# A SURVEY VALIDATION OF AN INFORMATION STUDIES CURRICULUM

by

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*under the direction of the Chairperson of the candidate's Guidance Committee and approved by all members of the Committee, has been presented to and accepted by the Faculty of the School of Education in partial fulfillment of the requirements for the degree of Doctor of Education.*

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# CHAPTER I

# STATEMENT OF THE PROBLEM

> Only the supremely wise and abysmally ignorant do not change.
>
> Confucius

## Background

Information Studies is an emerging academic discipline with knowledge and skills sufficiently discrete to merit special curricular attention. The impact of new technologies on communication capabilities have long been heralded with such terms as the communications revolution and the information age. Coupled with the advances in hardware has been the exponential increase in the amount of information or product to be communicated often referred to as the information explosion.

Authors such as Martin (1978) in The Wired Society and Toffler (1980) in The Third Wave have examined the potential of the new technologies and broadly projected their effects upon our culture and social institutions. Their assessments are often dramatic:

> What appears on the surface to be a set of unrelated events turns out to be a wave of closely interrelated changes sweeping across the media horizon from newspapers and radio at one end to magazines and television at the other. The mass media are under attack. New, demassified media are proliferating, challenging—and sometimes even replacing—the mass media that were so dominant in all Second Wave societies.
>
> The Third Wave thus begins a truly new era—the age of the de-massified media. (Toffler, 1980, p. 181)

Toffler (1980) goes on to explain that the demassification of society, which the media both reflects and intensifies, brings an enormous increase in the amount of information exchanged between individuals. And this is why an "information society" is emerging.

> For the more diverse the civilization—the more differentiated its technology, energy forms, and people—the more information must flow between its constituent parts if the entirety is to hold together . . . The more uniform we are, the less we need to know about each other in order to predict one another's behavior. As the people around us grow more individualized or demassified, we need more information—signals and cues—to predict, even roughly, how they are going to behave toward us . . . .
>
> As a result, people and organizations continually crave more information and the entire system begins to pulse with higher and higher flows of data. By forcing up the amount of information needed for the social system to cohere, and the speeds at which it must be exchanged, the Third Wave shatters the framework of the obsolete, overloaded Second Wave info-sphere and constructs a new one to take its place. (p. 183)

Academic curricula seem always to lag behind societal needs, especially in technological areas. (Gillespie, 1982) Today's college student will not only have to perform with the latest equipment, techniques and procedures when they graduate, they will just be reaching the apex of their careers in the second decade of the 21st century.

The knowledge industry is the fastest growing segment of our society. It is fueled by the exponentially increasing demands of information (a product) and communication (the process of using the product). Therefore, the information industry is expanding rapidly providing many new options for the transfer of information. The schools and curricula should be part of these changes.

The obvious voids in education provoked the design of a curriculum at California State University, Chico, that reflected the needs of industry and government, and gave recognition to the information professional. Called "Information Studies," the curriculum reflects input from the disciplines of computer science, mass media, instructional technology, business, education, industrial technology, mathematics, language and speech. The program is for the generalist of the highest order, one who can relate to information and design, operate, and evaluate systems in response to information needs.

## The Purpose of the Study

The purpose of this study was to determine if an Information Studies curriculum developed at California State University, Chico meets the needs of the information age as perceived by business and higher education.

This curriculum was established to narrow the chasm between business and higher education and produce individuals called information specialists. Therefore, it was imperative to survey those very industries where Information Studies graduates would eventually make their careers. To validate the proposed curriculum, its career options, and each course within the curriculum, a survey was mailed to educators representing business information systems and computer science disciplines as well as business information professionals.

## Description of the Curriculum

Primarily the curriculum merges the traditional communication "arts" with computer, library and management "sciences." The curriculum is to be offered as a degree option within the School of Communications. In addition to a BA in Information Studies, the School has degree options in Journalism, Radio and Television Broadcasting, Photography and Graphic Design, Public Relations and Instructional Technology. The Instructional Technologist is required to have production skills in at least one medium: television, film, print, or computer assisted instruction. The School of Communications also offers an MA degree in Public Communication and Instructional Technology.

The University operates on the semester system and all graduates are required to complete 124 semester units for the BA degree. To insure a liberal arts background, 48 semester units are required from a prescribed "General Studies" curriculum. The information studies major curriculum includes an additional 66 to 69 semester units in mass communication, information science, computer science, management and business. Figure 1 graphically displays the curriculum components.

The program is to be administered within the School of Communications, which requires that all students must complete a series of five core classes for a total of 15 units. The classes consist of a beginning survey course covering the principles, methods and forms of communication, a communications history course, an information and communication theory course, a course in basic communication research methods, and a senior capstone class on communication and society concerned primarily with ethics and social effects, industry operation and structure, and governmental regulation of information and communication. All of the core courses are heavily biased toward mass media content.

Information Studies majors take an additional five classes designed as the Information Science core. These include two courses in writing: professional writing which teaches the forms and styles of audiovisual writing, and

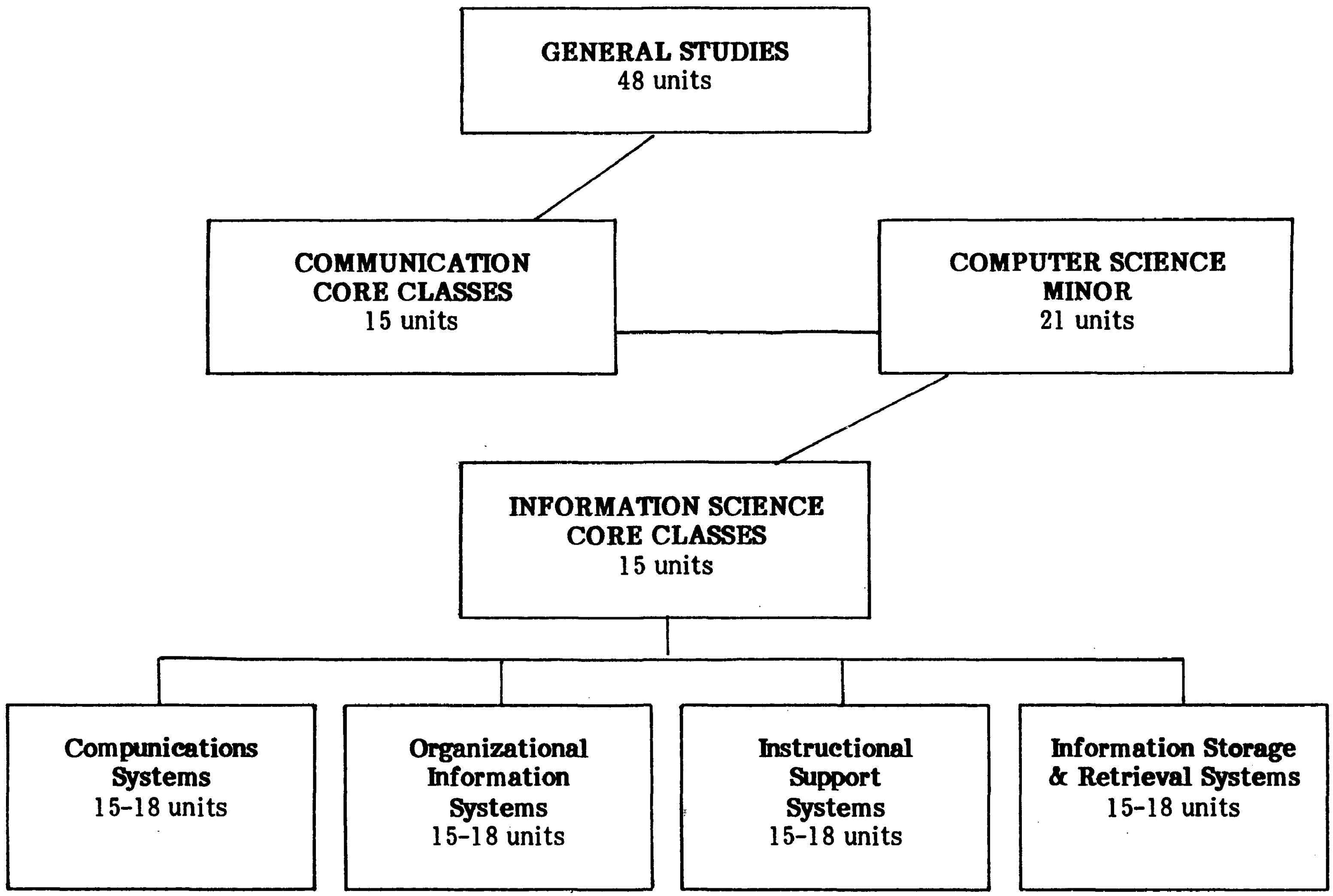


Figure 1. Information Studies Curriculum

technical research and report writing. There is also a course on computer graphic applications in media which introduces computer imaging, design and animation. The human factors in man-machine interactive systems course examines social considerations in designing interactive information systems and consumer products for personal, home and office applications. And finally, a class on the computer impact on society which covers social consequences and effects of computers and related systems upon people and the environment.

Information Studies majors must also have a minor in Computer Science that consists of 21 semester units. The seven courses are designed to provide the graduate with a foundation in computer operation and hardware and programming skills in at least one computer language. The course listings are as follows:

1. Introduction to Programming—Topics include algorithm development, control structures, functions, procedures, arrays, and records. Top-down designs, structured programming and modularity are emphasized.

2. Assembly Language Programming—The structure of computers; numbers and character representation, word and instruction formats, flow charting, machine and assembly language programming, address modification indexing, indirect addressing, subroutines, mnemonic interpreting systems.

3. FORTRAN, COBOL, Algol, Pascal or BASIC Language Programming—The study of language programming with emphasis on language structure, data representation, file manipulation and interactive programming.

4. Data Program Structures—Traditional data structures are examined as they relate to information, parameter passing, recursion, assemblers, compilers, operating systems, and machine organization.

5. Data Base Management—Introduces large data base management and associated automatic information processing with concurrent application of the Cobol language.

6. Information Display Systems—Design and application of visual information display and storage systems.

7. Microprocessor Components and Systems—Several microprocessors analyzed and compared. Students work with microprocessor kits in lab programs and develop interface circuits for them.

To this point the curriculum offered the information studies' student has been relatively rigid and doctrinaire. The Information Studies degree option, however, offers a selection of four career specialty emphases. Depending on the individual's aspirations and talents he/she may elect the particular field in which he/she is most interested. The areas offered are compunication systems, organizational information systems, instructional support systems, and information storage and retrieval systems.

Each field offers a number of courses from which the student selects 15 to 18 semester units.

The Compunications Systems (telecommunications) emphasis is designed for the student seeking a career in the telecommunications industry.

> We have built a society, especially in the Western world, which is highly dependent on technology, some of which has a limited future. The world supply of petroleum is running out and it will continue to rise in cost . . . Certain vital minerals needed to produce the array of goods that characterize Western consumption are running out . . . Pollution is growing . . . And yet we live in an age of immense technological

riches . . . One of the most exciting technological developments of this century is the marriage of telecommunications to that of the computer industry. (Martin, 1977, p. 2)

Traditionally, such diverse information systems as the print media, the telegraph, the telephone, the television networks, and electronic data processing have been seen as providing distinct services for distinct users, through distinct technologies and market structures. However, the computer and telecommunication technologies form a natural symbiotic relationship. They have merged as "compunications," a term coined by Oettinger of the Aiken Computation Laboratory at Harvard, to describe the combination of computer and communications systems. Compunications systems supply most of the infrastructure not only for all information industries, but of most other activities as well. Vast scientific and technological advances have taken place in compunications since World War II and promise to continue well into the next decade.

The Compunications Systems curriculum offers courses in audio and television production, computer graphics and computer applications in telecommunications. It also includes foundation courses in electrical and electronics technology, communications systems and components, microwave technology, and national and international information policies.

Graduates of this emphasis can expect to find employment throughout the communications industry as computer applications continue to proliferate in newsrooms, publishing, broadcasting and the burgeoning cable and satellite systems.

The Organizational Information Systems emphasis merges the data processing management field with communications. Data processing in business is one of the oldest applications of computers. The computer's ability to handle vast amounts of repetitive numerical operations and analysis made it extremely valuable to all manner of accounting, billing, payroll, stock control and other operations. Applications have proliferated in data base management and information processing for managers and decision makers. However, the creation of information data bases alone does not necessarily improve the quality of management. In fact, the computer's ability to produce information at mind boggling speeds can contribute to slowing down the decision-making process (Vaid-Raizada, 1982). Too much information may be just as harmful as the lack of information in some situations. Information utility is dependent to a great extent on communication quality. Information is a product, a thing, while communication is a process by which meaning is shared. Increasing the amount of data may simply result in "data pollution." Few managers can cope with more information than they now receive. What is needed are communication specialists with knowledge of data base management.

The Organizational Information Systems career specialty offers courses in accounting and management information systems, information systems analysis, decision support systems and interactive computer graphics as well as classes in interpersonal and organizational communications, office information systems, and behavior of information users.

Computer application in training and education is a rapidly expanding field and the Instructional Support Systems curriculum prepares students interested in this type of career. Since the invention of the printing press, every new communication technology has been hailed as the promise to revolutionize education. Unfortunately, film, radio and television have been more boondoggle than boon. (Main, 1980) Now, however, the application of the computer with new laser video disc technology offers the opportunity of using the power and density of information presented with sound, visuals and motion without the fixed pace, fixed sequence format. The self-paced quality of print, with its repeatability, browsing and skipping capability along with varying levels of difficulty and learner interaction are possible with the new technology and hold the promise of individualization of instruction. Coupled with management routines and accounting procedures, the computer provides record keeping, scheduling a host of other instructional support functions.

The Instructional Support Systems curriculum offers preparation for careers in business, industry and government in developing and operating computer assisted instruction and computer managed instruction systems. Included in this career field are courses in instructional design fundamentals, instructional systems evaluation, the design of instructional systems, specialized information resource systems, and media services and centers. Also available are classes in basic and advanced computer assisted instruction and interactive computer graphics. The program will not provide certification for the public school system and employment in elementary/secondary education systems is, therefore, limited without additional courses in the School of Education.

The fourth emphasis available as a career specialty is Information Storage and Retrieval Systems.

> The espionage agent is one of the most powerful metaphors of our time . . . . Cowboys, cops, private eyes, adventurers, and explorers—the traditional heroes of print and celluloid—typically pursue the tangible: they want land for cattle, they want money, they want to capture the crook or gain the girl. Not so the spy. For the spy's basic business is information—and information has become perhaps the world's fastest

growing and most important business. The spy is a living symbol of the revolution now sweeping the info-sphere. (Toffler, 1980, pp. 171-172)

Ultimately all information systems rely on data bases. And more and more information is being placed in data bases. Estridge, chief of IBM's personal computer division, envisions using the computer to summon and explore anything mankind can record—from art to politics (Newsweek, 1982). Historically, data base designers and computer engineers have been primarily concerned with system efficiency—how to pack the information for maximum density and speed of operations. Initially data bases were developed for the scientific and educational community and funded largely by the Department of Defense, NASA and other Federal agencies. Users were highly sophisticated—engineers and researchers—and little attention was paid to protocols and procedures that were easy to understand. As the data bases became more and more useful in management and business applications, system developers were increasingly concerned that procedures be user friendly. Today, personal computers in the home open new uses for information storage and retrieval from library services to marketing to banking to entertainment and on and on. As Newsweek proclaimed, personal computers have the power to take a limitless wealth of knowledge out of the sacristies and put it at the disposal of the masses (Newsweek, 1982). The challenge for information storage and retrieval systems for the coming decade and beyond will be to make data bases not just friendly, but irresistible.

As competition between vendors of information services increases and the functions of data bases expand into the marketing arena, the idea of packing information will be displaced by packaging; for the purpose of packing is to keep a thing safe and to make it portable or preservable. As Boorstin

(1973) notes:

> The better a thing was packed, the less apt it was to be damaged, the farther it could travel, the longer it could be stored. Packaging created whole new vistas for the consumer. For while packing was designed to transport and to preserve, packaging was designed to sell. (p. 435)

The curriculum for this emphasis includes courses in specialized information resource systems, specialized media services and centers, automated indexing and abstracting systems and services, archives and manuscript management, behavior of information users, information sharing and transfer, governments and information and interactive computer graphics.

A complete listing of the courses within the Information Studies curriculum is provided in Appendix A.

There are a number of efforts in higher education to meet the changing requirements of the information age. One of the most notable is the Data Processing Management Association (DPMA) Model Curriculum for Undergraduate Computer Information Systems Education (DPMA Education Foundation, 1981). Most of these innovations are primarily modifications of existing computer science, library science or management and business information systems curricula. These programs have traditionally served an industry with sophisticated and relatively specialized clients.

This curriculum concept originated in the School of Communications serving an industry whose clients have traditionally been the public and as much of the public as possible. The communicator's emphasis has been on message design to first attract an audience and ultimately change its behavior. This seems an appropriate parentage in preparing graduates for careers in the expanding knowledge industry.

## Questions

The principal question investigated by this study was the evaluation of an Information Studies curriculum. The major question was divided into a number of components. There was a question of evaluating the curriculum as a whole, by its major options and by each individual course. It was important to determine the evaluation of the curriculum by information professionals and by members of academia involved in similar educational concerns. Specifically, the study addressed the following questions:

- What is the overall evaluation of the Information Studies program?
- What is the evaluation of the major curriculum subdivisions and each individual course?
- Are the perceived values by professionals in the field different than those of educators?
- Is a graduate of the program marketable as an information specialist?

## Definition of Terms

Communications

A curriculum which offers degree programs in public communication, instructional technology, information studies, journalism, radio broadcasting, television production, public relations, and visual communications and design.

Compunications Systems

The application of computers in the telecommunication and mass media fields.

Computer Science

A curriculum which addresses the development of computer system software technology: design and implementation of system software-operating systems, language translators, data management software, and other programming, processing, and operating aids that facilitate use of the computer hardware. The curriculum has a strong theoretical, scientific, and mathematical emphasis, and graduates of computer science programs commonly seek employment with computer manufacturers or software houses that specialize in system software.

Information Age

A society in which over 51 percent of the population are engaged in the handling and transfer of data and information. A stage in an evolutionary process beginning with an agrarian society and passing through an industrial stage to a post industrial stage.

Information Storage and Retrieval Systems

The use of computer technology in the design and development of information retrieval systems to include tailored data base design as well as a generalized information resource center.

Information Studies

An interdisciplinary curriculum which produces information professionals or specialists who are concerned with the process, packaging and movement of information messages rather than the specific device (computer, book, file or video tape) or the particular agency (library, computer utility, or educational systems). The curriculum provides the graduate with the ability to deal with the total information process.

Instructional Support Systems

The application of computers in training and education.

Organizational Information Systems

The design, development and operation of computer systems for meeting information and communication needs of organizations.

Telecommunications

Transmitting data and information electronically, i.e. through telephone, cable, optical fibers, satellite, and microwave devices.

## Limitations and Assumptions

This information studies validation study is limited by the following parameters:

- The curriculum to be validated only involves undergraduate study. It does not address the needs of post-graduate students.
- The population surveyed is limited to members of a single professional society, the Data Processing Management Association (DPMA) as representing business and to the chairs of computer science and business information departments as representing higher education. These populations are not inclusive of either the job potential of the graduates or the disciplines included in the curriculum content.
- The study is not longitudinal. A tracking methodology would yield more precise validation information.
- The study does not include students and is therefore devoid of input from the curriculum's client population.

