departments can be transmitted to the information department CPT by phone modem or disks actually brought to the department for their use.

The total text processing investment in the Department of Information and Agricultural Journalism is around $35,000. An approximate cost breakdown would be: CPT word processor, $12,000; one dual head line printer, $13,000; the Typereader 2 optical scanner, $15,000.

Changing role for communicators

McClure predicts that information and publications professionals who spend a lot of energy preserving their jobs the same as they are today will see their positions downgraded. Information persons who keep up with the technology will be immersed in the center of the action, and will be devoting more time serving as professional communicators rather than as technicians for specialists. McClure believes those communicators who keep up with technology will gain advantages that others will miss.

Summary

Computer-based communications systems in operation at five land grant universities and which are part of ongoing activities of information and publications offices have been described. The systems vary considerably in terms of investment, sophistication of the technology, and functions performed. The Oregon State University and the University of Nebraska computerized news services, for example, were implemented with just a few thousand dollars whereas the investment in that type of operation was much higher for Michigan State University and Purdue University. In terms of computerized typesetting, the range extends from relatively modest systems at Nebraska and Purdue to a very large investment and the latest in technology at the University of Minnesota. With regard to electronic editing and text processing, Purdue has the most elaborate system with editors keyboarding much of their own material into the computer system for both news material and publications destined for typesetting. Some of the systems utilize computers for ordering publications, inventorying publications, office record keeping, and archiving information. By and large, however, it is clear that the office functions are not at the top of the departmental priority list. It is fair to say, however, that other departments on campus, such as data processing centers or business offices, often handle these functions.

The fact that there has been such a range in functions, cost, and the complexity or configuration of these systems, however, has been useful in that the differences provided more opportunity for those of us who are still computer illiterates to grasp the extent and diversity of these pioneering systems. No "ultimate" system was discovered, but certainly the Purdue computer-based system is perhaps the most integrated and efficient system on line in terms of overall functions of news transmission, typesetting, electronic editing, and office management. Copy is being entered by writers and editors. There is only one keystroke operation regardless of whether the material is destined for news releases, printed publications, or interoffice memorandums. The system now being implemented at Michigan State and the one on the drawing board at Minnesota are approaching this level of operation.

In terms of the five major concerns delineated earlier, not many problems were uncovered. With regard to the proprietorship or sovereignty over informational material, there looms no major threats to the function of the information office as a "chief gatekeeper" for the university. In fact, where external users can generate their own information and see it through to printed form while bypassing the information office, in all cases the editorial expertise of the information service is sought. In other words, the editing function the information office provides is well recognized and used. In most of the systems described herein and for those computer-based systems being planned, there is a major effort to preserve the "gatekeeping" function of the information department.

With regard to issues of "standards and quality," again there are no major problems. The quality and amount of material produced has improved and increased. Electronic editing and word processing gives editors more freedom to make editorial changes because revisions are easier to make. The new computerized typesetting systems provide greater options of type sizes and fonts. The functions of editors have not really changed except for Purdue and Michigan State University where editors are performing more keyboarding operations. Editors are still using the "blue pencil" in most other systems with clerk-typists delegated to keyboard final drafts of information into the computerized systems. The real test of the standards and quality factors will occur when writers reach a point where they, too, are keyboarding material. The first place where this may happen is with the Minnesota system.

None of the systems were operationalized to save money. For the most part they were implemented to make the news processing operation easier, quicker, and in some cases to guarantee that news material would be used by media. Electronic news has probably increased both delivery as well as keystroking costs because keystroke redundancy has not been completely eliminated in most cases. But there is a reasonable tradeoff in that the computerized news systems see more of their material being used and, in some cases, media are demanding more material from the university. There is greater potential savings with computerized typesetting systems, but an important point to remember is that what such systems essentially involve is the transfer of the typesetting task from the printing department to the information office. Not much time is saved via the keystroking operation regardless of where it is done or who does it. The greatest savings comes with the fact that once a manuscript is in the computerized typesetting system, further editing changes can be made cheaply and efficiently.

The only major man-machine interface problem occurred with the Minnesota system. Their problem may be the result of the peculiarities of the job market in the Minneapolis-St. Paul area. On the other hand, it may be because of another factor that bears watching. The Minnesota operation is the only one that is processing considerable material from external users. Experiences there are reflecting those of business offices which have been computerized--greater personnel problems and not much improvement in productivity (American Institute of Industrial Engineers, 1978). In the other systems, only a limited number of persons external to the information department access the systems. Other man-machine interface problems can be classified as merely nuisances, such as typists not using the right typewriter font for optical readers.

Technical limitations seem to be no major problem in that they usually can be overcome with additional hardware or software equipment. There are some compatibility problems between terminals and computers or with interfacing computers and typesetters, but in most cases these are resolved. A good example of this is the instance where Purdue had to build its own interface device for its typesetting equipment because of no cooperation from the phototypesetter manufacturer. There was no evidence that these systems are complex and expansive to the point that full-time computer specialists are needed on the information office staff. Computer specialists were consulted when the systems were designed and are occasionally called on when problems arise.

Perhaps the most "telling" thing of all is that at no time during this research did anyone ever suggest that they would prefer to scrap everything and revert to earlier modes of operation. They continue to look to the future, trying to find ways to further refine and expand their operations.

CHAPTER V. THE INFORMATION UTILITY

Introduction

Someone once coined the term "information utility" to describe home or office computer-based information systems. The label is adequate in that it fosters an image of a communications operation that supplies information to the user, much like a public utility supplying electric or water service.

Sometimes "information utility" has been used to describe computerized news service such as those described in the previous chapter, but information utilities usually provide a much larger and more diverse set of services and programs than does the typical computer-based news service. Furthermore, information is usually conveyed directly to the end user, not through an intermediary such as mass media. A third characteristic is that most information utilities are interactive systems. In other words, data can be entered by the user for participation in problem-solving or decision-making programs. Interactive systems also make possible the use of educational programs based on self-instruction or tutorial assistance.

Jones (1979) and Zimmerman (1979) indicate that the United States is considerably behind other nations, particularly Europe, in the development and application of information utilities. One British system, operated by the British Broadcasting Corporation, has 40,000 subscribers and provides more than a dozen different kinds of information. The British postal system also has a system with 1,500 subscribers in homes and offices. A major feature of the system is electronic mail. Denmark, Finland, and a number of other European countries are rapidly developing similar systems.

Tyler (1979) classifies home and office information systems into teletext and videotext types. The videotext category encompasses the interactive systems. Teletext describes the noninteractive systems. In this research, however, we will use the term "information utility," and it will include both interactive or noninteractive systems. Furthermore, to earn the title, information utilities must supply a variety of information to end users.

Six land grant university information utilities will be described in this chapter: Computerized Management Network (CMN), Virginia Polytechnic Institute; TELPLAN, Michigan State University; AGNET, the University of Nebraska; Green Thumb, the University of Kentucky; FACTS, Purdue University; and the Integrated Pest Management System, Iowa State University.

Some Commercial Systems

Before presenting the individual descriptions of the land grant systems, two large-scale, general interest, and interactive information utilities operating in the United States and one noninteractive, specialized operation will be described to provide the reader a general introduction as to how these systems operate and the kinds of programs they provide.

The Source

The Source is the nation's largest information utility. It was created by the Source Telecomputing Corporation, McLean, Virginia, in 1979, and now claims 10,000 users.

A wide variety of programs is offered: 1) the United Press International news wire--weather, news, syndicated columns, and stock and commodity exchanges, 2) electronic mail--permits instant communication with other clients on the system and features key-word indexing of incoming and outgoing messages (electronic filing), 3) Datapost--service that allows the user to type a message into the system and have it received (in hard copy) in the next day's mail, 4) the New York Times Consumer Data Base--provides extracts of articles which have appeared in major publications, 5) the Dartmouth College Educational Library--features thousands of programs primarily for self-instruction, 6) text editing--a complete word processing system, 7) data base management--permits users to create and manage their own data files without additional software, 8) travel club--permits lodging and travel reservations and ticket ordering direct from home or office, and 9) The Washington Post (an electronic newspaper service). This last program is the latest addition to the system. The Washington Post and three other newspapers--to be joined by eight other papers by the year's end--are involved in an experimental electronic publishing operation. The Washington Post is being delivered electronically to subscribers of The Source. Viewers in 189 cities can make a local call (with a time charge of 8 1/3 cents per minute) from 6 p.m. to 5 a.m. A separate staff of Post editors works on the project to enter from 60 to 70 stories from the next morning's paper for viewing each night along with other "data base" material. The experiment was organized by the Associated Press to give member newspapers experience with electronic publishing and includes research to find what kinds of information home computer users are interested in and what markets exist for electronic publishing.

Cost of The Source is $15 per connect hour from 7 a.m. to 6 p.m. local time. The rate from 6 p.m. to midnight is $4.75 and from midnight to 7 a.m., $2.75. There is a minimum charge of $5 per month. If users create their own data base with the data management program, there is a storage cost of $.003 per block of 2,048 characters per day.

Micro-NET

Micro-NET, an information utility created in 1979 by Personal Computing Division of CompuServe, Inc., Columbus, Ohio, has 8,000 subscribers. The system is being marketed in cooperation with the Tandy Corporation which handles application procedures through its Radio Shack retail stores. The basic application fee is $19.50 with purchase of Radio Shack hardware and $29.50 if other brands of computer hardware are used. Users are given an identification number, a secret password, a local network telephone number, and the basic documentation of the Micro-NET system. The rate per connect hour is $5. The system operates between 6 p.m. and 5 a.m. on weekdays but all day on weekends and holidays.

The system can be accessed by dialing local telephone numbers established in 189 cities across the country. Users located elsewhere are charged a $4 surcharge per connect hour and, of course, must pay their own long-distance line charges.

Micro-NET offers electronic mail, programs pertaining to business and financial management, educational aids, and Micro-Quote, which provides trading statistics and descriptive information on more than 32,000 stocks, bonds, and options. Micro-Quote is updated daily and historical prices and volumes are available for most stocks back to 1974. This service has an additional charge of $5 per connect hour.

Information utilities expand the potential use of the small microcomputers that are typically used in home or small office situations. To participate in these systems, the user must have a simple computer terminal with a communications interface or phone modem. More services of the utilities can be accessed and used, however, if the user has a microcomputer.

The Source and Micro-NET are interactive systems whereby users can enter their own data either for word processing, educational programs, or data base creation. An example of a noninteractive information utility follows:

Instant Update

Instant Update is the product of Professional Farmers of America, Cedar Falls, Iowa. It is described by the company as an electronic newsletter and specializes in agricultural information for farmers. Instant Update began operation in March 1981 and has 500 farmer subscribers.

Professional Farmers of America provides the farmer a receiver that connects both to the home or office phone and to a television set. (The phone line must be a single party line.) The farmer types in his personal code number and another special code to request general categories of information he or she wants from the system, and then dials Professional Farmer's information center. Within a three-minute-period, an electronic burst of information is transmitted to the receiver and is stored within it. Then, either immediately or at his or her convenience, the farmer can view up to 16 pages (screens) of information. The information can be retrieved at any time unless the receiver is turned off or the next message is recorded.

The cost is $95 per month plus a phone toll for the 2-to-4 minute station-to-station phone call that is necessary for each transmission.

Programs offered by Instant Update are as follows:

Pro-Farmer Today: Current news and analysis by the Pro-Farmer's staff, 12 pages written each day.

Futures Price Profile: Four pages of futures quotations covering corn, soybeans, Chicago wheat, Kansas City wheat, Minneapolis wheat, fed cattle, hogs, oats, and gold. The information is updated every 10 minutes.

Technical Triggers: A summary of important chart points including support and resistance plus analysis highlighting key chart points important to market decisions.

Cash Market Scan: Tracks prices and basis at several key points for the major crops.

Washington Watch: News from Professional Farmer's Washington bureau that alerts members to major market-making events likely from Washington. Details of important government reports when released.

Market Strategy: A commodity-by-commodity summary of Professional Farmer's overall marketing plan.

Market Tactics: A summary of current market recommendations.

Your State's Weather: State weather forecast updated from weather consultants.

Price Chart Trends: A weekly analysis of commodity price charts covering all major commodities including interest rates and precious metals.

Instant Update plans to add additional services by linking up with other computer-based systems to obtain farm management decision-making programs.

As indicated earlier, information utilities at six land grant institutions will be highlighted in this report. Four of the systems are interactive. Kentucky's Green Thumb project and Iowa's Integrated Pest Management Program are noninteractive systems.

The Green Thumb Project

Since March 1980, the Kentucky Extension Service at the University of Kentucky has been testing a home information delivery system they have named "Green Thumb." The idea for the pilot project originated with Harold Scott, chief of agricultural weather for the National Weather Service in Washington, D.C. Scott also provided the leadership for the

FM Weather Radio service that is now functioning in all states. The Green Thumb project is a cooperative effort involving the Kentucky Extension Service, the Science and Education Administration-Extension of the U.S. Department of Agriculture, and the National Weather Service.

Initial support of the project was in the form of a $200,000 grant from SEA-Extension and $100,000 from the National Weather Service. Approximately $200,000 also was contributed later by SEA-Extension.

One hundred farmers in each of two Kentucky counties were given an electronic data receiver to connect to their phone and television receiver. The farmers then dial-up a microcomputer in their county extension office for weather, markets, and agricultural production and home economics information. The receiver, termed the Green Thumb, stores the information in its memory and then displays the information on the television either immediately after transmission or at the convenience of the farmer. Farmers from all income levels were selected for the project. All services are provided free of charge.

Ragland and Warner (1980) indicate that Kentucky farmers need detailed weather, market, and farm production information on a real-time (immediate) basis and a computer-based information system can meet such a demand.

Pre-existing information

One of the major principles followed in establishing the system was to use existing information sources and equipment. In keeping with this goal, the system was designed to allow use of the home television set, the telephone, and information already assembled by organizations such as the Extension Service, state weather people, farm commodity market sources, the U.S. Department of Agriculture, and others. The key ingredient to bringing all this information together was the low-cost, reliable electronic box for receiving, storing, and then displaying the information. The box, which came to be known as the Green Thumb, was designed by personnel from SEA, the National Telecommunications Institute, the Bureau of Domestic Business Development, the U.S. Department of Commerce, Purdue University, and the University of Kentucky. According to Ragland and Warner, the inputs of all these cooperating sources were integrated into a set of specifications for hardware and software, which was developed by a computer industry consultant. The Green Thumb box was specially manufactured for the project by Motorola and the Tandy Corporation. Two-hundred-fifty boxes were built at a cost of $310 each.

County computer

A somewhat unique aspect of the project is that instead of using one large, centrally located computer, two microprocessors were used, one in each county extension office. The microcomputers are Western Union GS200 remote data base units. Specifications for the software required that the county microprocessors had to automatically receive, sort, and format the weather wire, market data, and other information and updata material every 15 minutes.

The "state" computer, a Hewlett-Packard HP3000 Series III minicomputer located on campus, automatically enters the weather and market information and allows manual inputs of extension personnel.

Information offered

There are 16 classes of information and 170 subcategories. The majority of the information is text matter but weather information is mostly displayed with graphics. The categories of information are: county news, weather, markets, and information pertaining to pest management, 4-H, home economics, resources development, agricultural economics, agricultural engineering, agronomy, animal science, entomology, forestry, horticulture plant diseases, and rural sociology. National weather maps and radar reports are obtained from the National Weather Service. Local radar reports are obtained from radar installations at Covington, Kentucky, and Nashville, Tennessee.

