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VIDEOTEX IMPLEMENTATION:
TITLE: CASE STUDY AT JOHNSON CONTROLS, INC.

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VIDEOTEX IMPLEMENTATION:

CASE STUDY AT JOHNSON CONTROLS, INC.

BY

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CHAPTER I

INTRODUCTION

Electronic information retrieval and communication is a rapidly growing industry. Its impacts are being felt throughout the world by governments, public and private organizations, and individual consumers through such technologies as videoconferencing, electronic funds transfer, videotex, teletext, electronic credit reporting, corporate data communications, etc.

Of all the new information technologies being developed, videotex is emerging as one with many applications that will potentially impact a major portion of the population. Videotex has not developed in the United States as quickly as many experts expected. The emphasis on the acceptance and implementation of videotex is shifting from the individual consumer market to the business market.

As in other countries, one of the keys to the success of videotex in the United States will be its acceptance and usage in private business. As stated in the book *Teletext and Videotex in the United States*:

Although the consumer market is assumed to hold the greatest long term potential for videotex, many claim that, in the short run, it is the business market that is likely to develop most rapidly. As evidence, observers cite the experience in England, where more than 85 percent of the early subscribers to Prestel have been business. Similarly, approximately four-fifths of current sales of personal computers are to the business market.

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Looking back a few years at the introduction of personal computers, it was thought that the individual consumers would be the primary market for these devices. Time has proven this wrong. The primary market for personal computers is the business community. The individual consumer, generally, did not begin purchasing personal computers to a large degree until they had been exposed to the uses of the machines at the office. The general marketing direction of videotex in the United States seems to parallel that of the personal computer.

Noted expert in the field of information processing and telecommunications, James Martin, indicates that "Although it was designed with the residential market in mind, viewdata's initial penetration will probably be in the business marketplace. The reasons are clear. The need for timely, accurate information is more obvious and more urgent, and the market is less price sensitive." 2

Mr. Martin also states, "To operate effectively, a corporation must have good information sources and excellent communications. As world telecommunications improve, corporations will be able to tie together their national operations with corporate communication networks." 3

The evidence of the current shift in the usage of videotex from the commercially based networks to the business based networks can be found in the recent discontinuation of videotex services by Times-Mirror Company and Knight-Ridder Newspapers, Incorporated. In February of 1986, Times-Mirror Company closed its Gateway videotex services which began in 1984 and had approximately 300 subscribers in the Los Angeles area. In March of 1986, Knight-Ridder Newspapers, Incorporated closed down its Viewtron unit, a provider of home videotex information services. This company is, however, still continuing to offer videotex services geared to business. 4

A report in the April 9, 1986 edition of The Wall Street Journal identifies such companies as Rockwell International Corporation, American Express Company, Ford Motor Credit Company and others as having a private videotex system installed for some aspect of electronic corporate communications. The report makes a point that "... experts expect electronic corporate communication systems to spread as companies try to reduce paper clutter and more computer-literate employees enter the work force." 5

Many corporations now have large private communication networks spread across the United States. The physical electronic technology is installed and beginning to be used. Most of these companies, however, are struggling with how to apply this new technology to the integration and dissemination of

corporate information in a timely, easy to access manner. Dimitris Chorafas states that: "... harnessing information and its understanding will be one of the basic premises of corporate management in the 1980's: Information is management's most important resource for productivity."6

A few major companies in the United States are beginning to implement private videotex systems. These systems are being used primarily for the dissemination and exchange of information throughout the organizations. More companies are beginning to evaluate the potential and cost effectiveness of a private videotex system to meet their individual organizational needs.

Johnson Controls, Incorporated, a world-wide company with its corporate headquarters in Milwaukee, Wisconsin is one such company that is in the process of installing and testing a private videotex system. This test at Johnson Controls is part of an Information Systems research and development effort. The focus of the test is to install the videotex software, install the necessary electronic communications network, and implement a series of pilot services to introduce the company to videotex and to demonstrate the potential for cost savings and better information availability.

As part of this test, videotex terminals will be installed both locally in the Milwaukee area and remotely at select sites around the United States. The test will be a very controlled and well documented test. Johnson Controls and

IBM Corporation have entered into a joint agreement to utilize and test the videotex technology. The results of this test will determine directly whether Johnson Controls installs videotex permanently and accepts the videotex technology as a primary means for future interorganizational and intraorganizational communications.

The author has been placed in a key position for testing videotex and documenting the results. As project manager, the author will be responsible for all activities of the test and for preparing the final recommendations to management. The pilot videotex services that will be implemented will be selected from a list of candidate services that have been compiled with the assistance of several department managers and corporate executives. The specific services selected will be those that, on the surface, will potentially offer some cost savings to the corporation as well as be good services to demonstrate the functional capabilities of videotex. The author will be in direct contact with all of the videotex users. This will allow the comments, concerns, and suggestions to be received and documented on a first-hand basis. The author will also be making several management presentations and education sessions to various levels of corporate management.

**SUBJECT OF STUDY**

This study will focus on the implementation of a private videotex system within Johnson Controls, Incorporated. This study will document, firsthand, the efforts involved in planning and implementing such a system. The study will describe the pilot services that were implemented and document the
reactions (acceptance or rejection) of corporate management to the use and application of this technology in a corporate environment.

As technologies have developed, the amount of information being gathered, stored, retrieved and communicated has increased tremendously. Over the last few decades, how this information is being processed, stored, retrieved and communicated has been greatly revolutionized.

The marriage of the computer industry with the communications industry through the utilization of electronic components has allowed this revolution to take place. With the arrival of this computer revolution and the information age, the quest for office automation and a "paperless" society has brought along with it many uncertainties and challenges to business organizations.

PURPOSES AND METHODOLOGY OF STUDY

There is a driving requirement in most business organizations, especially those with many facilities in multiple locations, to implement a system that can effectively and efficiently distribute information and allow for the exchange of information throughout the organization. Videotex is being evaluated by some business organizations as a possible medium to complement their existing data communication systems by allowing for an easier and friendlier dialog between individuals and the information database.

The research method used for this thesis will be a case study conducted at Johnson Controls, Incorporated, a major U.S. Corporation headquartered in
Milwaukee, Wisconsin. Case studies have been established in the past as an effective means of conducting research in a business setting. "Case research usually concerns observations made of a person, a group of persons, an institution, an event or other phenomena.... As a minimum requirement, case research presumes to record the observations made of a single case or a limited number of typical ones."7

Good and Scates define a case study as: "The essential procedure of the case study method is to take account of all pertinent aspects of one thing or situation, employing as a unit for study an individual, an institution, a community, or any group considered as a unit."8 A case study is further identified as having several characteristics, these include "completeness of data, validity of data, confidential recording, and scientific synthesis."9

Good and Scates also identify case studies as being broken down into five steps.

Step 1: Identify the status of the situation or unit of attention.
Step 2: Collection of data, examination and history.
Step 3: Diagnosis and identification of causal factors.
Step 4: Adjustment, treatment and therapy.
Step 5: Follow-up program.10

9 ibid, p. 731.
10 ibid, pp. 733-755.
A well conducted case study will offer a sound foundation upon which
future research can build and expand. McGrath identifies the utility of case
study research to be of "unquestioned value in generating a base for ad hoc
evaluations and for designing further inquiry based on hypotheses derived from
these investigations."11 Donald Ary, et al say that "Case studies are also
frequently conducted with the primary aim of gaining knowledge."12

The communication study at Johnson Controls has been requested by three
different business units. The general manager of the Controls Unit of the
corporation has identified a need to reduce the amount of paper that is printed
and distributed to the field, for the maintenance of the volumes of technical
product installation and maintenance manuals. Currently, over one million
pages of textual and graphic information are printed and distributed annually
for this process.

A second business unit requesting a study was the Battery Unit. The
engineering and manufacturing management of the Battery Unit have identified a
need to reduce the amount of paper that is printed and distributed to the
manufacturing plants that contains the engineering and manufacturing
 specifications for each part produced. Today, an average of 78,000 pages of
 specification information are printed and distributed to the seventeen battery
plants each month for filing and reference.

11 McGrath, J. H.  Research Methods and Designs for Education. Scranton,
12 Ary, Donald, Lucy Chesor Jacobs, and Asgar Razavieh. Introduction to
1972, p. 287.
A third unit requesting such a study was the corporate unit. There are over one million pages of printed material being distributed to employees each year for normal employee relations correspondence on such topics as company performance, employee benefits, position announcements, etc. Corporate management identified a requirement to reduce the amount of paper being distributed without reducing the amount of information being distributed.

After reviewing these requests and also recognizing the need for a less costly, more timely and efficient means of communication, the corporate executives directed the Information Systems and Services department to conduct a study into the applicability of videotex as a communication medium to meet the needs of these business units as well as the potential needs of the other units of the company. Although little was known within the company about videotex, it was selected as the medium to be studied because of its reputation for being an easy to use, easy to understand, and cost effective method of communication.

The executives indicated that this study was to have two major goals. First, the study's primary goal was to gain knowledge and background into videotex and its application. The second major goal was to build a base of cost and benefit information from which management could begin analyzing the potential effectiveness of videotex.

The specific objectives of the study were developed as follows: 1) To develop a working understanding of videotex and educate management and the primary users in its usage. 2) To determine the costs associated with building a videotex network of hardware and software throughout the country. 3) Install
a pilot videotex system that would demonstrate its functionality and effectiveness as a communication medium within the company. 4) Utilize all IBM hardware, software and communication protocol as it is defined in the corporate policies. 5) Recommend to management the future directions that should be pursued for electronic information communication.

A review of recently published information regarding the status and application of videotex technology in business organizations around the world is required. A review of some of the corporations in the United States that have implemented videotex systems to identify their uses of services and their successes and failures will be conducted. Through the author's professional contacts, professional organizations and various publications, several companies currently using videotex for business applications have been identified. These companies will be contacted through telephone conversations to identify their existing videotex services, the success of those services, and the future of videotex within their organizations.

These investigations will provide the author with the appropriate information to identify the status of videotex in the current business environments. This collection of information will also provide the necessary background and history information to begin the installation of the Videotex product and the implementation of the pilot services at Johnson Controls, Inc.

The videotex services implemented will be selected to show the capabilities of videotex in areas of the organization where the primary job functions consist of internal and customer communication. As these services
are implemented and reviewed, they will be adjusted and modified to meet the communication needs in the best way possible. Through this review process, it is also conceivable that some services may be cancelled and other more appropriate services developed in their place.

This case study will take place over a six month period of time. It is recognized that certain constraints have been placed on this study by management and corporate policy. Corporate policy has dictated that only IBM hardware be utilized for business computer applications. Management has directed the project team to utilize the available IBM videotex software and the existing communications network using the IBM communication protocol for the execution of this study. These constraints limit the project team from studying and analyzing all of the other alternatives for processing hardware and software. These constraints, on the other hand, provide for a clear project scope and direction and help ensure that this study not exceed the six month time period allocated.

The author has received the necessary authorizations to document all aspects of this private study except for the descriptions and documentation of the licensed proprietary software products. Along with the author's inability to disclose any information about the proprietary software products being used, the author must also recognize the need to document this study as an impartial observer. Being the primary person responsible for conducting this study and reporting to corporate management, the author realizes that a conscious effort must be made to remove himself from the details of the study and report the factual findings. The author also realizes that because of his closeness to
the project and his corporate responsibilities, he will be unable to remain totally objective in his writing.

Ben-Ami Lipitz, in his book *A Guide to Case Studies of Scientific Activity*, cites several uses of the case study for research. One of these is the account of the design, construction, and production methods changes conducted at Whirlpool Corporation, St. Joseph, Michigan, on the Whirlpool clothes dryer. This study documents the basic components of the machine and their functions. It illustrates the changes that were made and discusses the factors affecting the programming of the design and the production cycles and identifies the results achieved.

Case studies are an effective means of research to develop a framework and foundation for further testing and study. In their discussion of case studies, David Fleckenstein, et al. say, "This method is justified in order to discover and describe new relationships which may be representative of a large number of cases, and frequently the case study method is used in the earliest stages of research to suggest working hypotheses for empirical testing."  

This documented study, and the experience gained by the author, will be available for reference by other organizations and studies into the potential use of a private videotex system in a business organization.

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ORGANIZATION OF THE STUDY

The remainder of this thesis is divided into the following chapters.

Chapter II

Chapter II provides a review of the components of videotex and a brief description of how videotex works. This chapter will review the current state of videotex in other countries with the primary emphasis being placed on applications within business organizations. The status of videotex within the United States will then be reviewed. Some of the major U.S. companies involved in the development of videotex will be identified. Emphasis will be placed on business applications in private videotex systems.

Chapter III

Chapter III will introduce the corporate case study. A profile of Johnson Controls, Incorporated will be presented as background information along with the reasons why videotex is being evaluated as a communication tool. This chapter will identify Videotex services implemented in the other business organizations that were contacted. A model of the pilot videotex services used in this case study will be presented. This discussion will cover the impact each pilot service is expected to have on the corporation.
Chapter IV

Chapter IV will highlight the details of the case study. A summary of the hardware architecture and the communications network will be presented. The final product achieved for each pilot service will be presented identifying the target areas of the organization that utilized the service. An analysis of each pilot service will be documented identifying the cost savings, organizational impact, and corporate acceptance. This will be based upon the content of each service, detailed management discussions, and potential future applications of the pilot services and other new services. The management discussions will involve a range of department managers, company vice-presidents, the president, and the chairman of the board of Johnson Controls, Incorporated.