The study is based on a number of assumptions whose validity can be questioned and which must be considered in examining the conclusions and recommendations:

- The most basic assumption is that the populations surveyed are representative of the business fields and higher education domains concerned with information studies application and knowledge. This assumption may be challenged on a number of points.
- The study assumes that the knowledge and skills an information specialist needs for a future professional career are known and can be articulated. A field in which change is continuous and dramatic, makes this point arguable.
- A related assumption is that present college curricula are inadequate for preparing college graduates for professional careers in the information field. This assumption is related to the second in that it implies that these inadequacies can be determined and corrected, i.e., the knowledge and skills are knowable.

## Chapter Summary and Organization of the Study

This study was to evaluate an undergraduate curriculum preparing graduates for careers in the information field.

This first chapter has presented an introduction, description of the curriculum, the purpose, a statement of the questions to be answered, and the limitations and assumptions of the study. The remainder of the report documents the conduct of the study and its results.

The collection of data for the validation took two major approaches. The first was a search of the literature to examine expert testimony on the skills and knowledge needed in the information age.

The results are presented in Chapter II as a review of the literature. It is organized from the whole to the part. The first section deals with the general description of the information society, the role of higher education, an identification of curricular needs and, finally, the career needs of the information professional. The literature was then examined for justification for the four major career patterns included in the information studies curriculum: Instructional Support Systems, Information Storage and Retrieval Systems, Compunications (telecommunications) Systems, and Organizational Information Systems.

The literature was also examined to compare other curricular approaches for meeting the needs of the information age.

The second approach to validating the information studies curriculum was the collection of data by a survey conducted among educators and businessmen involved in the information field. Chapter III is a description of the research procedures. It contains the methodology used in developing the survey instrument, the results of the pilot study, the population parameters and sample selection procedures, the statistics used in analysis and the data sources.

The results of the survey are presented in Chapter IV. A description of the respondents is presented first and then the validation results for the curriculum as a whole. Each course is then examined in terms of its validation score and relative ranking. The four career options results are presented separately and a qualitative analysis of the responses to a series of open-ended questions is presented. The results conclude with a report on the differences between responses from business professionals and those educators from colleges and universities.

Chapter V presents a summary of the study and a discussion of conclusions to be drawn from the research. It also lists the weaknesses in the study and recommendations for further research in the field.

## CHAPTER II

## REVIEW OF THE LITERATURE

Litera Scripta Manet.
(The written word remains.)

Horace

This literature reviews both the need for the proposed undergraduate Information Studies program as well as the decision to place the program within the School of Communications. The literature review begins by examining the purpose of higher education and the economic and social conditions of the United States and questions the extent to which higher education is fulfilling its role today. Extensive citings from both members of industry and higher education reveal that higher education is indeed lagging behind the times and needs of our economic, political and social institutions. The second part of the literature review defines the information needs of society and then examines the four options of the proposed Information Studies program to assess how well they appear to meet these needs. The literature review concludes by examining other curricular efforts within the computer science and business disciplines and assessing the placement of the proposed Information Studies program within the School of Communications.

Though the question of the purpose of higher education is today the topic of much debate, it cannot be argued that the purpose is at least in part to educate our citizens and impart the type of knowledge and intellectual abilities necessary to enable them not only to function in but to contribute to the development of society.

## The Information Society

That we are no longer in the period of transition from an industrial society to an information society but have, in fact, actually arrived at this state is well documented. But what is an information society? How did we get there? What problems and manpower shortages is it creating? And finally, what is higher education's role in meeting the needs of an information society?

Porat, Executive Director of the Aspen Institute Program on Communications and Society, gave economic evidence that we have indeed moved into an "information economy."

> In 1967, 25.1 percent of the U.S. Gross National Product (GNP) originated with the production, processing and distribution of information goods and services sold on markets. In addition the purely informational requirements of planning, coordinating, and managing the rest of the economy generated 2.1 percent of the GNP. These informational activities engaged more than 46 percent of the work force, which earned over 53 percent of all labor income. On the strength of these findings, we call ours an "information economy." (Porat, 1976. p. 5)

Porat suggested that one of the primary indicators used in analyzing the stage of economic development of a country is the structure of the work force. When we were an agricultural economy (1860s) almost 50 percent of the labor force was engaged in agricultural activities. In the height of the Industrial Revolution, industrial activities occupied almost 40 percent of the work force. In 1978 agricultural activities engaged only four percent of the labor force and industrial activities only engaged about 20 percent. "And now information occupations which engaged only about 10 percent of the work force at the turn of the century account for 46 percent of all jobs" (p. 5).

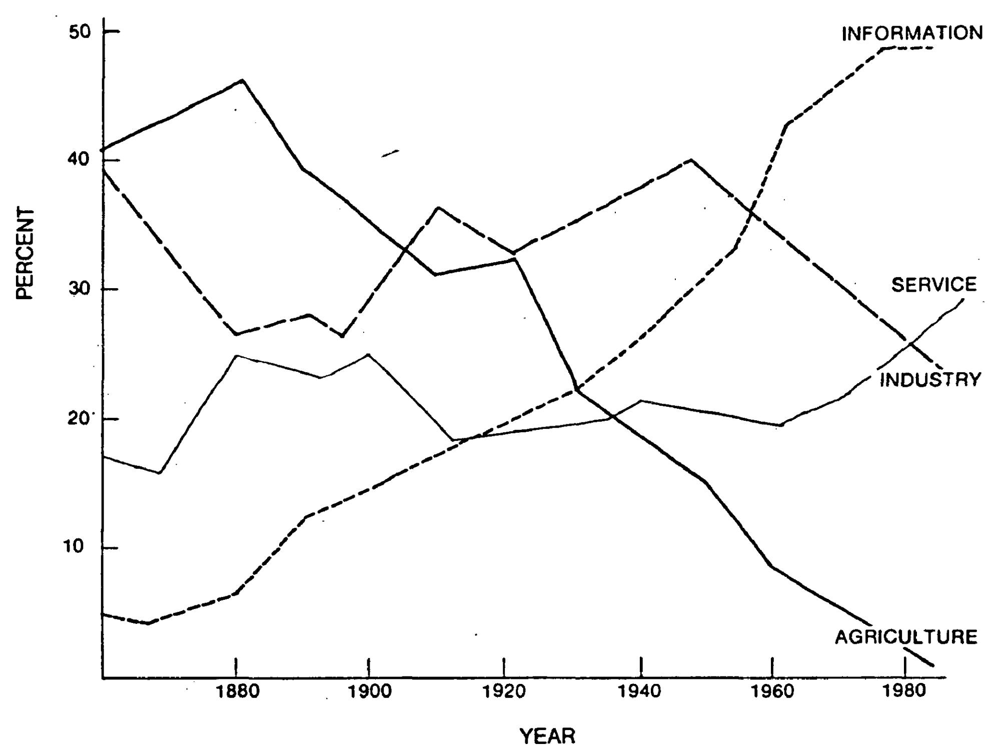


**Figure 2.** **The Growth of Information Occupations**
**U.S. Work Force 1860 - 1980**
Source: Porat, The Information Economy, Vol. 1, p. 121

Bell (cited in Robinson, 1978) described the transition to a post-industrial society (the information society):

> In pre-industrial societies . . . the labor force is engaged overwhelmingly in the extractive industries . . . Life is primarily a game against nature . . . . Industrial Societies . . . are goods producing societies. Life is a game against fabricated nature. The machine predominates . . . . A post-industrial society is based on service. What counts is not raw muscle power, or energy, but information. (p. 5)

Information is the key word, the end product, the primary activity for those in an information society. The importance of information must be stressed if we are to fully understand its potential impact on the world today.

> Materials, energy and information are mankind's basic resources. Without materials there is nothing. Without energy, everything stands still. Without information all is chaos. Information makes it possible to use all other resources effectively and efficiently. (Johnson, 1982, p. 4)

In High and Low Politics; Information Resources for the 80s, Oettinger (1977) stresses the importance of information and the management of information resources for the world today.

> Information is a resource just as energy is a resource. Both are vital to the well-being of individuals and organizations in today's world. As with energy politics and technology are changing the ways in which information is produced, stored, communicated, processed and used. No crisis like the Arab Oil Embargo and Iranian revolution have dramatized the implications of these changes, but they are readily apparent if we lift the veil of such vague aphorisms as "knowledge is power" and ask: How essential are information resources? Who produces or controls them? Who can get them and on what terms? (p. 3)

These questions force the realization that information is the key product in an information based economy and society is not an isolated variable. Rather, in fact, it is inextricably connected to the process of transmitting that information. The process of communications is equally important as the product. When focusing on the information society as a combination of product and process one can begin to understand that the revolution was heralded by the computer and communications technology and the national and international social, economical and political implications become awe-inspiring.

> Social scientists engaged in futures studies have suggested that the information revolution, spurred by both advances in computers and communication and by the changing role of information in U.S. society, will have profound long-term effect as dramatic as those caused by the invention of the printing press. Just as the printing press, by stimulating literacy and speeding the flow of ideas, supported the Renaissance and the transition from medieval society to the age of enlightenment, so the new information systems could profoundly transform the social and political environment of U.S. and the world society. (Molnar, 1980, p. 8)

Molnar (1980) stressed again the importance of computers, communications and access to information.

> Access to information and communications may turn out to be one of the most significant social forces in the information society. Information has always been an important social, political and economic force. Information can be transformed into power. Low cost computer-communications have the potential to expand that power base. (p. 46)

In an information society, communications is more important than ever. "Communication has clearly been a part of every civilization in every stage of development. But the importance of communication, relative to other aspects of life has taken on a new meaning: communication is central to an information based economy" (Robinson, 1978, p. 10). In The Third Wave, Toffler (1980) explained that traditional forms of media are being challenged and even replaced. With the information explosion and the demassification of media, communicating information becomes the essential need and is making people and nations more and more dependent and interdependent on each other.

> For the more diverse the civilization—the more differentiated its technology, energy forms and people—the more information must flow between its constituent parts if the entirety is to hold together . . . The more uniform we are, the less we need to know about each other in order

to predict one another's behavior. As the people around us grow more individualized or demassified, we need more information—signals and cues—to predict, even roughly how they are going to behave toward us . . . .

As a result, people and organizations continually crave more information and the entire system begins to pulse with higher and higher flows of data. By forcing up the amount of information needed for the social system to cohere, and the speeds at which it must be exchanged, the Third Wave shatters the framework of the obsolete, overloaded Second Wave info-sphere and constructs a new one to take its place. (Toffler, 1980, p. 83)

With The Third Wave and our realization of the global village comes a host of problems associated with communication and information policy. Communication policy addresses issues related to "arrangements of the information infrastructure itself, e.g., common carrier policy, competition in the related telecommunication markets and investment policies in new technologies" while "information policy" is concerned with issues "relating to the application of information technologies across all sectors of the economy, including the postal service, publishing, finance, media, education, manufacturing, transportation, medicine, energy and governance" (Robinson, 1978, p. 12).

These communication and information policy issues have far reaching international importance. In a global village and an information society "Interdependence for better or worse, perfectly describes the communications and information arena. As Cleveland reminds, the opposite of interdependence is not independence, but dependence" (Robinson, 1978, p. 49).

In this era of power created by the information explosion and communications technology it becomes increasingly important for the United States to remain in the forefront in both the creation and application of communications/information technology and its policy formation.

Molnar (1980) warned of educational competition from other countries. Foreign governments have "placed a high priority on the development of computer based skills in their educational systems" (p. 44). In 1980, the French government set aside a special week for computers in society. They also have a national plan to make a computer literate society. In response to special requests by the Prime Minister, the British Science Research Council "has established a major program of academic research to help the United Kingdom maximize the benefits from microprocessor and electronic technology" (Frey, 1983, p. 88). The plan includes five year projects to expand existing commitments in Computer Aided Instruction.

Japan, Britain and France all have plans for promoting and easing their country's transition to an information society. These plans involve the cooperation of industry, government and higher education. Yet, the United States is just beginning to realize how important the role of higher education is to the national welfare of an information society.

## The Role of Higher Education in an Information Society

The key words in an information society are not just technology, computers, telecommunications, and information. For all these would be useless without the educated manpower available to implement these technologies and appropriately apply them to national goals of economic stability and international goals of world peace. Thus, in an information society the role of higher education may be more important than ever before. Information and communications are neutral entities in and of themselves. It is people who either effectively use or misuse the power of information.

Frey (1983) asserted that "We as nations must make the necessary investment to improve these abilities. The investment we need to make is the investment in the educational development of the needed skills in an information society" (p. 89). Frey further stated that "History is unambiguous in demonstrating that the development of human skill is even more critical to economic progress than the presence of natural resources, physical capital or raw labor . . . we must bring our educational resources into fuller play in national economic rejuvenation" (Frey, p. 89).

That the key to an information society is educated persons with an increasingly important role given to the "intellectual elite" was predicted by Bell (quoted by Reid, 1978) in his analysis of trends exhibited in the transition to an information economy. Bell not only discussed that this transition includes the move from a goods oriented society to a service oriented economy, but he also stated in his axial principle that

> . . . the centrality of theoretical knowledge is the sources of innovation and of policy formulation for society. . . . Theoretical knowledge increasingly becomes the strategic resource, the axial principle of society. And the university, research organizations, and intellectual institutions, where theoretical knowledge is codified and enriched, become the axial structures of the emergent society. (p. 179)

That the role of education has special implications and new more important roles in the age of an information society, and that it is currently lagging behind in the formulation of that role and in meeting an information society's needs is evidenced in the following quotes by leading industrial, governmental and educational experts.

In a recent report entitled "Computing and Higher Education: An Accidental Revolution," Gillespie (1982), suggested that the change in the computer's role from calculating to information processing has caused us to question and expand the role of higher education in an information society:

> As the applications of computing have expanded from calculating to information processing, the issues of computing and higher education have enlarged to include questions about the nature of information transfer and about the role of higher education in an information society. (Gillespie, p. 1)

Gillespie (1982) stated that it is the changes in how we store and communicate information that has transformed our nation to an information society. Because technological changes and "The transition has been extremely rapid, and because it has been largely unplanned, with continual new unexpected developments, it is an accidental revolution" (p. 1) and one that has left education lagging behind.

The approach to higher education in the 1980s will have to be new and broader and will have to "integrate the traditional roles of higher education into the new information market place and consider how to link interests of education, industry, and government in efforts to improve national productivity" (Gillespie, 1982, p. 2).

Gillespie's report was the result of a National Science Foundation grant that funded a panel of industry and education members. The panel sent a survey to special interest groups concerned with computing and higher education such as: Association for Computing Machinery (ACM) groups, interest groups of university computer centers, computer science chairpersons and members of the Association of Educational Communications & Technology (AECT).

Some of the results of this research suggested the changing role of higher education. The panel proposed that the National Science Foundation set up a commission involving professional industrial, education and government groups to focus on issues and tasks for educating in the eighties. The important tasks of this board would include "stimulating curriculum development" and "identifying new strategies for human resource development particularly to ensure the equality of opportunity" (Gillespie, 1982, p. 3). A report by Licklider (1980) entitled "The impact of Information Technology on Education in Science and Technology in Science" reaffirmed the supposition of education's being behind in educating our society.

> Education is not only missing a great opportunity; it is failing to discharge a crucial responsibility. The world is rapidly moving into the "information age." In order to make the transition wisely and well, the public must understand information science and technology. People must master the technology or be mastered by it. (p. 1)

Educators are not the only ones who recognize the need for higher education to define and implement its role in educating citizens for an information society. In fact, the impact of a lagging higher educational system can perhaps best be felt in industry. The reality of technologically displaced workers with the lack of educated persons to fill new roles is frightening.

Frey (1983) has stated:

> Whole careers have become obsolete as a result of change in the global economy . . . but the glut of young people seeking employment today will be a glut of middle-aged workers in 10 to 20 years. Unless we can begin now to prepare these young people for the jobs of the future we are likely to suffer years to come with a large population of chronically unemployed and underemployed--and all the economic and social problems attendant to that. (p. 87)

Hamblen (cited in Molnar, 1980), after studying manpower needs in the information age concluded that "the cause of many problems associated with computer usage is the overutilization of undereducated people" and that a "sufficient number of properly educated people are not available nor will be in the forseeable future" (p. 46).

In a recent article in Data Training (1983), De Long interviewed training directors from major high technology corporations including Wang, DEC, Hewlett-Packard, and Xerox. He concluded that education is just not producing the type of educated people that are needed. Since there are just not people "out there who are trained," major companies are having to develop their own training programs.

A primer prepared to enlighten college presidents on the recent evolvements of telecommunications and their relation to higher education stated that observers believe that most of the transformation to a "deeply transformed telecommunications system" will occur in this decade (1980-1990) (Smith, 1978, p. 8). These developments will have a tremendous impact on the "content, methods, and economics of education" (p. 8). Educators need to take an active role now and "relate events to the problems and requirements of education, and must move to protect education's stake before its too late" (p. 8).

Newton, quoted by Smith (1978), stated that "If there is any area of society where we ought to be doing more to prepare for the business of communications of the future it is in our schools" (p. 10).

## Identification of Curriculum Needs for an Information Society

What do educational institutions need to do in terms of revitalization of their curriculum to prevent them from becoming what Peter Drucker has dubbed "the railroads of the knowledge industry?" (Molnar, 1980, p. 46). Since part of the problem is the newness of the field and the inadequacies of existing curriculum, it seems logically appropriate to answer the question of curriculum needs by looking both at what type of people are needed to fill the jobs created in an information age and by examining the types of knowledge and skills needed to enable individuals in an information age to take their place as leaders in education, industry and government.

That the information age has and will be continually creating a tremendous need for everyone to be educated in the "basics" of Computer Science can hardly be questioned.

> The vitality of education, both teaching and research, depends upon the capability of schools to meet the needs of human beings in society. The pervasiveness of computers into the communication and information behaviors of people require that a basic computer literacy become part of our curriculum as communicators and educators . . .
>
> It makes little sense to wait until the verdict is in on whether computers are (or will be) a part of our information and communication futures. What the studies do tell us is that computers are so formidable a communication device they cannot be ignored. (Schuelke, 1982, p. 8)

Researchers at the Human Resources Research Organization have attempted to clarify goals of computer literacy. After analyzing 24 college and university programs and defining computer literacy as "what a person needs to know and do with computers in order to function competently in society," they found three important areas needed stressing: "(1) writing algorithms and computer programs (2) knowledge of computer applications in one's field and (3) understanding of computers and their impact on society" (Molnar, 1980, p. 45). The Computer Science minor of the proposed Information Studies program seems to cover these areas in general while the individual options satisfy the requirements of being familiar with computer applications in individual fields.

On the importance of these requirements of "computer literacy" Molnar (1980) concluded that ". . . if individuals are not computer literate and do not understand how these systems work, they will be unable to meaningfully participate in actions that affect their lives" (p. 46).

It seems evident that in the information age experts from industry and education need to cooperate more than ever in determining educational needs for this society. This trend toward cooperation is exemplified in a recent article for Technological Horizons in Education (THE) where Palko of the Human Resources Planning and Development Division of Prime Computer joined forces with Hata, the Chairman of Electronic Engineering Technology at Portland College, to analyze important components for educational curriculum in the 1980s.

They stated that computers "are creating a need for technical personnel with skill sets not envisioned ten years ago. Coupled with the pervasiveness of computers in our society today, the computer industry is on a collision course with a manpower crisis" (Palko, 1982, p. 69). The crisis is not only caused by the lack of the number of graduates in the field, but also by the inadequacy of past programs.