Use of the system

Market information is requested more often than other topics, and weather data are the second choice. During a 21-day period in April 1980, the 200 farmers made 3,434 calls requesting 11,530 items of information. Ninety-three percent of the calls were completed successfully. Forty-two percent of the requests were for market information, 38 percent for weather. County information was requested 5.7 percent of the time and home economics information was requested 4.6 percent of the time. All other types of requests were less than 2 percent. The eight most frequently requested items of information were the county forecast, soybean futures, corn futures, three-to-five day market outlook, wheat futures, state radar map, national radar map, and the state weather forecast.

During the 21-day period, calls were made every hour but the peak time was between noon and 1 p.m. Other busy times were between 10 a.m. and 11 a.m. and from 3 p.m. to 4 p.m.

The Institute for Communications Research at Stanford University has been given a research contract to study the attitudes of farmers about the system and details as to how they have used the system. That research will get underway in mid-1981.

The University of Kentucky is conducting research to determine if there is a relationship between personal characteristics of farmers and use of the system.

According to Paul Warner, associate professor of sociology and Green Thumb project evaluation leader, usage of the system dropped off considerably during the winter months of 1980-1981. He says there is no way to know at this point if this occurred because farm production activities decline with the end of the growing season or if the novelty of the new system influenced its early use.

There have been some problems, too. The state computer has often been overloaded, not from Green Thumb use but from other university needs. Therefore, there have been a number of delays in updating material and in being able to accept new data from the external suppliers such as the National Weather Service. Warner indicates overall "downtime" would be less than 5 percent, but some farmers may have become somewhat disenchanted with the system because of these problems and may not be using the system as much. Warner says he will be anxious to see the next results of system use to see if a new growing season brings on new interest. A new videotext computer is being ordered to replace the Hewlitt-Packard for Green Thumb use. Warner indicates there have been fewer technical problems with telephone connections and the farm Green Thumb boxes than what might have been expected.

Future prospects

The Green Thumb project was initially a one-year experiment but it was extended to a second year. Warner says, "I don't really see public money becoming available to expand or to continue the system as it presently exists. The original plan included eventual expansion into other counties and other states, but that would mean federal money to finance the expansion. Given the general budget cutting mood in Washington, I don't think expansion, at least with federal money, will take place."

Warner thinks the private sector is moving ahead more rapidly than anyone might have anticiapted in terms of the development of hardware He says that this does not suggest that anyone is filling the gap in terms of providing information. "If Extension and other public institutions continue to play a role in computerized communications, it would probably be in the information provision area. Private marketing organizations, agricultural advisory groups, and other private firms are stepping in to develop these systems. The public sector has taken an initial step to get the technology going and to get people thinking and innovating beyond early constraints. A public effort was necessary to get things off dead center, and now I think the second generation of computerized systems will be much more in the hands of private enterprise," Warner adds.

J. L. Ragland, state project leader and associate director of the Kentucky Cooperative Extension Service, is more optimistic about the future of Green Thumb or similar systems. "Green Thumb will be continued in Kentucky and other states but probably with a combination of state, federal, and county funds and perhaps sponsorships from agribusiness firms," states Ragland. "The reason is because you have those reoccurring phone charges that are awfully difficult for the public agencies to pick up. So maybe country banks, farm supply stores, or other types of agribusiness might somehow assist these systems."

Ragland thinks that perishable information such as weather and market information will be delivered by teletext systems whereas general education and problem-solving programs will be delivered by videotext systems. He foresees the day when teletext units will be in tractor cabs so that farmers can keep up with market activities while performing field work. He also believes more of the educational and problem-solving software will be packaged for use with stand-alone home or office microcomputers and thus drastically decrease the need for telephone line transmission. "We are "downloading" programs, why not program listings," contends Ragland. He also believes software should be made available to the public under the same conditions as the typical extension or research publication. According to Ragland, the fact that software can be copied so easily and delivered quickly will create a great multiplier affect in spreading the technology of computer-based communications systems.

He foresees software being produced and approved for use by the land grant system in much the same way that publications are authored, reviewed, and approved for dissemination to the public.

In general, Ragland and Warner are satisfied with the Green Thumb equipment, farmer acceptance seems to be strong, and extension personnel have been willing to adequately maintain the data base. Ragland and Warner hypothesize that after farmers get accustomed to noninteractive systems they will desire interactive programs for problem-solving functions.

Virginia's Computerized Management Network

The Computerized Management Network (CMN) at Virginia Polytechnic Institute and State University was begun in 1969 to assist extension personnel in Virginia and nationwide in solving problems, retrieving information, preparing educational or training presentations, and evaluating extension programs. In its first years, there were only a handful of software programs but now the total list of available programs is more than 60.

The Virginia information utility was started as a pilot project of the Federal Extension Service (now Science and Education Administration, U.S. Department of Agriculture). End users are state extension personnel at both state and county levels. Communications Management Network now has more than 500 users in 44 states and Canada. About one-third of the county extension offices in Virginia have terminals.

The system was designed for noncomputer-oriented persons. No special training is needed for accessing and using the system. Only a brief instruction period of 30 or so minutes is required to familiarize a new user with the mechanics of connecting the terminal with the computer, signing on the system, accessing a program, entering data, receiving the output, and signing off the system. There is no need to learn job control language, details of running the computer, or any other technical aspects of computer operation.

Computer and communications support for the Computerized Management Network are obtained from a commercial time-sharing vendor, Honeywell's DATANETWORK. A time-sharing network allows users to communicate directly with the computer. Because a computer can communicate and compute thousands of times faster than a human being, a time-sharing system can interact with thousands of users simultaneously. Therefore, each user shares computer time with all other users.

Users of the system can access the DATANETWORK computers with their own computer terminals via local or toll-free (IN-WATS) telephone lines from anywhere in the United States. Although the computers are in Minneapolis, users in California or Maine can access them just as easily as if they were in their own community.

Types of users

Subscribers to the system are accepted in two kinds of categories. Class I users are state-supported institutions of higher education and federal, state, and local government agencies. These users are charged for their individual computer usage, connect time, and data storage charges at the current rates for the system as established by Honeywell. Class II users are all other clientele. These users are charged 1.5 times the Class I rates for computer usage, connect time, and storage. There is a $25 monthly minimum charge. Class II users have access to the same programs as Class I clients.

Class I users may become subscribers upon receipt of a letter from a member of the person's administrative staff. The letter is treated as an agreement to assume responsibility for reimbursing Computerized Management Network for all charges accruing to the institution or agency through the use of the system.

Cost

Depending on the type of the program, the length of the program, and skill of the terminal operator, costs of running Computerized Management Network programs vary. Charges can range from 50 cents for very simple analyses to $15 for complete linear programming models. The median cost is approximately $2 per analysis. The Network's users are billed according to the following rates: terminal connect time, Unites States, $12 per hour; terminal connect time, Canada, $15 per hour; central system usage cost, per time sharing unit, $0.10; storage/ data block/month (a block is 1,280 characters) $0.09. The typical cost for county extension offices is $10 per month for light usage, $50 per month for moderate usage, and $300 per month for heavy usage. There are reduced rates for evenings and weekends. The system operates on a 24-hour basis except for short periods of maintenance.

Equipment

Users are advised to have 30 characters per second terminals. In some areas of the nation, the system will accommodate 1,200 CPS terminals. Hard copy terminals typically cost from $1,500 to $3,000. Users purchase their own hardware. New clients receive a Users Guide which contains basic instructions for the system. An on-line Help program provides general information as well as tutorial programs on various topics.

Programs

Programs used on the Computerized Communications Network have been developed and contributed by various departments at Virginia Polytechnic Institute and State University, Clemson University, the University of Minnesota, and the U.S. Department of Agriculture.

Table 3 provides a complete listing and description of programs available on the Virginia system. The three most popular programs have been on dairy cattle feeding, a dietary intake analysis, and livestock and crop market information.

The Science and Education Administration, U.S. Department of Agriculture supplies marketing, futures, and summary information on all major crops and livestock market activities. This information, called Computerized Outlook Information, is available on the system within one hour after release. A major advantage of this service is that it

Table 3. Computerized Management Network programs and costs

Utility programs

HELP - A program that prints sections of the CMN User's Manual on the user's terminal. Includes input forms, program descriptions, and credits for each CMN program. (Avg. cost $1.78)

LEDIT - A program to edit data files on a line-by-line basis. A machine-independent progrm designed for use by noncomputer trained people. (Avg. cost $1.88)

READ - Program designed to read messages sent to your account by other users. (Avg. cost $.62)

SEND - Program designed to send messages to another account. (Avg. cost $1.37)

The CMN monitor also provides the data file manipulation commands: CRFATE, COPY, RENAME, EDIT, LIST, and DELETE.

Information retrieval

OUTLK - Retrieves and prints Outlook information released periodically by USDA. (Avg. cost $2.35)

Human nutrition and health

GROCR - A simulated grocery shopping experience to provide support for nutrition educational programs. (Also see TPGRO) (Avg. cost $2.00)

PRSRV - Food preservation cost analysis program. Compares costs of preserving foods at home versus buying them retail. (Avg. cost $2.95)

RCALL - A food intake analysis program for a person of any age or sex for a period of 1-7 days. (Avg. cost $4.64)

RISKO - Heart attack risk program designed to alert the user to tendencies toward heart attack. (In no way meant as a diagnosis.) (Avg. cost $2.44)

TPGRO - Prints the entire food list in the grocery store for the GROCR program. (Also see GROCR) (Avg. cost $4.17)

Table 3 (continued)

AFFRD - Can We Afford It? Program to assist in financial counseling with families. Examines family's projected spending and income patterns given various rates of inflation, changes in income, unemployment, addition or loss of family members and major purchases or debts. (Avg. cost $.77)

AUTO - Estimates cost of owning and operating an automobile. (Avg. cost $1.79)

CARVAL - Calculates breakeven points and return on investment for cars and trucks using E.P.A. ratings, kinds of fuels, initial costs, and miles driven. (Avg. cost $1.17)

CESTM - College savings estimation program aids parents in determining how much to save each month for their children's college education. (Avg. cost $.66)

COLLG - College cost estimation programs estimates the cost of attending various colleges in Virginia and selected out-of-state colleges. (Avg. cost $1.36)

DSTIX - Fuel tank calibration program for home fuel consumption. Relates depth of oil in tank to the number of gallons used. (Avg. cost $.67)

ENERG - Insulation program to determine optimum energy conservation techniques for homes based on type of heating system and climatic zone. (Avg. cost $.87)

HACC - Heating and cooling costs program designed to determine the savings derived from using insulation based on the physical factors of your home, type of heat, local weather, and costs of insulation, storm windows and the local electric and fuel costs. Also analyze possible investments in weatherproofing. (Avg. cost $2.43)

MONEY - A family budget program similar to SSPEN, but data base for expense figures is drawn from national averages rather than South Carolina data. Most appropriate for use in urban areas.

Table 3 (continued)

RETIR - A retirement budgeting program that aids the user in developing a financial plan for retirement based on planned adjustments, needs, and income. The user may test the effects on this plan of: high inflation rates, financial catastrophe, loss of family member, and early retirement. (Avg. cost $70)

SSPEN - A family budget program that creates a monthly budget summary for a family unit and compares this budget to the norm, given the family's size and income bracket. Uses average expense figures for South Carolina, but is also appropriate for other low-cost-of-living areas. (Avg. cost $2.84)

ASPENVA - Same program a SSPEN except it uses average expense figures for Virginia. (Avg. cost $2.70)

General financial and accounting

ANUIT - Single value annuity program computes future value of a present amount. (Avg. cost $47)

DECAL - Evaluates business alternatives. Can compare economics of various alternatives. Uses benefit-cost ratio, payback analysis and realized rate of return (based on present value). (Avg. cost $4.87)

FVAL - Cash-flow annuity program. Computes future value of nonuniform cash-flow series. (Avg. $.61)

FVAL2 - Uniform cash-flow annuity program. Computes future value of period payments plus accrued interest for regular installments. (Avg. cost $1.51)

LOAN - Analyze current loan situation, computes possibilities for a refinanced loan, and analyze the consolidation of several loans into one. (Avg. cost $1.40)

MORTG - Mortgage analysis and/or capital recovery analysis with repayment schedule. (Avg. cost $.91)

PAYMT - Computes equal monthly payments from an estate or for repaying a loan. (Avg. cost $.64)

PVAL - Discounted cash-flow program. Computes present value of an irregular cash-flow series (Avg. cost $4.87)

Table 3 (continued)

PVAL2 - Discounted cash-flow program. Computes present value of a uniform cash-flow series. (Avg. cost $.51)

Taxes and estate planning

EST1 - Federal estate tax analysis program to assist users in planning their estates. Includes options for farm operations. (Avg. cost $2.46)

EST2 - Estate tax analysis (survivor's benefits) program to help families project and compare the source of and needs of funds upon the death of the husband. (Avg. cost $1.05)

TAX - Income tax management program to calculate estimated federal and state taxes (VA & SC only) prior to the end of the year to enable the user to take steps to save on taxes. (Avg. cost $1.54)

Crop management

BCROP - Break-even analysis of two alternative cropping choices. (Avg. cost $2.49)

BUDGET - Prepares enterprise budget using the traditional budget format. (Avg. cost $.84)

DRYING - Computes margin available for drying corn as related to market price and high moisture discount schedule. (Avg. cost $1.87)

LEASE - Crop cost and returns program. Computes the cost and returns for the leasee and leasor for varying types of rental agreements. (Avg. cost $1.46)

LOBYD - Produces table giving the yield of wood from acre of loblolly pine trees in Virginia for specified ages. (Avg. cost not available)

NURSERY - This program will provide you with profit measures and physical performance measures for your nursery. (Avg. cost $4.39)

Table 3 (continued)

Livestock management

BCOW - Beef cow herd budget generator. Computes returns for a beef cow herd under different management strategies efficiency levels, cattle prices, and production costs. (Avg. cost $2.35)

CTLFD - Cattle feeders' cost analysis and marketing guidelines. Generates budgets and performs cost analyses under user-adjustable feeding regimes. (Avg. cost $3.77)

DARIY - Dairy cattle feeding formulation system. Options for balancing rations and maximizing profit. (Avg. cost $3.83)

DAIR2 - Simplified dairy cattle feeding program computes rations to meet energy, protein, and major mineral requirements. Provides balanced feeding program with feeding charts for various levels of production. Does not compute least-cost ration. (Avg. cost $2.33)

DYADF - Simplified dairy cattle feeding program which is a revision of DAIR2 using acid detergent fiber as input instead of crude fiber. (Avg. cost $3.10)

DAIRY3 - New simplified least cost dairy feed program.

EGGS - Poultry analysis program. (Avg. cost $1.65)

FBEEF - Cattle feeding budget generator. Computes returns to labor and facilities under various cattle and grain prices. (Avg. cost $2.25)

LVMKT - Livestock feeding - marketing guidelines. Generates break-even market or feeder prices for major livestock classes under specified performance and economic conditions which may be altered by the user. (Avg. cost $2.08)

PIGCL - Breeding-farrowing and nursery-finishing swine calendar generator for a varying number of sow grouping systems.