Chapter V

Chapter V will provide the results of the videotex pilot project. The total anticipated costs and savings of videotex will be presented. This chapter will document the advantages and disadvantages of using videotex in a corporate environment. The projected impact of videotex on information distribution timeliness and effectiveness will be presented. The final decision on the long-term usage of videotex within Johnson Controls, Incorporated will be presented along with the reasons behind this decision.
Chapter VI

Chapter VI will provide an analysis of the videotex pilot project described in the previous chapters. In this chapter, the author has an opportunity to separate himself from the project and provide an objective, after-the-fact review of the project. This chapter will contain an evaluation of the results and the effectiveness of the videotex pilot project. It will also identify some of the implications for future studies of videotex use in business organizations.
CHAPTER II

REVIEW OF VIDEOTEX

Looking back over the course of human history, one can find that society has had a tendency to place labels on the events of the times. Surveying periods of history, we can identify the stone age, medieval time, the Renaissance, the ice age, the time of the Roman Empire, etc. Focusing on the twentieth century alone provides us with the great depression, the space age, and what is now becoming commonly referred to as the information age.

Society has made its way through the agricultural revolution for several centuries before entering the industrial revolution. From the industrial revolution several decades have passed and society finds itself in the middle of the computer revolution. What contributions and enhancements are being made now, after only thirty-five years of commercial applications of computers, to allow the label of information age to be placed on today's society?

This, perhaps, may be best summarized by Wilson P. Dizard as he writes:

... technology offers a wider range of information and communication resources than people have ever had. The resources are so pervasive and influential that it is now becoming clear that the United States is moving into a new era - the information age. Ours is the first nation to complete the three stage shift from an agricultural society to an industrial one and to a society whose new patterns are only now emerging. One characteristic of the new age stands out among the welter of trends. This is the increasing emphasis on the production, storage, and distribution of information as a major activity. Our strategy for organizing the transition to this new environment will set the pattern and quality of American life well into the new century.

---------------------------
As the computer technology has developed, the amount of information being
gathered, stored, retrieved and communicated has increased tremendously. Since
the early 1950's, the data that were normally stored on paper and in filing
cabinets have been transferred to electronically readable devices for use in
electronic information systems. Vincent Mosco writes: "The revolution in
microelectronics that brought us first the transistor and now the silicon chip
makes information resources the twentieth century equivalent of what coal and
oil were for the nineteenth century - the driving force behind fundamental
social change." 2

The introduction and use of electronic information systems brings with it
many important changes to the way information is handled and communicated.
Because of the lower cost of storage, more information tends to be recorded,
and the records tend to be kept for longer periods of time than ever before.
With the variations in information systems and the vast electronic
communication systems available, this recorded and stored information is
available to more people than ever before.

There are many views of what communication really is. These views,
however, generally have the common concept that meaning or information is
represented by symbols and as those symbols are exchanged, meaning is conveyed
from one person to another. In their book, Telecommunications for Management,
Meadow and Tedesco state, "Communication does not take place because one person

Corporation, 1982, p. 120.
sends a message. That message must also be received and understood...
Communication is said to be successful when a message has been transmitted and the same message received."³

Ronald Uhlig, et al, through their studies, estimate the amount of time a typical "knowledge worker" (managers and executives) spends in the communication activity is 50% to 90%.⁴ Meadow and Tedesco identify that the average manager in today's organization makes use of a wide range of communication technologies and techniques. The manager might employ face-to-face, one-on-one communication, telephone communication both internal and external to the organization, remote computer communication, teleconferencing, and printed media communication.⁵

Information, and the communication of that information is the cornerstone of all organizations. It is the flow of information and its availability that dictate the structures of organizations. Gerald Goldhaber, et al, in their book Information Strategies state the following:

From an information viewpoint, today's organization has never been more complex. Even small organizations are finding that they need more sophisticated information processing techniques; toward this end they are hiring more highly educated managers and are relying more greatly on the use of computer hardware and software technology.⁶

These authors continue their discussion of information and its impact on management and organizations by identifying management's growing inability to cope with and tolerate the effects of "information overload". They define information overload as "the total complex of information acquisition and dissemination activities that most organizations experience".  

The integration of the computer and communication technologies has made it possible for data to be manipulated, combined, correlated and analyzed to provide easily accessible information that could not have been attained without the use of those technologies. Dr. John Tydeman, an expert on new communication technologies with the Institute for the Future, identifies the joining together of the computer and communication technologies as having produced a new hybrid technology for delivering information services. The distinctive feature of this technology is the assembly of a total system comprised of information data bases, computer and communications hardware and software, and system management.  

Such an integrated system will allow people to have easy access to a variety of information. The information can be provided to a dispersed audience rapidly and inexpensively.

7 Ibid, p. 79.
This joining of two technologies has provided society with several new communication applications. Satellite communications, video conferencing, digital voice transmission, teletext, videotex, and electronic funds transfer are just a few of the new applications to surface. Most of these applications are in their development stages and their potential use and applicability in society and business are as of yet not being fully realized. The new communication applications have only scratched the surface of identifying and implementing the practical uses of these two technologies. In his book *Pushbutton Fantasies*, Vincent Mosco writes, "Human invention, the practical application of scientific principle, will surround us with limitless possibilities. We can reach out and 'touch someone' anywhere in the world; we can shape our individual environment to meet our precise desires."  

Of all of these new applications of the technologies, videotex is receiving an extremely high amount of attention in both the public and private sectors of society. Videotex and teletext are two components of an application of technology commonly referred to as viewdata. Rex Winsbury, an expert in viewdata, defines this technology in simple terms. He writes: "Viewdata revolves around one simple notion, that of linking the ordinary television set to the ordinary telephone line, so that the television set can display on its screen not just television programs, but text, figures, graphics, and pictures."  

---

Unlike many new computer communication technologies, viewdata first emerged in Europe rather than in the United States. A British research engineer, Sam Fedida, is generally recognized as the inventor of viewdata. Dimitris Chorafas identifies viewdata as basically a simple technology. It requires no elaborate data, and it uses standard components and it provides capabilities which so far have only been possible with expensive computer networks requiring a great deal of software and support by trained personnel. 11

Viewdata is a form of electronic publishing that has two basic components, teletext and videotex. Viewdata has been defined in the literature by Tydeman, et al, as "Systems for the widespread dissemination of textual and graphic information by electronic means, for display on low-cost terminals (often suitably equipped television receivers), under the selective control of the recipient, and using control procedures easily understood by untrained users." 12

The differences between the two components of viewdata is quite simple. Teletext consists of text and graphic images stored on a computer database. These images are then broadcast as a video signal and transmitted with the regular television signal on the unused lines in the vertical blanking interval. The information is cycled by the broadcast station. Access time,

the delay between requesting a page and viewing it on the screen, depends on the number of pages being cycled by the broadcast station. This is a receive only medium. (see figure 1).

Videotex also consists of text and graphic images stored on a computer database. The database design, however, is such that it permits the access and rapid retrieval of specific pages of information. The transmission lines between the information retriever and the computer include the public telephone network. This provides the ability for full two-way communication between the computer and information retriever. (see figure 2).

Author Efrem Sigel identifies videotex as having "... one very important advantage over all other forms of publishing, whether on parchment, paper or using the newer materials like microfilm, magnetic tape or even video cassettes. The distinguishing characteristic of viewdata (videotex) is that it is interactive. That means that the user does not merely receive information..."13

Figure 1: Teletext

Figure 2: Videotex
Videotex services are being offered in many countries around the world. Within each of these countries, videotex has a distinguishing characteristic which makes it a bit different from the others. Videotex offerings can be either public or private. Public videotex can be supported by the telephone utility (PTT in most European countries), by a service bureau offering, or by a value-added network (Telenet or Tymnet in the United States). A private videotex system can run on a local area network and personal computers, a dedicated minicomputer or a shared mainframe computer. A private videotex system can also utilize the same telephone utilities or value-added networks as the public systems.

The videotex systems that are being utilized throughout the world are generally comprised of three classes of services. First, there is the public database service. The information within this database is accessible by the general public. Most of the videotex implementations have this public database divided into two parts, a general interest database and a business database. The frames within the public database service are typically accessed with a cost per frame being assessed the subscriber, or a flat fee being charged for use of the information services, or a combination of both. The range of public videotex service offerings varies for each of the national videotex systems.

The second class of videotex services is the closed-user group services. In this class, the syndicate of users has exclusive access to a database. Membership to the closed-user group is based upon a fixed fee or a fee plus pay-as-you-use basis. The information within the service is itself either proprietary or of specific value to the particular paying clientele.
The third class of videotex services is in-house applications or private systems. These may be made up of informational services or interactive messaging services for national or international corporations. John Tydeman, et al, identify three main types of private videotex services emerging: 1) a stand-alone computer system ranging from a small microcomputer with a database of about 5,000 frames to a minicomputer with a database of about 180,000 frames; 2) a front-end minicomputer which operates off of a mainframe computer; and 3) a mainframe computer system itself for large videotex services or to share videotex with other corporate processing.14

Each country in which videotex exists utilizes some mixture of the above options. In the United States, videotex is in its development process. There exists several public systems and several private systems. Because the public telephone utilities are run by private organizations and because of the lack of agreement and control by the companies developing videotex systems, there is no uniform direction for the application of this technology in the United States. Tydeman, et al, state that, "It has become conventional wisdom that applications, not technology, will determine the success or failure of videotex."15

One common thread among all videotex offerings around the world is that the services and application offerings have been aimed at two major groups, the

14Ibid, p. 60.
business users and the home users. To business, videotex is primarily utilized as a database - data communication medium serving information access and information dissemination needs. For home users, current videotex offerings are based on entertainment, shopping, home banking, reservations, computer-based instruction, and so on.

In the European countries, there has been a change in emphasis over the last few years from consumer-based home use services to closed-user group and private business services. This document will not provide a detail description of the services offered by the major videotex suppliers in the United States and Europe. The services being offered are changing constantly and documenting them would quickly render this document obsolete. Appendix A contains a partial list of the videotex systems that are in use in various countries.

The diversity of approaches to the implementation of videotex in the United States illustrates one striking difference between videotex in the United States and videotex in the European countries. Unlike the European countries, the United States has maintained its broadcasting and telecommunications industries in the hands of private companies. This has been the major contributing factor in the start-up of the many public and private videotex companies in the United States since 1979. It has only been in the last few years, however, that videotex has been looked upon as a possible productivity tool to management and the business organization. There have been several companies in the United States that have discontinued their home based services while they are continuing and expanding their business services.
Along with this, several major computer hardware and software companies are now offering videotex software for sale or lease to business customers who would like to install a private videotex system within their company. The table below lists the major suppliers of complete videotex systems.

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T</td>
<td>Aregon IVS 5</td>
<td>NAPLPS</td>
</tr>
<tr>
<td>Digital Equipment Corp.</td>
<td>VAX/VTX</td>
<td>NAPLPS</td>
</tr>
<tr>
<td>Honeywell</td>
<td>Inforomow</td>
<td>Antiope Protocol</td>
</tr>
<tr>
<td>IBM</td>
<td>Videotex/370</td>
<td>ASCII/NAPLPS</td>
</tr>
<tr>
<td>Sperry</td>
<td>Videotex 1100</td>
<td>ASCII/Prestel</td>
</tr>
</tbody>
</table>

Table 1: List of videotex system suppliers.

Besides these large computer companies that offer videotex hardware and software to their customers, there are several independent software companies that market videotex software to run on a variety of computer manufacturer's equipment. Table 2 contains a listing of the major independent software companies in the United States and the types of videotex software or the services they market.

<table>
<thead>
<tr>
<th>Type of Software/Service</th>
<th>Company Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host System Software</td>
<td>Disc International</td>
</tr>
<tr>
<td></td>
<td>Formic</td>
</tr>
<tr>
<td></td>
<td>Langton</td>
</tr>
<tr>
<td></td>
<td>Videodial</td>
</tr>
<tr>
<td></td>
<td>Videotex Systems, Inc.</td>
</tr>
<tr>
<td>Frame Creation Software</td>
<td>AT&amp;T</td>
</tr>
<tr>
<td></td>
<td>Cablesshare</td>
</tr>
<tr>
<td></td>
<td>NORPAK</td>
</tr>
<tr>
<td></td>
<td>Sony</td>
</tr>
<tr>
<td></td>
<td>TCS</td>
</tr>
<tr>
<td></td>
<td>VSI</td>
</tr>
</tbody>
</table>
Videotex Installation Consulting
Arthur Anderson
Foursquare Software

Frame Creation Services
Cableshare
NORPAK
Riddick Communications, Inc.
St. Claire Videotex
TCS
Vision Information System
Voltex

Table 2: List of independent videotex software/service suppliers.

As can be easily seen, the videotex market in the United States is
developing into a very dynamic and growing industry. Virtually all of the
major computer manufacturers are positioning themselves to offer private
videotex systems to their business clients. How this is going to be accepted
by business is still unclear. What is becoming very clear, however, is that
videotex as a technology is growing in the business community. Companies and
organizations are becoming more aware of the facilities of videotex. Companies
are beginning to look at what contributions videotex can make to their
organizations and investigate its usage.