Education in Computer Science has traditionally focused dichotomously on hardware or software. But new technologies are transcending those distinctions and it seems appropriate to suggest that not only computer science graduates but also information studies graduates need "to be trained with a program of integrated hardware and software skills" (Palko, 1982, p. 69). These authors also suggested the importance of integration of communications courses for Computer Systems Technology Education for the 1980s. Although they did not identify specific curriculum content, they suggested the important need for courses not only on written and oral communication, but also on the impact of technology on society (Palko, 1982, p. 69).

Perhaps equally, if not more important for the purpose of this literature review, is the evidence that in our age of information not only has computer science curriculum been lacking in fulfilling societal needs, but that general education for all is needed not just in "computer literacy" but more importantly information, communication and technology literacy. The interrelationship and importance of uniting basic computer science courses with courses in communications and technology cannot be over-emphasized.

> Computer literacy is a popular buzz word these days, although the more comprehensive, but obviously less catchy educational need might be better expressed as information-and-communication-technology education. Learning how to use a computer is a good avenue . . . but (the essential issues are) the control of distribution of knowledge; the social and environmental consequence . . . of the evolution of computer and telecommunication technology. (Johnson, 1982, p. 8)

This brings up the interrelationship of computers and communications and the realization that most college graduates are not aware of the issues, much less the definitions of such terms as telecommunications and their social, political, economical, and ethical ramifications.

For the sake of clarification this investigator accepts Johnson's definition of telecommunications which is defined "as a process by which information is exchanged electronically. Information may be 'tele' (meaning over a distance, from Greek) 'communicated' using the electromagnetic spectrum in the case of television, radio and microwave transmission, or by use of physically installed lines in the case of telephone and cable TV" (Johnson, 1982, p. 6).

Unfortunately, college curricula has been negligent in supplying college graduates with either definitions or implications of telecommunications and information/communication technology.

The "Telecommunications Primer for College Presidents" released in 1978 stressed the importance of the "coming of communications super-highways . . . with their intermingling of computers and communications networks and their capabilities of providing numerous services . . ." (Smith, 1978, p. 10).

The primer continued to point out the deficiencies of higher education in this areas:

> Education should do more to produce a citizenry that has at least a rudimentary awareness of communication matters and their impact on society. With the exception of a few graduates of specialized curricula in a few schools of communications, it is probably safe to say that . . . (these) matters are almost totally terra incognita to nearly every educated person.
>
> In addition to producing graduates who have little or no familiarity with the public and social impact of communication in the modern world, institutes of higher education are producing many graduates who have little or no familiarity with the hardware, its capabilities or its use. The impact of this is being felt at both the level of management and the level of actual usage. (Smith, 1978, p. 10)

## Career Needs for an Information Society

Academic curricula seem always to lag behind societal needs, especially in technological areas. (Gillespie, 1982) Today's college students will not only have to perform with the latest equipment techniques and procedures when they graduate, they will just be reaching the apex of their careers in the second decade of the 21st century. Eary (1978), President of Scripps-Howard Newspapers, reinforced this assessment with his predictions for the late 1980s.

> . . . Americans are now accustomed to a society where many functions are carried out by computer supported telecommunications. A new generation of people now dominate who can communicate effectively with computers. Programming is taught in elementary schools and any educated

> person over 30 is fluent in at least one high level programming language; digital TV has led to experimental 3-d telecasts, proliferation of video terminals has reached the home and many employees now work out of their homes . . . business is now conducted via picture phone conference hook up . . . The wired city is coming together. Satellites now provide for home reception of world-wide television. Increased band widths permit delivering of many languages on TV . . . digital library systems can now store 100 trillion bits on line. Every issue of the world's major newspapers is stored in retrieval systems with automatic indexing . . . Similar systems exist for magazines and technical and legal journals . . . these systems are accessible by terminals from anywhere in the world via satellite network. . . . And in 1990 voice/video communication begins to lead to the demise of printed media in large segments of society. (Eary, 1978, p. 31)

This certainly has a tremendous effect on the role of higher education especially if it is to keep up with the needs of this society. College graduates of traditional fields: liberal arts, communications, or even computer science are not educated enough in the broad sense of understanding the needs and having the skills for an interdisciplinary, interdependent information society.

This section of the literature review looks at how some of these traditional boundaries and distinctions among academic disciplines are broken down in terms of the four career options of the proposed curriculum.

## Instructional Support Option

As mentioned the traditional role of education will change as computing and telecommunications technology move into education, the office and the home. This will cause increased demand for those educated in the Instructional Support Option. Instructional designers capable of developing and implementing the new technologies and determining the appropriateness of courseware will be needed in government, in education and in industry.

The rise in the use of educational technologies is evident and will continue.

> Building upon the premise that staff costs can be reduced through increased mechanization, more and more training and educational instructions will become semi-automated using a variety of programs on an even greater variety of machines with the capacity for switching and visual display. The first widespread adoption of computer assisted instruction is now occurring in business and industrial settings where computer courseware developers are in greater demand than classroom training instructors. (Schuelke, 1982, p. 3)

Industry will continue to push the new technologies into the home, industry and education. The 1980s are years of "radical change" for education and people are needed who are educated in "the salient features of this change" and who understand and can apply for educational purposes machines capable of "(1) computerized programming, (2) automated switching, (3) electronic video display" (Schuelke, 1982, p. 3).

The implementation of these new educational technologies (video disc, video text, microprocessors, etc.) accompanied with the increased need for life-long training and retraining caused by technologically displaced workers will change the role of higher education.

> Institutions of higher education will be called upon to provide greater opportunity for life-long learning and for retraining to meet the needs of new technological developments. Increased public awareness of, and ability to use, computers will compel schools to incorporate the new technologies in their services. . . . (Gillespie, 1982, p. 29)

Luskin (1980) of Coastline Community College suggested that the technology is ready and the time is ripe to integrate the new telecommunications technologies into our educational system. He specifically referred to the readiness of " . . . broadcast television, cable, instructional televison (fixed service, ITFS, and point to point microwave) video disc and cassette, data/computer networks, satellite radio and the various subgroups under each of these technologies" (Luskin, 1980, p. 43).

In examining the future of educational technology in the next 10 years Dede (1980) emphasized the educator's need to prepare for the future now because the economic crunch for education will continue in the 1980s. Education is no longer going to get an increasing share of the pie because it is "labor-intensive" rather than "capital intensive." He stressed the importance of implementing the new educational technologies now. He referred to the five areas of electronic educational technology as home TV, CAI electronic calculators, home terminal video discs, personal computers and "electronic communication and information processing (electronic mail, computer conferencing, computerized search and information processing)" (p. 21). These technologies will "ease professional busy work, thereby increasing efficiency and effectiveness and reducing boredom" (p. 21). He emphasizes that skills in using and applying these machines must be developed by educators and transmitted to students. ". . . Massive changes need to occur in both inservice and preservice teacher training; educators must be prepared to program these new technologies" (p. 21).

According to Dede (1980), the impact of implementing these new educational technologies will not be to reduce the number of educational jobs available as many fear, but on the contrary to increase the number of jobs for those educated in the topics of instructional support. Many more jobs in training and education will shift from the school to industry and expand in instructional jobs in communications and media. He also felt that one of the benefits of implementing educational technology would be to reduce the "inequality of education" because instruction will become more standardized and curriculum developed for televison and video disc would be of higher quality.

The need for persons educated in communications and the use of these educational technologies is apparent. Computer Assisted Instruction (CAI) will also take on an increasingly important role in the 1980s and beyond. It will not only be used increasingly in education, but also in industry specifically for the training and retraining that is required to keep up with advances in technology. Frey (1983) not only stressed the importance of college graduates coming into industry computer literate but stressed the importance of training and retraining to keep up with technological changes. Dede (1980) also noted that while "education" may continue to take place by people interaction, more and more training will be taken over by machines.

Interestingly, Dede (1980) also thought that not only education's role and people needs will change but our very definitions of intelligence will change. As we rely on information storage and retrieval devices, memory as an aspect of intelligence will become less and less important. What will become more important will be our ability "to work with others using machines as intermediates (CAI, computer conferencing, etc.), new types of communication skills will be necessary" (p. 22).

Dede (1980) stated that educators need to begin now to devise "anticipatory social inventions to regulate the use of instructional technologies . . . To accomplish this we need to reconceptualize the training we give to teachers and administrators and promote alliances between media associations and computer associations" (p. 22). He concluded that we are in an era similar to that of the invention of the printing press: "We can be similar to monks copying manuscripts by hand while the printing press makes us obsolete, or we can be in the forefront by simultaneously developing instructional technology and retaining traditional educational approaches where appropriate" (Dede, 1980, p. 22).

Norris (cited in Cunningham, 1977), has been one of the leaders in promoting computer assisted instruction and the implementation of the latest technologies into the educational arena. In 1977, Norris delivered a keynote address to The Society for Applied Learning Technology. He predicted the integration of technology into education and the role of video tapes, discs, computering, computer conferencing, cable TV, and satellite transmission. For the future he foresees a national and international network of learning centers. "The system is computer controlled and the main method of delivery is CAI with integrated terminal subsystems which include videodiscs, audio input and output, and touch input" (p. 451). The keys to the system will, of course, be computer assisted and managed instruction and their ever increasing use for employee training, special education, vocational training and in primary, secondary, and college education here, and in developing countries through international learning networks. Instructional technologists will be needed to develop and maintain these centers. There will be increased jobs in both industry and education. People will be needed to "train other teachers and administrators to use the educational products" (Cunningham, 1977, p. 453).

The proposed Instructional Support Systems curriculum will prepare graduates for careers in business, industry and government in developing and operating computer assisted instruction and computer managed instruction systems. Course work includes courses in instructional design fundamentals, instructional systems evaluation, design of instructional systems, specialized information resource systems, and media services and centers. There will also be classes in beginning and advanced computer assisted instruction and interactive computer graphics.

## Information Storage and Retrieval Option

In The Third Wave Toffler (1980) stated that " . . . information has become perhaps the world's fastest growing and most important business" (p. 171). Computer and communications technology has and will continue to revolutionize the way we store and transmit information. There is more information than there has ever been before and it continues to increase at an almost incomprehensible rate:

> It has been estimated that it took 32 years (between 1907 and 1938) for Chemical Abstracts to reach its first 2 million scientific papers, in 18 additional years the second million was reached, the third million in eight years. The fourth million took 3 3/4 years and fairly soon the journal will be abstracting scientific papers at the rate of a million a year. (Johnson, 1982, p. 16)

This increase in the amount of information available in this age of information necessitates the need for information specialists . . . those knowledgeable about methods of storing, selecting and retrieving information for others. Today there are problems for anyone attempting to keep up with the increasing amount of information in their field. In Goodbye Gutenberg, Smith (cited by Johnson, 1982) emphasized the problem:

> In the world as a whole there are now more than 50,000 journals pouring through university and academic presses every year. They are increasing in size at a compound rate of four percent a year. It is common for journals to double their size every five years . . . If a scientists spends a given portion of his time catching up with his field and continues

> dedicating the same proportion for twenty years, he will clearly acquire knowledge over a rapidly decreasing proportion of the necessary and relevant material. If he increases the proportion of this time dedicated to scanning the outpouring of the field he will have no time for anything else. There are clearer and painful mathematical constraints that must begin to operate. (p. 20)

As with education and industry, the capabilities of computers and communications technology are breaking down traditional distinctions between industries and those traditionally responsible for the management of information. In an information age everybody is in the information business. As old distinctions break down new types of skills and education are needed. Johnson (1982) stated that:

> The transition from an industrial to an information based economy in fifty years time has dramatically altered our communities by creating yet another round of jobs . . . the technology of computers and telecommunications presents us with new economic and social orders in which there would be a more evenly distributed settlement pattern . . . There are new jobs directly related to the development and management of information and communication systems but in addition there are new possible jobs, work patterns and working relations between individuals and groups. For example skilled weavers of information who can work in the electronic networks of computer and telecommunications systems as guides in the wilderness, who can match information resources with individual and community needs will be very necesary if we are to cope with information overload. (p. 21)

These "weavers" of information would need coursework as proposed in the Information Storage and Retrieval Option. The traditional roles of libraries as storers of information and the media as transmitters of information is changing. Distinctions and boundaries between and within industries are breaking down. With the dissolution of traditional distinctions information specialists are needed who are knowledgeable about both information storage and its transmission.

Johnson (1982) believed that getting information to the public today is a hit and miss procedure. Today

> Only about 10 percent of the total information collected every day in a typical newspaper is actually used in the paper. The newspaper reader then only reads 10 percent of what is in the paper. This means that only one percent of the information generated is being effectively utilized and that other forms of distribution of information might . . . help raise profit margins (p. 16).

There is a need for information specialists with a background in media and telecommunications and who are knowledgeable about "the new developments in information and communication technology that allow us to produce and organize information and distribute it through more well-aimed channels of communication" (Johnson, 1982, p. 4). The new computer and telecommunication technology has the potential to not only transform the way information is stored and communicated, but it has the potential to transform the very content of that media. Johnson (1982) sees the information age as the beginning of a new era one:

> . . . the stage is set for a move from mass-media to special media, cable television, interactive information services via broadcast television and cable, microcomputers and computer-mediated telecommunication links are providing us with the opportunity to increase the number and kinds of information and communication channels, changing from the low-content broadcast medium as the primary force to higher-content, specialized channels of communication. (p. 4)

Computer and telecommunications technology is not only transforming the nature and content of the media but it is also breaking down traditional boundaries between forms of communications. Johnson (1982) foresees that future communication including voice communication will be "digital." When that happens "Our primary forms of communications, the telephone and mail service, can be regarded as one industry" (p. 14).

Johnson (1982) further stated that the traditional method of storing information—the library, is both archaic and expensive and only about 20 percent of the adult population use it for their information needs.

In "Everything You Always Wanted to Know May Soon Be On Line," Kiechel (1980), echoed Johnson's sentiments. "We have the computer to thank for the revolution in the way information is collected and stored. An entirely new industry is growing up around data bases that are providing a radical improvement in the ease of selecting and retrieving information" (p. 226). The merging of appropriate uses of information and communications technology requires a merging of the skills of what was traditional library or information science education with education in communications, mass media and capabilities of telecommunications technology. For example, Johnson (1982) believed:

> The whole future prospect for newspaper storage and retrieval will depend upon constantly increasing expertise in the field of librarianship. Journalists will have to acquire more and more of these skills while librarians will need to understand more precisely the daily needs of reports if they are to file and index their material effectively. (p. 16)

A modern example of a newspaper transcending traditional distinctions between storage and dissemination of information by the incorporation of the latest communications technology is the Nibon Keizaishimbun in Japan which offers the world its Total Economic Information System which stores and organizes the information and news produced by 1000 correspondents around the world. The entire contents are stored in a computerized data base and fed into four newspapers, seven magazines and 300 other publications, as well as telephone and computerized information services and radio and television news (Johnson, 1982, p. 16).

Johnson (1982) also suggested that the merging of communications sytems with information and retrieval systems may even change the nature of data bases from being "countless records" to providing conference space where functions carried out by public information officers could be relayed by "computer-mediated communications systems like the Electronic Information Exchange System" (p. 20) which could be opened up for conferencing.

Information specialists are needed to help solve some of the problems created by the expansion of these new technologies. Some concerns will be common data element definition, centralization and decentralization of data and problems related to the responsibilities of system design and long range planning for implementation of these systems. Information specialists need to be trained in not only the establishment and management of data bases, but also in the latest thesauruses, key-word indexing and search protocols (Scheulke, 1982).

Data bases are fast becoming one of the newest and most pervasive of the information industries. As Kiechel (1980) stated "A slew of corporations, big and small, are scrambling into the business of delivering information at the push of a button" (p. 227). The increase in the number and type of data bases and information storage and retrieval systems is increasing the need for information storage and retrieval specialists, or people who know where the information is, and how to get it . . . rapidly! In discussing the evolution of the many new suppliers of information, Kiechel (1980) outlined their stages of evolution where these companies first see themselves as a printer, then as a publisher and finally "the company comes to see itself as an information supplier, willing to employ all sorts of media to get the data out the door" (p. 220).

Ho (cited in Taylor, 1981), who heads the computer technology department at Purdue, said "There's a whole new breed of specialist whose primary responsibility is communication and its use in support of computers . . . The data base manager is one of the newest occupations with the largest number of openings . . . Managers are responsible for keeping huge banks of information 'up to date' and immediately available" (p. 70).

Not only data base managers but information specialists are needed at all levels in industry, government and education.

> Multi-national corporations, a 980 billion dollar part of the global economy, are supported by a vast network of commercial transactions made possible by sophisticated computer and comunications technology. They are dependent upon transitional data flows, information moving across national frontiers through computer communications networks . . . The electronic global village is with us today, and the leaders seem to be as much the multi-national corporations as the national governments. (Johnson, 1982, p. 5)

The proposed Information Storage and Retrieval career option requires students to complete courses in specialized information resource systems, specialized media services and centers, automated indexing and abstracting systems and services, archives and manuscript management, behavior of information users, information sharing and transfer, governments and information and interactive computer graphics.

## Compunications Systems Option

Compunications is a term coined by Oettinger of the Aiken Computation Laboratory at Harvard to describe the marriage of telecommunications to the computer industry. Much of the literature reviewed for the Information Storage and Retrieval career option also supports the need for this career field. In that review the change that took computers from 'number crunchers' to information processors, and the merging of computer and telecommunications technology that is transforming and replacing traditional forms of industry, communications, education, media and even government was analyzed.

The unification of computer and telecommunications technology which is breaking down distinctions between those who store and those who disseminate information is also creating a need for telecommunications specialists capable of implementing the various levels of computers and communications technologies according to the needs of the wide spectrum of existing and potential users. Graduates of this emphasis can expect to find employment throughout the communications industry as computer applications continue to proliferate in newsrooms, publishing, broadcasting and the burgeoning cable and satellite systems.

The proposed compunications systems curriculum includes training in audio and television production, computer graphics, computer applications in telecommunications and a strong foundation in electrical and electronics technology, communications systems and components, microwave technology and national and international information policies.

Telecommunications technology advances and the application of the computer to information processing systems will have increasing effects on the way information is stored, retrieved and communicated.

In this era of dwindling natural resources and increasingly sophisticated technology compunication is one of the key factors in the information age. It will continue to expand, replace, or intensify other uses of media. Over the last 50 years telecommunications is decreasing in cost while its conventional competitors (newspapers, magazines, books, postal services and travel) are increasing in cost.

> . . . human activities involve the application of energy to achieve the movement and organization of both materials and information. Looking to the future, the movement and organization of material face resource and environmental constraints: constraints on the extraction of materials arising from the increasing costs and enviromental damage . . . constraints on the movement of material arising from energy costs, environmental damage and physical risks associated with moving larger quantities materials at higher speeds; constraints on the organization and processing of materials arising from the physical limitations of materials themselves and the difficulty of disposing waste . . . This is to suggest that the information related activities which do not face these constraints are likely to play an increasingly dominant role as the agents of change in society. (Reid, 1978, p. 177)

Given the increasing significance of the impact of compunications, Reid stressed that it is the responsibility of higher education to teach the ethics and possible social effects—benefits and dangers of implementing these technologies.