PIFGN - Finishing pig budget and return tables generator. Computes returns to labor and facilities over a range of hog and grain prices. (Avg. cost $1.88)

Table 3 (continued)

BIGLP - Linear program which optimizes use of resources (land, labor, capital, etc.) in determining the most profitable combination of enterprises for a given farm. Requires detailed information from the clientele. (Avg. cost $13.56)

EZAID - A debugging aid for new data bases to be used with EZLP and BIGLP. (Avg. cost $3.30)

EZLP - A generalized linear programming model using the modified simplex method. Accommodates a 40 x 60 matrix. Requires previously stored data base which may be modified during program execution. (Avg. cost $5.32)

FINAN - Annual financial analysis program for farm businesses. (Avg. cost $1.00)

FNLRB - Long-range budgeting program for comparing the physical and financial characteristics of alternative long-range farm plans. (Avg. cost $1.45)

INVST - Minnesota investment analysis program. Uses the net present value method to evaluate a capital investment as to profitability and feasibility over time. (Avg. cost $3.38)

PLAN - Aid to farm financial planning and cash flow projections. (Most convenient for swine operations.) (Avg. cost $1.36)

Machinery and equipment

HIRE - Buy versus custom hire program. Compares costs of owning and leasing machinery in terms of costs, present value, and income taxes. (Avg. cost $2.63)

MCOST - Machinery cost program. (Avg. cost $5.10)

SILO - Silo feeding program. Projects how many days of feeding will deplete the contents of a silo. (Avg. cost $1.26)

Miscellaneous demonstration programs

TIME - Determines the day of the week that any data occurred upon.

DEVIA - Standard deviation and mean calculation. (Avg. cost $.64) allows the user to obtain an unprecedented and relatively low cost opportunity to obtain hard copies of USDA periodic market reports, according to CMN personnel.

The Dietary Intake Analysis Program is widely used in extension human nutrition education programs to help families make wise food selection decisions. The program evaluates individual diets and creates awareness of the relationship between diet and health.

A program called Simplified Dairy Cattle Feeding Program is designed to increase farm profits. Sixty-percent of Virginia's dairymen have used the program as well as many dairymen in other states. Computerized Management Network staff say this program is saving the Virginia dairy industry $12 to $15 million a year.

Resurgence of interest

According to Craig Woods, extension specialist, management information, the number of CMN clients doubled in the past year. Woods says for many years the number of clients remained at around 250 but last year there was an extensive resurgence in interest and much of it coming from farmers who have microcomputers. Woods indicates that 90 percent of the users have been extension personnel with the balance being mostly agribusiness clients. He says this proportion may change considerably if interest of farmers continues to grow as rapidly as it has in the past few months. The CMN system could handle as many as 1,000 users before additional computer equipment would have to be utilized. The Computerized Management Network is exploring the possibility of installing its own computer.

"The strange thing about the sudden interest is that we aren't doing any promotional work," notes Woods, "Interest is increasing just by word of mouth." He reports that one state has requested 1,000 copies of the CMN brochure. "We are getting many requests for the brochures, and I think those states are promoting the system more than we are," observes Woods.

With home microcomputers increasing in number, Woods thinks the role of the Computerized Management Network might change somewhat. CMN would be less of a software developer and more of a communications mechanism. He envisions it as becoming a national clearing house of software, maintaining an on-line data base of programs with information as to what types of microcomputers with which they can be used. Then, if CMN has the requested program on-line, it could be "down-loaded" to the user's microcomputer and transferred to its memory.

Woods says he doesn't think the best microcomputer has been developed yet. He feels all present models have deficiencies. "I have tested a number of them and sometimes they just go off into never-never land. I can usually figure out what is wrong and correct it because of my computer training, but farmers may not be able to do this. I think it will be two years or so before there is an adequate microcomputer on the market," observes Woods.

Woods says CMN is not a money-making operation. State funds amounting to $150,000 per year supplement the operation. Users, of course, pay for a large share of the expenses incurred by the network.

Woods would like to see more promotion of the Computerized Management Network. He indicates that staff size (now three people) may have to be enlarged if the number of users continues to increase. CMN has been discussing the possibility of finding a cheaper system, perhaps purchasing its own computer. Much of this would involve working out arrangements with the telephone company, according to Woods.

Users are widely dispersed, but there are heavy concentrations in Virginia, Missouri, Idaho, Ohio, Arkansas, and Texas.

Michigan's TELPLAN System

First information utility

Michigan State University's TELPLAN program was the first land grant university information utility and may have been the first information utility in the nation. It was started in 1966 with some seed money from the Kellogg Foundation. The system did not become operational until 1968, however, when from 30 or 40 programs were put on-line. TELPLAN provides computer-based, individualized, problem-solving programs to county extension offices and other extension specialists. It is designed to be a low-cost, easy-to-use system --a system with which noncomputer-oriented extension personnel would feel comfortable.

TELPLAN began as a touch-tone telephone system with a voice response unit on the computer. If the extension office did not have a touch-tone telephone, touch-tone pads could be attached to the phones. The user would use the phone to dial the computer and then communicate with the computer by using the pad. The user would get a voice response after data were entered. These units were used because hard copy terminals were still very expensive, $4,000 to $5,000 each. The system now uses all hard copy terminals. Most of the clients use Texas Instruments Silent 700 Series terminals but Kelsey says almost any brand can be used with the system.

The system is primarily meant to be used by extension personnel, but a few farmers, particularly cattle feeders who often utilize the system for planning least cost feed rations or for calculating feed cattle profit levels, are also clients and have their own home computer terminals.

Programs

The system has 90 problem-solving programs with topics ranging from crop and livestock production and management, home economics, forestry, 4-H, and farm budgeting. According to Mike Kelsey, project leader for extension farm management and TELPLAN coordinator, the most popular program has been one on balancing dairy rations. "This program was the one that really made our system popular and made people in Michigan and other states really interested in TELPLAN," says Kelsey. "Half of the runs on TELPLAN are for this program. It went on-line in 1972 just prior to the time when the price of livestock feed really jumped, so in a short time dairy farmers really became interested in the program. It saved them hundreds of dollars in feed costs."

One forestry program involves the determination of optimum wood cutting patterns for tree harvesting. Kelsey says the forestry programs are becoming almost as popular as the dairy software. (See Table 4 for a listing of programs.

Table 4. Michigan State University TELPLAN programs

Program name and description

Compound interest model: Computes the future value of a sum of money using the compound interest formula or to discount future money streams.

Investment planning for new dairy systems, dairy systems analysis: Determines the total investment capital, feed storage capacities, acreage and labor required on a new or expanded dairy farm.

Capital investment model: Evaluates the investment of capital to reduce or eliminate costs including custom hire and leasing, or to generate new income.

Air-blast sprayer calibration: Computes discharge rate from one side of an air-blast sprayer.

Income tax management analysis: Computes an estimate of the current year's income tax, next year's tax and the appropriate tax strategy to be used in making year-end tax management decisions.

Apple scab spraying: Determines degree of infection expected and spray chemical to use.

Spray compatibility: Determines spray chemical compatibility and tolerances if used together.

Weed sprayer calibration: Computes nozzle spacing and gallons per acre applied with specified settings.

Plant disease identification: Identifies several plant diseases derived from entering symptoms.

Soybean herbicide recommendation: Selects a soybean herbicide program based on weeds present, soil type, crop history, etc.

General linear programming: Solves various least-cost or profit maximization problems after setting up budgets.

Swine ration formulation: Formulates the least-cost combination of feed ingredients that meet the nutrient requirements for growing and finishing rations.

Fertilizer recommendations: Computes amounts of N, P, K, lime, and magnesium required from given soil test results.

Table 4 (continued)

Poultry and game bird ration formulation: Evaluates the nutrient content of an existing ration or to formulate a balance, least-cost ration for specific birds given feeds available, their prices, and special restrictions.

Corn herbicide recommendations: Selects a corn herbicide program based on weeds present, soil type, crop history, etc.

Beef-price forecasting model: Forecasts future expected prices of beef cattle.

Corn-bean enterprise planning guide: Determines the best corn and soybean production systems and enterprise mix.

Labor estimator: Estimates total farm labor requirements given size and kinds of crop and livestock enterprises.

Livestock feeding planning guide: Compares profits from alternative feeding programs.

Livestock farm planning guides: Determines the most profitable fed beef, corn grain and corn silage enterprise mix given expected prices, yields, production costs, machinery performance, field time and tillable land available.

Corn enterprise planning guide: Determines the best corn production system including machinery complement and hybrid selection.

Dairy cow cost/return model: Evaluates the economics of selected dairy cows, given the associated milk production factors and costs.

Swine finishing planning guide: Computes profits under alternative feeding programs.

Best depreciation method: Selects the best depreciation method considering one's tax bracket and other uses for capital.

Best ration and feeder type selection model: Determines the most profitable type of ration to feed and type of feeder to buy, given feed supplies, purchase and sale options, and feedlot capacity.

Corporation program: Compares annual taxes paid by farm business for various organizational structures.

Survivor's income protection: Projects additional survivor's income needs for the family in case a wage earner prematurely passes away.

Table 4 (continued)

Beef cow planning guide: Computes profits under alternative feeding systems, calving rate, and calf weights.

Least-cost dairy ration: Formulates and evaluates the least-cost combination of available feed ingredients that meet the nutrient requirements of milking cows, dry cows, and diary heifers.

Amortized loan calculator: Calculates the total interest paid and annual interest rate on an amortized loan.

Wet corn buying guide: Computes the effective equivalent price of U.S. #2 corn from wet corn.

Machinery replacement program: Determines the optimal time to replace machinery and the associated cost.

Loan refinance and evaluation model: Decides whether to refinance an existing loan, or to compare costs of two different loan plans.

Financial long-range whole-farm budgeting: Compares alternative long-range plans for a complete farm business. The primary comparisons relate to the financial consequences associated with each plan.

General least-cost rations: Formulates general least-cost rations, the user must specify the nutrients of each the feeds to be considered and the ration requirements.

Silo capacity/cost analysis: Determines size of tower or bunk silos and/or high moisture corn storage requirements for dairy and beef animals.

Income possibilities for crops and livestock: Provides a basis for estimating specific returns from a farm business including crop and livestock.

Beef expansion cost model: Determines costs, investments, annual costs and debt repayment for a particular beef feeding system.

Impact of corn--soybean mix: Determines the impact on returns to machinery, improvements, and land of (1) allocation of tillable acreage between corn and soybeans, and (2) nitrogen allocation.

Dairy pedigree evaluation model: Obtains an objective measure of an animal's breeding merit based on the animal's own performance and on that of its offspring and ancestors.

Table 4 (continued)

Machine cost calculator: Computes ownership and operating costs for various types of equipment.

Beef ration formulation: Formulates the least-cost combination of feed ingredients that meet the nutrient requirements of growing and finishing beef feeders.

Heating and ventilation requirements for cattle shelters: Computes heating and ventilation requirements to control moisture and to maintain a minimum temperature in cattle shelters.

Michigan dairy farm planner: Computes an annual whole farm budget resulting in management income, the feed balance made up of corn equivalents, hay equivalents, and pounds of crude protein and a labor balance given livestock numbers and acreages of specific crops for a dairy farm.

Calcium for consumers: Computes weekly Recommended Dietary Allowances (R.D.A.) for calcium intake, and weekly cost savings in reducing overconsumption or cost increases in making up calcium deficits. Computation is based on the needs for one person for one week.

Protein for consumers: Calculates the recommended and actual consumptions of protein for one day, given a person's daily consumption of protein, age, and sex. Results are stated in terms of percentage of the U.S. Recommended Daily Allowances (U.S. RDA).

Family financial planning: Calculates a monthly cash balance given family income by source and time period and cash outflow by month. Individual monthly details and change in net worth for the year are given.

Major capital investment program: Calculates the income and expense flows that could be expected to be generated by an investment, converts these flows to an after-tax basis and discounts the after-tax flows to determine the expected gain or loss (net present value) that would result if the investment was made.

Badger ration model: Provides a simple method of utilizing the results of a chemical feed test in formulating a balanced dairy ration for alternative milk production levels.

Monthly dairy herd growth: Projects a farm's monthly livestock inventory, given current inventories, planned purchases, cull rates, calving interval, and heifer freshening age. Output options are livestock numbers, gross income, feed required and manure generated in any specified 12-month period.

Table 4 (continued)

Impact of nitrogen on corn yields and profits: Determines the rate of nitrogen fertilizer which maximizes net returns per acre or to determine the expected yield from a specified rate of nitrogen fertilizer. Expected yields and added returns to the last 10 pounds of nitrogen are given for 10 and 20 pounds on each side of the most profitable rate <u>or</u> the specified rate.

Life-cycle management of swine: Develops schedules for breeding, farrowing, nursing, weaning, feeding, and marketing swine.

Feeder enterprise planning guide: Compares the profitability and break-even prices for alternative feeder types, feeding systems, and marketing systems. A comparative analysis of alternative systems can be carried out by doing a base analysis followed by subsequent adjusted analyses.

Simulation of feedlot performance of growing and finishing cattle: Calculates the expected payweight daily gain, feed conversion, and feed disappearance given ration sequence, feeder type, feeder condition, and environment.

Feedsheet calculation for beef rations: Calculates the percentage composition and scale readings on an as-fed basis for alternative feed truck load sizes.

Batch and crossflow corn dryers: Assists in understanding how the cost per bushel for drying high moisture shelled corn is affected by changing the operating conditions of the drying equipment.

Dollar watch: Computes an estimate of a monthly budget by family size, income and whether or not a family has a car payment. To compare that budget in dollars and percents with a "typical" budget for urban families of similar size and income based on Bureau of Labor Statistics figures and University of Michigan Consumer Finance studies and farm families on income to the Farm-Operators Family Living Expenditures. The aim is to encourage families to begin thinking about how their money is being spent, not to offer a specific plan.

Optimum furniture cutting program: Determines which grade(s) of lumber are least expensive in meeting the needs of the rough mill cutting bill.

Taking charge of your food dollar: Designs a personalized spending plan for food for your family, based on the number of persons in your household, the number of meals they usually eat at home each week, and individual nutritional needs.

Table 4 (continued)

Data expansion program: Expands on the input section of TELPLAN programs that are designed for and need a larger input section than the basic program allows. (Should be used only by more experienced TELPLAN users.)

Dairy farm linear programming: Computes the most profitable dairy herd size, amount of purchased feeds, and crop combinations given available land, labor plus any special restrictions set by the user.

Fruit orchard replacement analysis: Determines when a current orchard or land should be replaced by a new planting.

In the bank or up the chimney: Helps you figure out what it might cost to add these energy-savers to your house, how much each might save on heating costs, and how long it would take to pay off your initial investment.

Dairy health and breeding management: Decides what specific animals should be bred, receive health treatments or require special management attention, given a herd of dairy cows. Designed for daily use out of a farm milk house office.

Crop enterprise cost analysis: Analyzes enterprises of a particular fruit, vegetable, cash crop farm and generates enterprise budgets suited to preparing a financial long-range whole-farm budget.

Should I participate in the Food and Agriculture Act of 1977: Evaluates the return to "fixed" factors of participating versus not participating in the wheat and corn "price support" program.

Transitional planning: Analyzes annual profits and cash flow for a five-year farm plan.