Dimitris Chorafas identifies one of the key attractions of videotex in
business is that it is very user friendly and it encourages the end-user to try
new features and to experiment with ways of getting something done more quickly
or conveniently.\textsuperscript{16} He goes on to state that the features of videotex support
the four top most considerations in regard to executive productivity and
identifies them as:

\textsuperscript{16} Chorafas, Dimitris N. \textit{Interactive Message Services: Planning,
1. The ability to communicate information through electronic managing.
2. The ability to integrate on the same intelligent workstation diverse functions spread on different mainframes and specialized non-intelligent terminals.
3. The facility to experiment on financial and operational planning with easy-to-use tools and present the results in an interactive manner.
4. The ease in reading public databases online, which is one of the pillars of the knowledge society.17

In their book Information Strategies, Gerald Goldhaber, et al, write: "A distinctive quality of those organizations that survive the highly competitive and rapidly changing environments of the 1980's and beyond will be their performance capabilities and information processing systems. Information and power will become increasingly synonymous."18

This has been a very slow process in most major corporations. There are many alternatives to apply to the need for information availability. No one of these new technologies for information access and dissemination solves all of their problems. Frank Corrado identifies that, "The new communications technologies have yet to develop a culture that replicates the textures and hues of our contemporary life. Video conferencing may never replace the 'look in the eye', the handshake, and the 'sizing-up' that comes from a personal meeting".19

In a similar analogy, videotex may never replace the hardcopy piece of paper describing a new product that is required by a marketing representative when attempting to entice a client into purchasing this product during a business meeting.

Where does videotex fit into the structure of American business? What role might it play in the application of information dissemination and information exchange? Efrem Sigel, a researcher in electronic information services states, "If it is to be developed at all, videotex must flourish as an information service, not as a technology." 20

In two separate publications written by Dimitris Chorafas, the author makes philosophical statements about the application of videotex and the new technologies in the office. He states:

Whenever we deal with technology in the office, we find that the real problems are behavioral, not technological. Perhaps no other aspect of the new computers and communications services impacts managerial acceptance as much as the effect on the traditional ways of doing business. 21

In a later publication, he identifies a goal of videotex in its contribution to the office of the 80's.

The automation of offices has not yet truly begun. Of all the possible innovations in office procedures, automated task management potentially has the greatest payoff. The thing to do is focus on

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professional and managerial personnel and make systems easy to use. That is the goal of interactive videotex.  

Videotex is one of a number of techniques for communicating that have been developed by the merging of the computer and communication technologies. It is a technique that is currently receiving much attention based upon its potential uses. The usage of these technologies is summarized well by Gerald Goldhaber, et al, when they identify that all of the major changes that are forecast for management relate to communication. They identify the computer is the primary agent of these changes, by making available to managers, today and in the future, more information about operations, markets, world trends and technological developments than their predecessors had ever conceived of.

The computer, when joined with an electronic communication medium, has the ability to reduce the time frame in which decisions are made. This creates a demand for more information to be produced and for faster delivery of that information. It also increases the amount of work that is expected to be done and the amount and type of information that is generated to support the management decisions.

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CHAPTER III

A COMPANY PROFILE AND THE
VIDEOTEX MODEL

COMPANY PROFILE

Johnson Controls, Incorporated is a diversified manufacturing corporation headquartered in Milwaukee, Wisconsin. The company employs more than 27,000 people at approximately 300 locations in 53 countries around the world and has annual net sales in excess of $1.7 billion. In the United States, there are approximately 24,000 employees in over 200 locations.

The corporate structure is broken into four major organizations; the controls group, the automotive group, the battery group and the plastics group. The controls group accounts for 41% of the annual net sales. This group designs, manufactures, installs and services both mechanical and electrical systems to control energy management, heating, air-conditioning, security, and fire safety for new and existing buildings. The controls group has 12 manufacturing facilities and 124 sales and service offices across the United States.

The automotive group represents 25% of the corporate net sales. This group designs and manufactures seating systems and foam and metal seating components for many of the cars, trucks and vans manufactured in the United States. This group also manufacturers metal and plastic components for automotive applications such as seat adjustors, window regulators, radiator
end-caps, gears and power steering reservoirs. The automotive group has 22 manufacturing plants strategically located across the United States for quick delivery of products to the automobile manufacturers.

The battery group is the largest producer of lead-acid batteries for the United States automotive replacement market. This group is also a leader in supplying original equipment batteries to the automotive industry for placement in new vehicles. The battery group represents 23% of the total annual sales volume and produces batteries for construction equipment, boats, telecommunications, security and uninterruptable power applications as well as the automotive industry. There are 18 manufacturing facilities across the United States to service customers within specific geographic regions.

The plastics group is further divided into three primary organizations. In total, the plastics group represents 11% of the annual sales and is the fastest growing segment of the company. The plastics container division is the largest supplier of one, two and three liter plastic soft drink bottles in the United States. The plastics machinery division designs and assembles plastic blow molding machinery to produce a variety of containers such as those used for motor oil, milk, industrial liquids and a range of personal care items. The third division within the plastics group designs and manufacturers metal and plastic plumbing products. In total, the plastics group is comprised of 17 manufacturing facilities around the United States.¹

¹The figures presented in the company profile represent the status of Johnson Controls as of fiscal year-end 1985 and are documented in the annual report.
As has been shown by the above company profile, Johnson Controls manufactures a very diversified product line, is spread across the entire United States and is responsible to a range of customers that stretch from the automotive giants to the small privately owned construction companies. In analyzing the exact location of each of the 200 plus facilities in the United States, there is a large concentration of facilities in the Wisconsin, Michigan, Indiana, and Ohio areas. There is, however, at least one location in every state as well as several in Canada and Mexico.

INFORMATION DISTRIBUTION PROBLEMS

Having the number of facilities located throughout the United States as indicated above has presented a major communication and information distribution problem for each corporate group. This is, however, only a piece of the problem. It also presents a major information distribution problem for several departments located at the corporate headquarters in Milwaukee who are responsible for company-wide information distribution. The information distribution problems at Johnson Controls will be reviewed from two levels. The first level will be those problems being experienced by the corporate headquarters in their quest to disseminate information throughout the organization. The second level will be at the group level. This section will focus on some of the major information distribution problems being experienced by the controls group and the battery group.

The automotive group and plastics group have intentionally been left out
of this study for several reasons, some of which are business related and some of which are geographically related. Both the battery and controls group headquarters are located in Milwaukee, Wisconsin, making it easy to interview management and discuss their problems and concerns while the other group headquarters are located in Michigan. Also, the automotive and plastics groups are relatively new entries to the Johnson Controls profile, having been acquired in mid 1985 as a part of a major acquisition of Hoover Universal and Ferro Manufacturing Corporations. The acquisition of these two companies has greatly complicated the information distribution problems and has served to highlight the need for a better, faster and more accurate means of intercompany communication.

The corporate headquarters in Milwaukee houses several departments that are responsible for distribution of information to all company locations. One department whose major responsibility is to provide information to and receive information from all locations is the benefits administration department. This department is responsible for the communication to all locations the information concerning all company benefits. They need to communicate any changes to coverages in the medical, dental and life insurance plans. This is information that is available prior to the plan changes taking place and is distributed in writing to all locations. Reminder notices are then also distributed in writing as the date of the change draws near. Information of a more time dependent nature is also distributed in writing by the benefits department. This information includes the current performance of the savings and investment plan, current interest rates for loans from the savings and
investment plan, current valuation of benefit accounts, stock performance, etc.

This information is often received in the remote locations too late for employees to react and make most advantageous use of their money. Currently, over 100,000 pages of employee benefit information are published annually and distributed to the various facilities. Delivery time of the information ranges from the same day as available for the local facilities to as much as seven to ten days for the remote facilities. The delivery is made by company trucks during their normal delivery schedules. This delivery method has proven to be very cost effective over other delivery methods but it drastically lacks timeliness.

Another department at the corporate headquarters that is responsible for distributing information to all company locations is the public relations department. This department publishes several documents containing information about the company. Included might be company performance information, major contracts received, major awards received, new facility acquisition or construction and other company related articles. Public relations is also responsible for publishing major announcements about organization changes, financial performance and other corporate happenings to the public media as well as to employees. In total, over 200,000 pages of information are printed annually and distributed via company trucks. One major problem identified is that the employees at remote locations sometimes find information out through the news media several days before they get the information through the company channels.
The controls group has its own set of information distribution problems. Each of the system service engineers throughout the country, as well as each of the 124 sales and service offices, maintains a complete set of product documents for reference. Each set of product documents has been measured to consist of 64.5 inches of paper when removed from the binders and stacked in a pile. This is approximately 30,000 pages of product information. Due to the nature of the controls products and technological advances, these documents are revised by the central engineering group several times a month. As changes are made, the documents are revised, printed and sent on the next available truck to each location where they are filed as time permits. In total, well over one million pages of information are printed, distributed and filed into their appropriate manuals annually.

The controls group also contains a training organization known as Johnson Controls Institute. The institute is responsible for developing, scheduling and conducting training courses for all system engineers, marketing representatives and those customers performing their own system maintenance. A course catalog and course schedule are published annually and distributed to the field locations, engineers, marketing representatives and customers. The printing and distribution of the course catalog involves 200,000 pages of printed information. As the year progresses, some of the changes to the course content and course schedules are made, published and distributed to the field, some changes are not communicated at all. Again, these changes may or may not be received by the customers or field personnel in a timely manner.

The battery group has some very similar information distribution
problems. The battery products are designed and engineered centrally in Milwaukee and are manufactured in the plants around the United States. As engineering changes are made to the products, new manufacturing specifications and tooling requirements are distributed to the manufacturing facilities. These specifications must then be filed in the proper book and made available for reference. Analysis of this process has identified an average of 78,000 pages of information being produced and distributed to the plants each month for engineering changes.

Also, crucial to the battery group is the communication to the battery customers for price quotations, shipping charges and the order terms and conditions. The price of batteries to customers is dependent upon several items such as order quantity, customer discounts and the price of lead. The most volatile ingredient in the formula for the customer price is the price of lead. The lead prices fluctuate quite often, thus causing changes to the customer battery price quotations. The revised quotations must be distributed to the customers in a timely manner to ensure proper pricing of orders. Currently, over 50,000 pages of information are printed and distributed to the battery customers each year for quotations and customer product bulletins.

Johnson Controls is a very large and complex organization. The intercompany and intracompany communication and information distribution requirements are complicated by the number of company locations and their disbursement throughout the United States. Several times during the past two years, the concept of electronic information distribution has been introduced in meetings that discussed various communication problems. Many times, this
concept has been dismissed as not being a practical, cost effective method of handling the specific problem being discussed.

During the last six months of 1985, the corporate executive management of Johnson Controls received requests from the general managers of the battery and controls units to initiate a project that would investigate the applicability of electronic publishing to meet the above mentioned printing and distribution requirements. These requests identified over 2.5 million pages of information that are prepared, printed, and distributed annually within the corporation. Based upon these requests and the volume of printed information identified, executive management assigned a project to the information systems and services department to investigate methods of electronic publishing, demonstrate its usage, and identify the costs and benefits associated with this technology.

WHY VIDEOTEX

The author was assigned the responsibility to manage this study and was given the authority to utilize whatever resources were required to complete the study. Besides the major goals of the project mentioned above, the corporate executives placed two major restrictions on the study as well. They stated first that the study was not to exceed six months in duration and secondly it was to focus on the elimination of paper.

The author began the project by contacting the technical representative from International Business Machine Corporation (IBM) who is assigned to the
Johnson Controls account to discuss the requirements of the project. As the discussions evolved, the technical representative became a valued member of the project team. In December 1985, the author and the IBM representative conducted an analysis of the individual requests made by the division general managers for improved communication and information distribution methods. This analysis identified many common characteristics in the needs for information distribution in the separate divisions.

There was a need in each of the areas studied to distribute large amounts of textual information to many locations throughout the country. The battery locations are mutually exclusive from the controls unit locations. However, the corporate requirement for information distribution include the locations from both units. The corporate unit and battery unit identified requirements for elementary graphics such as bar charts and line charts to show company and divisional performance. The controls unit and the battery unit identified the requirement for sophisticated graphics for detailed drawings of automotive batteries and complex engineering drawings of schematics and electronic devices. The requirements for graphics also included the requirement for text and graphics to appear together as in a technical manual or an engineering specification sheet.

Both the battery and controls units expressed a requirement to allow the ability to overlay some information on the display screen while leaving other information on the screen static. One example of this is to display an unlabelled automotive battery on the display screen. Then, as the individual viewing the display requests, overlay that battery drawing with an image of a
label to appear as if it were placed in the appropriate place on the battery. This could be done to show a customer what various label designs would look like on a battery without actually printing labels and sticking them on sample batteries for review.

Another overlay requirement was expressed for the engineering specification and the technical manuals. Many times, the text associated with an engineering diagram exceeds the capacity of one display screen. There was an expressed requirement to provide the ability to page through the text while leaving the graphic image undisturbed on the display screen. Thus a requirement to overlay text on a screen while leaving the graphics static.