> The individual must develop an awareness of what telecommunicatons can do for him now and in the future . . . He should value the old media for their distinctive characteristics, and he should see the bland and standardized electronic image as the gateway to the richer sensation of direct experience. (Reid, 1978, p. 182)

Today there is much confusion about implementing the new technologies and people are needed who are trained in compunications and can solve the problems of constructing communications networks:

> Many technologies exist which can be adapted: coaxial cable, locally installed telephone wires, the telephone system fiberoptics, microwave system and additional to existing radio and television networks. Unfortunately, few of these technologies are directly compatible with existing computing equipment and few are compatible with each other. The result is a cloud of confusion complicated by rapid change and conflicting vendor claims. The totality and the magnitude of the problem are frequently misunderstood. (Staman, 1981, p. 8)

Besides the lack of people to know where and how to apply the latest in compunications technology there is also a lack of people able to manage these resources once they are in place.

> One of the biggest problems with some current applications of information and communications technology is lack of the critical mass of people to make systems really work where the technology is basically in place. (Johnson, 1982, p. 19)

## Organizational Information Systems Option

A search of the literature was also made for the career needs for the Organizational Information Systems emphasis of the proposed Information Studies Program. This option merges the field of data processing management with communications.

Data processing in business is one of the oldest applications of computers. The computer's ability to handle vast amounts of repetitive numerical operations made it extremely valuable to all manner of accounting, billing, payroll, stock control, and other operations. Applications have proliferated in data base management and information processing for managers and decision makers. However, as noted previously, information is proliferating beyond our ability to keep up with it. This fact, combined with the ability of the computer to produce information at mind-boggling speeds may actually create information overload and interfere with the decision making process. In addition to the need for skills in the most efficient methods of information storage and retrieval, there is an increasing need for those who can function as communication specialists with knowledge of data base management. Industry now needs managers with an ever increasing sophistication not only in computer systems, communications networking and data bases, but they also need people who understand the organizational impact of implementing these new technologies into the workplace.

The proposed Organizational Information Systems career option offers courses in accounting and management information systems analysis, decision support systems, interactive computer graphics as well as classes in interpersonal and organizational communications, office information systems and the behavior of information users.

The need for these skills is well documented in the literature. Johnson (1982) stated that in the management of small organizations there's need for people to "use the potentials of a computer placed in a communication environment in which the computer is just a small part of shared computing power" (p. 19). It therefore becomes critical to reach more people with distributed networking but few know how to implement the technology. "With new information and communication technology we are able to find ways to reach more and more people; but in fact, some of our uses of the technology are crude stabs in the dark" (p. 19).

In an article which examines trends in computing and office automation, Staman (1981) stated that there are "changes in our understanding about how technologically based information-processing services will be provided and who will provide them" (p. 3). Factors contributing to these changes are office automation, the lack of available trained personnel, and technological change. Information processing is changing and the typical administrator is requiring more "increasingly complex computing support and service frequently involving microcomputing, graphics, data-based language and query languages . . . The trend is toward different kinds of people who will provide information processing services in different ways and in different locations than in the past" (Staman, 1981, p. 3). As technology moves into the mainstream of industrial life previous descriptors and previous level of trained personnel are no longer appropriate. Executives are not even aware of "requirements for executive understanding and action" (p. 3). There is a critical lack of trained personnel who can help managers make decisions about becoming involved in computing.

As computing and information processing expands into non-traditional fields this shortage problem will become worse.

> First we increasingly see computing as a tool for the professional administrator and researcher, but computing is becoming a tool for many professions. Not only is the number of computing applications within traditional fields expanding, the number of fields which use computing as a basic tool is expanding. (Staman, 1981, p. 6)

There is an increasing need for personnel educated in organizational theory with a background in types of systems (distributed vs. central). There is a need for people educated in organizational communications who have the ability to break an organization into "logical applications groups and consider the systems development, systems operation and systems management functions for each" . . . group (Staman, 1981, p. 7). There is a need for those able to aid management in the selection of computing services as well as in the development of realistic goals, objectives and priorities for computing.

This article also emphasizes the importance of interactive computer graphics in this field.

> In recent years graphics has received almost explosive attention, the adjectives describing it covering a range of activities and causing some confusion about the use of the technology. Color graphics is now common as is interactive graphics . . . Batch graphics is also still in substantial use . . . Applications of graphics include computer-aided design and manufacturing in engineering, architecture, data analysis, graphic arts, publishing language instruction (with special characters such as Chinese and Russian) music composition, interior design and real time monitors. (Staman, 1981, p. 7)

The effect of the computer and information systems on organization communications is mentioned by Scheulke (1982):

> In the area of organizational communication and informational inquiry and utilization the computer itself becomes a medium for both inquiry and exchange. In this case the intrinsic element of organizational communication, for example, is modified and adapted by the computer itself. (p. 7)

There is also a need for knowledge of computer networking and conferencing techniques. The "evaluation of the effectiveness of organization via computer networks is a problem of cost-effective application" (Scheulke, 1982, p. 7).

As Porat (1976) points out in the "The Information Economy," information is the foundation of all organizations and how it is stored and used affects the organization, the very structure of all institutions. In the Information Age traditional distinctions continue to blur:

> A banker, a newspaper publisher and the Postmaster General do not fancy themselves in the same business yet, they are all information brokers specializing in the retail packaging and distribution of (unlike) information services. Function and forms are converging, driven by a convergence of technologies. (Gillespie, 1982, p. 5)

The blurring of traditional distinctions spurred by the applications of computers and communications present new opportunities to improve productivity and efficiency but there needs to be planning, joint cooperation between education and industry and there needs to be those educated to aid in the evaluation of the organizational impact on all of our institutions.

> These services are all concerned with the transformation and distribution of information. Organization focuses will shift more toward the fundamental task of moving information through networks. Joint planning will be needed to avoid unnecessary duplication and uncoordinated standards. Information technologies are a catalyst for organizational change because they alter the framework for producing and transmitting knowledge . . . . (Gillespie, 1982, p. 27)

In a recent book on Managing the Flow of Technology, Allen (1977) of MIT stressed the importance and interrelations of organizational management, information services and communication theory. He emphasized both how the organization of an institution influences communication as well as how the communication and information flow of an institution influences its organization.

Today's institution perhaps more than ever before needs persons educated with what may be considered an interdisciplinary approach. They need not only a background in computer science and communications, but they need specific management and business skills and training in the possible organization impacts of implementing the latest information and communications technologies into the workplace.

DeLong (1983) interviewed prominent high technology business leaders and concluded that the role of representatives and managers is changing with the proliferation of small business systems and word processing systems. Industry does not have qualified people to choose from who are educated in business, computer science, and interpersonal and organizational communications skills.

Potter, manager of sales training and customer education for Xerox, stressed the need for more emphasis on both business and communication skills. Xerox sales training is now focusing more on presentation skills, needs analysis and the ability to read and interpret financial statements and annual reports. . . . The trend toward developing consulting and business analysis skills has led to a reassessment in training priorities (DeLong, 1983, p. 9).

And on the importance of the organizational impact of implementing these new technologies Mead (cited in DeLong, 1983), Director of Corporate Education at Wang, stated that "probably the biggest thing that will hold our business back for the time being is our ability to deal with issues such as the organizational impact of installing a large office automation system" (p. 9).

The need for the skills provided by the proposed Organizational Information System career option is summed up very well by Potter of Xerox: "This is a new turn for almost everyone. Where do you hire someone who has experience in networking. They don't exist. We have to train our own people" (DeLong, 1983, p. 9).

## Other Curricular Approaches

The question of which discipline is most appropriate to accommodate the new curricular requirements of the information society is relatively new and there are actually more questions than answers. In a 1973 report on Curriculum Recommendations for Undergraduate Programs, Couger (1973) stated that because the field of information systems (computers and communications) is so new and because such a program interacts so closely with other disciplines "it is not possible to give a generally applicable recommendation about the organizational location of the information systems program" rather, it depends upon "the particular academic structure and interests of faculty" (p. 737).

This situation is really not so different today. The efforts of higher education to meet the changing educational requirements in an information age are diverse. One of the most notable efforts is the Data Processing Management Association (DPMA) Model Curriculum for Undergraduate Computer Information Systems Educations. Some schools have created new departments, other innovations are primarily modifications of existing computer science, library science or management and business information systems curricula. However, after reviewing these approaches it seems the expansion of the programs within specialized fields which traditionally have served an industry with specialized clients is no longer appropriate.

The Couger report identified the types of people and educational requirements that were not being met by existing Computer Science curricula. It stressed the need for education related to information (and communication) systems in organizations and suggested that curricula was needed under two subspecialities: organizational and technological. The main emphasis in information analysis is the determination of information needs and patterns of information flow which satisfy these needs. This requires interaction with organizational personnel and a good understanding of how the organization functions (Couger, 1973, p. 728). What is being described is the need for personnel who understand organizational needs and communication requirements. The person who is educated in the technological aspects of system design or computer languages (graduates of Computer Science programs or the person educated with traditional business curricula) is no longer qualified. What appeared to be needed is someone with the business and computer science background, but with additional understanding of communication requirements within an organization.

The report outlined two needed levels of computer education. The minimal level is for the person who merely uses the results of computer processing. "For example an introduction to information systems might be sufficient for a manager who is communicating with the computer via a terminal" (Couger, 1973, p. 729). But at the other end of the spectrum is the need of a person trained for a career as an information system specialist. After summarizing the growth of the information systems field and stressing the need of personnel educated in information systems he stated:

> A university degree may not have been necessary for a position in information systems in the past but informal surveys show that a college degree is an implicit if not explicit requirement for information systems positions in medium to large size companies . . . (Couger, 1973, p. 729)

Couger also suggested that many more graduates will be needed with BA's than with MA's. He stated that although traditional business courses cover the area of knowledge needed for the minimal level of user other approaches are needed for the second level of user.

In answering the question of what school to place the organizational and technological concentrations within, Couger (1973) suggested the possibility of placing the organizational concentration within the school of business and the technological concentration in engineering. But he added that there are really more questions than answers about where to house the needed curricula and stated that it might be argued "that a more desirable solution would be to make the combined program with both concentration options available in a school of arts and science or equivalent, thus removing the more narrow emphasis in business or engineering" (p. 730). However, it was pointed out the aim of information systems is practical and not intellectual and this is an important consideration in deciding the compatibility of this curricula within a department of arts and science. Although the School of Communications imparts theoretical and intellectual knowledge it is perhaps fundamentally the most practical of schools for an Information Society. As one final consideration as to where these options should be housed the report stated that "Foremost, wherever the program is housed, its courses should be easily available to majors in other programs" (p. 738).

In continuing with the analysis of the evolution of Computer Science curricula from ACM '68 to current efforts of DPMA, it is increasingly apparent that Computer Science curricula has been too limited and too technical to meet the needs of our society for computer literate graduates. And finally and more appropriately what is needed is information and communication literate college graduates.

As recently as 1977, "A Survey of Computer Science Offerings in Small Liberal Arts Colleges" revealed that over half of the colleges surveyed had either no computer science programs or only offered programming courses. Although the best known proposal for Computer Science curricula was ACM '68 only 12 percent of small liberal arts colleges surveyed had implemented it (Lopez & Tardiff, 1977). It is interesting to note the technicality and lack of general applicability of the courses required of ACM '68:

> For an institution to be classified into ACM '68, it was required to offer each of the following courses: Introduction to Computing, Computers and Programming; Introduction to Discrete Structures; Numerical Calculus; Data Structures; Programming Languages; Computer Organization; System Programming; and at least two of the following courses: Compiler Construction; Switching Theory; Sequential Machines and Numerical Analysis I and II. (Lopez & Tardiff, 1977, p. 903)

In 1973, ACM Small was published by a subcommittee of the Committee on Curriculum in Computer Science. The ACM course recommendation included expanded work with a little more emphasis on user applicability.

Computer Science curricula is too narrow to encompass the broader communications applications needed in an Information Age. In further Communications of the ACM, it is stressed that computer science has to adapt to the changing trends in employment if it is going to remain effective. One area that is rapidly growing is the area of information systems management. McCracken (1977) identified the features of a computer science education that is most attractive to employers as:

> The person who knows computers and accounting, or computers and hospital administration, or computers and whatever, will usually have a decided advantage over the narrowly trained person. The combination of a Bachelor's in Computer Science and a Master's in some application area, or vice versa is especially attractive. Second, the graduate needs to have some area of specialization, some area in which he or she comes to grips with an intellectual discipline . . . Third, college experience in working with teams is highly desirable. Most work in business involves team operations. Fourth, it is agreed that almost all technical graduates are deficient in communication skills and that most know little about how to motivate others. (p. 684)

The most recent effort to propose computer and other disciplines' needed curricula for an Information Age is the DPMA Model Curriculum for Undergraduate Computer Information Systems Education. It was prepared in 1981 by the DPMA Education Foundation Committee on Curriculum Development.

> The model curriculum presented in this report is the result of combined efforts of computer educators, professional computer specialists, and data processing and information systems managers to identify the need for commercial programmer/analysts, to define the education and training requirements for servicing those needs and to specify those requirements as a formal set of undergraduate coursework. (Adams & Athey, 1981, p. 1)

The guidelines proposed for the curricula were for four year programs either in schools of business or in applied computer science courses that require business courses in support of the technical computer science courses.

The curriculum established evolved from two national conferences, two national questionnaires surveys, six regional conferences and several consultations with computer, business, and education experts (Adams & Athey, 1981, p. 1).

The DPMA proposal actually began with a conference of industry and education representatives on computer information systems held at Polytechnic University in Pomona in February, 1979. They divided computer disciplines conceptually into those that develop technology (Computer Science) and those who educate the users of the technology—computer information systems (Adams & Athey, 1981, p. 6).

The goal of Computer Information Systems (CIS) is more for the targeted career of business applications programmer/analyst. CIS programs can lead to positions in systems analysis, systems design, programming, project leadership, and management.

Competency requirements for those who intend careers in management and computer information systems transcend both traditional business and computer science boundaries and require skills included in the communication discipline and included in the proposed information studies program. These include interpersonal skills in working with users of information systems in developing computer solutions to business problems, being able to communicate ideas and project results orally and in written form, being able to work on a team and manage people, being acquainted with technical and human aspects of change and understanding business functions and operations and the role of computer information systems in these functions (Adams & Athey, 1981, p. 9).

As the computer has transcended its role as a calculator and moved into the role of an information processor and even communicator, so too have the educational requirements of the information age transcended the traditional computer science field. Another likely placement for an Information Studies program seems to be within traditional schools of library or information science. This may indeed be approriate for the Information Storage and Retrieval Systems career option, but the other options are too broad for the traditional field of Library Science to accommodate.

In conducting research on trends in library science, Fosdick (1978) took a survey of graduate library school course offerings to gauge present attitudes in library education toward the broader emerging field of information science. He asked questions concerning the place of information science in terms of the overall curriculum and possible new developments and tendencies. The findings reflected the need for systems analysis courses and library automation or "courses concerned with the use of modern technology, particularly computer, to facilitate library operations and technical services" (Fosdick, 1978, p. 103).

In an article "Requirement for Middle Managerial Positions," Bailey (1978) discussed the problem of library schools not adequately preparing persons for positions as administrators and middle managers. The graduates of library schools interviewed suggested that schools of information science contain more "business" topics such as general management, psychology, human relations and communication and even building space and design. The latter is of itself a very important element in recent theories of organizational communications. The conclusions were that " . . . middle managers and administrators concurred in the opinion that schools of library and information science were doing a poor job of teaching administration and management. Most middle managers suggested changing the curricula . . . " (p. 330).

Another area lacking in traditional schools of library and information science is the developing area of international information and communication policy. Miller (1978), of the United Nations, noted the important need for scholars to develop an international information system.

In a Delphi Study on the "Future of Library Education," 100 library and information scientists were asked to identify experts and leaders in the library and information science profession. They were optimistic not only that goals and objectives would be identified, but also that goals for information science would expand to include "education for a variety of positions (not necessarily institution bound) where acquisition, organization and transfer of information is needed" (Vance, 1975, p. 5).

Consistent with this was the desire that library science, information science and educational media programs might be integrated and that equal emphasis should be given to all forms of recording and transmitting knowledge (Vance, 1975). It is important to note the emphasis of these experts on the importance of the transmission (or communication) of this knowledge. Also interesting to note is that while 86 percent of the experts interviewed thought these programs should be integrated, only 56 percent thought it was probable that they would be. The lack of existing integrated programs perhaps serves as potential evidence as to the accurateness of the Delphi method. These experts further thought that the content of the objectives of information studies programs needed to emphasize theoretical and philosophical issues as well as cultural, social and educational trends:

> Participants supported the idea of curriculum emphasis on such topics as theories of communications skills and expertise needed to work within governmental bureaucracies, libraries and the political process, and understanding of the power of information transfer and the librarians intellectual freedom responsibilities. (Vance, 1975, p. 6)

Further support was indicated on the importance of communication and its related technologies. At least 70 percent of the experts indicated hope and optimism about curricular emphasis on potential uses of communication technology, and on training both basic and advanced, in the application of computer technology.

Research by Drexel (cited in Oller, 1978) in determining what should be a fundamental core course for information scientists suggested the need for an interdisciplinary approach to information studies and stated that indeed information studies "has its roots in many disciplines, such as psychology, communications, sociology, management and technology" (p. 167).

Another study on Curriculum Development and the Nominal Group Technique stressed not only the need for information scientists to be skilled communicators, but that the principal core of an information science curriculum should include the concept of the library as a communication agency.

## Summary

There is ample evidence in the literature to support the need of an information studies curriculum for higher education. Authors from a variety of academic disciplines, business and research institutes provide a rich and varied background of information concerning the impact of the information age on society and the educational requirements for knowledge and skills generated.

The importance of computer literacy as an essential skill for the knowledge industry was emphasized by Johnson (1982), Molnar (1980), and Palko (1982) among others and provided validation support for the computer science major of the information studies curriculum.

The application of computing and telecommunications technology in education and training was discussed by Cunningham (1977), Dede (1980), and Luskin (1980) and generally supported the curricular needs of the Instructional Support career option.

The Information Storage and Retrieval Systems career option was supported by a number of sources including Kiechel (1980), Johnson (1982), and Taylor (1981). In general, the literature pointed out that the data bases and information storage and retrieval systems were increasing the need for specialists with knowledge and skills in locating and getting information quickly.

The trends in office automation, data processing and organizational communication networks were discussed by Allen (1977), DeLong (1983), Gillespie (1982), and Staman (1981). Their studies examined business needs for information systems and supported the curricular content of the Organizational Information Systems career option.

Other curricular approaches to meeting the needs of the information age were examined. Lopez and McCracken (1977) found the ACM '68 curriculum too narrow to encompass the broader communications applications needed in an information society. The more recent (1981) Model Curriculum for Undergraduate Computer Information Systems Education developed by DPMA offers two career options: Computer Science for those who develop technology and Computer Information Systems for those who educate users of the technology. An assessment by Adams and Athey (1981) indicated computer information systems required communication skills beyond traditional business and computer science disciplines. Bailey (1978), Fosdick (1978), and Vance (1975) examined library science curricula and concluded communication and computer technology essential components. And finally, Oller (1978) reported that research in determining the basic core requirements, found information studies derived from many disciplines including communications, management and technology.

In summary, the Informations Studies curriculum concept has substantial support in the literature.

# CHAPTER III

## PROCEDURE

> . . . what happens with me is, first, a logical instinct that the truth must lie in a certain region, and then an attempt to find its exact whereabouts in that region.
>
> Bertrand Russell, 1914

A survey was conducted to determine the validity of the Information Studies curriculum among industry and higher education. The survey was designed to measure the value of each course contained in the program as well as a summative evaluation of the degree program.