Budgeting for unemployed families: Provides budget guidelines for reduced incomes. The budget guidelines are based on 1972-1973 Consumer Expenditure Surveys and data collected from Michigan families in 1977. Printed for both employment and unemployment incomes, the guidelines serve as a basis for discussing ways to reduce expenditures.

Dollars and decisions in the supermarket: Calculates food cost comparisons for a household, based on size and consumption patterns for selected foods. It shows what a difference the forms, brands, and package sizes can make in the yearly food bill.

Table 4 (continued)

Energy information retrieval system for MSU extension: Lists out curently available publications, training aids and human resources from a data file when the user queries the system by specifying the energy type and target audience. This program is preliminary and demonstration in nature.

Budgeting for retirement: Makes a plan of spending for retirement; to test this spending plan under various conditions; and to compute an ongoing asset structure. The program is written for a 1, 2, or 3 member family with the head of the household being 55 years of age or older.

On-line information storage and retrieval program: Stores and delivers news and feature stories to mass media (newspapers, radio and television stations, etc.) and to Michigan county extension offices and agricultural experiment stations.

Heart disease: Assesses the risk of potential risk of heart disease given your age, hereditary background and lifestyle; and to evaluate the degree the risks can be reduced by changes in your lifestyle.

The decision as to which programs are used with the system is up to the computer programmers, according to Kelsey. "If some specialist comes forth with a program idea, the programmer in charge makes the decision."

TELPLAN does not offer other types of computer-based services, such as electronic mail or transmission of general educational information. Plans call for incorporating TELPLAN into Michigan State University's new COMNET program. TELPLAN will essentially provide the problem-solving software portion of that expanded program. COMNET will essentially be the communications system that will carry TELPLAN as well as other services, such as the computerized news service, at Michigan State University.

Four-hundred users

TELPLAN has 400 accounts. Two-thirds of the clientele are in Michigan but there also are major user concentrations (mostly dairy interests) in New York, Wisconsin, Ohio, and Illinois.

Two identical, central processing computers are used. Each of them has the full set of programs. One computer is at the University of Michigan and the other at Wayne State University. "If one computer happens to be 'down' or busy, requests are automatically routed to the others," explains Kelsey. He says this arrangement has worked out very well. Within Michigan, there are IN-WATS lines to the computers so extension calls are free of charge to users. External users pay their own line or communication tolls.

Costs

There is a specific rate schedule for each program. There is a charge for a first run and then a smaller charge for each subsequent adjustment run. Users are billed quarterly. There are two different rate schedules. One schedule is for extension personnel and a slightly higher rate for nonextension users. Rates do not change for weekends, holidays or time-of-day. The system operates 24 hours every day.

Man-machine problems

Kelsey says there are major problems with some extension personnel in regard to the computer system. "You have some people who are computer-oriented and love it, and you have some people who don't. Essentially, there are some counties which use TELPLAN extensively. Some counties don't have a terminal and don't expect to have one until they are forced into it when COMNET becomes operational," says Kelsey. "Farmers or other users wanting help in counties not utilizing TELPLAN can still be helped, however, since area extension subject matter specialists have access to portable terminals farmers can use if the need arises," adds Kelsey. "It is a very unusual when a county agent who is more than 40 years old decides to slip into the computer age and go with it." Some farmers come into the county extension office and use the computer terminals, themselves. In one case, a group of 20 farmers purchased a computer terminal for their county extension office. These were dairy farmers who wanted access to the dairy rations software.

The future

Kelsey says farmers will have more interest in TELPLAN as well as similar systems because if a farmer obtains a microcomputer, there is no appropriate software for it. Therefore, farmers will want to tap into systems such as TELPLAN for programs. "When farmers buy their own microcomputer, they have to figure out what they are going to do with it. Few of the standard programs you get from the computer companies are applicable to agricultural and farm situations," Kelsey notes. "TELPAN or similar systems could make their programs available for stand-alone systems but at a high cost, because it would mean a complete reprogramming effort. Even if this were done, there is no easy way to access the programs in the microcomputer, to update or make other changes. A system such as TELPLAN permits programming changes; one operation makes the same adjustment for all users on the system," explains Kelsey.

Kelsey says use of the system by extension personnel will increase in the next few years, particularly because of the new COMNET system plus increased use by farmers, themselves. Kelsey says farmers will be purchasing microcomputers and will be accessing information utilities for services that cannot be performed on their hardware.

The Purdue FACTS Program

FACTS is an acronym for Fast Agricultural Communications Terminal System, a new multi-million dollar information utility that has been designed and built by the Indiana Cooperative Extension Service.

Equipment

Purdue's information utility is a computer network consisting of 92 microcomputers located in each of Indiana's county extension offices, 10 microcomputers in area extension offices, and 27 microcomputers in campus department offices. The microcomputers, Digital Equipment Corporation's PDP 11V03 models, are stand-alone units (intelligent terminals) equipped with Vadic 3455 phone modems. These computers have 56k byte memory capacity; two single density, single side diskette drives; a video (or CRT) screen; a 180 character per second printer; and a 120 character per second communication modem.

The central processing computer, a PDP 11/70, is housed on the Purdue campus and functions as a storage and forwarding system between the 128 separate computers. Two OUT-WATS telephone lines and a local phone line are used to communicate with the field computers.

Essentially, FACTS is a decentralized computer-based communications system. Problem-solving and decision-aid types of programs are produced on disks for use with the microcomputers to help agricultural users and others solve particular problems. There also are a number of other services available on the system. The system operates 20 hours per day.

Present uses

Twice daily, weather information, operational notices pertaining to the communications system itself, and extension bulletins and newsletters are transmitted from the main computer to the microcomputers. Weather information was the first information entered on the system in October 1978. Automatic software monitors a weather wire, stores text in the data base, selects certain weather information and sends the material to the main computer for distribution. A computing system called MIRACLE, operated by the Experiment Station, is used to generate the newsletters and bulletins. Some of the county extension offices distribute weather and other information to local news media. Of major interest is a special agricultural weather advisory which is particularly geared to agronomic conditions. The system also transmits closing market prices.

Information transmitted over the system can be viewed on the CRT screen or printed out with the hard copy printers. The printers also have the capacity to make stencils for duplication of material.

During the evening hours, the system sends out new programs and data bases and updates existing data bases. Each microcomputer has a library of more than 50 disks. The microcomputers are left on during the night to automatically receive the updates and the early morning messages.

The microcomputers also have office management programs for word processing, creating data bases, and performing mathematical calculations. The program also will permit local county extension offices to build in their own special programs to meet specific office needs. There are two kinds of programs for clientele: The first type of program is designed for computing or problem-solving. The second type is extraction of data from a local data base. See Table 5 for a complete listing of program options.

The system also has two-way communication or electronic mail capability. Messages can be transmitted between individual counties, between a county and all other counties, from the county to certain groups of counties, and between county offices and campus computers and area extension offices.

Some campus departments are upgrading their microcomputers by adding additional disk capacity or additional CRT terminals.

Objectives of the system

According to William H. Blake, director of the Agricultural Data Network section of the project, the following objectives were major goals of the project:

1) Develop a system which might be a prototype for communication systems in other states.

2) Provide a system that would handle 1,000 electronic messages per day and a delivery delay of no more than four hours 90 percent of the time.

3) Provide functions which reduce the amount of clerical and menial activities of county extension and campus-based staffs.

4) Provide useful management, analytical, and decision-making aids and other types of information for users.

5) Develop interdisciplinary data bases to enable several disciplines to work cooperatively on research problems.

Table 5. Purdue University FACTS programs

Program name and description

Speed and currency (utilize communications)

Weather reports: For receiving, displaying, and printing daily weather forecasts.

Mail program: This version of the mail program allows the user to receive, read, and print messages.

Problem solving (computing)

Home vegetable garden planning program: This program will design a vegetable garden for family use.

Field equipment calculator: Collection of programs to assist the farm manager with routine machinery management calculations.

Greenhouse plant cost estimation program: Program estimates individual greenhouse-grown plant costs for pot crops per square foot of production.

Double crop: Produces a budget sheet and computes the profit potential for full season and double cropping.

Rate of return/present net worth: Costs and/or benefits associated with a financial alternative.

Installment land contracts: May be used for any type of installment type purchase schedule of payment.

Real estate tax table generation: Produces a table of net valuations.

Maximum bid price for land calculator: The "Maximum Bid Price" model helps a user determine how much could be bid for land under specified return assumptions.

Weather index calculator: A Weather Index is used to describe the combined effects of weather.

Soybean seeding rate program: This program gives recommended populations and calculates the seeding rate required.

Income tax management for farmers

Table 5 (continued)

Blitecast: Program designed to warn potato growers of potential late blight.

Pork carcass performance evaluation: Program designed to analyze swine carcass and performance data.

Home insulation analysis: The program provides information on insulation levels needed.

Grain marketing alternatives: Program designed to assist farmers and elevator managers in evaluating grain marketing and storage alternatives.

Feeder cattle breakeven: Designed to aid feedlot operators in evaluating the profitability of finishing feeder cattle.

Feeder pig break-even: Designed to aid producers in evaluating the profitability of finishing feeder pigs.

Generalized crop budgets: Compares the economics of crop production for two or more cropping alternatives in a budget sheet format.

Beef carcass performance evaluation: Designed to analyze beef carcass and performance data.

Cropland lease comparisons: Crop lease alternatives and returns realized.

Crop fan match grain drying and aeration fan selection--application: Calculates the air flow delivered and the horsepower required or used in drying or aeration.

Subdivision impact model: Helps evaluate new subdivision developments.

Fuel use estimator list: Estimates the fuel required per acre for a series of field operations.

Repetitive material (memory or data base)

Budget: Client input produces three budgets tailored to a specific family.

Food costs: Designs a food spending plan for individuals and families.

Cost of children's clothing: Clients compare their present spending with standard clothing budgets for children.

Table 5 (continued)

Indiana state 4-H enrollment system

Feeding programs for horses: Collection of programs and management suggestions for proper horse nutrition.

Farm building plan service catalog: Plans available for specific types of farm or residential buildings or livestock equipment.

Rations for beef cattle: 1) Winter rations for the breeding herd. 2) Growing and finishing rations for steers and heifers.

Crop pest management: Programs designed to aid clients interested in pest management.

Clean--Stain removal: This program is designed to retrieve, understand, and use most effectively the available instructions for removal of stains from fabrics.

Mailing labels package: A set of programs for maintaining a data base of address label information.

Retired couple's budget: A guide to help a retired couple review and evaluate budgeting practices.

Plant disease profile: A large data base that provides information about specific plant diseases and disorders.

Preserve: A data bank of answers to food preservation questions.

CHARLIE CAREERS: Computer Help To Aid Research Locally In Education. School of Agriculture information about study and career opportunities in agriculture.

Selected nutrient composition: Provides planned diets related to cholesterol, iron, potassium, and sodium.

Alfalfa insect information and identification program: Identification key and economic information.

Corn insect key: Identifies corn insects.

Alfalfa diagnostic guide: Identifies insects, nematodes, weeds, herbicides, disease, and other factors.

Soybean diagnostic guide: Soybean problem determination.

Corn diagnostic guide: Corn problem determination.

6) Design the system so that additional hardware and software could be added when needed for expanding the system (Blake, 1980).

Funding

For five fiscal years beginning in 1977, $5.6 million was spent in planning and building the computer-based system. Of that amount, approximately $1.9 million was provided by a grant from the Kellogg Foundation. Purdue University funds amounted to $1.6 million and funds from county extension operations totaled just slightly more than $2 million. Kellogg funds ended with fiscal 1981 and from here on total financial support will come from Indiana Cooperative Extension Service funds which come from county and/or state and federal sources.

Each microcomputer and associated equipment costs approximately $10,000, which represents a savings of about $8,000 per unit because of volume purchase. Funds for the purchase of the county extension office computers came from both state and local county funds. Indiana devised two unique ways to generate funds for purchase of the county computers. Congress has always appropriated money to cover the costs incurred by state extension services in the use of penalty mail. Money is held by the federal government and transferred annually to the Post Office Department. Thus, there is not much incentive for states or counties to conserve such funds. In Fiscal Year 1976, Indiana's share of penalty mail was $475,000. Any savings would be retained by the Cooperative Extension Service and any overage had to be sent to Washington from internal funds. A system was worked out to both save money and assist counties in purchasing their own microcomputers. Each county was given its proportion of mail funds. Any savings reverted to a reserve account for their computer. On the other hand, when a county spent its allotment, all the county extension office's mail went on postage for the ramainder of the fiscal year at their expense. The result was that counties saved an average of $1,000 per year toward the purchase of their computer.

The state also offered matching grants to counties to aid in the purchase of microcomputers. Because of the matching grant program, savings from reduced use of penalty mail, and some gifts and donations, the share of the microcomputer cost that had to be covered by county extension appropriations was only 44 percent.

Planning efforts

During the planning and building phases of the Purdue communications system, an extensive number of committees were selected and assigned specific responsibilities. A Policy Committee--consisting of deans, directors, department heads in the School of Agriculture, the Director of Extension, and several chairmen of other project committees--established policies, reviewed key project plans, and monitored the progress of the project. The Policy Committee essentially functioned as the senior executive level. A Priority Committee comprised of project departmental coordinators, members of county extension committees, area extension administrators, program leaders in agriculture and community development, and others evaluated and selected the decision-aid programs for the system. A County Committee represented the field staff. A Technical Committee dealt with hardware and software concerns.

Assessment

H. G. Diesslin (1980), director of the Indiana Cooperative Extension Service, described the total project effort as:

> Integrating a complex, highly structured component into a highly unstructured academic and field staff educational program--the Cooperative Extension Service (Diesslin, 1980:18).

Diesslin listed headaches and heartaches: Computer people thought the entire system was being built by and for them. Department heads thought the whole idea would just go away eventually. The field staff was not enthusiastic about purchasing equipment and wanted everything tomorrow and on their own terms. Programmers and specialists felt they should set the parameters for their software as they saw fit. Communication between computer people, scientists, and county agents was often times less than efficient or effective. Time and cost of the software packages were underestimated.

Among surprises and successes, Diesslin offers the attitudes of local people, who influenced county agents from being very negative to being positive about computerization and computer hardware. He also lists watching late adopters joining the effort, the ease at which the system can be operated by noncomputer people, and remarkable success of the matching grant program and the penalty mail savings effort to build funds for computer purchases.

Lynn Busse, assistant director of the Cooperative Extension Service and training and marketing manager for the FACTS program, says the programs available with the system have a tremendous amount of human engineering built into them, in terms of "help" messages and ease of operation. Busse says after clients have seen a program run once by the county extension agent, the user is free to use the microcomputer at his convenience and on his own. Busse says demand for computer use is such in three counties that users have to make reservations.

"An ideal situation would be for farmers and other users to tie into the system with their own home computers," explains Busse, "but at the present time the PDP 11/70 central processing computer does not have the capability for such an expansion of the system." He says there are some possibilities for cooperative types of arrangements or the private sector developing computer mini-networks and then perhaps accessing the PDP 11/70 to obtain programs for their cleints. Another possibility would be that the mini-networks would outright purchase the programs and use them on their systems. They also would have the capacity to have weather, market, and other types of information.