All areas analyzed expressed a requirement to make whatever technique used for information distribution and electronic communication easy for the end-user to use and understand. The requirement was established for this system to be useable by everyone from the unsophisticated computer user with little or no keyboard and computer experience to the very sophisticated and knowledgeable user with much exposure to electronic devices.

A global requirement for this communication technique was placed by corporate management. This requirement was two-fold. First, since Johnson Controls already has a sophisticated electronic communications network linking its computer data centers and computer terminals throughout the country it was required that whatever technique was to be employed to distribute information, was to utilize the existing electronic network. A second network would not be purchased and set in place to support this electronic information distribution
system. Secondly, corporate management indicated that the information to be communicated must be made available for access by field personnel and customers from anywhere in the country. This requirement implies that access to the information needs to be available through either a dial-up telephone network or a satellite network with cellular telephones.

One final requirement placed on the communication process was the ability to secure pieces of information from specific end-users who may access the system. A customer should only be allowed to access the information that is pertinent to that particular customer's needs. Unauthorized users should not be allowed to enter the system at all. Product specific information should be made available to field engineers and marketing representatives only. As well as the ability to make general, non-confidential information available to all end-users.

After reviewing many of the technologies and products available for electronic communication, electronic publishing and electronic information distribution the project team found that the videotex technology appeared to be the best technology available to meet all of the above mentioned requirements. Videotex met the requirements for ease of use and understanding very well. Videotex as a technology allows for easy access through the normal public telephone system. Various levels of security and service access capability is readily available to some degree on all videotex products. Among all of the videotex products available for use, whether they are purchased and installed in-house or the services leased through a videotex service company, there are varying degrees of availability of graphic and overlay capabilities. These
differ from product to product and are dependent upon the electronic
communication protocol utilized by the product. See table 3 for a list of the
primary communication presentation protocols utilized by videotex products
within the United States.

Videotex technology was selected by the project team as the primary medium
to meet the requirements for information distribution and communication at
Johnson Controls primarily because of its ease of use features and the
availability of products to meet the networking requirements set forth by
management. Also, because of the company policy requirement to utilize IBM
hardware and software wherever it was available, the IBM videotex system was
selected as the software to be used for the remainder of the study. This
product uses the NAPLPS protocol for communication and will be installed on the
mainframe computer in the corporate data center in Milwaukee.

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Type</th>
<th>Graphics Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII</td>
<td>American Standard Code for Information Interchange</td>
<td>None</td>
</tr>
<tr>
<td>Prestel</td>
<td>British Videotex Protocol</td>
<td>Basic Alpha-Mosaic</td>
</tr>
<tr>
<td>Antiope</td>
<td>French Videotex Protocol</td>
<td>Extended Alpha-Mosaic</td>
</tr>
<tr>
<td>NAPLPS</td>
<td>North American Presentation Level Protocol Syntax</td>
<td>Alpha-Geometric</td>
</tr>
<tr>
<td>Customized</td>
<td>Various custom developed for videotex system usage</td>
<td>Range from a simple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prestel subset to detail</td>
</tr>
<tr>
<td></td>
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<td>engineering level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>diagrams</td>
</tr>
</tbody>
</table>

Table 3: Primary videotex presentation protocols used in the United States.
VIDEOTEX USAGE IN BUSINESS

A review of some of the companies in the United States that have implemented videotex systems has shown a very diverse usage of the technology. Many of the services offered on these corporate videotex systems are unique services that meet the specific requirements of each company. Yet, generally all of the services tend to fall into a few main categories of service types. There are bulletin board services, training services, documentation/manual publication services, trade show services and general information services.

This document will identify many of the videotex services that have been implemented in some companies in the United States. Since some of the companies reviewed requested that they not be specifically identified in this document, their identity will remain confidential. They will be referenced by type of industry in which they are involved only. Those companies not requesting anonymity will be identified by name as their videotex applications are reviewed.

Pacific Bell telephone company implemented videotex in January, 1984. The purpose for acquiring and implementing videotex within this company was two-fold: to acquaint them with the videotex technology through actual experience and to facilitate communication among managers within its large marketing department.

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The information obtained on the use of videotex in business was obtained through telephone interviews between the author and the primary person responsible for videotex within each of the documented organizations. The interviews were conducted in December, 1986.
The production videotex services to-date utilize the Prestel protocol and they are in the process of migrating all services to the NAPLPS protocol. Pacific Bell has several services installed on their videotex system to provide daily executive communication and messaging, company announcements, internal financial data, general telecommunications industry news, competitive assessment summaries and conference and seminar announcements. Currently, there are approximately 400 users of the videotex system utilizing 250 videotex terminals.

Pacific Bell also has plans to develop additional services to include project status reports, flow charts, organization structure diagrams, presentation graphics for slides or teleconferencing and business graphics. To provide the level of graphics capability required by these services it became mandatory that they migrate from the Prestel level of presentation to NAPLPS. Also, the marketing group is exploring ways to utilize the videotex system at trade shows as well as installing kiosks in areas of heavy pedestrian traffic such as shopping malls or business parks as value-added services. This will be one way to generate revenue for the company. Since they are a telecommunication company, they are also exploring the use of videotex in the home and the potential for offering services through their utility telephone communications network to the public as a future revenue producing service.

Digital Electronic Corporation (DEC), a major manufacturer of electronic computer and communication equipment located in Massachusetts, was reviewed. DEC has been pursuing videotex for internal services since the early 1980's and has developed their own product to meet their specific needs. Since then, DEC
is also in the process of marketing their videotex product to process on the
DEC line of computer systems for purchase by major United States corporations.

The internal videotex system installed at DEC is used to distribute
information and communicate to its employees throughout the country. The
videotex system provides many services such as electronic bookshelves,
electronic bulletin boards, news wires for closed internal user groups,
technical documentation and trade show applications. The current videotex
system utilizes the ASCII protocol, Prestel level presentation protocol, NAPLPS
protocol, and a proprietary protocol developed by DEC for use only with their
videotex system.

The electronic bookshelf services store and facilitate access to
constantley updated technical documentation. Their managers and engineers
around the country have up-to-date engineering manuals, policy and procedure
manuals, product specifications and descriptions, newsletters, training
schedules and travel guides. The electronic bulletin board services provide
general product information to over 800 field employees involved in the office
sales support activities. The bulletin board also contains an index of all
printed material within the company, its availability, and its order numbers.
With this service, employees not only access the index of company brochures,
business forms, and publications, but can order material as well. The
electronic bulletin board services are also used to distribute employee
information. These services give employees on-line information through news
flashes, employee activity announcements, seminar schedules, and other company
related information. These services have saved DEC several hundred thousand
dollars annually in printing and distribution costs.

As with Pacific Bell described above, DEC utilizes videotex at trade shows. Videotex provides for them attractive, easy to read descriptions of local restaurants, exhibitions, floor maps, and schedules of activities for most trade shows where they participate. DEC is currently experimenting with a pilot program that distributes general and business news from the Associated Press News Service as a menu selection over their corporate videotex network.

A large east coast manufacturing corporation, who requested to remain anonymous, is implementing a pilot program that will utilize videotex to distribute centrally stored information to several of its dispersed plant sites. This pilot is still in the development process but the company is actively determining how it can devise gateways from the plant mini-computers to its central mainframe systems. Because it has not yet been fully developed and implemented, actual costs and savings have not been determined. The company is however anticipating a savings in excess of one million dollars annually by using videotex over their current methods.

A major mid-Atlantic drug manufacturer, who also requested to remain anonymous, is establishing a videotex network to communicate personnel policy information to its employees. Videotex is currently being used to communicate formulations and product information to researchers located at its various facilities. The formulations are stored on one of the company's central mainframe computer systems. The company chose videotex, as a front-end interface to its existing data processing facilities, to interface with and
communicate traditionally stored computer information. The videotex system allows the chemical information to be easily shared between facilities and minimizes errors in research that were previously caused by obsolete or unknown information.

A large United States investment advisor has implemented a videotex system and is exploring the feasibility of offering information services on-line through the system. If the offering appears to possess retail potential, the company expects to offer much of its current mainframe based information research and inquiry facilities through videotex for profit. Due to the sensitive nature of this feasibility study, the company requested anonymity and would not discuss their use of videotex in any detail.

Metropolitan Life Insurance Company has implemented videotex services primarily as an electronic bulletin board and employee communication vehicle. The company estimates that each month, about half of its 8,000 home office workers utilize the system through centrally located kiosks. The videotex services allow employees to access benefit information, have retirement plan calculations performed dynamically, check their vacation and holiday eligibilities, and check on the status of their savings plans. A modeling feature within the videotex service allows employees to play "what if" to determine how different savings strategies will affect taxes, take-home pay and loan repayment plans. These services have eliminated the telephone calls to the benefits administration department requesting the benefit information. The major benefit of this system cited by Metropolitan Life was the increased employee awareness and improved communication.
Ford Motor Company has implemented a videotex system for use at its corporate headquarters. The videotex system allows the employees to review the current job postings and bulletin board announcements, update telephone directory listings, review corporate procedures and organization structure charts, and vote in a company opinion poll. All of this is available for about half of the headquarters employees right from their desks using the existing communication network. The remaining employees can access this same information from a videotex monitor located in the lobby of the building. Ford Motor Company has identified no major cost savings with this system, but considers the improved communication and the better availability of information to have had a very positive impact on employee relations.

General Motors Corporation has also implemented videotex primarily as an employee communication tool. Through this videotex system, employees can access news synopses of auto related stories, weather, stock information and various corporate announcements and features. This is available through a touch sensitive display monitor without the use of a key pad or keyboard-like device. The videotex terminals are located in central areas of the buildings for general accessibility. Improved employee relations was identified as the major benefit to the videotex system.

As can be determined by this brief review of some of the current uses of videotex within corporations, the services themselves can be quite unique. They extend from simple employee bulletin board services to sophisticated information distribution and integration with traditional data processing applications. Each company reviewed implemented videotex somewhat differently.
Each company had different objectives for the system and different long-range plans. In some companies, videotex will not be anything more than an employee communication medium. In other companies, videotex is being pursued as a potential strategic product to produce future revenues for the company.

Reviewing these companies has provided a good information base for the project team at Johnson Controls. The information obtained allowed the team to begin investigating those same areas within Johnson Controls that requests for better communication methods were developed and where other companies have implemented videotex services and appear to be satisfied with the results. Other information obtained by this review served to confirm that videotex was a practical tool for the communication of the technical documentation that is currently printed on paper and distributed via company trucks.

MODEL OF PILOT SERVICES

The model of pilot videotex service offerings developed quite slowly at Johnson Controls. The content of the model evolved and became solidified as the project progressed. At the initiation of the videotex evaluation project, the knowledge of videotex and experience with this technology for the individuals within the project team was extremely limited. Other than the project manager, who had studied videotex academically, there was no knowledge or previous exposure to videotex by the project team members.

This made it very difficult to define a model for services that could
demonstrate the capabilities of videotex and also show specific applications of videotex that would provide cost reductions to the corporation. With these two items as the project's primary objectives and a limited budget of financial resources, in January 1986 the project team began the development of the videotex pilot model.

The first task of the project team was to provide management with a base level understanding of videotex. The project team determined this to be the most important task to be accomplished. If a service were developed that would provide some basic background into what videotex is, how it is used, and some brief examples of where it could be applied at Johnson Controls, the team felt that creative management should be able to generate ideas and identify specific areas within the corporation where videotex could be applied to generate a cost savings. This strategy for developing the videotex pilot model, with the assistance of corporate management, proved successful. It not only provided the project team with a model of services to be developed, but it also generated first-hand management interest in the project because the services that were developed were some of the ones suggested by management.

Appendix B contains a summary description of each of the model services developed for this videotex pilot project. A more detailed description of each of the model services follows.

As indicated above, the first service developed would be an overview of videotex, how to use videotex, and a few examples of where it could be used at Johnson Controls. This introductory service would demonstrate the use of
colors for both foreground and background and demonstrate some of the basic
graphic capabilities of videotex. The primary purpose of this service would be
to provide a background of the videotex technology and to stimulate the
generation of ideas for the other model services by company management. Upon
completion of this service, it was planned to present its contents to various
levels of company management as a basis for the discussion of the potentially
applicable uses of videotex.

The management presentations generated very much discussion about the
capabilities of videotex and its potential applications within Johnson
Controls. Out of these discussions evolved the structure of the model of pilot
services that were to be developed. It was decided that the model would
contain five services in addition to the introductory service already
developed. These services would each address a different application within
the organization and would be in an area where management felt there was
potential for a cost reduction.

The first of the five additional services in the model was to be a
demonstration for public relations. One of the obvious uses of videotex, based
on the previous review of other companies, was for employee announcements and
bulletin boards. This service would provide a sample of some of the
information that the public relations department considered to be most required
by employees on a timely basis. The service would include the Management
Briefing newsletter, a sample of organization structure charts, and some
general information company announcements.
The second service in the model was to provide product descriptions, product specifications, and parts price lists for the field engineering personnel in the controls group. This is another application where the review of videotex usage in other companies provided excellent background. Within Johnson Controls the product descriptions, specifications, and parts price lists are printed on paper and distributed to the field where the numerous volumes of manuals are updated. The potential for videotex would be to eliminate the paper volumes and allow access to the centrally stored and maintained electronic information using the features of videotex. Such a service would eliminate the printing and distribution of copies, thus reducing cost, and it would guarantee access to current and up-to-date information from the field. This service is very similar conceptually to one that was implemented by Digital Equipment Corporation for their service representatives.