### The Instrument

A questionnaire to be administered by mail was designed as the data collection instrument (Appendix A). The curriculum was divided into several components so that validation could be accomplished on a course by course basis, by degree option, and as a degree program.

Headings were provided in the questionnaire for the common core requirements of the School of the Communications, the Computer Science minor, and each of the four degree options. This provided the respondent with a logical organizational framework for evaluating the course and placed each course in a context of related subjects. This was extremely important because in the pilot study the subjects complained they found it difficult to establish coherence from a simple listing of courses.

A five point evaluation scale was constructed to measure perceived course value. Respondents were asked to check each course as to whether it was A - Essential, B - Highly Desirable, C - Desirable, D - Of Little Value, or E - Unnecessary. Values were assigned from five to one with A as five and E as one. This provided a Likert type scale with a midpoint value of three which was designated the validation level. No forced ranking of the classes was attempted in the final version of the questionnaire. Required ranking of the classes in the pilot study was almost universally condemned as artificial and arbitrary and there were several refusals to do so.

The questionnaire was printed on five pages. The first four pages contained the 51 course listings with the evaluation scale. Respondents could complete this portion with a simple check mark in appropriate boxes after each course listing. Each course listing consisted of the course title and a one sentence description of the content.

The fifth page of the questionnaire contained open ended questions. It was printed on a single sheet and placed as an insert to the course listing "booklet." The back of the page was blank in order that respondents could expand their comments if desired. A demographic section at the bottom of the sheet allowed respondents to give their name, position, organizations and address. There was also a box that could be checked if they wanted the results of the survey sent to them. This portion of the questionnaire was scored so that respondents seeking anonymity could detach it and return it in a separate envelope from the completed questionnaire.

The open-ended questions were prepared in two versions--one for the academic community and the other for respondents in industry. Respondents in academia were asked the following questions:

1. What other subjects or courses do you feel are needed to improve this program?

2. Do you have a degree program similar to this at your university/college?

If yes, what is it called?

In what department or school is it located?

What are the major differences?

3. How do you feel this curriculum compares with the instructional program(s) at your university/college in the information field (computer science, MIS, Instructional Technology, Information Science, Library Science, others)?

___ Better ___ About the same ___Poorer ___ No programs in the information field

Respondents in industry were asked these questions:

1. What other subjects or courses would you feel are needed to improve this program?

2. Would you hire a person with this degree? Comment.

3. What job position or title would a person with this academic training be able to fill in your company/agency?

4. Approximate starting salary range?

## Pilot Study

When the questionnaire had been prepared, a pilot study was conducted to determine its efficacy. Members of the California Educational

Computing Consortium (CECC) Board of Directors and faculty of the Instructional Technology Department at San Jose State University were mailed copies with a letter asking them to complete the questionnaire and comment on its construction or any difficulties they had in responding. As a result of this pilot study, the evaluation scale was revised from being under each course to the format in Appendix A where the response boxes are placed in the right margin and adjacent to each course listing. Several subjects from the pilot study indicated this would make the questionnaire much easier for respondents. As mentioned previously, the forced ranking of classes was questioned by most of the pilot study respondents as being artificial and arbitrary. This requirement was dropped from the final version of the instrument used in the study. Otherwise, the responses were positive and encouraging for the questionnaire construction.

## Population

Two distinct populations were used, one for higher education and one for business. The population in the business sample consisted of members of the Data Processing Management Association (DPMA). A membership list of the DPMA was obtained from the president. Members were designated as business.

DPMA is an organization comprised of all levels of management personnel who have an interest in the field of information processing. It is dedicated to the advancement of the profession in all areas of business, industry, science, education and government. It seeks to encourage high standards of competence and to promote a professional attitude among its members. It was originally founded in 1951 as the National Machine Accountants Association. With the advances in information processing techniques brought about by the introduction of the computer, the nature of the association changed, and the present name was adopted in 1962.

The population in the second sample consisted of academicians. A national listing was obtained of all computer science and information systems university and college chairpersons which was used as the population for the higher education sample.

## Sample

Once the populations had been identified, a purposive sample was selected. From the 4,000 names of industry members of DPMA, a sample of 200 were chosen. The population was numbered and the list was entered randomly by use of a random number table. From this entry point an interval was established by dividing the total number of names designated as industry members by the sample size (4000 ÷ 200). However, this random selection was modified by the following procedure: Only one name was permitted for each company and from each zip code of address. As the interval was counted off, the new name was checked against all previous selections. If it was found to duplicate a company or a zip code of a previously selected subject, the selection continued down the list to the next entry that had a unique company name and zip code. However, the interval count for the next subject began from the last interval designation and not from the last subject selected. This insured the random selection procedure did not overlap the population list.

The purpose of excluding sample selections from the same company and zip code was to permit as wide a representation of companies as possible. The assumption was that subjects from the same company would be reflecting a common need within the organization and thereby reducing the range of responses. Since the sample size was small, it was considered important to obtain responses from as large a variety of business representatives as possible. Rationale for eliminating zip code redundancy was to allow as great a geographic dispersion of subjects as the sample size would permit.

A similar procedure of random identification and purposive selection was employed for the higher education sample. Again, subjects were not allowed from the same educational institutions or zip code address. The interval for higher education was found by dividing the total population listing (897) by the established sample size (113).

A sample size of 200 was chosen for business and 133 from higher education. The size of the sample was limited by the cost. The disparate sizes of the samples was based on expected returns. Consultation with Athey (Adams & Athey, 1981) who had conducted a similar type curriculum study using DPMA members indicated a return rate of 35-40 percent could be expected from the DPMA sample. Consultation with Madrigal, chairman of the computer science department, indicated a return rate of 60-70 percent could be expected from the higher education sample. These return rates were expected to produce between 70 and 80 usable responses for each group.

A cover letter was prepared to explain the purpose of the survey and emphasize the importance of responding (see Appendix B). An addressed, stamped envelope was also included in an effort to improve the response rate.

## Analysis

This investigation was primarily a descriptive survey designed to measure a curriculum validity. Consequently, the first analysis required the computation of the frequency distributions of responses for each course listing in terms of whether it is essential, highly desirable, desirable, of little value, or unnecessary.

To provide more powerful analytic tools, the evaluation scale was assigned numerical values and subsequently treated as an interval scale for statistical manipulation. This permitted the computation of a mean standard deviation and z value for each course listing and the establishment of confidence intervals to test the sample means for significance. However, it must be cautioned that the evaluation scale is not a true interval scale and numerical values are arbitrary. In other words, a course rated "highly desirable" does not necessarily mean it is twice the value of a course rated "desirable" when both are compared to a course rated "of little value". The assignment of values is arbitrary but necessary in order that a quantification of the data can be accomplished. Consequently, since all statistical inferences assume scale values are linear, they must be analyzed with a healthy skepticism.

All responses to the questionnaires were coded as follows: essential 5, highly desirable 4, desirable 3, of little value 2, unnecessary 1.

To determine differences in business and higher education perceptions of the curriculum validity, an analysis was made with the population (business-higher education) as the independent variable and the course evaluation scores as the dependent variable.

By collapsing the scores and computing summative means and standard deviations for listings under each of the major headings of the questionnaire, an analysis of the findings was possible in terms of the communication core courses, the computer science minor, the information studies core and each of the four degree options.

A qualitative analysis was made of the information obtained from the open-ended portion of the questionnaire. The responses were examined collectively to determine if common issues were present and individually for suggestions and criticisms of merit.

## Data Sources

Eighty-six questionnaires were returned. This represented a response rate of 27.5 percent which was much lower than expected. From the business sample there were 51 questionnaires returned (25.5 percent rate) and from the higher education sample there were 32 questionnaires returned (28.0 percent). All of the returned questionnaires were usable, however, three failed to include the business/higher education open-ended questions and consequently could not be coded as to group. However, they were used in all other analyses.

There is little explanation for the low response rate. No follow-up mailing or telephone contact was made with the sample members who did not respond. Since respondents were permitted the option of returning the questionnaire anonymously, there was no way to determine precisely the subjects that did not respond. A followup would have required a complete remailing. It is speculated that the timing of the questionnaire (they were mailed in May and June, 1982) was a contributing factor to the low return rate. This is the close of the spring semester and a particularly busy time for faculty members grading term papers, final exams and making preparations for summer acitvities which often involve travel. It is also a time in business when many people are arranging or taking their annual vacations.

The raw data were coded and all statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS), (Nie, 1970). The program was run on a CDC 3170 servicing the California State University System. Descriptive data was provided by a frequency distribution of all course evaluation scores (51 variables). The comparison of academic and business responses was made using the analysis of variance with higher education/business variable fixed and course evaluation scores as dependent variables. Curriculum components were compared by collapsing the fields of Communications core (courses 1-5), Computer Science minor (courses 6-12) Information Studies core (courses 13-17) and each option. Compunications (courses 18-26), Organizational Information Systems (courses 27-35), Instructional Support Systems (courses 36-43), and Information Storage and Retrieval Systems (courses 44-51).

## Summary

A survey for validating an Information Studies curriculum was conducted using a questionnaire mailed to 313 subjects in business and higher education. The population consisted of all members of the Data Processing Management Association and the chairpersons of all Computer Science and Business Information Systems departments. These populations represented two groups: people responsible for the management and operation of information systems and therefore potential employers of graduates of the proposed curriculum and educators involved in the teaching and curriculum development of information systems. Samples were randomly selected from each population except that only one subject was permitted from any organization and particular zip code area. The evaluation instrument consisted of a five point evaluation scale for each of the 51 course listings and a series of open-ended questions for qualitative comments concerning the curriculum. Eighty-six responses were received and the data analyzed using frequency distributions and analysis of variance to determine the perceived value of each course, comparison of business evaluations with those from higher education, and summative evaluations of the major components and options within the degree program. In addition, qualitative analysis was performed using the open-ended responses.

# CHAPTER IV

# FINDINGS

> One of the easiest things in the world is to assemble a list of hilarious courses offered in the colleges and universities of the United States. Such courses reflect the total lack of coherent, rational purpose in these institutions.
>
> Robert Maynard Hutchins, 1961

## Demographics of Respondents

This study constituted a nationwide panel of judges to evaluate a curriculum designed for the information age. The value of the study therefore is largely determined by the credentials of the judges, in this case the respondents to the survey. Consequently, the first effort of analysis was to examine the demographic data furnished by each subject. The selection of the sample populations was designed to ensure the respondents were in a position to provide accurate value judgments in relation to skills and knowledge needed for graduates pursuing careers in the information field.

Of the 200 surveys sent to the membership of the Data Processing Management Association (DPMA), 51 were returned. This represents a response rate of 25.5 percent. The organizations represented by the respondents offer a wide cross section of American industry. A listing of the corporations and agencies is provided in Appendix C.

The companies also varied widely in their geographical locations. The greatest number were from the East (13) and the West (18). There were nine responses from the Midwest and six from the South.

The diversity of businesses and agencies makes any meaningful categorization difficult. Approximately three-fourths can be classified as service industries. They include banking, trade associations, telecommunications, media, and state and city governments, among others. Only eleven were principally companies that manufacture products. All represent major organizations providing goods and services as diverse as Pepsi Cola and the Archdiocese of New York. The list of participants emphasizes the growing need for information specialists in all aspects of our society and perhaps most importantly for the validation of this Information Studies curriculum, the array of job opportunities available to graduates.

Of the 113 surveys sent to the population of department chairs in computer science, business and management information programs, 32 were returned. This represents a return rate of 28.3 percent. The responses came from universities and colleges represented across the United States. Again, the greatest number came from the East (6) and the West (7). There were five from the Southeast, five from the Midwest and four from the Southwest. Five questionnaires did not designate the school. A listing of the educational institutions is included as Appendix C.

## Overall Program Validation

Since this was a curriculum validation study, the question most urgent to answer in the investigation was whether the degree program was perceived as valuable. Although there was ample evidence in the literature that the society is entering the information age and of the need for people to be trained in handling the increasing amount of information, the survey was to provide empirical evidence of this fact. It was particularly important to see if the need expressed in the literature was perceived by practitioners in the field and whether this program had validity in filling the need. The ultimate test, of course, is the marketplace and consequently the reponses from the business professionals were examined to answer this question.

Of the 86 questionnaires returned, 51 were from business, 32 were from higher education, and three were not identified. The questionnaire completed by the business professionals included the question, "Would you hire a person with this degree?" Forty-one respondents answered yes and one subject responded no. Ten subjects did not complete the question.

As an additional indication of the program's value, the industry respondents were asked to list the approximate starting salary they would pay a graduate. The results are shown in Table 1.

**Table 1**

**Approximate Salary Ranges For Program Graduates Based Upon Returns From Business Respondents**

| Salary Range | Frequency |
|---|---|
| Below 12,000 | 1 |
| 13,000 - 15,000 | 5 |
| 16,000 - 19,000 | 8 |
| 20,000 - 25,000 | 16 |
| 26,000 - 30,000 | 7 |
| 31,000 - 35,000 | 0 |
| 36,000 - 45,000 | 2 |
| Depend on individual | 2 |
| Typical Engineer level | 1 |
| No response | 9 |
| Total | 51 |

The median salary range of $20-25,000 is considered a favorable response in support of the program's validity. According to a national survey by Michigan State University the median starting salary that college graduates could expect in 1983 was $17,085.

The 32 respondents from higher education were also asked to provide an overall program evaluation. The queston was, "How do you feel this curriculum compares with the intructional program(s) at your university/ college in the information field? This was a comparative judgment that is obviously affected by the perceived quality of resident curricula. Only 25 of the 32 subjects provided an evaluation. Of these, eight felt the information studies curriculum presented was better than their programs. Four felt it was about the same, and five perceived it as worse. Of the remaining 15 responses, four indicated their university or college did not have a program in the information field, four felt they were unable or it was inappropriate to make a comparison and the remaining seven did not answer the question.

The results were not overwhelmingly in favor of the evaluated program as can be seen in Table 2.

**Table 2**

**Comparison of Evaluated Curriculum With Resident Program Based Upon Returns From Higher Education Respondents**

| Value Judgment | Frequency |
|---|---|
| Better | 8 |
| About the same | 4 |
| Poorer | 5 |
| No program to compare | 8 |
| No response | 7 |
| Total | 32 |

The results of the survey from business professionals support the validity of the information studies program with 80 percent indicating they would hire a graduate at a good starting salary. The responses from higher education were less supportive with less than 50 percent of the respondents who made a comparison indicating they felt the program was superior to their own. Thirty percent stated it was not as good. However the question used to indicate program value is not a clear cut indicator. Since the question asked for comparative value with existing curricula there is considerable ambiguity in using it to affirm the degree. Almost one half of the respondents were unable or unwilling to make a comparison.

A noncomparative evaluation of the curriculum was obtained by computing the mean evaluation scores for all the course listings. This was the heart of the study—to validate the content of the curriculum. Each questionnaire contained a listing of the 51 courses offered in the program. Respondents were asked to indicate their evaluation of each course in terms of whether they considered it essential, highly desirable, desirable, of little value, or unnecessary for students seeking careers in the information science field.

Each course was judged on its own merit without comparative evaluations or rankings being required. A frequency distribution was made of each course evaluation. In addition, values were assigned to the evaluation scale items so that a mean value and standard deviation for each course could be computed. An arbitrary linear scale was established with a value of five given to "essential," four to "highly desirable," and so forth until "unnecessary" which received a value of one.

For qualitative analysis purposes, "essential" and "highly desirable" were considered positive evaluation judgments. "Unnecessary" and "of little value" were considered negative evaluations and "desirable" was given a neutral connotation. Generally, the term "desirable" is thought of as a positive value statement, however, in this context where it appears as the center statement on a five item semantic scale it was considered to be the balance point in judgment. Furthermore, it seems in education that the bias in evaluating knowledge and skills tends to be on the high side, i.e., if there is doubt as to the utility of the educational experience the tendency is to consider it positive. This is reinforced in the results by noting that there were very few responses to any courses as being "unnecessary."

At any rate, it was felt that any bias introduced by weighing the term "desirable" as neutral would be on the safe side for this validation study, i.e., it would increase the internal validity of the evaluations.

The overall mean score for the course evaluations was 3.60 which is a positive rating as shown by Figure 3.

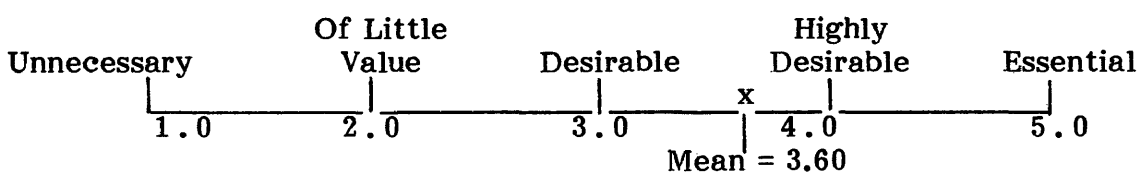


**Figure 3.** Overall Curriculum Evaluation Score

A simple z test was run to determine the confidence level that the sample mean reflected a population mean above the validation point of 3.00. The test was made for the overall program evaluation and for each of the major components of the curriculum. The results are presented in Table 3.

**Table 3**

**$\underline{z}$ Test for Confidence Level that Population Means Exceed Validation Point**

| Area | Validation Point | Evaluation MS | $\underline{z}$ Value |
|---|---|---|---|
| Overall Program | 3.00 | 3.60 | 9.09 |
| Communications Core | 3.00 | 3.36 | 4.62 |
| Computer Science Minor | 3.00 | 4.14 | 18.65 |
| Information Studies Core | 3.00 | 3.79 | 11.47 |
| Career Specialty Programs | | | |
| a) Compunications Systems | 3.00 | 3.18 | 2.64 |
| b) Organizational Information Systems | 3.00 | 3.92 | 12.36 |
| c) Instructional Support Systems | 3.00 | 3.61 | 7.92 |
| d) Information Storage and Retrieval Systems | 3.00 | 3.40 | 5.71 |

Significance level at .05 confidence level for two-tailed test $\geq$ $\underline{z}$ score of 1.96.

As can be seen, the validations were confirmed at the .05 level of significance for the Information Studies Program and for each component of the curriculum.

## Course Evaluations

Once the overall program validity was established, the individual course evaluations were examined. The results of the frequency distributions for each course are presented in Table 4.