With the FACTS system, changes in the basic programs of the software can be made by "downlining" from the main computer to the program disks of the county microcomputers via the one-way communications program. Programs can be modified or entire new programs can be transmitted to the county microcomputers. "We feel that with our system we have the best of two worlds in that we have the intelligent computer in the extension office for stand-alone use and we have also located the hardware in the county microcomputers so that counties can directly access larger systems if they desire," notes Busse. "The county will be able to access other systems such as Nebraska's AGNET or Virginia's Computerized Management Network. We have capabilities to use county microcomputers for various independent uses as well as to link-up with larger external systems for additional services."

Busse explains that the reason for so much computer activity at land grant universities is that private vendors do not have the expertise and knowledge base to put together agricultural computer programs. He sees great potential for universities to sell or lease agricultural software they develop to commercial computer companies. Purdue has marketed some of its programs.

Busse says there are some problems in getting county extension agents and other county staff to use the microcomputers, but overall they are beginning to see the value of the system as an added educational tool and, therefore, are becoming more enthusiastic.

The most popular programs are a home vegetable gardening program and a home insulation planning program. Busse says it is important to recognize that these programs are not just related to agricultural users but to urban people as well. The FACTS program tries to work with both farm and nonfarm people.

"Projections indicate that for any new computer system, it takes a shake-down period of five or so years to get everything operating smoothly and really become a useful tool. We are finding this to be an accurate assessment in that our system is now settling down. Programmers know what they need to do and the constraints that they are operating under. The extension staff is becoming more satisfied with use of the programs and interpretation of the programs. We also are listening to clients in terms of programs they would eventually like to have. All in all, the system is really beginning to operate smoothly, both hardware and software," states Busse.

Iowa State's Integrated Pest Management Program

The Integrated Pest Management Program (IPM) at Iowa State University was developed in 1979 to help farmers control crop pests as cheaply and efficiently as possible. The program places considerable emphasis on prevention whenever possible. Farmers can limit their chances of pest infestations or outbreaks by timing tillage practices, using insect resistent crops, and using pesticides properly and judiciously. When farmers, or even commercial spray applicators, follow the program offered by Integrated Pest Management, they use chemicals to control pests only when it pays to do so. The computer-based communications system helps the farmer determine exactly when chemical treatments are necessary.

A computer-based communications system undergirds the Integrated Pest Management Program. The system provides up-to-the-minute weather reports, crop conditions, and pest infestation information. The farmer or commercial pesticide applicator can then enter appropriate data into his or her programmable calculator and determine the economic threshold--whether chemical treatment is economically feasible.

The Integrated Pest Management Program is not an interactive computer-based system in that no calculations or problem-solving procedures are carried out on the system, itself. Those types of operations are done by the users with their own programmable calculators using programs that have been designed by agronomists, entomologists, and economists at Iowa State University.

System design

Figure 3 illustrates the structure of the system. During the growing season, special weather observations, weather forecasts, crop and insect reports, and comments and recommendations of state specialists are entered daily into a central computer located in the Department of Entomology on the Iowa State University campus. The computer is a Texas Instruments 990 with 2.3 megabytes of on-line disk storage. This computer also has access to on-line archiving facilities of Iowa State University's large, main frame computer. The system is programmed so that data can be received by the computer at any time of day. The system also interrogates (accesses information) from five microprocessor-based agricultural weather stations scattered throughout the state. Eventually, there will be 15 in operation. Information also is received from National Weather Service offices. Additional data are received daily from 12 area extension offices. These offices have Texas Instrument Silent 700 Series (Model 765) computer terminals with 40k bytes of memory. Extension crop production specialists, extension pesticide management associates, and 81 volunteer scouts located throughout the state regularly monitor crop, insect, and weather conditions within local areas assigned to them and report the information by entering the data on the portable computer terminals. These terminals are preformatted with operational IPM forms. The data are then transmitted to the central computer on the Iowa State campus and then processed and

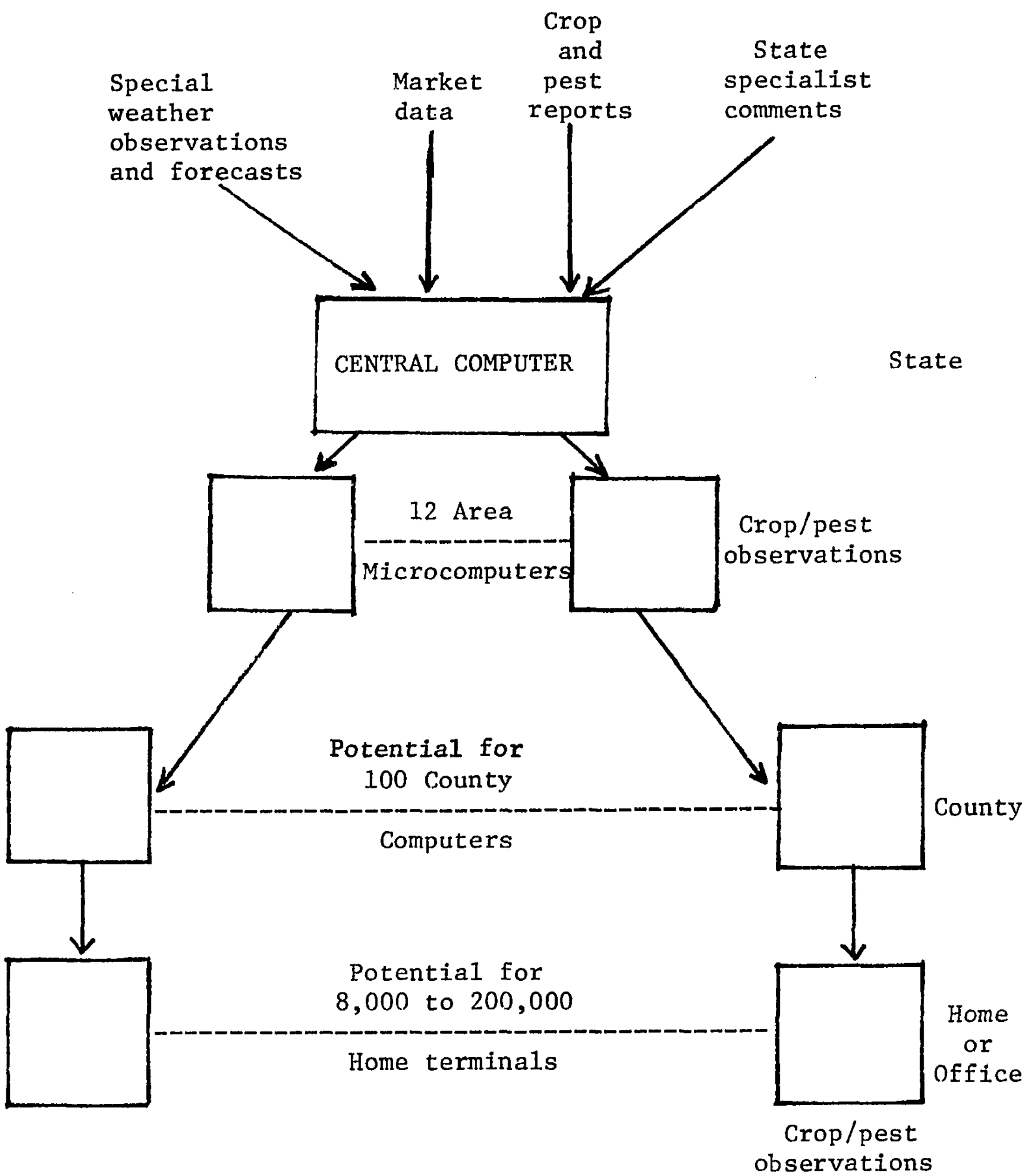

Figure 3. Structure of Iowa State University Integrated Pest Management Program

re-distributed back to the area extension offices for public release. Much of the information conveyed with the system involves data from the National Weather Service, weather data from the remote weather stations, and observations from specialists about crop and insect situations.

The "scouts" receive extensive training so that they can readily assess such factors as the pest involved, stage of growth cycle, condition of the crop, extent of present damage, activity of the pest, pest population, and many other factors. Scouts report their findings daily during the growing season by entering the information into the computer terminals located in the area extension offices. They seek information from individual farm situations as well as from constantly monitoring selected, scattered fields or plots located in their jurisdiction. There are approximately 1,200 acres of crops that are closely watched for pest problems in each of the 12 extension areas of the state.

The Iowa State University Extension Service has designed more than 70 programs that can be used with programmable calculators. Topic areas are agricultural engineering, agronomy, animal science, dairy science, farm management, and marketing. In addition, there are five programs for use with the Integrated Pest Management Program:

1) Black cutworm: (a) guidelines for treatment, (b) replanting advice, (c) guidelines on soil treatment at time of replanting.

2) European corn borer: (a) first-generation treatment advice, (b) second-generation treatment advice, (c) decision-making methods for treating adult moths, (c) growing degree day calculation and interpretation, and (e) yield loss analysis.

3) Center-pivot irrigation for applying pesticides and fertilizer.

4) Grain bin insect management program.

5) Corn rootworm-sequential sampling: allows use of the programmable calculator as a logging and decision-making tool for field use. Helps select a statistically sound sample without excessive observations.

The programs are written for Texas Instruments TI-59 and the Hewlett-Packard 41c programmable calculators.

According to S. E. Taylor, assistant professor of agronomy, and a key developer of the IPM program at Iowa State, the scouting portion of the IPM program is crucial to formulating control decisions. He says control decision should always be based upon an understanding the environment's influence on crop-pest interactions, including present and future weather conditions. The decision maker must base his decision on weather observations, public weather reports and forecasts, and specialized agricultural weather information. Taylor says the specialized weather information such as soil temperature, occasion and duration of leaf wetness, and degree days, is not readily available through ordinary information sources such as mass media. But this information is crucial for pesticide application. The following section details the intricate, complex, and important relationships of weather, pest, crop, and environmental factors:

Role of weather and biological factors

Taylor explains that weather has always and probably will continue to be the single most uncertain element in crop production because weather determines the outcome of both the crop involved and crop pests.

"Although there is no climate on earth that will not support some form of life, every climate has definite environmental limits. Often, abnormal conditions will hinder the development of adapted crops and at the same time appear to support certain crop pests. Pests may thrive because of increased crop susceptibility or because conditions are more favorable to their development," notes Taylor.

Integrated pest management is based on an understanding of pest response to environment and of pest relationship to crops. A description of crop-pest-weather interactions over a period of time is often referred to as a "model." Most pest-management models accept weather data as the primary real-time driving function. For example, a model for predicting continued activity of cutworms when when newly planted corn emerges must consider soil temperature because this variable affects both the rate and larval development and the time required for corn germination and emergence.

According to Taylor, initiation of plant growth and interstage development are strongly influenced by weather. Some of the factors influencing growth initiation, such as day length and suitable temperature, are easily predictable with mathematics and climatology. Factors such as moisture and temperature that influence developmental rate are somewhat predictable.

Weather affects both the biological interaction between crops and pests and crop pest management. Pesticide effectiveness, application effectiveness, wash-off, soil condition, and spray drift are examples of weather-sensitive pest control concerns.

During the entire growing season, the crop also is sensitive to temperature, moisture, light, and numerous other environmental factors.

When sufficient moisture is available, early growth is directly related to temperature. Both air temperature and soil temperature are important, but soil temperature is especially crucial as long as the growing tips remain below ground level. Under optimal environmental conditions for crop growth, pest damage and competition are likely to be minimal. However, during less than ideal weather, pests may amplify the effects of weather.

Taylor says native weeds are usually well adapted to the local climate. In areas where the growing season is not long, many weeds grow in cold air and soil temperatures. Most corn varieties, however, are not adapted to cold weather and show little development at temperatures below 50° F. When temperatures remain above freezing but below 50° F. for extended periods of time, weed problems can be expected to be more serious than when temperatures are near 80° F. At 80° F., corn development is near optimum and will often exceed weed growth. In addition, some weed-control chemicals have little effect at temperatures below 50° F.

Insect development and activity are quite dependent on temperature. The effects of temperature may be expected to differ slightly according to the adaptation and origin of the insect, but all insects will exhibit some response to temperature, according to Taylor. Although optimal environmental conditions for insect activity may coincide with optimal crop conditions, the overall response to environmental variation is likely to vary in some way.

Taylor says black cutworm development is a good example of this. The optimal temperature for growth of both young corn plants and young cutworms is about 80° F. At lower temperatures, cutworm activity decreases less rapidly than corn development. A specific number of cutworms will therefore have a greater net effect on a stand of corn when the soil temperature is 65° F. than when the soil temperature is 75° F. A low population of cutworms may cause economic damage when soil temperatures are low because the crop is relatively more susceptible.

According to Taylor, there are numerous examples of the effects of weather on crop and pest interaction. When sufficient investigation has been completed, the relationship between the pest and its physical and biological environment can be described, using weather as the primary controlling factor. Accordingly, many predictive pest models now use weather data as a principal real-time input.

Research has successfully determined the environmental factors that regulate the development of many crop diseases. For example, the effect of weather on late blight of potato and on numerous other diseases is well known. Moreover, the principle of differential crop and pest response to different environmental conditions applies to diseases as well as to weed and insect pests. Temperature and moisture are often found to be the most significant environmental parameters controlling plant-disease interactions, according to Taylor.

"Degree day," "growing degree unit," and "heat unit" are terms applied to any one of several techniques for estimating crop or pest stage according to weather records and forecasts. The National Weather Service has defined the "growing degree unit" as the measurement of the effect of temperature on crop development. The units are accumulated day by day and are based on maximum and minimum temperatures during the 24-hour period. Since many crops, notably corn, show little development below 50° F. or above 86° F., the units are calculated as the average of the maximum and minimum temperature, less 50° F. where the minimum is limited to 50° F. or higher and the maximum to 86° F. or lower.

Taylor says the growing degree unit is useful in determining developmental stages for crops and pests that are active primarily between 50° F. and 86° F. Many seed companies give the growing degree unit requirements for their varieties as a guide in variety selection. Other units have been proposed for insects, weeds, diseases, and crops that are active across different temperature ranges.

Although temperature units are useful in predicting developmental stages of both crops and pests, Taylor indicates the concept is not directly applicable in determining the relative susceptibility of the crop to the pest or of the pest activity except to indicate the occurrence of particularly susceptible crop stages and especially aggressive pest stages. In cases where the relative development of crops and pests is crucial, a modified or alternative method must be used. An example of such a method is the weather-adjusted economic threshold.

Economic threshold

The economic threshold is a basic model for predicting probable economic damage to a crop. It assumes under normal conditions that after a pest population density reaches a specified level, development will continue to the point that the cost of treatment is justified in the majority of cases. Should environmental conditions favor the pest over the crop, the threshold would in reality be somewhat lower than under "normal" or average conditions. If conditions favor the crop, the threshold would in reality be somewhat higher. Taylor says corn and black cutwork activity is a good example.

"Over a period of years," says Taylor, "it has been noted that when 3 percent to 5 percent of a corn stand has been removed by black cutworms, the damage will usually continue to affect crop yield significantly. In 1979, it was observed that the majority of Iowa fields that had this level of damage did not suffer the expected yield-reduction. In this case, the relative activity of the insect and the rate of crop development differed from the average in that conditions encouraged rapid corn growth. The high rate of corn development minimized the pest damage, and many more larvae were required to inflict economic damage than in some other years. The threshold effect can be estimated from the graph that is provided by the Integrated Pest Management program. To do this, however, soil temperature must be known. This information is not always reported by radio stations, but it is always available from the Integrated Pest Management Program. Using the soil temperature data, the ratios for both the corn crop and the cutworm insect can be determined from a graph used by pest management specialists. The threshold can then be calculated by dividing the corn rate by the cutworm rate and multiplying the result by 5 percent."