The third service to be placed in the model is to be a demonstration service for the Johnson Controls Institute. The institute is an organization within the controls group that provides training to the field engineering personnel, the marketing representatives, and customers in the use and maintenance of the company's environmental control systems. A course catalog and course schedule is published once a year with 2,500 copies being distributed to all field locations and selected customers. As the catalog or schedule changes throughout the year, few updates are provided (because of the cost involved) to the field. This results in inaccurate and unreliable information for the field management and customers to be using to perform their planning activities for training. It is hoped that videotex would allow for easy access to current course description and schedule information via a simple telephone dialog.
The fourth service in the model is a simple marketing service for the battery group. It is planned that this service will provide battery price quotations and billing and shipment terms and conditions for the customer to access directly through videotex. The major variable in determining the cost of an automotive battery is the cost of lead. Because the cost of lead fluctuates dynamically, customer quotations must be prepared and delivered on a timely basis. In today's environment, the typing of the quotation letter and price lists and delivery of the quotation by the U.S. Postal Service, in some cases is not timely enough, thus causing thousands of dollars in lost revenues for the company. This pilot service is to demonstrate the capabilities of videotex to provide a timely, easy to access information distribution system for the battery customers. Security in this service is of utmost importance. It is not acceptable for a customer to be allowed to view the quotations for another customer.

The fifth service in the model is also for the battery unit. The objective of this service is to show the graphics capabilities of videotex to display a plain unlabelled battery and then to overlay that with customer labels as requested through simple commands. This service will be designed to also demonstrate the interactive capabilities of videotex for communication to customers and potential customers by showing them the designs and placement of their labels on the automotive batteries.

These six services that will make up the pilot videotex system at Johnson Controls are to be designed and developed by the project team. Members from
each of the organizations impacted by the services would be consulted to obtain the current printed documentation, background information and all requirements for the service. The services themselves will be evaluated by the management personnel responsible for each area impacted by the pilot study as well as by general company management. Pilot videotex terminals will be placed in selected remote locations of the company. This will allow for usage and feedback from the individuals who will ultimately be utilizing the videotex system in their daily job functions. A complete schedule of the videotex study at Johnson Controls can be found in Appendix C.
CHAPTER IV

VIDEOTEX PILOT SYSTEM

HARDWARE/COMMUNICATION NETWORK

For the pilot videotex system at Johnson Controls, an attempt was made to utilize as much of the existing computer hardware and telecommunication equipment as possible. This decision was made as an effort to minimize the cost of the pilot project as well as to demonstrate the ability of videotex to fit into the current environment.

The videotex software was obtained from International Business Machine Corporation (IBM) as part of a joint agreement between IBM and Johnson Controls to test and evaluate various aspects of the software prior to its general availability. The videotex software was installed on one of the IBM mainframe computers located in Milwaukee at the Johnson Controls corporate headquarters on January 2, 1986. The information providers and end-users of the videotex system utilized IBM personal computers as their primary access devices to videotex. The personal computer was selected because these devices already exist in large quantity throughout the company, the devices support the full complement of text and graphics capability of videotex, and they can readily communicate to the mainframe computer.

The only enhancements that were made to the current processing and communications network of Johnson Controls were in the electronic communications network. Several new communication lines were installed
specifically for the videotex pilot system. This was done to provide easy access to the system from anywhere, eliminate all contention for the communication facilities from other processing systems, and to allow the project team to easily monitor the line usage and traffic.

The new communication lines installed were all standard dial-up telephone lines that fell into three categories. The first category of lines installed were digital telephone lines that passed through the company's computerized branch exchange (CBX) telephone system. This eliminated the need for a modem to perform the normal modulation and demodulation required to communicate through a telephone line. This also made videotex accessible by simply dialing a four digit internal extension number.

The second category of lines installed was a standard local telephone line. This allowed access to the videotex system from anywhere within the Milwaukee area by simply dialing a local seven digit telephone number. This line required the use of modems to perform modulation and demodulation.

The third category of lines installed was a set of toll free inbound watts telephone lines that would allow videotex access from anywhere in the country without charge. These lines also required the use of modems and were utilized by dialing 1-800 followed by a standard seven digit telephone number. Figure 3 contains a detail drawing of the hardware and communication network configuration used for the videotex pilot project.
Figure 3: Videotex hardware and communication network configuration

PILOT SERVICE DETAILS

A brief description of each of the six videotex services that made up the model for the pilot project at Johnson Controls is contained in the section labelled Model of Pilot Services in Chapter III. That section identified each
of the pilot services comprising the model and the issues that each will address. This section will serve to document the detail contents and organization of each of the pilot services to show how the issues were addressed.

The first service in the model was the introduction to videotex service. Figure 4 shows the general tree structure of the service and its contents. The first page of the service is the main menu. The menu provides for three options for movement to the details of the service. Option one goes to several informational pages that describe the videotex technology, background into the history of videotex, and some short description of the uses of videotex in business and the commercial environments.

Option two provides the end-user with a glossary of some basic videotex terminology. The definition of each term is directly accessible by the end-user keying the term on the keyboard. This option also provides a description of the usage of each of the special function keys that are useable on the personal computer keyboard.

The third option from the menu provides some examples of potential uses of videotex at Johnson Controls. It shows sample excerpts from the Management Briefing newsletter that gets printed and distributed to all managers and supervisors within the company. This option also contains samples of general public relations communications that are printed and distributed to all employees, as well as some graphic representations of the actual first quarter 1986 company performance.
In total, this service is made up of forty individual frames of information. Figures 5 through 8 contain some sample frames from this videotex service.

Figure 4: General structure of the introduction to videotex service.
1 VIDEOTEX CONCEPTS

2 VIDEOTEX COMMANDS

3 USAGE AT JOHNSON CONTROLS

Figure 5: Main menu frame from the introduction to videotex service.

Videotex is a new communications medium that delivers information from the host computer in the corporate data center in Glendale, WI to any user of an IBM personal computer.

The basic premise of videotex technology is that it requires no special training to use, and it utilizes the public telephone network to deliver the information.

Videotex makes use of the characteristics of the personal computer to display text information enhanced with color graphics.

Figure 6: A sample frame from the videotex concepts topic of the introduction to videotex service.
HELP displays additional information on a help frame. The help function may be made up of one or several help frames as appropriate.

To exit from the help function the subscriber presses HELP (F1) again and is returned to the frame on which HELP was pressed.

Figure 7: A sample frame from the function key descriptions of the introduction to videotex service.

The massive Central Arizona water project controlled by our JC-5000 digital system went into operation in November. The sophisticated system controls water flow along the initial 190-mile leg of the aqueduct using 92 remote units that feed information to the central computer. The system transports water from the Colorado River to three million people and one million acres in central and southeast Arizona.

Figure 8: A sample frame from the potential usage topic of the introduction to videotex service.
The second service that was developed from the model was the JCI News service. It was generally recognized by all of management that this was an obvious usage of the videotex technology. Interviews were conducted with the public relations department to determine what publications would be best served by videotex. Three sample areas were selected to implement into the pilot system. These were selected based on current printing costs, accuracy of the current information, and timeliness of information delivery. The general tree structure of the service appears in figure 9.

The first page of the JCI News service is a main menu providing three options for proceeding to the detail information. The first option consists of actual information from the Management Briefing newsletter. Several articles from the newsletters were placed on videotex with a menu containing an index of each of the articles for review. All the end-user needs to do is select an article from the menu and that article will be displayed on their screen.

The second option consists of a structure chart of a subsection of the corporate organization. Each page contains the names and titles of the people within an organization and the manager to whom they report. Graphic characters were used to illustrate the reporting relationships on the screen. This option contains the ability to sequentially page through the organization hierarchy or to select a specific organization for viewing by keying the manager's last name on the keyboard. The third option consists of a series of public relations announcements made to employees for general distribution.
This service was made up of 53 individual frames of information for viewing. Figures 10 through 12 contain sample frames from the JCI News videotex service.

Figure 9: General structure of the JCI News videotex service.
1 MANAGEMENT BRIEFINGS

2 ORGANIZATION STRUCTURES

3 COMPANY ANNOUNCEMENTS

Select one option and press Enter.

Figure 10: The main menu frame from the JCI News videotex service.

Sears has introduced our Incredicell Diehard motorcycle battery.

The unit is produced in two different sizes by the Industrial Products Unit of our Battery Division.

The units feature an immobilized electrolyte system that makes it spill-proof and maintenance-free.

calcium alloy grids that eliminate the need for charging during the

all-season, heavy-duty metal terminals

and cold-cranking rates of 150 to

155 amps.

Figure 11: A sample frame from the Management Briefing segment of the JCI News videotex service.
The third service to be developed from the model was the product specifications service for the controls group. This service proved to be much larger and more complex than the first two services. This service was developed from selected sample pages of the actual printed engineering specification manuals that are used by all engineering and service personnel in the field. This service was developed as a pilot primarily because of the difficulty in maintaining the currency and accuracy of the hundreds of copies of manuals currently in the field. Figure 13 contains the general tree structure of the product specifications service.

The first page of the product specifications service again was the main selection menu that listed the possible options for selection and navigation.
through the service. This frame contained five options for review. The first three options were to allow for the selection of a specific product for review. The fourth option was to allow for a review of the standard construction materials that are available for use during maintenance. The fifth option was for the selection of the standard price list of materials for over the counter sales to customers and maintenance technicians.

The first three options were broken down into a similar format. The selection of any of these three options provided the end-user with another selection menu from which they could retrieve detailed information about that particular product. Some of the detailed information available includes a description of the product, mounting, operating and adjustment instructions, a listing of different models available and their accessories, technical specifications and a list of repair parts. The sample of products placed on this service includes a pneumatic piston damper actuator that is used to accurately position a damper in the environment control system, a pneumatic room thermostat, and a control loop processing unit. The details for each of these products is highly technical and is generally accompanied by a diagram illustrating various components and details.

The list of standard construction materials option, when selected, proceeds to a more detailed menu categorizing the construction materials by type, such as elbows, tees, couplings, tubing, clamps, etc. Proceeding to any of these categories is possible by either keying the category keyword or by selecting the appropriate option from the menu. Each category contains a simple diagram of the part, and the various part numbers, sizes, and packaging
quantities available for that category. This detail information can also be accessed directly by simply keying the part number into the keyboard directly.

The price list option begins by stating the pricing policy on the first frame followed by a listing of parts, a description and the price in part number sequence. If the part number is already known, it could be keyed into the keyboard to directly access the frame that contains the part information.

In total, there are 83 frames available in this service for viewing. Figures 14 through 17 contain sample frames from the product specifications videotex service.

Figure 13: General structure of the product videotex service.
1. D-251 Pneumatic Piston Damper Actuator
2. T-4000 Series Adjustment Data
3. Loop Processing Unit (LPU)
4. Standard Construction Materials
5. ATC Price List

Figure 14: The main menu frame from the Product videotex service.

1. Description
2. Sensitivity Adjustment
3. T-4000 Range of Remote Realignment
4. Set Point Adjustment

Figure 15: The menu for the T-4000 thermostat from the Product videotex service.
1. Tubing Clamp
2. Sealing Cap
3. Urethane Tubing
4. Spring Insert
5. Coupling
6. Elbow Coupling
7. Tee Coupling
8. Adaptor
9. Adaptor Elbow
10. Adaptor Tee

<table>
<thead>
<tr>
<th>Adaptor Elbow (size in.)</th>
<th>Code No</th>
<th>Quan/ Pkg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barb x M.P.T.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4 x 1/8</td>
<td>F-500-41</td>
<td>100</td>
</tr>
<tr>
<td>3/8 x 1/8</td>
<td>F-500-36</td>
<td>100</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barb x F.P.T.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4 x 1/8</td>
<td>F-500-42</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 16: The menu for standard construction materials from the Product videotex service.

Figure 17: A sample frame from the standard construction materials segment of the Product videotex service.
The next videotex service to be developed was for the Johnson Controls Institute. This service contained information from the course catalog, currently published on paper and distributed. The first frame of this service was again the main menu. This menu contained three options for selection, general institute guidelines, factory trained system engineer course information, and system representative course information. The Institute service was designed to not only provide the detail course information electronically, but also to provide for the on-line registration for any course, directly through videotex. The general tree structure for this service can be found in figure 18.

The first menu selection, general institute guidelines, presents the end-user with a lower level menu from which to select policy information, enrollment information, general prerequisite information, travel and housing information and course cost and evaluation information. A selection of each of these options provides the user with the institute's policies and procedures in each area.

The next two main menu options are designed very similarly. The second option, when selected, proceeds to a lower level menu frame listing the courses intended for the factory trained systems engineers. The third option, when selected, proceeds to a lower level menu frame listing the courses intended for the systems representatives. The further breakdown from this point in both option paths is identical. When the user selects the appropriate course that he/she is interested in, a detailed selection menu appears on the screen. From this menu, the user can selectively view the course objectives, intended
audience, course description, homework information, course prerequisites, course duration, class size, primary contact at the institute for the course, and the course schedule.