**Table 4**

**Individual Course Evaluations**

| Title of Course | Essential | Highly Desirable | Desirable | Of Little Value | Unnecessary | M | z Value |
|---|---|---|---|---|---|---|---|
| COMMUNICATION CORE | | | | | | | |
| Principles of Information and Communication | 25 | 21 | 28 | 8 | 2 | 3.70 | 5.98 |
| History of Information and Communication | 1 | 6 | 33 | 35 | 9 | 2.46 | ** |
| Theory of Information and Communication | 21 | 27 | 27 | 8 | 1 | 3.70 | 6.48 |
| Research in Information and Communication | 16 | 21 | 30 | 14 | 2 | 3.42 | 3.62 |
| Contemporary Issues in Information and Communication | 13 | 17 | 44 | 7 | 2 | 3.38 | 3.74 |
| COMPUTER SCIENCE MINOR | | | | | | | |
| Introduction to Programming | 74 | 7 | 4 | | | 4.82 | 15.54 |
| Assembly Language Programming | 23 | 26 | 21 | 10 | 6 | 3.58 | 4.46 |
| FORTRAN, COBOL, ALGOL or BASIC Language Programming | 58 | 20 | 4 | 3 | | 4.57 | 19.38 |
| Data and Program Structures | 38 | 25 | 17 | 2 | 1 | 4.17 | 11.57 |
| Data Base Management | 49 | 19 | 15 | 2 | | 4.35 | 14.54 |
| Information Display Systems | 32 | 26 | 23 | 4 | | 4.01 | 10.12 |
| Microprocessor Components and Systems | 15 | 21 | 31 | 13 | 4 | 3.36 | 3.00 |
| INFORMATION STUDIES CORE | | | | | | | |
| Professional Writing | 28 | 28 | 20 | 8 | 1 | 3.87 | 7.84 |
| Computer Graphic Media Application | 11 | 32 | 36 | 5 | | 3.58 | 6.70 |
| Computer's Impact on Society | 11 | 17 | 36 | 19 | 1 | 3.21 | 2.00 |
| Technical Research and Report Writing | 35 | 37 | 11 | 1 | 1 | 4.22 | 13.90 |
| Social and Human Factors in Man-Machine Interactive System | 17 | 29 | 28 | 11 | | 3.61 | 5.94 |
| COMPUNICATION SYSTEMS | | | | | | | |
| Audio Production | 5 | 6 | 26 | 33 | 8 | 2.58 | ** |
| Electrical and Electronics Technciogy | 3 | 23 | 21 | 29 | 4 | 2.90 | ** |
| Communication Components and System | 6 | 20 | 28 | 22 | 2 | 3.07 | .69 * |
| Television Production | 5 | 11 | 25 | 27 | 8 | 2.71 | ** |
| Computer Graphics | 18 | 31 | 27 | 2 | | 3.83 | 9.05 |
| Communications Systems Technology | 12 | 26 | 29 | 11 | 1 | 3.47 | 4.33 |
| Microwave Systems Technology | 5 | 13 | 32 | 26 | 2 | 2.91 | ** |
| Computer Applications in Telecommunications | 21 | 37 | 16 | 4 | | 3.96 | 10.23 |
| National and International Information Policy | 8 | 17 | 37 | 9 | 7 | 3.13 | 1.07 * |

**Table 4**
**(continued)**

**Individual Course Evaluations**

| Title of Course | Essential | Highly Desirable | Desirable | Of Little Value | Unnecessary | M | z Value |
|---|---|---|---|---|---|---|---|
| ORGANIZATIONAL INFORMATION SYSTEMS | | | | | | | |
| Management Information Systems | 36 | 31 | 14 | 1 | | 4.24 | 14.41 |
| Information Systems Analysis | 57 | 20 | 6 | | | 4.61 | 23.73 |
| Support Systems | 24 | 39 | 17 | 2 | | 4.04 | 12.05 |
| Accounting Information Systems | 34 | 27 | 17 | 2 | 2 | 4.08 | 10.14 |
| Interpersonal Communications | 18 | 24 | 32 | 8 | 1 | 3.60 | 5.62 |
| Behavior of Information Users | 15 | 26 | 31 | 10 | | 3.56 | 5.44 |
| Office Information Systems | 18 | 34 | 27 | 2 | 1 | 3.81 | 8.56 |
| Organizational Communications | 12 | 33 | 30 | 6 | 1 | 3.60 | 6.22 |
| Interactive Computer Graphics | 14 | 30 | 33 | 3 | 1 | 3.65 | 6.88 |
| INSTRUCTIONAL SUPPORT SYSTEMS | | | | | | | |
| Instructional Design | 32 | 21 | 15 | 8 | 1 | 3.97 | 7.91 |
| Instructional Systems Evaluation | 15 | 25 | 28 | 7 | 2 | 3.57 | 5.04 |
| Specialized Information Resource Systems | 10 | 17 | 42 | 7 | 1 | 3.36 | 3.67 |
| Specialized Media Service and Centers | 8 | 12 | 39 | 14 | 2 | 3.13 | 1.23 * |
| Introduction to Computer Assisted Instruction | 23 | 16 | 30 | 10 | | 3.66 | 5.62 |
| Advanced Computer Assisted Instruction | 14 | 24 | 28 | 8 | 2 | 3.53 | 4.57 |
| Interactive Computer Graphics | 15 | 28 | 28 | 4 | 1 | 3.68 | 6.64 |
| Design of Instructional Systems | 19 | 22 | 24 | 8 | 2 | 3.64 | 5.24 |
| INFORMATION STORAGE & RETRIEVAL SYSTEMS | | | | | | | |
| Specialized Information Resource Systems | 11 | 27 | 30 | 10 | | 3.50 | 4.95 |
| Specialized Media Services and Centers | 12 | 18 | 32 | 12 | 1 | 3.37 | 3.27 |
| Governments and Information | 3 | 14 | 37 | 18 | 4 | 2.92 | ** |
| Archives and Manuscript Management | 7 | 19 | 40 | 9 | 2 | 3.26 | 2.60 |
| Automated Indexing and Abstracting Systems and Services | 14 | 26 | 33 | 3 | 2 | 3.60 | 5.79 |
| Behavior of Information Users | 14 | 20 | 30 | 11 | 4 | 3.37 | 3.00 |
| Information Sharing and Transfer | 8 | 24 | 34 | 13 | | 3.34 | 3.48 |
| Interactive Computer Graphics | 13 | 26 | 34 | 3 | 2 | 3.58 | 5.65 |

* Below significance level at .05 confidence for two-tailed test (z score 1.96)

** Mean score below 3.00 validation point. Test for significance not applicable.

Based on the total responses, results indicated a general validation of all course listings (neutral = 3.00 and z score of +1.96 indicates .05 confidence level) except nine. These courses were the History of Information and Communication, Audio Production, Television Production, Electrical and Electronnic Technology, Microwave Systems Technology, and Governments and Information whose means were below the 3.0 validation point. Three additional courses, Components and Systems, National and International Information Policy, and the Specialized Media Services and Centers, had mean scores above 3.00 but failed to meet the .05 confidence level test for significance.

Six of the nine courses are listed under the Compunications degree option of the curriculum. They are the audio and television production courses, the electrical and electronics technology courses, communication components, microwave systems, and the information policy courses. The lack of support for these courses can be explained partially by an examination of the corporations included in the sample. The knowledge and skills in these courses are most applicable to career positions within the telecommunications industry. As can be noted in the corporation listing, there are only a few such companies included. Furthermore, the population consisted of members of the Data Processing Management Association and these members could be expected to have a more traditional view of information studies oriented toward business and management applications. The higher education sample was drawn from a population of computer science and business information system department chairs and this also would tend to present a bias toward business and management applications.

The government and information course would also have more utility among the regulated industries in the telecommunications field and for people involved in library applications where copyright is always a consideration in the reproduction and distribution of information.

The failure of the Specialized Media Services and Centers course in the Instructional Support Systems career specialty is more difficult to explain. The same course listed under the Information Storage and Retrieval Systems career specialty was validated.

## Course Ranking

The computation of means for each course was used to rank the courses in order of their reported value. The mean values from Table 4 were used to list all 51 courses in their descending order of evaluation. The results are shown in Table 5 with a rank order of the curriculum courses as determined by the means of their perceived value.

An examination of the rank order of courses disclosed two strong trends. The first was the consistently high evaluations of computer science courses and the second was an equally strong showing for business information systems courses. There were 10 courses that had mean evaluation scores above 4.00. Of these, five were from the university's Computer Science Department: Introduction to Programming, computer language (FORTRAN, COBOL, etc.), Data and Program Structures, and Information Display Systems. Four of these top 10 ranked courses were from the Business School's Management Information Systems Department: Information Systems Analysis, Management Information Systems, Accounting Information Systems, and

**Table 5**

**Rank Order of Courses Based on Evaluation Means**

| Rank | Course Title | Mean |
|---|---|---|
| 1 | Introduction to Programming | 4.82 |
| 2 | Information Systems Analysis | 4.61 |
| 3 | Computer Language (FORTRAN, COBOL, etc.) | 4.57 |
| 4 | Data Base Management | 4.35 |
| 5 | Management Information Systems | 4.24 |
| 6 | Technical Writing | 4.22 |
| 7 | Data and Program Structures | 4.17 |
| 8 | Accounting Information Systems | 4.08 |
| 9 | Support Systems | 4.04 |
| 10 | Information Display Systems | 4.01 |
| 11 | Instructional Design | 3.97 |
| 12 | Computer Applications in Telecommunications | 3.96 |
| 13 | Professional Writing | 3.87 |
| 14 | Computer Graphics | 3.83 |
| 15 | Office Information Systems | 3.81 |
| 16 | Theory of Information and Communication | 3.70 |
| 17 | Principles of Information and Communication | 3.70 |
| 18[a] | Interactive Computer Graphics | 3.68 |
| 19 | Introduction to Computer-Assisted Instruction | 3.66 |
| 20[a] | Interactive Computer Graphics | 3.65 |
| 21 | Design of Instructional Systems | 3.64 |
| 22 | Social and Human Factors | 3.61 |
| 23 | Automated Index and Abstract Systems | 3.60 |
| 24 | Interpersonal Communications | 3.60 |
| 25 | Organizational Communications | 3.60 |
| 26 | Advanced Computer-Assisted Instruction | 3.53 |
| 27[a] | Interactive Computer Graphics | 3.58 |
| 28 | Assembly Language | 3.58 |
| 29 | Computer Graphics - Media Applications | 3.58 |
| 30 | Instructional Systems Evaluation | 3.57 |
| 31[b] | Behavior of Information Users | 3.56 |
| 32[c] | Specialized Information Resource Systems | 3.50 |
| 33 | Communications Systems Technology | 3.47 |
| 34 | Research Methods in Information and Communication | 3.42 |
| 35 | Contemporary Issue in Information and Communication | 3.38 |
| 36[d] | Specialized Media Services and Centers | 3.37 |
| 37[b] | Behavior of Information Users | 3.37 |
| 38 | Microprocessor Components and Systems | 3.36 |
| 39[c] | Specialized Information Resource Systems | 3.36 |
| 40 | Information Sharing and Transfer | 3.34 |
| 41 | Archives and Manuscript Management | 3.26 |
| 42 | Computers' Impact on Society | 3.21 |
| 43[d] | Specialized Media Services and Centers | 3.13 |
| 44 | National and International Information Policy | 3.13 |
| 45 | Communication Components and Systems | 3.07 |
| 46 | Governments and Information | 2.92 |
| 47 | Microwave Systems Technology | 2.91 |
| 48 | Electrical and Electronics Technology | 2.90 |
| 49 | Television Production | 2.71 |
| 50 | Audio Production | 2.58 |
| 51 | History of Information and Communication | 2.46 |

[a]No. 18, 20 and 27 are the same course, but listed under three of the degree options.

[b]No. 31 and 37 are the same course, but listed under two of the degree options.

[c]No. 32 and 39 are the same course, but listed under two of the degree options.

[d]No. 36 and 43 are the same course, but listed under two of the degree options.

Support Systems. The only course to make the top 10 from the School of Communications was Technical Research and Report Writing.

On the other end of the spectrum, of the 10 courses that had mean evaluations below 3.25, six were from the Compunications degree option: Audio Production, Television Production, Electrical and Electronics Technology, Microwave Systems, Communication Components and Systems, and National and International Information Policy.

The relative position of the Microprocessor Components and Systems course was surprising. The proliferation of microprocessors and the projection of their applications would appear to make this one of the more prized courses in the curriculum. The fact that the class is ranked 38th (see Table 5) is probably a reflection of the experience of the respondents' working with large mainframe systems. It is less easy to offer an explanation for the responses from higher education, however, and the one-way analysis of variance showed no significant difference in evaluation between the business and higher education respondents although the trend was toward a higher evaluation from higher education (see Figure 4 on page 96).

## Curriculum Component Evaluation

Table 3 on page 78 shows the results of the evaluation in terms of the major components of the curriculum.

An examination of the component evaluations clearly indicates the bias toward computer science and business information systems. The Computer Science minor had the highest evaluation averaging between essential and highly desirable with a mean of 4.14. The minor consists of seven courses and only two were evaluated below 4.00. They were the Assembly Language course at 3.58 and the Microprocessor Components and Systems course at 3.36. The Assembly Language course was not surprising, as the knowledge and skills of machine coding would rarely have application in most information specialist positions. By far, the bulk of programming coding would be in a computer language such as FORTRAN or COBOL. However assembly language does give a basic understanding of machine operations that would seem to be valuable in understanding computer language development and operations.

The Organizational Informations Systems had the second highest average course evaluation (3.92) and was easily the most popular of the four degree options or specializations (Compunications, Organizational Information Systems, Instructional Support Systems and Information Storage and Retrieval Systems). It also had the most consistent evaluations with no courses falling below a 3.50 evaluation mean.

The second most popular career specialization pattern as measured by the mean evaluation was the Instructional Support Systems with a mean of 3.61. The most highly valued course was Instructional Design with a mean of 3.97 and the least valued was Specialized Media Services and Centers with a mean of 3.13.

The Information Storage and Retrieval Systems career specialization had an evaluation mean of 3.40. Although the overall evaluation was lower than the Organizational Information and Instructional Support Systems evaluations, there was only one course that did not receive validation. It was Governments and Information which had a mean of 2.92.

By far the lowest ranking career pattern was the Compunications or telecommunications curriculum. With an overall mean of 3.18, it barely achieved statistical significance. Indeed, of its nine courses, six were not validated at the .05 level. On this basis, the career specialty must be considered as failing validation. Since students must take at least five courses in the specialty field, this option does not offer enough valid courses to complete the requirement. The low ranking of both Information Storage and Retrieval Systems and Compunications Core curricula probably reflect the parochial biases of the two populations sampled. The DPMA member most likely has limited contact with professionals in either of these fields. Certainly Computer Science and Business Information Systems departments have not traditionally been concerned with placing their graduates in the telecommunications or specialized library fields.

The Information Studies Core curriculum was strongly validated with an overall mean of 3.79. Only one course was valued below a mean of 3.50 and the Technical Writing course ranked sixth among all courses in evaluation score with a mean of 4.22. This was reassuring since these courses were designated as required classes for all Information Studies majors. The skills and knowledge contained in this portion of the curriculum was deemed to be common for all information specialists and the data supported this assumption.

The Communications Core requirement received a less enthusiastic endorsement. The five courses which are required of all students in the School of Communications received an overall mean of 3.36 which was slightly below the evaluation of the Information Storage and Retrieval Systems specialty. When each course evaluation was examined independently, it indicated only one course was not validated. This class, the History of Information and Communication Studies, ranked last among all courses in the curriculum with a mean of 2.46. If this course is removed from consideration, the core evaluation becomes 3.73 which places it just below the Information Studies Core in validation.

There were four courses in the career specialty curricula that were duplicated. The Interactive Computer Graphics course was listed in the Organizational Informations Systems, Instuctional Support Systems and the Information Storage and Retrieval Systems curricula. The Specialized Information Resource Systems and the Specialized Media Services and Centers courses were both listed in the Instructional Support and Information Storage and Retrieval Systems curricula. The fourth course, Behavior of Information Users, was listed under Organizational Information Systems and Information Storage and Retrieval Systems curricula. This duplicate listing provides a limited repeated measures check on the reliability of the survey instrument. A comparison of the repeated course scores are shown in Table 6.

The low variance among the repeated scores indicates a high internal consistency in evaluation and supports the reliability of the questionnaire.

**Table 6**

**Duplicated Course Evaluations**

| Title of Course | Location in Curriculum | | |
|---|---|---|---|
| | Organizational Information Systems | Instructional Support Systems | Information Storage and Retrieval Systems |
| | | MS | |
| Interactive Computer Graphics | 3.65 | 3.68 | 3.58 |
| Specialized Information Resource Systems | | 3.36 | 3.50 |
| Specialized Media Services and Centers | | 3.13 | 3.37 |
| Behavior of Information Users | 3.56 | | 3.37 |

## Qualitative Analysis

To expand the evaluation's utility and make it in part formative, the respondents were invited to list any courses they felt should be added to the curriculum. This open-ended question was placed immediately following the last course evaluation listing on the questionnaire. And it was on both the academic and business versions. A majority (57%) of the respondents recommended at least one additional course. More than a third (36%) recommended two courses be added and just over a fourth (26%) proposed three courses for addition to the curriculum.

A course in business practice or business management was the most frequently mentioned addition to the curriculum. Thirteen respondents listed a course of this type that they felt would improve the curriculum. There were seven other courses normally found in business curricula listed as needed additions. Finance and accounting were listed by three respondents while organizational structures, organizational behavior, productivity analysis and administrative systems were each listed once.

The computer science discipline drew a wide range of courses. Additional programming courses were requested by three people and a course on personal computers was also requested by three respondents. Other computer science courses included basic computer concepts (mentioned twice), software development (also mentioned twice), microcomputers, APL language, simulation, logic, and structured programming design.

The field of information studies drew a number of recommended course additions of which the most frequently listed was databases (seven times). Data representation, administration of ADP functions, interactive systems, and distributed data systems were other courses recommended.

Systems analysis was another area that drew frequent additional course recommendations. The courses recommended included operations research techniques, operating systems analysis, systems development cycles, structured analysis, administrative systems analysis and project control and management.

Three additional courses were recommended in the instructional support area. They were learning theory, adult education theories and instructional evaluation.

Four courses were recommended in the communication and telecommunication fields. They were: theory of communication systems, personal communication, graphics, and satellite technology.

There were also a number of courses from other areas. Statistics and logic were each cited by six respondents as a recommended addition. Other courses included physics, mathematics, economics, and public affairs.

A complete listing of the additional courses recommended and their frequency is shown in Table 7.

Only nine respondents from the academic sample indicated they offered a similar program at their university or college. However, when asked the name of their program, 12 subjects responded as follows: Computer Information Systems (five responses), Computer Science (three responses) and Data Processing (two responses). One subject listed an MA program in Information Systems as a similar curriculum at his university and another cited mathematics as a similar program at his university. There is no explanation for these results, but it can be speculated that three subjects did not feel their institutions offered this type of curriculum but, felt they should indicate the closest academic program to it.

**Table 7**

**Recommended Courses to the**

**Information Studies Curriculum**

| Subject | Frequency |
|---|---|
| Business practices | 7 |
| Database | 7 |
| Business management | 6 |
| Statistics | 6 |
| Logic | 6 |
| Systems development cycle | 4 |
| Computer programming | 3 |
| Personal computers | 3 |
| Structural analysis | 3 |
| Data representation | 3 |
| Interactive systems | 3 |
| Project control and management | 3 |
| Operation research techniques | 3 |
| Satellite technology | 2 |
| Software evaluation | 2 |
| Basic computer concepts | 2 |
| Accounting | 2 |
| Administration of ADP functions | 2 |
| Administrative systems analysis | 2 |
| Learning theories | 2 |
| Instructional evaluation | 2 |
| Adult education theories | 1 |
| Operating systems analysis | 1 |
| Distributed data basic systems | 1 |
| Organizational structures | 1 |
| Organizational behavior | 1 |
| Productivity analysis | 1 |
| Administrative systems | 1 |
| Finance | 1 |
| Microcomputers | 1 |
| APL language | 1 |
| Simulation | 1 |
| Structured design | 1 |
| Theory of communication systems | 1 |
| Personal communication | 1 |
| Graphics | 1 |
| Physics | 1 |
| Mathematics | 1 |
| Economics | 1 |
| Public affairs | 1 |
| More language (unspecified) | 1 |
| Work study, internship, application experience and practical experience | 8 |

The respondents were then asked to indicate the department or school in which the program was offered. Table 8 reflects the responses.