Taylor says, however, that this modified threshold does not consider the stages of corn growth or of the cutworm larvae and these also are important contributing factors to be considered in the decision-making model. "What the Integrated Pest Management Program does is to fill in the vital informational gaps," explains Taylor, "so that chemical treatment of crop pests can be done properly and only when it is economically necessary to do so. The system provides the information that the farmer or commercial pesticide applicator may not have easy access to."

Decision guide

The Integrated Pest Management Program has a publication called a Decision Guide that serves both as a training manual and reference source. It contains detailed sections on insects associated with corn, alfalfa, and soybeans. It also has sections pertaining to corn, soybean, and alfalfa plant diseases. A third major section deals with weeds of concern to these crops. An appendix contains the computer programs and instructions to determine economic threshold levels for black cutworm, European corn borer, corn rootworm, and a grain bin management program. There also are elaborate color plates for use in identifying insects, weeds, and plant diseases.

Newsletter

A newsletter is published weekly during the growing season and monthly at other times of the year so that farmers and commercial sprayers can keep up-to-date on crop pest problems statewide. A 90-second taped telephone message is prepared daily for farmers and commercial interests. The message provides the latest weather, crop conditions, and pest situations and recommendations. As many as 25 radio stations use this service, taping the message and broadcasting it to the public.

Other information

A 10 a.m. livestock market summary is transmitted over the computer-based system and has proven to be a popular service. Taylor indicates that additional kinds of information other than data associated with pest management will be added as the system is expanded.

Future plans

Although the system is designed to potentially handle considerably more computer terminals, the system at present is limited to the 12 area extension offices, a few county extension offices, and approximately 50 other users. These are typically agri-business firms who market pesticide chemicals or provide commercial spraying services. Thirteen radio stations and the Des Moines Register also are "other" users of the system with direct access to IPM information. A handful of farmers also have computer terminals and can consequently obtain information directly from the system. The usual procedure now, however, is for farmers to regularly check with his or her county extension agent or with the area crop specialists or pest management associate. Four of the 12 area extension offices have pest management associates. All area extension offices have crop specialists on their staffs.

Equipment cost

Each of the five weather monitoring units cost $2,000. The 12 computer terminals located in the area extension offices were approximately $2,500 each. County extension offices and external users purchase their own units. All users have access to a free IN-WATS telephone number and will continue to have this service during the remaining three years of the pilot five-year program. Cost of the minicomputer located on the Iowa State campus was $25,000.

Assessment

Stanley Murdock, area crop production management specialist at Creston, Iowa, says, "I like the program. One of the good things is that it has been very educational for the staff, itself, in learning more about pest management. The program is only in the beginning stages of being something that will be very helpful to farmers. It has been especially helpful to me in that I have learned much more about what particular pest problems are involved." Murdock says farmers are mostly relying on the expertise of extension people or agribusiness concerns for determining the economic thresholds of chemical applications. Some of the farmers are using the livestock programs on the calculators, but not many farmers in his area are using the crop programs. Private pest management consultants, farm supply stores, and farm cooperatives are using the service to a larger extent.

Murdock says that one of the biggest advantages of the system is the fact that because people from around the state enter data into the system, it keeps everyone more aware of potential problems. "If I see that a certain pest problem is in a nearby area, it alerts me to the fact that in a matter of time my area may face the same threat," Murdock explains. "The specialists on campus have done a remarkable job in continuing to evaluate the program and adding improvements to the system."

Kay Connelly, area crop production specialist at Waterloo, Iowa, says that in general he has been happy with the system, particularly as a two-way communication mechanism. "But, like any other piece of equipment, when the system doesn't work, it is very frustrating," notes Connelly. "There are times when we enter lots of stuff into the computer terminal and we just can't get the phone line or something else is fouled up so that the main computer doesn't get the data. So, sometimes I sit by the machine longer than I would like to. It would be great if the terminals could be wired directly to the computer at Iowa State so that when there is a clear spot the information could be transmitted pretty much on its own." Connelly says more complete terminal directions would also help noncomputer oriented field staff to operate the equipment.

Connelly does not believe the information the system utilizes is too technical for most people to handle. As he sees it, information has not been refined enough. There are not enough local data contributed to really help make local pest control recommendations. He believes the information is still much too general. Some changes are planned for this year so that perhaps that particular problem will no longer exist. Connelly also would like to see more observations from non-IPM people fed into the system. We made a lot of calls at farms that were not directly associated or identified as IPM monitored farms, and there was no way to enter enough of the information," states Connelly. If that could have been done, much more useful information and data would have been available to users. Connelly says last year was the first year for the system, refinements are scheduled for this year, and he thinks the system will be improved greatly with experience and time.

Nebraska's AGNET Program

AGNET (Agricultural Computing Network) is the largest and fastest growing agricultural information utility in the United States. It has an estimated 1,300 clients in 38 states. It has "partnerships," which are essentially franchise agreements, with seven states. The AGNET system has problem-solving programs, electronic mail, and computational services for its clients.

Philosophy of operation

Since its inception in 1975, AGNET has had an operating philosophy that computers and the very specialized knowledge that they process should be designed for persons with no previous computer experience. AGNET's planners believed that noncomputer-oriented user's needs should determine the direction taken in developing computer systems. They saw the computer as a tool for freeing the user of the menial tasks of calculating and manipulating information and data and as a method for providing answers to specific farming problems.

The origin

AGNET began at the University of Nebraska's Scottsbluff field station with two computer terminals, both linked to a computer at the State of Nebraska's Department of Administrative Services in Lincoln. The founders of AGNET, Jim Kendrick, professor of agricultural economics, and Tom Thompson, professor of agricultural engineering, preferred to try their idea out away from the traditional campus setting. They wanted extension and research staff and area farmers to test the system and the few programs Kendrick and Thompson developed. Reaction was high to the extent that more computers were made available in 1976 and 1977. Then in March 1977, the two computer buffs decided to try a long-shot, an attempt to get seed money to greatly expand the system. They submitted a $1.5 million proposal to the Old West Regional Commission. Two months later a 30-month grant for the full amount requested was approved by the Commission. What this meant was that the AGNET system was extended into all Old West Regional Commission states (Nebraska, North Dakota, South Dakota, Montana, and Wyoming). When the original grant period ended, the Commission awarded another $0.5 million for a 16-month period. When that grant ends on July 1, 1981, AGNET will be operating on funds it generated from user fees and partner state appropriations.

In addition to the original five partnership states, two more states have come on line: Washington (July 1980), Wisconsin (January 1981). There also are private, external (nonpartner) clients who represent a vast spectrum of the agricultural industry. Among them are farmers, ranchers, students, feed companies, banks, farm equipment manufacturers, agricultural consultants, community colleges, extension and research organizations, and many other types. The private users enter into a contract agreement which gives them access to all existing AGNET programs, any revisions in those programs, or any new programs and services that are added to the system.

According to Kendrick, 80 percent of the users represent extension service staff in the seven partner states. The balance of the users are divided about equally among governmental agencies, farmers, and agribusiness firms. Kendrick says the mix is changing rapidly in that more nonuniversity people are becoming clients. "In two years 50 percent of our users will likely be farmer clients," contends Kendrick.

Access to AGNET is through computer terminal equipped with phone modems. Nearly all brands of terminals are compatible with the AGNET system. Terminals can be used whenever there is an electrical outlet and a phone.

Organizational structure

Figure 4 illustrates the general organizational structure of the AGNET system. Central AGNET is the administrative unit of the operating system and is headed by Kendrick and Thompson and an administrative coordinator, Will Schutz. Three divisions are within Central AGNET: programming, systems, and user services. While Central AGNET owns the system, it does not own the programs. Most programs were developed

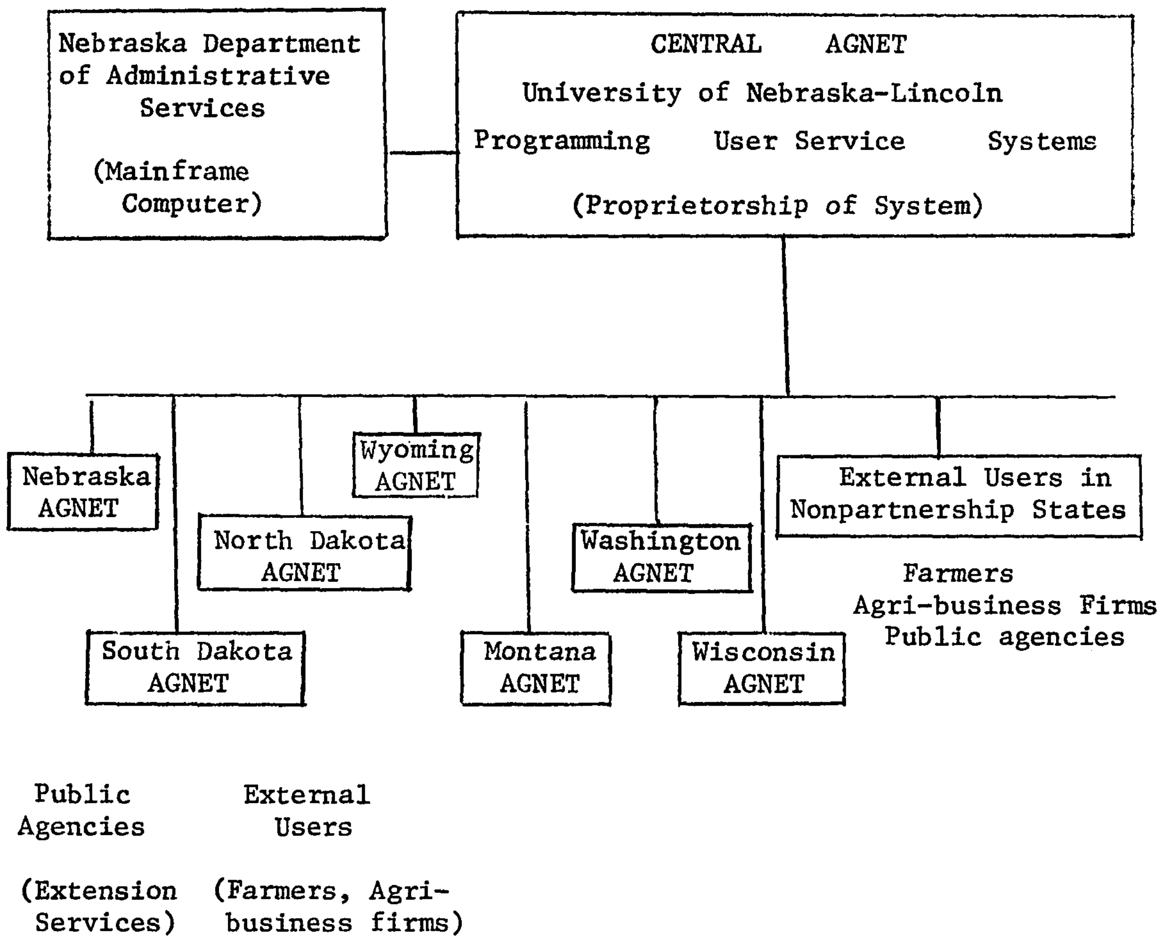

Figure 4. General organizational structure of the AGNET system

by University of Nebraska staff. Central AGNET leases computer time from Nebraska's Department of Administrative Services.

The next level of operation involves two classes of users. The first type of users is the "partnership," which has been established in six Midwest states and Washington. To date, the partnerships have been with the land grant institutions, primarily the extension component of these systems. But Kendricks says anyone is eligible to enter into a partnership agreement with AGNET. The major criterion is that every partner must have a qualified full-time coordinator to operate and manage that portion of the system. Partners pay for their own communications cost and will be billed by Central AGNET each month for program costs. Kendrick said each partner can establish their own system in terms of structure. "External users in partnership states must utilize the state system," explains Kendrick. "A South Dakota farmer, for example, can't link into the Nebraska system. He has to work with South Dakota AGNET."

The other category of user is a catch-all--any user not in an organized "partnership" state.

User costs

AGNET users pay directly for terminal rental or purchase and all of their own telephone line charges. They are billed monthly by their "partner," or in the case of external users in nonpartner states, by Central AGNET. Users are billed for computer costs determined by algorithms for machine and connect charges. Current charges are 15.28 cents per CPU (central processing unit) second during prime time (8 a.m.

to 5 p.m. Monday through Friday); 8.34 cents per CPU second for nonprime time (all remaining hours of the week and holidays); $5.65 per connect hour and $2.10 per cylinder per month for disk storage space. On the average, AGNET clients use 22 CPU seconds per hour of clock connect time. The average charge per hour of use is approximately $9 during prime time and $7.50 for other hours. Charges vary depending on the programs being used and how hard the user makes the computer "think."

User agreements

The contractual agreement for external users is made with the Nebraska Board of Regents. Agreements in partnership states are between the users and that state's AGNET system. AGNET users agree to the stipulations that use of AGNET is limited to existing programs and that the user will not develop, store, or run any other programs. No direct charge is made to other persons utilizing the user's hardware except for computer and telecommunication costs. AGNET personnel also are permitted to monitor terminal sessions and view stored data bases of the AGNET user.

Users are assigned a unique user-ID number and password, which they must use whenever they sign on to the system.

Programs available

What's the cheapest way to buy beef for the table?

What does it cost to own and operate farm machinery or do custom work?

What improvements can be made to cut heating or cooling costs?

Can livestock be raised more cheaply?

What is happening in the grain and livestock markets?

AGNET programs are designed to help a person make better management decisions. They are designed to use a person's records but not to keep those records. The system is a managment tool which can help analyze many alternatives accurately and efficiently with the assistance from extension and research specialists from seven states.

The AGNET system is for farmers and ranchers, homemakers, extension agents and specialists, adult vocational agricultural instructors, researchers, students in agriculture and home economics and by business.

Individuals with some knowledge of the program's topic can easily use AGNET, because the computer program leads the user through the problem solving process with questions, descriptions, examples, and help routines.

If a person becomes confused during a program, he can type "help" and the computer will explain what to do next. The program then calculates the expected returns per head and per pound, break-even price, average daily gain. average feed intake and average conversion efficiency.

Another feature of all AGNET programs is they enable the operator to ask "what if" questions. What if I could buy feeders for 25 cents per pound less? What if I sell direct and eliminate commission and yardage charges but have additional transportation charges? What if the selling price falls by 10 cents per pound? AGNET programs permit the individual to explore these and many other management alternatives.

There are now more than 80 programs available on the AGNET system and they fall into categories of "general programs" and "specialized programs," which are more oriented toward research pursuits. Tables 6 and 7 contain the complete listing of program options.

Most popular program

FEEDMIX, a program that calculates livestock rations, is AGNET's most popular program, and there are several features that explain its popularity. For example, as the computer balances the ration, it weighs the nutrient content and price of each feed against the nutritional requirements of the animal. The ration is balanced and it also results in the most economical combination of feeds possible. A second feature lets the livestock producer enter his present feeding program and then points out any deficiencies or excesses in it. Livestock specialists have also "stored" feed analyses and nutritional requirements for livestock in the program. The user can use these values or customize his own rations to fit most any situation. Rations are formulated by balancing from 20 to 30 nutritional and quality-control requirements.