When the end-user is viewing the course schedules, he/she can proceed to the registration service directly by pressing a function key on the keyboard. The registration service will prompt the user to enter the appropriate information for course registration and electronically communicate that information to the institute in Milwaukee for processing.

In total, twelve courses were implemented into the service. This service for the institute was made up of 172 videotex frames and was made available for usage at the midwest regional office in Milwaukee and the southwest regional office in Houston. This service was also available to Johnson Controls Institute to process the registration requests. Figures 19 through 24 contain a sampling of some of the frames from the Johnson Controls Institute videotex service.
Figure 18: General structure of the Johnson Controls Institute videotex service.

1. General Guidelines

2. Factory Trained Systems Engineer (DSC)

3. System Representative (SRS)

Select an option and press enter.

Figure 19: The main menu from the Institute videotex service.
1. General Information
2. Enrollment Information
3. Course Prerequisites
4. Travel and Housing
5. Cost/Evaluation Information

Select an option and press enter.

Figure 20: The guidelines menu from the Institute videotex service.

1. 628 - JC/85 Field Gear Maintenance Course
2. 629 - JC/85/40 Front End Maintenance I Course
3. 630 - JC/85/40 Front End Maintenance II Course
4. 631 - JC/85/40 Software Structure Course
5. 643 - DSC 8500/1000 Installation/ Hardware Maintenance Course
6. 648 - HVAC Systems - Concepts Course

Select an option and press ENTER.

Figure 21: The course menu for system representatives from the Institute videotex service.
JC/85 Field Gear Maintenance Course

1. Course Objectives
2. Intended Audience
3. Course Description
4. Prerequisites
5. Duration/Class Size/Contact
6. Course Schedule

Select an option & press ENTER.

Figure 22: The menu for course 628 from the Institute videotex service.

JC/85 Field Gear Maintenance Course

Schedule

July 7-10, 1986
September 8-19, 1986
October 20-31, 1986

Press F8 to request course registration
Press F2 to return to course menu.

Figure 23: The schedule for course 628 from the Institute videotex service.
Request for Course Registration

Last Name: <
First Name: < Initial: <
Title: 
Company:
Street Mailing Address:

City: < State: <
Zip Code: <

Type information and press ENTER.

Figure 24: The course registration frame from the Institute videotex service.

The next two services of the model were developed for the national marketing group of the Battery Division of Johnson Controls. The first service to be developed for the marketing group was a battery price quotation service for selected customers. The requirements for this service were to allow for customers to call into the videotex system and access their specific terms and conditions statements, junk battery buy-back procedures and their battery price quotations based on the current price of lead. The marketing group also requested that a newsletter be a part of each customers service so that special promotions and other marketing information could be communicated easily. The general tree structure for the Battery Quotation service appears in figure 25.

The Battery Quotation service was developed a bit differently from other
services in the model. Upon accessing the service, the end-user is required to
browse through a three frame newsletter prior to viewing the main quotation
menu. This ensures that the information communicated in the newsletter is not
inadvertently bypassed as the customer reviews his quotations. After paging
through the newsletter, the main menu appears on the screen. The main menu
contains three selection choices, terms and conditions, junk battery policy,
and the quotation of prices.

Upon selection of the terms and conditions option, a lower level menu
appears allowing for the selection of lead cost and lead level information,
pallet stacking and cost information, freight rate information and freight
terms, and payment terms.

The second option from the main menu presents the junk battery buy-back
policy as it pertains to this customer. This policy changes for each customer
based upon the volume of batteries recycled from the customer, the cost of lead
and the smelting cost to recapture the lead from used batteries.

The third option from the main menu is the price quotation itself. The
price quotation groups batteries by size (electrical capacity), by decorated
(labels pasted on) and undecorated, and by wet (already contains acid and
electric charge) and dry. The quotation is issued as a price per battery for
each of the categories of wet, dry, decorated and undecorated.

The size of this service varies for each customer depending on the
complexity of their terms and conditions and the variety of batteries they
purchase. Services were developed for two customer and consisted of 54 frames and 25 frames each. Figures 26 through 29 contain sample frames from the battery quotation videotex service.\footnote{The customer name has been removed from these frames to protect the confidentiality of their content.}

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Figure 25: General structure of the Battery Quotation videotex service.
1. Quotation Conditions
2. Junk Prices
3. Running Change Items
4. Color Code Key
5. Price quotations
   (April 1, 1986)

Figure 26: The main menu from a customer battery quotation.

1. Lead Level
2. Pallet Cost
3. Freight Rate
4. Freight terms / Payment Terms

Figure 27: The quotation conditions menu from the Battery Quotation videotex service.
Junk Pricing:

With the continuing decline of the market price of lead, the value of junk batteries has steadily decreased.

The published February lead average of $29.41 has once again caused our price calculation to drop to a negative junk value for the month of April.

Until such time as our formula again provides a positive number, we will discontinue any credit allowance on junk.

Figure 28: A junk pricing frame from the Battery Quotation videotex service.

<table>
<thead>
<tr>
<th>BCI Group</th>
<th>Part Number</th>
<th>Billing Price</th>
<th>Lead Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>21-656</td>
<td>$29.72</td>
<td>0.219</td>
</tr>
<tr>
<td>21F</td>
<td>21F-656</td>
<td>29.72</td>
<td>0.230</td>
</tr>
<tr>
<td>22F</td>
<td>22F-60</td>
<td>24.27</td>
<td>0.226</td>
</tr>
<tr>
<td>22F-50R</td>
<td>22F-50</td>
<td>21.36</td>
<td>0.196</td>
</tr>
<tr>
<td>22F-40</td>
<td>22F-40</td>
<td>20.30</td>
<td>0.177</td>
</tr>
<tr>
<td>22F-30GT</td>
<td>22F-30GT</td>
<td>18.13</td>
<td>0.156</td>
</tr>
</tbody>
</table>

Figure 29: A sample battery quotation frame from the Battery Quotation videotex service.
The second service for the battery marketing department consisted of primarily graphic frames with little text. The requirements for this service were to provide a drawing of an undecorated (not labelled) battery from 3 views, top, front and forty-five degrees off the upper front corner. This was also required to be an interactive service so the end-user could change the colors of the battery displayed on command and also key a label number on the keyboard and have the indicated label overlaid upon the battery image in the appropriate place.

Because of the interactive nature of this service, it does not follow the traditional tree structure, menu driven approach to videotex services. The first frame of the service instructs the end-user to key a color for the battery cover. Upon keying this color, a top view of the battery appears on the screen and videotex prompts the user to enter a label number to be displayed. That label is then placed over the battery image. Different labels can be selected and overlaid as necessary.

When completed with the top view of the battery, an undecorated front view is displayed and again the user is prompted to enter a label number. This label is placed over the battery image similar to above. Again, different labels can be selected and overlaid as necessary.

When completed with the top view and the front view, a function key on the keyboard is pressed and the top front corner, forty-five degrees view is displayed showing the final selection of top and front battery labels. This service is extremely complex and was developed with a limited number of labels
for the pilot model. The intent was to demonstrate how videotex could be used as an interactive marketing tool to demonstrate various options to a customer using interactive electronics rather than paper and pencil.

ANALYSIS OF PILOT SERVICES

The complete model of pilot services was developed and implemented over a ten week period. After the services were implemented, they were made available for usage by the various organizational areas associated with the study. The battery marketing department presented the concept to selected customers for their impressions of the new communication medium. Johnson Controls Institute established the regional offices in Milwaukee and Houston as test sites to obtain actual feedback from usage for course registrations. All of the pilot services were presented to various levels of corporate and divisional management for their ideas and comments. A final presentation was made to the Chairman of the Board and Chief Executive Officer of Johnson Controls and his staff to introduce them to the videotex technology and the concept of electronic communication.

The entire videotex project and study was aimed at two major objectives. The first objective was to introduce this technology and communication medium to the management of the company to make them aware of what currently exists to facilitate the communication process. The project team was responsible for educating management and providing them with a strong basic knowledge of videotex and its applications through the presentations of videotex and other
discussions. The second objective was to determine if a company such as Johnson Controls, which appears on the surface to be a perfect candidate for videotex usage, can actually generate enough cost savings annually to justify the added hardware, software and network cost associated with implementing a videotex system.

Each of the pilot services was addressed and discussed with these two goals in mind. The JCI News service for the public relations department generated a lot of discussion and interest. All of management agreed that this was a natural application for videotex. The director of public relations commented "this would be an ideal tool for distributing information to employees. I don't see my area, however, generating much cost savings". The Management Briefing newsletters, company announcements, financial profiles, etc. could all be communicated through videotex. Other services for communicating position announcements, company benefits, a corporate overview for new employees, and a personnel directory were all discussed as potentials for implementation on videotex.

The cost savings to public relations after implementing these services would amount to $5,000 to $7,000 annually. This covers the cost of printing and distributing the documents. Additional costs incurred by public relations would be $10,000 to $12,000 for the purchase of hardware and software to allow that department to become information providers to the system. The intangible savings to the company would be timely information received at all locations.

The product specification service was identified as not being a
particularly good application for videotex. There were two primary reasons why it was felt that videotex was not the tool that could best communicate this information. Videotex has a restriction that allows forty characters to be displayed across a screen with twenty-four lines of information displayed down the screen. The Management of the Controls Unit determined that not enough information could be placed on the screen to effectively communicate the detailed technical information contained in the manuals. Management also indicated that the NAPLPS standard did not provide a fine enough graphic resolution to accurately display the engineering level diagrams that are contained in the manuals. They indicated a very definite need for detail graphics capabilities.

Other portions of this service fit well into the videotex structure for communication. The standard construction materials and the price list as implemented in the pilot system proved to be well suited for videotex. It would not, however, be effective from a cost or an information access perspective to separate these two items from whatever medium is developed to communicate the remainder of these technical manuals. Other means of electronic communication or modified videotex will need to be reviewed.

The Johnson Controls Institute service was found to be the best model service suited for videotex. Videotex was found to be an excellent medium for communicating registration requests to Milwaukee. The request could be received in Milwaukee immediately, eliminating the costs of postage and handling. Videotex, however, would not suffice to be the only method for communicating the course catalog and schedules. The catalogs and schedules are
mailed to individuals today who do not have ready access to the hardware for communication through videotex. It was felt by the management at the institute that they could cut the publishing and distribution costs by fifty percent, or approximately $20,000 immediately with the remaining fifty percent being realized over time.

This would require two methods of publishing information by the institute, paper publishing and electronic publishing. The institute management also determined that implementing the institute service on videotex would offer no short term cost savings. The paper publishing costs saved by videotex would be offset by the additional efforts required by the institute to become an information provider and publish the information electronically. It was recognized that there would be substantial long term cost savings when all paper publishing could be eliminated. The institute director indicated "Videotex is what we need to display a high-tech image out in the field. It could eventually save a lot of time and effort in course registration. It will, however, need to be implemented over time".

The price quotation service for the battery division marketing department also proved to be an effective application for videotex. The customers contacted agreed this would be a superior method for communicating to them. The customer found videotex easy to use and it would guarantee timely and accurate information. Management calculated that the implementation of the quotation service would provide a total cost savings of $3,000 to $5,000 each year. It was also determined that customer goodwill, customer satisfaction, and Johnson Controls company image would all be enhanced with such a tool.
The price quotation service became the source of inspiration for several potential videotex services within the battery division. These services would communicate information between the divisional headquarters and the battery manufacturing plants and between the divisional headquarters and the battery customers. Table 4 contains a list of some of the potential videotex services and the organizations that would be impacted by them. Due to the time constraints placed on this study, these services were not analyzed in detail to determine any cost savings associated with them. They have been identified as areas of future study and consideration.

<table>
<thead>
<tr>
<th>Service</th>
<th>Organizations for Access</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plants</td>
<td>Headquarters</td>
</tr>
<tr>
<td>Freight Rate Charts</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Promotional Program Instructions</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Customer Line Specification Changes</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Engineering Specification Changes</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>New Product Announcements</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Customer Program Bulletins</td>
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<td>X</td>
</tr>
<tr>
<td>New Customer Targets - Sales Goals</td>
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<td>X</td>
</tr>
<tr>
<td>Private Label Club Materials</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Customer Product Order Sheets</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Technical Bulletins</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Marketing Standard Procedures Bulletins</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Table 4: Identified potential future battery division videotex services.

The interactive graphics service for the battery division also proved to be an excellent application for videotex. The analysis of this service found it difficult to associate any actual dollar cost savings with its usage but the marketing group indicated that the potential for usage was staggering. This service could be used with the customer to display various label designs on a battery without ever printing a label. It can show various colors of labels
without the efforts of redrawing the label. Because the images are drawn and
stored electronically, they can be manipulated, enlarged, reduced, or rotated
without ever redrawing the image. In the short period of time allowed for this
pilot study, it was not possible to investigate and document the dollar savings
associated with this service.

The analysis of this service did identify other areas of usage and
potential dollar cost savings for it. Once the final battery and label designs
become approved by the customer, the NAPLPS videotex frames can be transferred
directly to a publisher's typesetting software for the production of brochures
and posters. This would eliminate the need for much of the manual layout and
design.