**Table 8**

**Department or School in Which Information Studies Type Programs Are Offered**

| Department or School | Frequency |
|---|---|
| Business | 6 |
| Computer Science | 2 |
| Engineering | 1 |
| Mathematics | 1 |
| Systems Science | 1 |
| Technical Division (community college) | 1 |
| Interdisciplinary | 1 |

The School of Business appears the most likely place for information studies type programs. This is to be expected, but what is surprising is that these programs are not called business information or management information systems.

When asked to describe the major difference between the Information Studies program they had just evaluated and the similar program at their university or college the responses generally showed a greater emphasis on business, mathematics and management for their resident curricula. Table 9 lists the total responses.

**Table 9**

**Difference Between Evaluated Program and Resident University Program**

| Major Difference of Resident Program | Frequency |
|---|---|
| More of a focus on business | 3 |
| More management emphasis | 2 |
| More mathematics | 2 |
| Organizational information systems | 1 |
| Stronger in computer science | 1 |
| No communication courses | 1 |
| Does not combine communication and computing | 1 |
| Community college | 1 |
| Graduate level program | 2 |

The business sample respondents were then asked to list the job title they felt graduates of the program would be qualified to fill. Table 10 provides a summary of the responses. The most commonly listed job title with 12 mentions was computer programmer which was labelled variously as programming specialist, software developer, programmer, programming assistant, etc. Systems analyst was second in frequency of listing with eight mentions. In addition there were four responses that combined programmer and systems analyst in their job descriptions. Data processing was mentioned three times with the titles ranging from data processing trainee to data processing manager.

**Table 10**

**Job Title For Which Graduate Is Qualified**

| Job Title | Frequency |
|---|---|
| Computer Programmer | 12 |
| Systems Analyst | 8 |
| Analyst Programmer | 4 |
| Data Processing | 3 |
| Marketing Operations Analyst | 2 |
| Management Information Systems | 2 |
| Marketing Communication Specialist | 1 |
| Instructional Technologist | 1 |
| Research Associate | 1 |
| Information Specialist | 1 |
| Several Positions (unspecified) | 8 |

Eight respondents simply stated "several positions" or a "number of jobs." Strangely, only two respondents listed job titles that this investigation considered as being descriptive of the principal skills and knowledge the program was designed to impart. These positions were research associate and information specialist.

## Differences Between Business and Higher Education

To determine if higher education and business differed in their evaluations of the content areas of the curriculum, a one-way analysis of variance was conducted by curriculum area with evaluation source (higher education or business) as the independent variable and course evaluation scores as the dependent variable. Using the SPSS package, eight analyses of variance computations were made. The first was an overall comparison of higher education and business scores. Then, the scores for each curriculum component (communications core, computer science minor, information studies core, compunications systems, organizational information systems, instructional support systems, and information storage and retrieval systems) were compared. A summary of the results are provided in Table 11. As can be seen, there were no significant differences between higher education and business respondents in their overall evaluation or in their evaluation of each major component of the curriculum.

**Table 11**

**Comparison of Curriculum**
**By Higher Education v. Business Responses**

| | Evaluation Mean | | | |
|---|---|---|---|---|
| Curriculum Area | Academic | Business | F Value | Sig. Level |
| Overall 3.62 | 3.56 | .5907 | .7824 | |
| Communication Core | 3.45 | 3.31 | .7420 | .3917 |
| Computer Science Minor | 4.23 | 4.09 | 1.1090 | .2956 |
| Information Studies Core | 3.79 | 3.66 | .9593 | .3303 |
| Career Specialty Programs | | | | |
| A) Compunications Systems | 3.28 | 3.12 | 1.0954 | .2989 |
| B) Organizational Information Systems | 4.02 | 3.87 | 1.8010 | .1836 |
| C) Instructional Support Systems | 3.55 | 3.66 | .3943 | .5321 |
| D) Information Storage and Retrieval Systems | 3.37 | 3.42 | .1030 | .7492 |

Higher education had a slightly higher overall evaluation of the curriculum. The only parts of the curriculum in which business respondents gave higher evaluations than academic respondents were the career specialty patterns of Instructional Support Systems and Information Storage and Retrieval Systems. But, no significant difference was found in any of the evaluations.

Each individual course listing was subjected to a similar analysis to see if there were any significant differences in higher education and business evaluations. The statistical test used was the Kurkal-Wallis one-way analysis of variance which uses ranking comparisons as the dependent variable with a Chi Square distribution. Results of the comparison are graphically displayed in Figure 4. Only three courses had significantly different evaluations between academic and business responses. They were No. 5, Contemporary Issues in Information and Communication, the capstone course in the Communication core, No. 27, Management Information Systems from the Organizational Informations Systems career specialty and No. 36, Instructional Design from the Instructional Support Systems career specialty.

The Instructional Design course was the only class to receive significantly higher evaluation from business than from higher education. In the other two courses, educators evaluated them higher than business professionals.

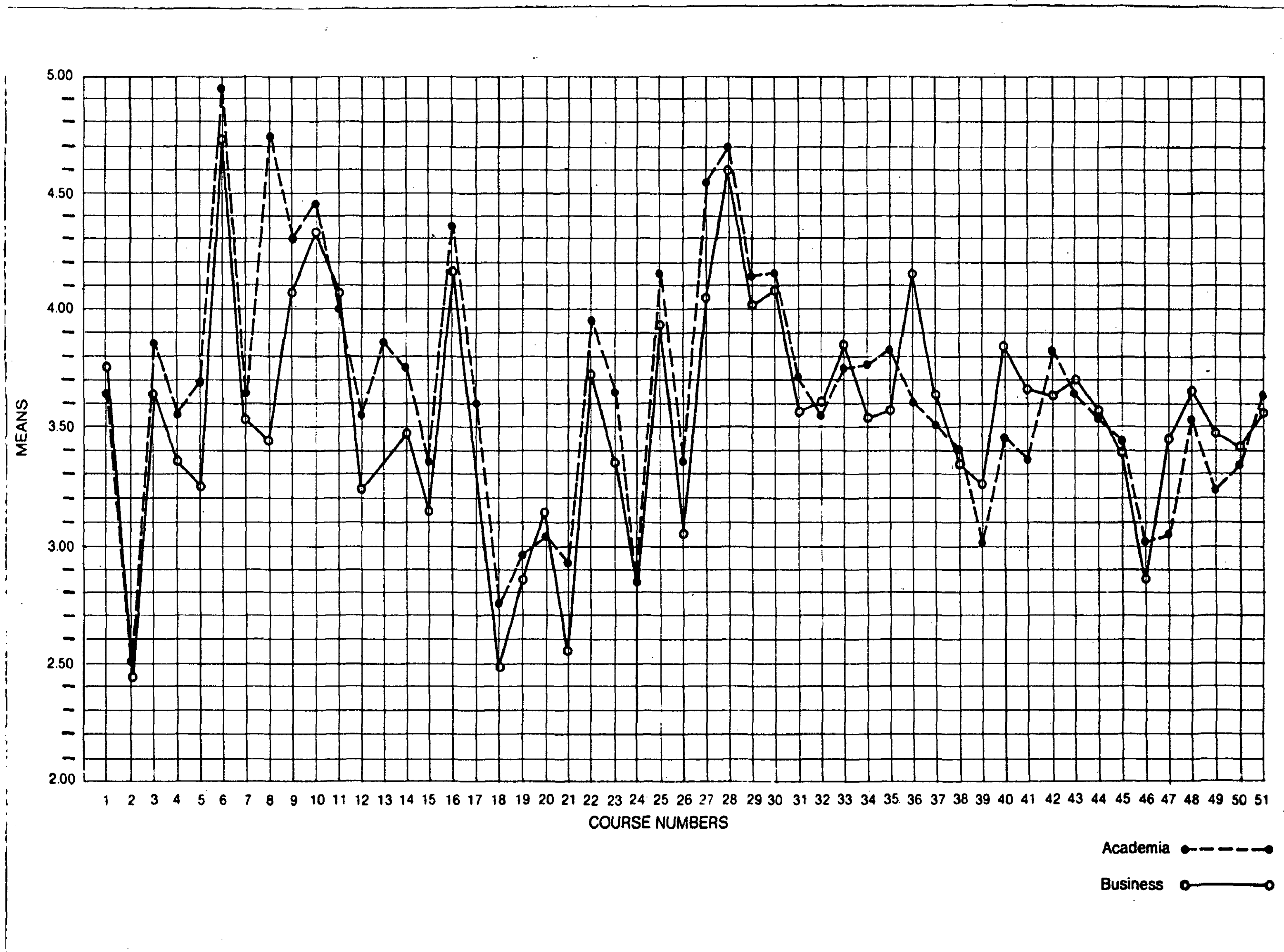


**Figure 4.** Comparison of Course Evaluations by Business and Higher Education

1. Principles of Information and Communication
2. History of Information and Communication
3. Theory of Information and Communication
4 Research in Information and Communication
5. Contemporary Issues in Information and Communication
6. Introduction to Programming
7. Assembly Language Programming
8. FORTRAN, COBOL, ALGOL or BASIC Language Programming
9 Data and Program Structures
10. Data Base Management
11. Information Display Systems
12. Microprocessor Components and Systems
13. Professional Writing
14. Computer Graphic Media Application
15. Computer's Impact on Society
16. Technical Research and Report Writing
17. Society and Human Factors in Man-Machine Interactive System
18. Audio Production
19. Electrical and Electronics Technology
20. Communication Components and System
21. Television Production
22. Computer Graphics
23. Communications Systems Technology
24. Microwave Systems Technology
25. Computer Applications in Telecommunications
26. National and International Information Policy
27. Management Information Systems
28. Information Systems Analysis
29. Support Systems
30. Accounting Information Systems
31. Interpersonal Communications
32. Behavior of Information Users
33. Office Information Systems
34. Organizational Communications
35. Interactive Computer Graphics
36. Instructional Design
37. Instructional Systems Evaluation
38. Specialized Information Resource Systems
39. Specialized Media Service and Centers
40 Introduction to Computer Assisted Instruction
41. Advanced Computer Assisted Instruction
42. Interactive Computer Graphics
43. Design of Instructional Systems
44. Specialized Information Resource Systems
45. Specialized Media Services and Centers
46. Governments and Information
47. Archives and Manuscript Management
48. Automated Indexing and Abstracting Systems and Services
49. Behavior of Information Users
50. Information Sharing and Transfer
51. Interactive Computer Graphics

**Course Listing for Figure 4.**

# CHAPTER V

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?

T. S. Eliot

In the late 1970's . . . every other dollar earned and spent in the American economy will be earned by producing and distributing ideas and information, and will be spent on procuring ideas and information.

Peter Drucker

## Summary

These were the ideas that provoked the development of the Information Studies curriculum which is the subject of this evaluation study.

The obvious voids in education motivated the design of a curriculum at California State University, Chico, that reflects the needs of business and government, and gives recognition to the information professional. Called "Information Studies," the curriculum was developed with input from the disciplines of computer science, mass media, instructional technology, busines, education, industrial technology, mathematics, language and speech.

Primarily the curriculum merged the traditional communication "arts" with computer, library and management "sciences." The Information Studies degree curriculum requires 66 to 69 semester units in mass communication, information science, computer science, management and business.

All students must complete a series of five core classes within the School of Communications for a total of 15 units. The classes consist of a beginning survey course, a communications history course, an information and communication theory course, a course in basic communication research methods, and a senior capstone class on communication and society.

Information Studies majors take an additional five classes designed as the Information Science core. These include courses in writing, computer graphic applications, human factors in man-machine interactive systems, and a class on the computer impact on society.

A minor in Computer Science that consists of 21 semester units is also required to provide the graduate with a foundation in computer operation, architecture, and programming skills in at least one computer language.

Depending on the student's aspirations and talents he selects one of four career fields. The areas offered are compunication systems (telecommunications), organizational information systems, instructional support systems, and information storage and retrieval systems. Each field offers a number of courses from which the student selects 15 to 18 semester units.

The principal question investigated by this study was the evaluation of an Information Studies curriculum. The major question was divided into a number of components. There was a question of evaluating the curriculum as a whole, by its major options and by each individual course. It was important to determine the evaluation of the curriculum by information professionals in businesses where the graduate would eventually make their careers and by educators involved in similar educational concerns. Specifically, the study addressed the following questions:

- What is the overall evaluation of the Information Studies program?
- What is the evaluation of the major curriculum subdivisions and each individual course?
- Are the perceived values by professionals in the field different than those of educators?
- Is a graduate of the program marketable as an information specialist?

A review of the literature provided abundant support for the concept of an information studies program and the need for higher education to be more responsive to the realities of the information age. Numerous citations in the literature supported the curricular content and its interdisciplinary nature. The impact of communication and computer technologies on the institutions and fabric of our society was well documented. As the amount of information increases (and it has been doing so at an exponential rate), the demand for all types of information services must also increase.

## The Survey

To obtain empirical evidence to answer the specific evaluation questions, a survey of business and higher education was conducted. Samples were drawn from two populations. One representing the business world and consisted of members of the Data Processing Mangement Association. The second representing higher education consisted of chairpersons in college and university computer science and business information departments.

Eighty-six responses were received, coded and analyzed. Fifty-one responses were from professionals employed in the field and 32 were from college and university chairpersons of computer science and business departments. Three were unidentified as to source.

## The Findings

The findings generally supported the Information Studies programs. The data provided a positive response to the first question with an average overall program evaluation rating of 3.60 on a 5.00 Likert type scale. A rating of 3.00 was established as the neutral point.

However, this was a much weaker validation than expected in view of the literature review which generally reflected a critical need for just such an interdisciplinary approach to educating professionals in the information field.

Seventeen respondents from higher education provided information comparing the Information Studies curriculum with related programs in their own universities or colleges. Eight felt it was better, four throught it was about the same and five preferred their own program. This, too, was a weak response although there were possible factors mitigating a favorable comparison. Most of the respondents were department chairs responsible for the program they were asked to compare. Proprietary bias is an obvious possible contaminant. To rate a competing program as being superior to their own could be considered a failure to provide the best quality program in their department.

The analysis of individual course evaluations showed only nine of the 51 courses listed that were not validated at the 3.00 scale level. All major component groupings of the curriculum were validated except for the career specialty in Compunications Systems. In that field which is primarily concerned with telecommunications, six of the nine courses failed the validaton test. The computer science minor received the highest evaluation with an average score of 4.14. Of the four career patterns, Organizational Information Systems had the highest mean evaluation (3.92) and Compunications Systems was the lowest with an average valuation of 3.18.

To determine if there was a difference in perceived value of the program between professionals in the field and educators, a comparison was made of their scores. The responses from higher education were generally higher than those from business in their evaluation of the curriculum. However, the differences were not statistically significant at the .05 level of probability for the program as a whole or for any of the career patterns. Only three of the 51 courses had significantly different evaluations at the .05 level between business and higher education.

To determine the marketablity of an information specialist graduate, respondents from the business sample were asked if they would hire a person with a degree from this program. Ony one subject answered no. Forty-one subjects said they would hire the graduate. There were 11 respondents that left the question blank. This was considered a significantly positive factor in the overall curriculum validation as well as giving a positive answer to the fourth question.

Forty-two respondents from the business sample provided starting salary information with a median range of $20,000-$25,000 which compares quite favorably with the results of a Michigan State University survey (Changing Times, 1983) that shows the expected median salary for all bachelor degree graduates of 1983 to be $17,085. This was also a positive indication of the marketability of graduates of the curriculum.

## Conclusions

There are a number of general conclusions to be drawn from the study as well as the more narrow and specific conclusions regarding courses that failed validation.

The major conclusion to be drawn from the study is that the Information Studies program has been validated by a survey of business professionals and higher education faculty. Respondents from both business and higher education approved of the curriculum as a whole and of its major components except Compunications. Forty-two of the 51 courses were also validated. And, graduates of the program are employable at competitive salaries.

The validation was not, however, an overwhelming consensus. This is due in part to methodological weaknesses of the study which will be discussed under Weaknesses of the Survey. However, it is possible to speculate on other possible reasons for the lower than expected assessments of the program's value.

In general, the implications of the new technologies in communication and computer science are probably not as widely appreciated by either professionals in business or education as the literature would indicate. The views of the information age as expressed by Oettinger, et al (1977), Drucker (1973), Toffler (1980), Kahn (1974), Martin (1978), and others are not universally accepted or at least not in terms of the educational changes needed to address the new career patterns these changes are creating. This conclusion is based both on the examination of existing curricula in computer sciences, communication and business and on the results of the survey data.

The less than enthusiastic comparison of the curriculum by educators is believed to be, at least in part, a reflection of traditional disciplines. Despite the emphasis in the literature of the merging of computer and communication technologies and their application, only eight of the 32 respondents from higher education stated they perceived the Information Studies program as superior to their own computer science or business information programs. This is not a particularly surprising conclusion. Most academicians are quite familiar with the difficulty of developing interdisciplinary programs. In the long run the fierce proprietorship and turf guarding are probably quite salutary to higher education by preventing the proliferation of educational fads and maintaining a stability of basic skills and knowledge. However, they can also contribute to the widening gap between the needs of society and academic curricula.

In the same manner, the high ranking of the Organizational Information Systems career speciality by business respondents is probably an accurate reflection of the current need for information specialists and the more universal demand for this expertise generated by office automation and the interpretation of information services. Other applications, such as Compunications (telecommunications), Information Storage and Retrieval and even Instructional Support Systems are less generally distributed throughout the business world and therefore received lower evaluations despite the literature that emphasizes the increasing importance of these skills.

Only five responses indicated more instructional design courses were needed and there were also only five responses for added courses in the communication field, and none for the Information Storage and Retrieval specialty.

Specifically, it must be concluded that the nine courses receiving mean evaluations with a z score value less than +1.92 above the 3.00 neutral value point are not validated by the national survey.

## Weaknesses of the Survey

There are three major weaknesses of the study that should be kept in mind when considering the results. The first of these is the low return rate. Only 86 of 313 questionnaires were returned. There were a number of factors that could have contributed to the low return rate, but the timing of the survey was probably the most significant. It was mailed to educators in mid-May, a time of final examinations, term papers, graduation exercises and preparation for summer activities. In this busy context, a curriculum survey could be expected to have a low priority for department chairs.

The business mailing was made in mid-June, again a busy time for many of the respondents. The end of the fiscal year, vacation plans and schedules to complete are some of the activities with pressing priorities during this time of the year.

The length of the survey, with 51 evaluation items and a sheet of open-ended questions may have intimidated many subjects. Although a cover letter and a stamped, self-addressed, return envelope were included, no telephone or mail follow-up was made. Nor was any attempt made to determine what differences, if any, might exist between respondents and non-respondents.

The second weakness of the study is perhaps even more basic. It concerns the credibility of the populations selected to make valid evaluations of much of the curriculum. Any curriculum validation research is only as good as the external criteria selected for the validation. In retrospect, the Data Processing Management Association (DPMA) and the national listing of computer science and information systems university and college department heads provided a built-in bias toward the traditional disciplines of business information systems and computer science. And, this is reflected in the high evaluations of the computer science minor and the Organizational Information Systems career pattern curricula at 4.14 and 3.92, respectively. In this regard, it must be speculated that the Organizational Information Systems and computer science minor are the only portions of the program to be genuinely validated.

This bias is further emphasized by the types of additional courses recommended by respondents from both business and higher education. The preponderance were in the areas of business, management and computers.