Other programs and special use

A BEEF ADVISORY program is a monthly beef feedlot placement and sales advisory report which presents specific advisory information along with general evaluation statements and caution guides to assist people involved in the beef industry with their decision-making processes. The basic analysis model consists of a system of price and cost fore-

Table 6. General AGNET programs and descriptions

Program	Description
BASIS	Develops historical "basis" patterns for certain crops
BEEF	Simulation and economic analysis of feeder's performance
BEEFADVISORY	Beef feedlot placement and sales advisory report
BEEFBUY	Comparison of alternative methods of purchasing beef
BESTCROP	Provides an equal return yield and price analysis between crops
BINDRY	Predicts results of natural air and low temperature corn drying
BROILER	Simulation and economic analysis of broiler's performance
BUSPAK	A series of financial analysis programs
CALFWINTER	Analyzes costs and returns associated with wintering calves
CARCOST	Calculates the costs of owning and operating a car or light truck
CONFINEMENT	Ventilation requirements and heater size for swine confinement
CORNPROJECT	Projects average U.S. corn price for various marketing years
COWCOST	Examines the costs and returns for beef cow-calf enterprise
CROPBUDGET	Analyzes the costs of producing a crop
CROSSBREED	Evaluation of beef crossbreeding systems and breed combinations
DAIRYCOST	Analyzes the monthly costs and returns with milk production
DIETCHECK	Food intake analysis

Table 6 (continued)

Program	Description
DIETSUMMARY	Summary of analysis saved from DIETCHECK
DRY	Simulation of grain drying systems
DUCTLOCATION	Determines aeration ducts to aerate grain in flat storage building
EDPAK	DEMO Programs illustrating concepts of computer assisted instruction
EWECOST	Analyzes the costs and retúrns of sheep production enterprise
EWESALE	Lists sheep for sale
FAN	Determination of fan size and power needed for grain drying
FEEDMIX	Least cost feed formulation for beef, dairy, sheep, swine, and poultry
GRASSFAT	Analyze costs and returns associated with pasturing calves
HAYLIST	Lists hay for sale
HOUSE	Estimates the costs of heating and cooling a house
IRRIGATE	Irrigation scheduling
JOBSEARCH	Matches abilities and interests to occupations
LANDPAK	Package of land management programs
MACHINEPAK	Machinery analysis package
MARKETS	Various Market reports and specialists' comments
MONEYCHECK	Financial budgeting comparison for families
NEWSRELEASE	A program for rapid dissemination of news stories
PLANTAX	Income tax planning/management program

Table 6 (continued)

Program	Description
PRICEPLOT	Designed to plot market prices in graphic form
PUMP	Determination of irrigation costs for surface or center pivot
RANGECOND	Calculates the range condition and carrying capability
SEEDLIST	Lists seed stocks for sale
SENDMAIL	Used to send mail to individuals and/or group mailing lists
SPRINKLER	Examines feasibility of installing sprinkler irrigation
STOREGRAIN	Cost analysis of on farm and commercial grain storage
SWINE	Simulation and economic analysis of feeder's performance
SWINEADVISORY	Feeder pig and slaughter hog marketing advisory report
TRACTORSELECT	Assists in determining suitability of tractors to enterprise
TREESALE	Listing of Clarke-Mcnary available inventory
TURKEY	Simulation and Economic analysis of turkey's performance
VITAMINCHECK	Checks the level of vitamins and/or trace minerals in swine diet
WEAN	Performance testing of weaning weight calves
YEARLING	Performance testing of yearling weight calves

Table 7. Specialized AGNET programs

Program	Description
AFFORD	Financial Budgeting model
AGBUS	Agribusiness management game
ANIMAL	Analysis of grain and feed consumption of experimental trials
BIGMGT	Big management farm supply game
BUDGEDIT	Builds and modifies files for use in budget
BUDGET	General accounting and bookkeeping system
BULLTEST	Used for Nebraska bull-testing program
CARCASS	Scoring and tabulation of carcass judging contests (beef or lamb)
COWGAME	Beef Genetic selection simulation game
ECON	Package of teaching programs dealing with economic concepts
FAIR	Scoring and tabulation of judging contests
FARMSUPPLY	Farm supply business management game
FEEDEDIT	Used for building and editing files for the feed-mix program
FILLEDIT	Constructs and modifies files for use in FILLIN
FILLIN	A "fill in the blank" quiz routine
GRADINGPRO	Package of programs used in grading exams and quizzes
INSECTCONT	Insect control teaching programs
LIFESTYLE	Lifestyle assessment
LP	Linear programming model
LPEDIT	Used for building and editing files for the LP program

Table 7 (continued)

Program	Description
MARKOV	MARKOV chain analysis - simulating trends of growth of systems
MBO2	Simulation of meat quality in merchandising
MC	A Multiple choice quiz routine
MCEDIT	Constructs and modifies files for use in MC
PCA	Management decision model for producion credit associations
PLANPAK	Package of programs for financial analysis and planning
PREMIUM	Compiles and summarizes fair premiums
SOILSPROGRAMS	Package of programs dealing with soil problems and analysis
SCORANIMAL	Random sorting and assignment of animals to pens in experiments
SOYBEAN PROD	Demonstration soybean production management model
STATPAK	Package of programs for statistical analysis of data
SUPERMARKET	Supermarket business management game
TESTPLOT	Standard analysis of variance
TRANS	Transportation model for allocation between supply and demand
TREE	Summarization of community forestry inventory
WILDLIFE	Programs simulating environmental effects on undomesticated animals

casting equations and a selection of the best set of activities to maximize expected profits for the planning period. All considerations are made on a monthly basis, and each month new price and cost forecasts are made which may or may not alter previous plans from past information.

The HAYLIST program grew out of a need to get feed moved around as a result of drought conditions in South Dakota. It only took about a week to get the program written and working. The program provides a convenient method of scanning, county by county, or state by state, for a particular type of hay in which a potential buyer might be interested. Names, addresses, and phone numbers of potential sellers and buyers are listed.

EWESALE is a program for producers who are looking for available ewes. The program was designed for young ewes in Nebraska because there was a great demand and a limited supply.

The purpose of the SEEDLIST program is to get buyers and sellers of grain seed together. SEEDLIST is an inventory of all the certified, foundation and registered seed in North Dakota.

The electronic mail capability of AGNET is its SENDMAIL/MAILBOX program. According to Kendrick, electronic mail will soon be the feature attraction of AGNET. Many users signed up for AGNET simply for electronic mail and use only this particular program. The electronic mail program permits six different functions:

1) Mass mailing: Lists are defined by users and set up by AGNET staff to allow mass mailing with a minimum effort by the sender.

2) Message recall: Old messages may be retrieved by the receiver up to 14 days after they were sent.

3) Message scanning: Receivers may quickly scan through their mail and select specific messages to be read.

4) Message forwarding: Users can forward copies of messages they received to other users.

5) Message status: Senders can check to see which users have read messages they have sent.

6) Reliability: Messages aren't lost if the computer goes down.

The electronic mail capabilities of the AGNET system were put to use during two major emergencies during 1980. Two days after the Mount Saint Helens eruption on May 18, 1980, specialists at Washington State University at Pullman began sending status reports over AGNET. The SENDMAIL program was used in response to requests for information by individuals outside of Washington. As information was released to the AP and UPI wire services, WSU specialists also placed the releases on AGNET. These releases contained reports of damage to crops, livestock, and property across the state, reports of lab tests on the composition of the ash, and recommendations on how to deal with the ash.

With communication channels hampered, USDA's Office of Intergovernmental Affairs turned to AGNET to gather situation reports from the affected areas. By Thursday, May 20, at the request of Secretary of Agriculture Bergland's office, a special mailing list was set up to allow all AGNET users in Washington, Idaho, Montana, Oregon, Utah, Wyoming, and Colorado access to the reports being sent by WSU and USDA.

Each of these users also had the capability to send reports detailing conditions in their local areas.

On June 3, 1980, a tornado devastated Grand Island, Nebraska. Hall County Extension Agent Larry Schultz transmitted reports of the damage from his office terminal to the U.S. Department of Agriculture AGNET terminal in Washington. The information was then "telexed" to President Carter, who was onboard Air Force One, returning from the West Coast to Washington. Based on the information, Carter decided to stop at Grand Island and view the damage. Essentially, the President had been fully briefed by the county agent before Air Force One touched down at the Grand Island Airport.

Type of use

Of the total connect time taken up by users, Kendrick estimates that 50 percent is devoted to problem-solving or simulation-type programs. A third of the time is used for obtaining general information and for electronic mail purposes. The balance of the time is used by researchers with computational assistance programs.

The future

Because of the quality and diversity of the AGNET system and the fact that input is coming from other "partner" universities, Kendrick predicts considerable expansion in the next few years. He forecasts huge growth in electronic mail services.

Summary

The information utility is a computer-based communications system that provides several different services, the most common being problem-solving or decision-making programs, general educational or informational programs, and electronic mail (message-sending) services. Information utilities are usually interactive systems, allowing for two-way communication between the end user and the computer. Another important distinction is that information utilities convey information and services direct to the end user--not through an intermediary such as mass media.

Six information utility systems have been described in this chapter. Two of the systems are noninteractive: the Green Thumb project at the University of Kentucky and the Integrated Pest Management Program at Iowa State University. Both systems provide much more limited information as compared to the four interactive operations. Green Thumb and the Integrated Pest Management Program assemble and then redistribute what they believe to be very vital and specific information that the farmer (in the case of Green Thumb) and extension specialists, agribusiness firms, and farmers (in the case of Integrated Pest Management) need on a day-to-day basis during the growing season to adequately manage crop production. A major emphasis is on weather information which is integrated with very localized and almost site-specific data pertaining to crop conditions, insect development, soil conditions, and other critical factors. The Integrated Pest Management Program is interactive in the sense that data collected daily from the field are entered into the system, are formatted and then disseminated back to the end users, but the system is not interactive in that problem-solving programs are not possible on the system itself. This is done with programmable calculators operated by the end user.

The four other information utilities have been in existence for considerably longer, since the 1960s in the case of Virginia's Computerized Management Network and Michigan's TELPLAN system. Purdue's system has considerable potential for expansion in that its delivery system is widely dispersed throughout the state of Indiana. The Nebraska AGNET operation, now the largest agricultural information utility in the nation, has made a very formidable beginning in that in five years it has gone from two terminals to 1,300 clients in 33 states.

With regard to the general concerns delineated in Chapter II, there seem to be few problems with the issue of man-machine interface. The programs offered by the information utilities are such that people can access the systems with very little training and knowledge. Most of the interactive systems have built-in "help" schemes that users can select if they need the computer to take them by the hand and lead them through programs. Apparently there is a natural reluctance on the part of older persons to use computerized systems and some may never develop an interest. But, "computer literacy" is increasing particularly with younger generations. The state of Minnesota recently claimed that 90 percent of its school children were trained or had "hands-on" computer experiences.

In the area of standards and quality, it was apparent that the prevailing philosophy of the system's personnel is one of always updating and improving systems and programs. Furthermore, the attractiveness of the computer-based information systems is that they are very applicable to so many different kinds of users--from farmers and their families to extension professionals, agri-business firms, public agencies, students and many others. Programs seem to address specific informational and problem-solving needs of the users.

One of the findings of the research is that not much effort is expended by the systems in evaluating the programs they have designed and are using. Purdue's FACTS system was the only operation that had a formal structure (a Priority Committee) that evaluated software. It would seem that most systems might benefit from some type of review process involving evaluations from both persons within the system as well as others, perhaps even users. Across the spectrum of systems, programs seem quite similar. Perhaps some type of procedure needs to be arranged whereby information utilities can more readily share programs or, at the minimum, be more aware of other program offerings. Another general impression is that programs come from discipline areas where computer literacy is relatively higher. Programs from other subject matter areas should be pursued.

One of the major technological limitations for using home computers or home computer terminals in rural areas is the problem of telephone service. Data cannot be transmitted over party line telephone systems. A Federal Communications Commission ruling permits only voice transmission over such systems. In some states, more than half of the rural telephone customers do not have private party service because it is simply not available. Consequently, linking home terminals or microcomputers to computer networks via telephone lines may hamper the adoption of computer services in rural areas.

With regard to the computer systems, themselves, few technological problems are incurred either with hardware or software. There are "shakedown" problems during the first years of operation, but these decrease considerably once system refinements and adjustments are made.

In terms of economics, two points need to be made. First, all of the systems have had either public or private help in getting started. It is encouraging, however, that some of the systems, such as Nebraska's AGNET, feel they can "go it alone" once major outside support is withdrawn. In other words, they feel user fees will cover the costs of the system. It must be observed, however, that part of their clientele as well as those of other systems, will be some public institutions such as extension services. Therefore, not all costs will be paid exclusively by private clients.

The second point is that participation in an information utility is economically attractive. For the relatively small cost of $3,000, a farmer can purchase a computer terminal and phone modem and for small additional costs (perhaps $10 per hour for connect time and a telephone toll) he can log on to an information utility. Well within that hour of computer time, he may be able to save hundreds of dollars in feed costs, tens of dollars by avoiding traveling costs locating needed hay, or save considerable postage costs by using the electronic mail service. To a modern-day farmer who regularly is faced with tractor and machinery costs in the tens of thousands of dollars, a $3,000 investment in a computer terminal or even a $10,000 investment in a microcomputer will not seem prohibitively high.

Pertaining to proprietorship or ownership of information, no major problems have developed. Information utilities are eager for new software and software developers are eager to provide it simply to get it used. In some instances, university-developed software has been sold to industry. The information utilities have safeguards built within the system so that their information is protected and can be accessed only by authorized persons. Most of the systems can be monitored so that administrators know what programs are being used and who is using them. Electronic messages also can be monitored, and users are made aware of this by the systems.

A concern which emerged during the research project and which was not recognized beforehand pertains to equity or equal access to information and services. For example, just as with all kinds of new technology, the larger farm operations seem to develop earlier interests in such systems than smaller farm operations. As with other technology, the land grant system must also be cognizant of its responsibilities to everyone and establish systems in which everyone interested has a way to participate. For example, a chemical company recently offered one year's free access with a private information utility to any farmer who purchased more than 250 gallons of its herbicide. Such sales schemes are proper and normal in business but such efforts point out the tremendous built-in advantages large farm operations have in utilizing new technology. The land grant system can be a "leavener" in the computerized information business if it choses to do so. And it can do this in two ways: 1) providing computerized information or communications systems or 2) educating the public--increasing computer literacy--so that less disadvantaged clientele are not left too far behind.

CHAPTER VI. CONCLUSIONS AND IMPLICATIONS

Introduction

When John Atanasoff, a mathematician and physicist at Iowa State University, built the first automatic electronic digital computer in 1939 he had no way of knowing that what he and a graduate student had assembled would have such a massive impact on the world. There is no denying that the computer affects all of us. Even university information services will be brought around to the Computer Age, perhaps kicking and sputtering a bit, but the computer is here and ready to go to work. Just as journalists had to become accustomed to terms such as offset, negative, Gothic, pica, single-lens reflex, audio, video, or anchor person, so will they become familiar with interface, hardware, disk, byte, megabyte, real-time and all those terms in the language of computerese.