The battery graphic service could also be utilized in the manufacturing
plants where the labels are actually placed on the batteries. The worker on
the plant floor could enter the label number required into videotex to display
an actual image of the label. Videotex could also place that image onto a
battery image showing the plant worker exactly where to place the label on the
batteries that are to be decorated and shipped. It was management's opinion
that the image of the label and its placement on the battery would eliminate a
large amount of time used now to locate the proper label in the storage room.
A part number and an image of the label would reduce the number of times the
wrong labels are selected because the part number itself was misinterpreted.
The videotex image would also minimize the misplacement of labels on the
battery. The marketing vice-president stated "This videotex service could
create a whole new atmosphere on the plant floor. It could make the workers
more effective and much less prone to errors".

This graphics service appears to be useable as a foundation service for several additional uses. The project team has recommended that this service be analyzed in detail to determine its overall impact on the current procedures throughout the battery division and identify any cost savings that will be realized from it.

Management's involvement and willingness to openly discuss concepts and ideas for this videotex pilot project was most admirable. There was a very real interest, at all levels, in pursuing the potentials of this new technology within the Johnson Controls organization. There was also a very keen awareness of the costs and efforts associated in implementing such a communication tool throughout the organization. Management played a very important role in balancing the desire and willingness to implement this new technology with the corporate business need to financially justify the efforts involved through tangible cost savings. Johnson Controls is a very successful, forward thinking company that is willing to invest in new technology when it is determined that this technology is an improvement to the business. Chapter V will document the final results of this videotex pilot project.
CHAPTER V

RESULTS OF VIDEOTEX PILOT PROJECT

VIDEOTEX COSTS

An analysis, by the project team, of the costs associated with implementing a videotex system within Johnson Controls has identified the total cost of videotex to be quite high. Generally, the base price of videotex system software that is available to run on a corporate mainframe computer ranges from $30,000 to over $100,000. These videotex systems are designed to process on various types of computer hardware. The videotex system selected for testing at Johnson Controls was provided by IBM and is designed to process on the company's existing IBM mainframe computer. The purchase price of this videotex software is $75,000. Along with this cost is an annual fee of $11,000 for continued support and maintenance of the videotex software. The IBM product was selected because of a corporate policy statement identifying IBM as the company's primary computer hardware and software product and because IBM provided the videotex software to Johnson Controls at no cost for the duration of the study.

In implementing any videotex system, there are other costs that may be easily overlooked. The first cost considered at Johnson Controls was the cost of additional telephone line requirements for user access. Two possible network configurations were presented. The first was a network of dial-up telephone lines that could be utilized from all facilities of the corporation. It was determined that the installation of toll free in-watts telephone lines would be the best choice. For the more than 200 locations of Johnson Controls,
along with the need for customers and field personnel to have telephone access with the least possibility of any location receiving a busy signal when calling, it was determined that a minimum of 120 in-bound telephone lines would be required. The current AT&T cost of a toll free in-watts telephone line is $150 per month. This extends to a total monthly cost of $18,000 for the telephone lines or $216,000 each year. Each of the telephone lines also has a $40 installation fee associated with it for a total installation cost of $4,800.

Each telephone line that would be installed for videotex would also require a modem to be attached to it to provide the modulation - demodulation required for communication. The price of a modem is about $100. This figure was used for calculation recognizing that a volume purchase of 120 modems would probably result in a ten to twenty percent discount off that price. The total purchase cost of modems would be between $9,600 and $12,000 depending on the discount received.

In the environment at Johnson Controls, one other item was required to facilitate the electronic communication process. A device known as a protocol converter was required. A protocol converter will support eight in-bound telephone lines and performs a conversion from the ASCII format of characters transmitted from the personal computer to the system network architecture format required by the corporate mainframe computer. Fifteen protocol converters would be required to support the 120 telephone lines. At a purchase cost of $5,000 for each protocol converter, a total cost of $75,000 is anticipated.
The project team made the assumption in the cost analysis that each facility of Johnson Controls already had a personal computer and a modem installed for access to the videotex system. This assumption resulted in a determination that there would be no cost associated with a facility to access the system.

The total cost for this configuration option of videotex is as follows:

- Initial purchase cost for hardware, software, and telephone lines: $166,800
- Annual fees for software and telephone line maintenance: $227,000

A second configuration option was analyzed by the project team to provide a cost comparison. This second option provided for the usage of the private communication network already installed at Johnson Controls. Each of the over 200 facilities is already connected to the mainframe computer by privately leased, high speed telephone lines. By utilizing this existing network, the analysis determined that most of the toll free telephone lines would not be required. Some would still be required to provide for dial-up access from the field and for customers.

In the analysis of this second configuration for videotex, there would be no change in the cost of software. The purchase price of $75,000 and the annual maintenance fee of $11,000 would still apply.

The number of toll free in-watts telephone lines would be cut from 120 to
20. The telecommunications analyst on the team felt this would provide adequate access. The installation cost of 20 lines would be $800. The annual usage fee would be $36,000. These calculations utilized the same cost figures as in the first configuration.

Along with the number of toll free telephone lines, the number of modems required would also be 20. This would result in a total modem cost of $2,000.

In this configuration option, the number of protocol converters required would increase dramatically. Three protocol converters are required to support the toll free in-bound telephone lines. An additional protocol converter would be required in each of the facilities to provide the conversion of the data format prior to entering the communication network. A total of about 210 protocol converters would be required. A cost of $5,000 was again used for each protocol converter recognizing a discount could be negotiated because of the volume purchase. The total cost for protocol converters would be $1,050,000.

The total cost for the second configuration option of videotex is as follows:

- Initial purchase cost for hardware, software, and telephone lines. $1,127,800
- Annual fee for software and telephone line maintenance. $47,000

As can be seen from the above analysis, the cost of videotex to Johnson
Controls over a three to five year period is in excess of $1 million. Other options for hardware and software could be pursued that would eliminate the cost of protocol converters. These options, however, would add the cost of an additional mini-computer or mainframe computer to the study. The time constraints of the study prohibited the project team from pursuing these other options in detail. Table 5 shows the comparison of the dial-up telephone option with the option utilizing the existing network and extends both costs out five years.1

<table>
<thead>
<tr>
<th>Option</th>
<th>Initial Cost</th>
<th>Annual Fees</th>
<th>Total 5 Year Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toll free dial-up telephone network</td>
<td>$ 166,800</td>
<td>$227,000</td>
<td>$1,301,800</td>
</tr>
<tr>
<td>Utilization of existing communication network</td>
<td>$1,127,800</td>
<td>$ 47,000</td>
<td>$1,362,800</td>
</tr>
</tbody>
</table>

Table 5: Cost comparisons for videotex implementation configurations.

VIDEOTEX SAVINGS

Chapter IV indicated some of the savings that were projected for each of the pilot services in the study. When compared to the costs involved in implementing a complete videotex system, these savings are trivial. From analysis of the pilot services, an actual savings of less than $20,000 per year could be readily identified. To identify further savings, a more detailed analysis of the pilot services and other potential videotex services would be required. To perform this analysis effectively, additional time and resources would need to be allocated to the videotex study.

1The costs identified are the actual equipment costs from the primary vendors utilized by Johnson Controls as of July, 1986.
The executive management of Johnson Controls recognizes that more time needs to be devoted to the study of videotex. In the executive presentation, the chief executive officer of the company stated "This technology offers much potential. It could give Johnson Controls a competitive edge in the industry. We need to study this further and begin implementing the technology in these areas where we see the most payback for the company".

**VIDEOTEX ADVANTAGES AND DISADVANTAGES**

The implementation of videotex and the pilot services in this study served to help identify, through practical experience, many of the advantages and disadvantages of videotex. All of the advantages of using videotex over paper for communication that are documented in the text books and published articles hold firm.

Videotex provides for the access of information immediately after it is supplied to the system. There is no waiting for the printing and distribution lead times. Videotex is a very easy to use and easy to understand interactive computer system. The time required to train the users of the pilot services averaged about 20 minutes. The average user of the pilot services had no knowledge of videotex, but did have a basic understanding of the usage of the personal computer and had used the personal computer for spreadsheet or word processing work.

The time required to train an information provider to use the software for
frame creation and to make those frames available to videotex averaged about 1.5 days. The individuals trained as information providers were also users of a personal computer with no prior knowledge of videotex. Once trained, the information providers felt comfortable creating frames with the software after they had actually created six to ten frames.

Videotex proved to be an excellent communication medium to quickly and efficiently distribute information throughout the country to employees and customers. The timeliness of information availability is immediate. This is a tremendous advantage over paper communication. Videotex also provides an image of "hi-tech" to its users. This is important to a company like Johnson Controls whose products are in the forefront using the latest technological developments. The use of videotex for customer communication would serve to enhance the progressive image of the company.

There are also some disadvantages associated with the use of videotex. They are few in number, but are major enough that they must be considered when planning for the implementation of videotex. For a corporation as large and spread out as Johnson Controls, the basic costs associated with the implementation of videotex are very high, as indicated in the cost analysis. For a smaller organization, or an organization with several facilities that are not as geographically disbursed, the initial cost of videotex implementation would be considerably less. A major disadvantage to implementing videotex at Johnson Controls is the initial cost.

Another disadvantage to implementing videotex is that to obtain maximum
return on the investment, videotex must be implemented across the entire
organization. To save some of the initial expenditure by implementing videotex
in only one portion of the organization would result in duplication of effort
involved in preparing information for communication through videotex and
through the traditional paper methods. The total initial cost must be expended
in order to receive sizable cost paybacks.

The final disadvantage of videotex is that no one or two applications
implemented under videotex could generate enough cost savings to justify the
expense of implementation. It was recognized by the corporate executives that,
in the long-term, videotex would provide a substantial payback to the company.
In the short-term, however, videotex provides considerable cost with little
payback. The more applications and services that can be installed into
videotex will provide for more cost effective use of the product. The
president of Johnson Controls commented "It will take at least three years
before any recognizable payback can be achieved. What can be done to implement
this technology so that significant savings can be recognized sooner?".

FUTURE OF VIDEOTEX AT JOHNSON CONTROLS

The three disadvantages to videotex mentioned above were of major concern
to the management of Johnson Controls. An expenditure of the amount indicated
must provide a payback within a three to five year time frame. The time
allocated for the videotex study and the implementation of the pilot services
was not adequate enough for a complete and conclusive analysis of the
effectiveness of videotex technology implementation at Johnson Controls.

Upon the conclusion of the management reviews, it was recognized that Johnson Controls must proceed in a direction for communication similar to videotex. The videotex system that was utilized in the study fell short of supporting some of the requirements for communication. The presentation protocol of videotex (NAPLPS) does not support the engineering level detail graphics required for communication with product specifications. The limitation to forty characters per line on each frame was also a major drawback to the videotex system utilized. Through the implementation of the product service, it was demonstrated that not enough information could be placed on the frame for review. If the line length could be increased to eighty characters, management felt the system could be utilized.

Since the pilot services could not identify enough cost justification for the purchase and installation of videotex and since the product service, the largest service with the most cost savings potential, could not be effectively implemented, the project team has recommended that the videotex system be removed from the mainframe computer. It was further recommended, by the project team, that the analysis and study of videotex continue. The people involved with this project gained considerable knowledge and experience in the business uses of videotex and the requirements of Johnson Controls for electronic distribution and communication of information.

Specifically, the project team recommended that further research be conducted in two directions. The first is to research and review other
videotex and electronic publishing/communication software products available to identify those with the ability to display detail graphics and eighty characters per line of information. The second direction is to perform more detailed analysis of other potential videotex applications that were identified by this study. The results of this analysis would be to identify the dollar payback and cost savings of each service and develop a detailed cost justification for the acquisition and installation of videotex.

Corporate management has concurred with the recommendations of the project team. Videotex, or some comparable form of electronic communication, is required by Johnson Controls for future utilization. The chief executive officer summarized it best with this comment during the executive presentation: "There will be a time soon when this form of communication will be a requirement to do business. We must acquire an understanding of the technology and make use of it in a cost effective manner and make it a way of doing business". Before implementing such a system, a sound business analysis must be performed and the costs and paybacks must be fully identified and presented to management and the board of directors for the necessary financial resources to be allocated.

The resource allocation and efforts put into this project have not been considered as wasted. Corporate management has become much more aware of the communication technologies that are available and now fully recognize the need for the corporate organization to evolve to these technologies in order to remain competitive and effectively communicate. Management has also become aware of the fact that the videotex technology, as it applies to corporate business installations, is still in its infancy.
CHAPTER VI

ANALYSIS, EVALUATION, AND IMPLICATIONS

ANALYSIS OF PROJECT

As identified in Chapter I, the videotex pilot project documented in the previous chapters had two major goals. These were to gain knowledge and background into videotex and to build a base of cost and benefit information from which management could begin analyzing the potential effectiveness of videotex. The project achieved these two goals effectively. By the end of the project, management had gained considerable knowledge of videotex and its potential applications in business.