The third weakness of the study is probably the most basic of all. It concerns the course listings and their descriptions. With 51 courses requiring evaluation, the descriptions were limited to a single sentence indicating the content and presentation method. The accuracy of evaluations based on such limited information must be considered. Obviously, an evaluation based on content outlines, course descriptions and syllabi would have had much greater construct validity, but would have been much more difficult to conduct as a survey.

## Recommendations

The first recommendation is that the Information Studies program be implemented as a response to careers needed in the 1980s and beyond. As a formative evaluation, the results of the study indicate nine courses are not validated. It is recommended that the course on History of Information and Communication be deleted from the core requirements and become an elective course. It is recommended the two courses in the Instructional Support Systems and Information Storage and Retrieval Systems career patterns not validated by the study remain within the curriculum. This recommendation is made for two reasons. First, because these courses are listed in career specialties which offer a number of alternative courses from which the student must select five. This makes them elective to a certain degree and they should remain for those desiring them. The second reason is that the bias of the population sample makes their lack of validation suspect.

It is recommended that further studies of the Information Studies program be made with a view of providing additional empirical evidence. These studies should include the selection of different external validation populations. Specifically, the Information Storage and Retrieval curriculum should be investigated with a sample from the Special Library Association and/or the American Society for Information Science (ASIS). The Instructional Support Systems should be validated by the membership of the American Society of Training Developers (ASTD) and the Association of Educational Communication and Technology (AECT). The Compunications Systems curriculum should be evaluated by a sample from the telecommunications and mass media industries.

Since students currently enrolled in higher education will be practicing their professional careers well into the 21st century, it is recommended a study of an appropriate Information Studies curriculum be conducted using prominent authors in the field as experts. The study could be a validation study using the experts as a panel of judges or a Delphi technique could be used in a developmental approach.

Finally, since the Information Studies program will be implemented at California State University, Chico, it is recommended that a longitudinal study be undertaken to track graduates' employment patterns and career progressions.

As for the Compunication Systems career specialty, this portion of the curriculum should not be implemented until two actions are completed. Firstly, a curriculum study group with faculty members from mass communications, computer science, and electronics and industry professionals from the mass media, telecommunications and computer fields should be formed to redesign the curriculum and develop course content. Secondly, the revised curriculum should be validated with a sample from among these populations.

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# APPENDIX A

# QUESTIONNAIRE

# APPENDIX A
# QUESTIONNAIRE

## INFORMATION STUDIES CURRICULUM

*The curriculum consists of four components: A series of courses in Communications (15 semester units), Computer Science (21 semester units), and Information Studies (18 semester units) must be taken by all students. The fourth component is a series of career specialty courses of which the student selects one sequence of 15-16 semester units. The career specialties include:*

*a) Compunication Systems (the application of computers in the telecommunication and mass media fields);*
*b) Organizational Information Systems (the design, development and operation of computer systems for meeting information and communication needs of organizations);*
*c) Instructional Support Systems (the application of computers in training and education); and*
*d) Information Storage and Retrieval Systems (the use of computer technology in the design, development and implementation of information retrieval systems).*

*In addition to this professional curriculum, there is within the baccalaureate degree program 54 semester units of general education courses—in the arts, sciences, and humanities—to broaden intellectual awareness and to serve in the development of cultural literacy and analytical and evaluative methods.*

*Directions: Please evaluate each of the following courses by simply checking (✓) the box which best describes your opinion as to desirability of including the course in the proposed curriculum. Courses are 3 semester units unless otherwise indicated.*

| COMMUNICATIONS REQUIREMENTS | A Essential | B Highly Desirable | C Desirable | D Of Little Value | E Unnecessary |
|---|---|---|---|---|---|
| Principles of Information and Communication<br>A survey of the principles, function and services of media in an information and communication oriented society. | ☐ | ☐ | ☐ | ☐ | ☐ |
| History of Information and Communication<br>Origin and development of the various media of mass communications. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Theory of Information and Communication<br>An exploration of basic theories in communication and information flow; nature, processes, and effects of human and mass communications behavior; innovation, change and technological future of communications. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Research in Information and Communication<br>Examination, evaluation and application of scientific methods of communication behavior analysis. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Contemporary Issues in Information and Communication<br>An in depth examination of current mass media issues, media systems as social institutions, and the interplay between communicator and audience. | ☐ | ☐ | ☐ | ☐ | ☐ |

| COMPUTER SCIENCE REQUIREMENTS | A | B | C | D | E |
|---|---|---|---|---|---|
| Introduction to Programming<br>Topics include algorithm development, control structures, functions, procedures, arrays, and records. Top-down design, structured programming and modularity are emphasized. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Assembly Language Programming<br>The structure of computers; number and character representation, word and instruction formats, flow charting, machine and assembly language programming, address modification, indexing, indirect addressing, subroutines, mnemonic interpreting systems. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Fortran, Cobol, Algol or Basic Language Programming<br>The study of language programming with emphasis on language structure, data representation, file manipulation and interactive programming through the use of business applications. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Data and Program Structures<br>Traditional data structures are examined as they relate to information representation, parameter passing, recursion, assemblers, compilers, operating systems, and machine organization | ☐ | ☐ | ☐ | ☐ | ☐ |
| Data Base Management<br>Introduces large data base management and associated automatic information processing with concurrent application of the Cobol language. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Information Display Systems<br>Design and application of visual information display and storage systems. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Microprocessor Components and Systems<br>Several microprocessors analyzed and compared. Students work in labs with microprocessor kits to program and develop interface circuits. | ☐ | ☐ | ☐ | ☐ | ☐ |

## INFORMATION STUDIES REQUIREMENTS

| Course | A Essential | B Highly Desirable | C Desirable | D Of Little Value | E Unnecessary |
|---|---|---|---|---|---|
| **Professional Writing**<br>An introduction to the many forms and styles of writing used in audiovisual media. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Computer Graphic Media Application**<br>Introduction to the use of the computer and plotter in the preparation of graphic forms, e.g., images, animation and graphics. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Computer's Impact on Society**<br>The social impact of computers and related systems upon people and the environment. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Technical Research and Report Writing**<br>Practice in composition skills and the writing of technical reports. (6 units) | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Social and Human Factors in Man-Machine Interactive Systems**<br>Evaluation of human factors in designing interactive information systems for personal, home and office applications. | ☐ | ☐ | ☐ | ☐ | ☐ |

## CAREER SPECIALTY COURSES

*In addition to the above requirements, students must specialize in one of the four options: a) Compunication Systems, b) Organizational Information Systems, c) Instructional Support Systems, d) Information Storage and Retrieval Systems.*

### a) COMPUNICATION SYSTEMS

*The application of computers in the telecommunication and mass media fields.*

| Course | A | B | C | D | E |
|---|---|---|---|---|---|
| **Audio Production**<br>Develop skills and expand application in radio performance and production. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Electrical and Electronics Technology**<br>An introduction to electrical and electronic technology: DC circuitry analysis, AC circuitry analysis and basic electronic components and circuits. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Communication Components and Systems**<br>Application of solid state devices and introduction to integrated circuit technology as electronics communication components. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Television Production**<br>Theory and techniques of performing and producing for television. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Computer Graphics**<br>Display devices and files representation and manipulation of graphics information. Graphic languages, interactive graphics systems and image processing. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Communications Systems Technology**<br>Introduction to electronic communication systems. AM, FM, TV, and digital communication systems. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Microwave Systems Technology**<br>Principles of microwave devices, generation and transmission. Circuit discussion: oscillators, mixers, cavity amplifiers, filters, couplers, transmission lines and measurement techniques. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Computer Applications in Telecommunications**<br>Examines the use of computer systems and technology in expanding and improving traditional communication methods. | ☐ | ☐ | ☐ | ☐ | ☐ |
| **National and International Information Policies**<br>Senior seminar in the role of information in economic and social systems. | ☐ | ☐ | ☐ | ☐ | ☐ |

**b) ORGANIZATIONAL INFORMATION SYSTEMS:**

*The design, development and operation of computer systems for meeting information and communication needs of organizations.*

| | Essential<br>A | Highly Desirable<br>B | Desirable<br>C | Of Little Value<br>D | Unnecessary<br>E |
|---|---|---|---|---|---|
| Management Information Systems<br>Presentation of information sources and data processing systems presently in use, including problems arising from changing the magnitude and direction of information systems. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Information Systems Analysis<br>Systems approach to problem solving and design, system life cycle, cost effectiveness, decisions under certainty, utility theory. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Support Systems<br>Decision analysis and support, design and implementation of decision support system. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Accounting Information Systems<br>Accounting systems requirements and data sources emphasizing system analysis and design, internal controls, and computer processing. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Interpersonal communications<br>Study of significant theories related to interpersonal communication, including important variables in the interpersonal communication process, relationship to other types of communication, major differing approaches and research problems. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Behavior of Information Users<br>Factors affecting people's information seeking and information handling behavior. How attitude formation, perception, introduction of innovations, other social influences modify an individual's communication patterns. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Office Information Systems<br>The role of the computer in handling office function is examined. Emphasis will be on the analysis of office services and operations in terms of organization structure and individual requirements. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Organizational Communications<br>A study of significant theories related to communication in organizations, including study of communication variables, non-verbal communication, interpersonal communication, small group communication, public communication, and communication research in organizations. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Interactive Computer Graphics<br>Display devices and files. Representation and manipulation of graphic information. Graphic languages, interactive graphics, graphics systems and image processing. | ☐ | ☐ | ☐ | ☐ | ☐ |

**c) INSTRUCTIONAL SUPPORT SYSTEMS:**

*The application of computers in training and education.*

| | A | B | C | D | E |
|---|---|---|---|---|---|
| Instructional Design<br>An introduction to precise definition of instructional objectives, development of skills and knowledge required in organizing content or concepts and instructional tasks in logical order. Development of instructional type scripts and sequencing of content and learning tasks. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Instructional Systems Evaluation<br>Evaluation of instructional media material prior to application. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Specialized Information Resource Systems<br>Development of skills, methods and operational criteria for the requirements and implementation of modern information and media centers. | ☐ | ☐ | ☐ | ☐ | ☐ |

| | A<br>Essential | B<br>Highly Desirable | C<br>Desirable | D<br>Of Little Value | E<br>Unnecessary |
|---|---|---|---|---|---|
| Specialized Media Services and Centers<br>Systems analysis and design of an instructional media services center to support information and instruction in either academia, industry or government. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Introduction to Computer Assisted Instruction<br>An introduction to computer assisted instruction, including the history, present status, and the future potential of this area. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Advanced Computer Assisted Instruction<br>The design of systems and course material for the presentation of lessons through the computer directed media. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Interactive Computer Graphics<br>Display devices and files. Representation and manipulation of graphics information. Graphics languages, interactive graphics systems and image processing. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Design of Instructional Systems<br>Selection of alternative system functions in equipment and procedure to meet the desired operating criteria. Evaluation and selection, including costs of mixed media equipment designed for use as a learning system. | ☐ | ☐ | ☐ | ☐ | ☐ |

**d) INFORMATION STORAGE AND RETRIEVAL SYSTEMS:**

*The use of computer technology in the design, development and implementation of information retrieval systems.*

| | A | B | C | D | E |
|---|---|---|---|---|---|
| Specialized Information Resource Systems<br>Development of skills, methods and operational criteria for the requirements and implementation of modern information and media center. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Specialized Media Services and Centers<br>Systems analysis and design of an instructional media services center to support information and instruction in either industry, academia or government. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Governments and Information<br>Relationships between governmental processes and the availability of public information. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Archives and Manuscript Management<br>Principles, methods, and techniques of archival management. Includes development, preservation, organization, description and service of collections. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Automated Indexing and Abstracting Systems and Services<br>Introduction to the skills of abstracting and indexing, with analysis of existing secondary services and varieties of index forms. Emphasis is on computer-based methods. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Behavior of Information Users<br>Factors affecting people's information seeking and information handling behavior. How attitude formation, perception, introduction of innovations, other social influences modify an individual's communication patterns. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Information Sharing and Transfer<br>Community and business organizations and associations as producers and consumers of information. Policies and programs for individual access to information, legal aspects, multi-instructional information sharing, expertise indexes, information counseling and referral. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Interactive Computer Graphics<br>Display devices and files. Representation and manipulation of graphic information. Graphics languages, inter-active graphics systems and image processing. | ☐ | ☐ | ☐ | ☐ | ☐ |

F. L. GRANT, CENTER FOR INFORMATION AND COMMUNICATION STUDIES, CALIFORNIA STATE UNIVERSITY, CHICO, CA 95929.

INFORMATION STUDIES CURRICULUM (CON'T.)

1. What other subjects or courses do you feel are needed to improve this program? ______________________

______________________

______________________

______________________

2. Do you have a degree program similar to this at your university/college? ____ Yes ____ No

If yes, what is it called? ______________________

______________________

In what School/Department is it located? ______________________

______________________

What are the major differences? ______________________

______________________

______________________

______________________

______________________

______________________

3. How do you feel this curriculum compares with the instructional program(s) at your University/College in the Information field (Computer Science, MIS, Instructional Technology, Information Science, Library Science, others)?

____ Better ____ About the same ____ Poorer ____ No programs in the information field

---

______________________
Name

______________________
Title and Position

______________________
Department/School

______________________
College/University

______________________
Address

______________________
City State Zip

☐ Please send me a copy of the findings at the above address.

F. L. GRANT, CENTER FOR INFORMATION AND COMMUNICATION STUDIES, CALIFORNIA STATE UNIVERSITY, CHICO, CA 95929.

A

INFORMATION STUDIES CURRICULUM (CON'T.)

1. What other subjects or courses would you feel are needed to improve this program? ______

______

______

______

2. Would you hire a person with this degree? ____ Yes ____ No

   Comment ______

______

______

______

3. What job position or title would a person with this academic training be able to fill in your company/agency?

______

______

4. Approximate starting salary range? ______

---

______
Name

______
Title Position

______
Organization

______
Address

______
City State Zip

☐ Please send me a copy of the findings at the above address.

F. L. GRANT, CENTER FOR INFORMATION AND COMMUNICATION STUDIES, CALIFORNIA STATE UNIVERSITY, CHICO, CA 95929.

# APPENDIX B

# COVER LETTER

# APPENDIX B
# COVER LETTER

**California State University, Chico**
Chico, California 95929-0502

Department of Information and Communication Studies
(916) 895-5751

Dear :

Academic curricula seem always to lag behind societal needs, especially in technological areas. Today's college students will not only have to perform with the latest equipment, techniques and procedures when they graduate, they will just be reaching the apex of their careers in the second decade of the 21st century.

The knowledge industry is the fastest growing segment of our society. It is fueled by the exponentially increasing demands of information (a product) and communication (the process of using the product).

A curriculum has been put together by a group of educators at California State University, Chico that combines the fields of computer science and the communications arts as well as a number of other disciplines. Called "Information Studies," the contributors to its development include faculty from the disciplines of computer science, mass media, instructional technology, business, education, industrial technology, mathematics, language and speech.

I'm gathering information about how the community views this proposed curriculum as appropriate in terms of skills and knowledge taught and the perception of what career positions our graduates might expect to find. Don Price, the president of Data Processing Management Association (DPMA), suggested your organization would be appropriate to review the program.

I hope you'll help me by filling out the enclosed questionnaire. I know your time is short, so I've tried to keep it brief and you don't have to do it all if you don't want to--if you just want to fill out the areas that you feel most comfortable with, I'll take it.

Your organization was selected for this survey because of its prominence. Consequently, your identity will lend greater validity to the findings. However, the questionnaire can be anonymous if you wish; simply leave the portion for name and organization blank.

The California State University

In any event, the information will be used to modify and improve the curriculum. The findings will be written up as a report, and perhaps as an article. If you want a copy of the results, please check the block at the end of the questionnaire.

If you have something to say about the curriculum and the questionnaire doesn't provide the opportunity, I'd like to hear it; just write it down and append it to the questionnaire.

If you decide not to fill the questionnaire out, please don't trash it; take just a moment to complete the statement at the end of this letter, which will simply tell me that you choose not to do it and briefly why. This will allow me to measure disinterest in the study which is as valuable as any other information I might gather.

Sincerely,

Frances L. Grant
Associate Professor

If you choose not to take part in the survey, please complete the following statement and return it with the questionnaire in the self-addressed envelope.

I choose not to complete this questionnaire because____________________

______________________________________________________________________

# APPENDIX C

# RESPONDENTS

## APPENDIX C

### Respondent's Organization

Lockheed Corp., Burbank, CA
Mellon Bank, Pittsburgh, PA
Digital Equipment Corporation, Boston, MA
State of New Jersey, Trenton, NJ
TRW, Cleveland, OH
Archdiocese of New York, New York, NY
Gatx, Chicago, IL
Delphi Comm Corporation, Inglewood, CA
Gesco, Fresno, CA
Control Data Corporation, Minneapolis, MN
Times-Mirror Corporation, Irvine, CA
Tab Products, Palo Alto, CA
Southern Pacific, San Franciso, CA
Microdata Corp., Irvine, CA
MCI Comm, Washington, D.C.
Watkins-Johnson, Palo Alto, CA
INTEL, Santa Clara, CA
New Jersey Department of Higher Education, Trenton, NJ
Charles Merril Pub, Columbus, OH
SPRINT, Burlingame, CA
Litton-Amercom Div., Melville, NY
SRI International, Menlo Park, CA
Penn State, PA
Cal Eastern Labs, Santa Clara, CA
Missouri Power & Light, Kansas City, MO
White-Westinghouse, Pittsburgh, PA
Joint Common Accreditation of Hospitals, Chicago, IL
American Tel & Tel, Piscataway, NJ
Computab, Honolulu, HI
Certified Groc., Commerce, CA
Airco Carbon, St. Marys, PA
State of New York, Albany, NY
Informatics, Canoga Park, CA
Viacom Cable, Pleasonton, CA
American Tel and Comm, Englewood, CO
Central Bank, Pleasant Hill, CA
Computer Sciences Co., El Segundo, CA
NCI, Inc., Atlanta, GA
American Satellite, Germantown, MD
Pepsi Cola, Charlotte, NC
Altec Industries, Birmingham, AL
City of Northampton, Northampton, MA
Cleveland Board of Education, Ohio
NCR, Dayton, OH
Griffiss AFB, NY
Companies not designated - 5

### Respondent's College or University

American River College, Sacramento, CA
Moorpark College, Moor Park, OH
Buffalo State, Buffalo, NY
Bryant College, Smithfield, RI
Purdue-Calumet, Hammond, IN
De Anza, Data Processing School, Santa Cruz, CA
Ohlone College, Fremont, CA
California State University, Los Angeles, CA
Albany J.C., Albany, CA
Vanderbilt, Nashville, TN
Arkansas Tech Univ, Russelville, AR
Freed-Hardman College, Henderson, TN
Oklahoma State, Stillwater, OK

Fort Hays State, Hays, KS
University of District of Columbia, Washington, D.C.
USN Academy, Annapolis, MD
Virginia Polytechnic, Blacksburg, VA
California State Poly University, Pomona, CA
University of Florida, Gainesville, FL
Loram County C.C., Elyria, OH
University of Wisconsin, Superior, WI
Middle Tennessee State, Murfreesboro,TN
Georgia State, Atlanta, GA
USCG Academy, New London, CT
Iona Colege, New Rochelle, NY
University of Hawaii, Honolulu, HI
Colorado University, Boulder, CO
Organizations not designated - 5