Computers are no longer limited to just business and industry. Five-hundred thousand home computers will be sold in 1981. By 1985, some experts predict three million units, worth around $10 billion, will have been sold to home users (Des Moines Register, 1981a). For around $3,500, the new computer jockey gets a basic computer with a disk drive that reads, prints, and stores information; a video monitor; and a printer for readable printouts. Some people complain that it takes hours to learn how to operate one and still others complain there is not enough software (programs) for home use or that they are not of adequate quality. But, while computers are being designed with greater memory capacity, they are decreasing in price and becoming smaller in size.

The computer has even found its way to the farm. In some rural areas of Iowa, for example, groups of farmers have formed computer clubs for swapping information and discussing programming problems (Des Moines Register, 1981b).

Kramer (1980) says by 1990 at least three-fourths of all farms in the United States will utilize computers and programmable calculators. They will use computers to process and store their farm management and production records and many farm operations will be automatically operated by computers. Ninety percent of all the nation's county extension offices will have microcomputers. Area extension offices will have computer specialists to work directly with farmers and there will be at least one computer specialist on every state's staff. All departments in the colleges of agriculture and colleges of home economics will have microcomputers. Academic policies will be changed so that as much credit will be given for development of computer programs as "publishing."

Computers can be enormously useful in a spacecraft, in a business office, on the farm, or even in the university's communication and information programs. That is what this research has addressed: how several innovative computer-based communication systems have been helpful in processing information and disseminating it to various kinds of university clientele.

Two kinds of computer applications were discussed. The first type involved computerized operations that have been implemented within the university information and publications offices. The second type included those computer-based systems that operate from the university but which are external to the information and publications effort.

With regard to information office functions, systems involving computerized news transmission, typesetting, and electronic editing were reviewed. Some attention was also given to computerized office management tasks. Operations taking place on five land grant university campuses were described.

In terms of the information utilities, six systems were described. Four of the systems are interactive in that they permit two-way communication between the user and the computer. The other two systems involve one-way communication. Information utilities provide a variety of services, are generally interactive systems, and communication is usually extended directly to the end user, not through an intermediary such as mass media. Information utilities may be thought of as both computerized classroom (problem-solving and educational programs), a computerized library (storage of data and other information), and even a post office (electronic mail or message-sending). Information utilities typically originate within one or two discipline areas of a university and then are expanded to include many others. Most of them operate under the auspices of the specific state's extension service organization, but others operate independently of any specific department.

This research is an exploratory study. General descriptions and concerns were presented concerning 12 computer-based systems located on 8 different land grant university campuses. There were some similarities among the systems but by and large they all involve different configurations of hardware and offer their own unique package of programs and services.

To formulate a number of very certain and definite conclusions based on the findings herein would not be very realistic nor honest. Any inferences drawn from this project should not be imbedded in concrete or carved in stone. These systems are all relatively new, there are innovations, they are constantly being modified and in some cases rapidly expanded. Some were planned in detail before they were begun while others began on a shoe string and expanded when needs occurred. If no absolute and unequivocal conclusions can be drawn, what is left? The author comes away from this research with certain impressions, feelings, and notions about these systems. These impressions will be listed and perhaps they will be useful for others who are considering the implementation of such systems or who may wish to do further research.

Impressions

1) Communications professionals must make major attempts to become "computer literates." The computer, communication, and telecommunications seem to have natural affinities for one another. The computer is as good processing letters as numbers. The word processor, simply a microcomputer designed especially for such a task, will replace the typewritter just as the pocket calculator replaced the slide rule.

2) One would think that some efficiencies could be achieved by the land grant insitutions if information utility and information office computer-based systems were combined, administratively. In some instances, such as Purdue, Michigan State University, and the University of Minnesota's

proposed system, computerized news transmission will simply be one program of the total computerized system. But administratively, the information utility and the news or information office are separate entities. I see no possibility for information utilities ever falling under the jurisdiction of the information service. Its responsibilities will largely continue to involve perishable news while information utilities will administer the educational and problem-solving computer software. At the minimum, however, it would be beneficial for information utilities to use the expertise of communicators when software is being written. The talents of editors have been recognized for their improvements in printed materials and there is no reason why editors should be ignored in the writing of and presentation of software programs; the programs should be improved because of it. A complete knowledge of computer programming is not needed by editors to advise on goals and editorial matters pertaining to computer programs and services.

3) The fact that the 12 separate computer-based systems described in this report involve different hardware and various configurations of use means that any land grant institution interested in designing and installing some type of computer-based system for itself needs to do extensive research as to what equipment is available and how it might be utilized. Every land grant university has its own peculiarities in terms of operation. Computer-based systems should take these factors into consideration. A system should be designed for specific needs.

4) Generally, the role of the university, its specialists, and its communications people have not been impacted all that much by the

new technology. The roles remain the same; the mechanism is changed. Editors continue to do what they have been doing except that they are doing it faster, easier, and in some instances completely without pencil and paper. The new technology has provided greater freedom for making extensive editorial changes, and writers and editors have found this to be an unexpected, pleasurable surprise. This, alone, creates a potential for improved communication materials. And the specialists involved with the information utilities continue to work on a one-to-one basis with specific problems of clientele but less so as a face-to-face or group situation. An information utility can provide unique opportunities to reach many more people while still providing individualized assistance.

5) As costs of computer hardware and software continue to decline and as the potential for saving money through use of problem-solving and other kinds of computer programs increase, use of computers in the home and office will increase tremendously. Universities must plan now for the onslaught of requests from farmers and others for applicable and useful software. All signs indicate that even if present software producers had the interest, they do not have the agricultural expertise to design adequate programs. This is one area where the land grant system can be most helpful, if it is ready and willing.

The land grant information utilities represent the first time that such systems have been made readily and cheaply (often free) available to the general public. Other systems have been designed for use by large business and industry at a considerably high cost.

6) Kramer's prediction that academia will eventually award faculty members as much for development of software as for "publishing" is difficult to accept regardless of its merits. It would take nothing short of an academic revolution to change the doctrine of "publish or perish" and the scientific journal as the approved mode of operation.

7) Information utilities have the potential to provide an almost unlimited opportunity for educational (self-instruction or tutorial) programs to the public as well as problem-solving or decision-aid kinds of software. Electronic mail is a further area that holds undeterminable potential. But several concerns need monitoring. For example, there is very little review of the material that is developed for the information utility. The general impression is that just about any program gets on the systems and in some cases (Michigan State, for example) those that are on but do not get used have remained on the system. The important question is why aren't they being used? One reason may simply be a lack of interest in the particular topics, but a more critical reason may be that the unused programs just aren't very good. Perhaps the solutions being generated are unreasonable. Whatever the reason, efforts should be made to learn what the problem, if any, really is. Peer review, involving both people internal and external to the system should be implemented by information utilities. Purdue's FACTS system was the only information utility that had a formal review structure established.

A general observation is that programs for information utilities emerge from disciplines that have had considerable experience with computer systems, such as agricultural economics, agricultural engineering, animal science, and agronomy. The social sciences are less represented yet there is agreement that there is potential for some useful software from these areas, as well. The review process should not overlook software from the social sciences.

8) In the case of computer use on the farm, the technical problem involving telephone service must somehow be resolved if farmers wish to take advantage of the services of information utilities. Either private telephone service will have to be installed, the computer will have to be wired directly by some other service, or linkage by satellite might be a possibility. But the problem remains that a significant portion of the rural phone system involves at least two-party telephone service or more. Because of this situation, it may be that use of stand-alone microcomputers will replace the use of the computer terminal. Farmers could purchase their own sets of software disks. But as pointed out earlier in this study, there is some problem with this in that when there has to be some basic programming changes, it is difficult to accomplish. Technological improvements may resolve this situation eventually, or it may become economical to simply replace the farmer's out-of-date software with updated versions.

One of the major incentives for developing and using stand-alone microcomputers versus the use of computer terminals is the elimination of line or communications charges. The trend seems to be toward use of the microcomputer and then only obtaining the services of an information utility for special informational or educational needs.

9) Another concern with the information utility is that, with the problem-solving programs, the end user must enter considerable personal data about his farm operation, finances, or whatever. This means the user must have correct information or the answers the computer provides may be erroneous. In nearly all cases, no fail-safe mechanisms are built into the programs to warn the user of unreasonable answers. As one information utility spokesman indicated, "Farmers will know if an answer is way off." Well, a farmer may know and he may not know. At the minimum, information utilities should be providing some training, some kind of guidance beyond what might be conveyed electronically, so that end users are more aware of the problem-solving limitations that exist.

Because information utility users must have accurate and complete farm and business records in order to obtain precise answers from problem-solving programs, information utilities have a built-in bias toward the larger, more sophisticated farm or business operations. The quality of the computer output will depend on the quality of the information that goes in and brings to mind the old saying, "garbage in, garbage out." At present, only a small, elite segment of farmers, those with thorough records of their farm operation, can fully utilize the information utility programs.

10) As pointed out in the previous chapter, the economic incentive to subscribe to the services of an information utility can be considerable. But it should be mentioned that, although not all programs have an economic pay-off, a larger number of those offered by the land

grant systems do, as compared with typical home computer systems. This is a real plus for the land grant information utilities. Many persons buying home computers quickly learn that the programs available are few in number, do not fit their particular situation, and primarily involve tasks that do not have much of an economic payoff or benefit.

11) It is important to recognize the differences in the way news and publications are traditionally handled by information offices. News initiation is primarily with the editor, who collects information through interviews and then writes and edits the material and follows the material through the delivery process. Gatekeeping lies with the editor and the information office and the subject matter specialist. With regard to publications, material is generally initiated by the subject matter specialist and is usually subjected to some type of formal peer review process. The information office provides additional gatekeeping functions by maintaining communication standards and quality and providing production functions. These two major differences in the patterns of handling information contribute to differences in computer systems and how computerized systems can function to save time, money, and improve quality.

The computerized news delivery systems require a minimum investment. The payoff is not with savings in production and delivery cost savings but in the fact that the information will more likely be used by the media. It may be the only way the news material will get used because publishers are becoming increasingly resistant to bear the cost of additional keystroking. Computerized news delivery becomes cost effective only with increased usage of news information.

In terms of publications, the cost savings depends on the point at which the keystroke operation is captured electronically. Man-machine problems probably are more likely to occur with early keystroke capture but savings will be greater at that point. This is because publications normally go through several drafts and must be keystroked, proofed, and corrected at each stage or revision. In most cases, the responsibility for keystroking publications is with the originating subject matter department, thus savings generated from electronic word processing will accrue to those offices rather than to the information or publications office.

Another important point is that the greatest savings in publication costs may have already been effected, even by those offices without computerized systems. The change from "hot" to "cold" type produced by computerized phototypesetting has been that factor. The contribution that complete computerization (the linkage of word processing and type-setting) makes is that the initial keystroke is captured electronically and all further copy changes come easily and cheaply. Furthermore, there are additional economic benefits in terms of electronic archiving, typesetting of news releases (to reduce mailing costs as in the case of Purdue's operation), direct linkage of information to information utilities for greater dissemination, and savings stemming from automatic or computerized formatting and pagination of publications.

12) In addition to the fact that use of news delivered by computer has a higher guarantee of use by computerized newspapers, information offices generally find that media demand more information from them. And in the case where university news is entered into the Associated Press system, more university news is used by the member newspapers because wire service delivery effectively adds credibility and legitimacy to the information.

13) The Michigan State University and Purdue University news delivery systems have attracted less use from media and the apparent reason is because it may be too much bother for media to access the university computers. The Nebraska system "dumps" its news material into the newspaper computers and the Oregon State system "dumps" its news into the Oregon Associated Press system. Perhaps the lesson to remember is that newspapers want news but they want to obtain it easily and cheaply. The Purdue and Michigan State systems will soon have the options of either continuing to permit the media to access the university computer or "dumping" news directly into the newspaper computers. A prediction is that most newspapers will prefer the second option and that use of the computerized news services will subsequently expand rapidly. Newspapers have enough of a nose for news that no computerized system should have to be "sold" to them. If a system is convenient and compatible, it will get used by the media.

14) It is somewhat disappointing that more land grant university information offices are not giving greater consideration to word processing and electronic editing systems. Newspapers have had electronic

editing capabilities for more than a decade. Information offices should be able to capture the same savings from reduced keystroke operations, ease of editing, and generally faster production of news and publications material. Only Purdue has real, total capability in electronic editing and word processing. Minnesota will have the same degree of capability when its new system is operational.

15) With computerized news systems and electronic editing, departments can create a variety of hardware and software configurations and select from a variety of hardware brands. With regard to computerized typesetting systems, however, both typesetting equipment manufacturers and computer manufacturers will likely build and market complete turn-key systems, linking word processors, phototypesetters, and printing presses. In other words, much of this technology and the design of the systems will be largely left to the printing and computer equipment industry. This is primarily because investments in complete systems such as these will be very extensive, more complex, and require considerably more capital investment.

16) In the future, information and publications offices will require computer expertise on its staff, but Kramer's prediction that full-fledged computer scientists will be needed is somewhat questionable. What is likely to happen is that there will be some subject matter specialists or perhaps some communications staff who will have sufficient expertise to service the department's computer needs.

17) The new computer technology does not seem to have jeopardized the carefully guarded role of "gatekeeper" for the university information

office. There are two reasons for this. First, the information office has the technology (although different) that is necessary to produce and disseminate information. It also manages the communications budget. Secondly, the expertise of the editors continues to be sought by specialists for enhancement of communication whether it is a news release, a publication, and we hope, computer software. With the information utilities, the gatekeeping function lies primarily with the systems' managers, who generally have computer backgrounds. The program review process, as mentioned earlier, may need greater surveillance as these systems continue to develop and expand.

18) Information offices have always tried to serve media fairly, and with regard to the computerized systems reported in this research, efforts are made to assure that media using computerized systems do not get news earlier than other media. There is no reason to believe that information offices will stray from this long-standing policy.

19) Man-machine relationships with regard to news delivery systems or information utilities do not seem to be a problem. The computer is simply another tool accompanied by its own set of accessories, uses, and terminology. Mankind has become accustomed to other new technology and the computer will be no different.

20) Both types of computer systems--the information utility and the news delivery systems--have considerable potential for continuing one of the major tasks of the land grant system, that is, education via dissemination of useful and practical information. The computerized news services are simply another avenue to put information into the

hands of the public. The information utilities are another mechanism for supplying direct, one-to-one assistance but with a greater built-in capability to reach a greater number of people. The computer terminal essentially can serve as a stand-in for an extension specialist or a county agent. Both systems need to be concerned about equity of services, but particularly the information utilities. As with any kind of new technology, the well-off, more educated citizens usually have an advantage in being able to adopt and use new technology earlier than others. The land grant system, however, is more likely to be concerned about the equity issue than commercial (private) information utilities.

The ultimate question is: Will the computer be a blessing or a burden? Kirkpatrick Sale sees it as another "techno-fix" tool that will lead to a more complex world with only temporary solutions to major problems and more power in fewer hands. Christopher Evans, however, sees the computer as a necessary tool to help master complexities mankind will face. On this continuum, I would plot myself more toward Evans' viewpoint. The computer, particularly in the case of communication and education applications, can assist in providing needed information more quickly and also aid in producing better information upon which mankind can make decisions about himself or his society. And, furthermore, the likelihood of this will increase in direct proportion to the degree to which mankind becomes "computer literate." The computer can be a useful mechanism in the land grant communications effort.

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