The costs associated with implementing a videotex system within a business were gathered and documented. Although many individuals could speculate that the cost of implementing a videotex system are high, this project provided a vehicle for documenting the exact hardware requirements and their associated costs. From the information accumulated by this project and documented in Chapter V, any enterprise can determine their hardware needs and the costs to implement a videotex system. This information could not be obtained when reviewing other companies that had implemented videotex systems, therefore, it had to be accumulated as the project developed. The benefits associated with the implementation of a videotex system were much more difficult to accumulate and identify. The six month time constraint placed on the project by corporate management was the primary deterrent in allowing the project to effectively analyze and document the benefits associated with implementing a videotex system. This will be elaborated upon in more detail later in this chapter.
The research methodology used for this thesis was that of a case study. J. H. McGrath identifies the utility of case study research to be of "unquestioned value in generating a base for ad hoc evaluations and for designing further inquiry based on hypotheses derived from these investigations". Donald Ary, et al, say that "case studies are also frequently conducted with the primary aim of gaining knowledge". The primary goals of this project were to gain knowledge and build a base of information to be used in future analysis of videotex techniques at Johnson Controls.

Chapter I contains the five steps of a case study as identified by Carter Good and Douglas Scates. This project has followed the five steps as identified. The current status of information distribution at Johnson Controls was reviewed and analyzed. The history and background of videotex was examined and discussed in detail. Information on videotex usage in other companies was gathered and the potential needs for videotex within Johnson Controls were identified and analyzed. Videotex was implemented in test areas where current procedures were adjusted and the effects of videotex usage could be documented and analyzed. The final project documentation that was presented to management indicated the need to perform further study and analysis into videotex and the electronic communication technology to better identify its applicability and its cost payback at Johnson Controls. In the document, four alternatives for future study and development were presented.

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The first alternative for future study presented was to analyze, in
detail, the use of videotex in the battery division. This study would analyze
several of the twenty-one potential applications of videotex that were
identified in the pilot study and investigate further the use of videotex for
customer communications and for the communication of manufacturing
specifications directly to the plant floor. The objectives of this study would
be to document the detailed costs associated with the methods utilized today so
a comparison can be made to the projected costs of using videotex to perform
these functions.

Another recommendation for future study, that was documented by the
project team, was to conduct an in-depth analysis of other videotex software
that is available in the marketplace and perform a detailed comparison of the
features and costs associated with the implementation of each product. This
study needs to be performed to allow Johnson Controls to select the best
possible product to meet the business communication needs of the company. The
objectives of this study would be to identify all computer hardware and special
communication requirements for each product as well as the product's ability to
meet the communication and functional requirements for text and graphics as
identified in the pilot study. This study would identify the alternative
vidotex products available for use within Johnson Controls and recommend the
most appropriate one for use.

A third recommendation for further study would be to perform further
analysis into other forms of electronic communication and electronic publishing
that are now available to provide quality graphics and expanded text
communication capability beyond those of videotex. This study would have two primary objectives. The first would be to identify other communication technologies and the products available that can meet the requirements of the controls product manuals for graphics and text. The second objective would be to determine if the products and technologies identified could be used in place of videotex throughout the company for the communication of information as defined in the pilot study.

The fourth alternative for future study and development was presented by IBM to the project team. IBM presented Johnson Controls with an offer to participate with them in a joint development effort. The objectives of this project would be to study the technical requirements for the communication of detailed level graphics and to enhance the current IBM videotex product to support this process. In this joint development offer, IBM would contribute the technical expertise required for videotex and electronic communication as well as their computer assisted engineering specialists. Johnson Controls would contribute the business requirements and the testing facility for the videotex enhancements. The end result of this study and development project would be a complete videotex product that would meet all of the requirements at Johnson Controls for electronic communication.

Each of these alternatives could build upon the base information accumulated in this project and are very specific to the Johnson Controls installation. Other potential follow-up research projects that could also build upon the information base obtained in this project are identified in the section IMPLICATIONS FOR FUTURE STUDIES found later in Chapter VI.
EVALUATION OF RESULTS

An evaluation of the results and the effectiveness of the videotex pilot project indicates that some of the constraints placed on the project by corporate management inhibited valuable research to take place and impacted the overall results of the project. The major limiting constraint on this project was the six month time period allocated to perform all of the project activities. The amount of work needed to be completed during the six month period was extensive. The project required a review of other companies who have implemented videotex systems, the project team members required technical training, telephone lines and equipment needed to be ordered and installed, approximately 450 videotex frames were designed and developed for the pilot services, and fifteen management presentations were conducted. This left little time to receive feedback from management and the pilot users of videotex and assimilate that feedback into recommendations. In retrospect, twelve to fifteen months should have been allocated for the completion of this project.

Appendix C contains the detail schedule of the events of the videotex pilot project. The six month time constraint allowed only one month for the project team to review the videotex implementations in other business organizations. One month did not allow enough time for a detailed review. The review was restricted to telephone conversations with members of these companies and the reading of some of their general videotex documentation that could be obtained. There was not enough time available to visit other organizations, view their videotex systems, and discuss their experiences and justification and implementation procedures for videotex. It was discovered
later in the project, that, because of this cursory review of other companies, only general information could be given to management about videotex usage in business. It also limited the project team's ability to effectively justify the benefits of videotex beyond pure dollar savings.

Through the analysis and development of the pilot videotex services, several other potential services were identified. The battery division identified twenty-one potential uses of videotex. None of these could be pursued and analyzed. Because of the tight schedule, there was no time available to analyze any of these potential services to identify their applicability to the user areas or the benefits that could be realized from increased employee productivity, better customer communications, and improved, more timely plant communication. The six months allocated for this project was not adequate to perform the research and analysis that is required by a project of this nature.

A basic question at this point is, how could this study have been conducted differently to yield better results? There are a few fundamental changes that could have been made at the beginning of this project that would have allowed for a more complete analysis of videotex, it uses, and its effects on the corporation. The most obvious change would be to increase the time constraint that was placed on this project from the original six months to a minimum of twelve months.

This greater time frame would allow for much more extensive research into other corporations currently using videotex. It would allow time for visits to
these companies for the purpose of viewing their videotex installations and discussing the details of their videotex environment with the primary people responsible for the installation. The information gathered at this stage would be vital in the final analysis and recommendations for videotex. Also, a longer time frame would allow the time necessary to pursue many of the potential services that were identified and demonstrate their effectiveness. Each of the pilot services could be installed in the user areas for three to four months for test and review. The four to six weeks allocated in this project did not allow the users an opportunity to become comfortable with the system as a part of their daily job functions. A twelve month duration for the project would allow more information to be gathered for analysis and would allow more time to be spent communicating with management about videotex.

A second change to the project that may have yielded better results would be a change to the project objectives. Chapter I identified the five specific objectives of this videotex pilot project. The project met these five objectives well. The project did not, however, adequately pursue the non-financial benefits that are associated with videotex implementation. An additional project objective should have been included to research and document those benefits gained from using videotex that relate to improved employee relations and communications, improved customer satisfaction, better plant communications, and the use of information communication to gain a competitive edge in business. These intangible, but very real, benefits of videotex would have required more time to document, but would also have had an impact on the conclusions drawn by the project team and the recommendations to management.
It is the author's opinion that a combination of these two changes in the project scope and definition would have caused significantly different project results. The longer time frame would have allowed for more information to be gathered and analyzed. It would also have allowed more services to be developed and reviewed. These definition and scope changes, along with placing less emphasis on the financial benefits of videotex and much more emphasis on the business communications benefits of videotex, would have introduced conclusions that did not exist in this project. These conclusions would have had a significant impact on the outcome of the project.

IMPLICATIONS FOR FUTURE STUDIES

The results of this videotex pilot project identified four future projects that could be pursued within Johnson Controls. These projects would provide the company with a better understanding of videotex and its usage. Beyond the specific boundaries of Johnson Controls, other opportunities for study have presented themselves as a result of this project.

In the videotex pilot project, no attention was given to the effects videotex or other forms of electronic communication would potentially have on the structure of business organizations. Organization structures are structured in part to support the flow of information throughout the hierarchy of the organization. Built into the organization structures are buffers, sometimes referred to as gateways, that filter the information being passed so that only the pertinent or desired information flows past that point. Lee
Thayer identifies that as the electronic information technologies progress, "The most significant buffers of all, those between organizations, are being dissolved by the new 'electronic mail', as well as by other interorganization computer communication.". Organizations are losing the communication filtration process. This technology is allowing organizations to become more decentralized and independent. Thayer also identifies, "The new organizational media are suited to the transmission of hard, clean information, abstracted and telegraphic, without social modifiers or appurtenances ...". What impacts have the electronic communication technologies had on organization structures? Is better information being communicated through the organization? Do these new technologies help or hinder the communication process?

There was also little attention given to the effects of electronic communication technologies on interorganizational communications in the videotex pilot project. Much has been published in the business and computer journals on the concept of developing information into a strategic weapon for a company. Communicating information electronically to external organizations, i.e., customers and vendors, can place an organization at a competitive advantage. James Cash and Benn Konsynski write, "Today the most dramatic and potentially powerful uses of information technology involve networks that transcend company boundries. Some of these interorganizational systems also have important social and public policy implications.".

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The videotex pilot project presented in this document touched on this concept with the battery division pilot services. No time was available to pursue the impacts on the organizations involved when this communication vehicle is put in place. What level of control is given up by either of the organizations involved when information is communicated electronically? What are the social implications of this electronic communication? How can computers and communications media be best used as strategic weapons by an organization?

As the electronic communication technologies continue to proliferate throughout organizations, much more emphasis will be placed on what effects these technologies are having on organizations and society. These topics are too broad and general to be studied in depth by most business organizations such as Johnson Controls. The results of such studies, however, could be readily used by business organizations in their decision making process. The results of such studies would have made a direct contribution to the conclusions of this videotex pilot project and the recommendations presented to corporate management.
### APPENDIX A

**Videotex Systems**

<table>
<thead>
<tr>
<th>Country</th>
<th>Service Name</th>
<th>Transmission Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>Telidon, Vista, Grass Roots</td>
<td>Telephone, Telephone, Telephone/Fiber Optics</td>
</tr>
<tr>
<td>Finland</td>
<td>Telset</td>
<td>Telephone</td>
</tr>
<tr>
<td>France</td>
<td>Teletel, Private Business Projects</td>
<td>Telephone</td>
</tr>
<tr>
<td>Germany</td>
<td>Bildschirmtext</td>
<td>Telephone/Switched Circuit Network</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Viewdata</td>
<td>NA</td>
</tr>
<tr>
<td>Hungary</td>
<td>Teletext Test Transmission</td>
<td>Broadcast</td>
</tr>
<tr>
<td>Italy</td>
<td>Videotel</td>
<td>Telephone</td>
</tr>
<tr>
<td>Japan</td>
<td>Captain</td>
<td>Telephone</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Viditel</td>
<td>Telephone</td>
</tr>
<tr>
<td>Norway</td>
<td>Teledata</td>
<td>NA</td>
</tr>
<tr>
<td>South Africa</td>
<td>Beltel</td>
<td>Telephone</td>
</tr>
<tr>
<td>Spain</td>
<td>Spanish Videotext Project</td>
<td>Telephone</td>
</tr>
<tr>
<td>Sweden</td>
<td>Teledata</td>
<td>Telephone</td>
</tr>
<tr>
<td>Switzerland</td>
<td>NA</td>
<td>Telephone</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Prestel</td>
<td>Telephone</td>
</tr>
<tr>
<td>United States</td>
<td>CompuServe, Dow Jones News/Retrieval, The Source, Various other public and private offerings</td>
<td>Telephone, Telephone/Cable, Telephone/Cable/Satellite/Packet Switched Networks</td>
</tr>
</tbody>
</table>
## APPENDIX B

### Model of Pilot Services

<table>
<thead>
<tr>
<th>Service Number</th>
<th>Service Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>An introduction to videotex, background information, usage information, potential applications within Johnson Controls.</td>
</tr>
<tr>
<td>2</td>
<td>JCI News</td>
<td>A sample of various public relations communication documents for employees.</td>
</tr>
<tr>
<td>3</td>
<td>Product</td>
<td>Controls group product descriptions, product specifications, and parts price lists for field engineering and service personnel.</td>
</tr>
<tr>
<td>4</td>
<td>JCI Institute</td>
<td>The course catalog and class schedules for Johnson Controls Institute.</td>
</tr>
<tr>
<td>5</td>
<td>Quotations</td>
<td>Price quotations and billing and shipment conditions for Battery group customer access.</td>
</tr>
<tr>
<td>6</td>
<td>Labels</td>
<td>NAPLPS drawings of automotive batteries and customer labels for product presentation.</td>
</tr>
</tbody>
</table>
# APPENDIX C

## Schedule of Videotex Study

<table>
<thead>
<tr>
<th>Event</th>
<th>Begin Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Review videotex implementation in other businesses.</td>
<td>12/01/85</td>
<td>12/31/85</td>
</tr>
<tr>
<td>2. Attend videotex training.</td>
<td>12/02/85</td>
<td>12/06/85</td>
</tr>
<tr>
<td>3. Attend frame design training.</td>
<td>01/08/86</td>
<td>01/10/86</td>
</tr>
<tr>
<td>4. Install videotex software and communication hardware.</td>
<td>01/01/86</td>
<td>01/15/86</td>
</tr>
<tr>
<td>5. Develop and implement first pilot service.</td>
<td>01/15/86</td>
<td>02/01/86</td>
</tr>
<tr>
<td>6. Conduct management presentations.</td>
<td>02/01/86</td>
<td>05/01/86</td>
</tr>
<tr>
<td>7. Develop and implement second through sixth pilot services.</td>
<td>02/01/86</td>
<td>04/15/86</td>
</tr>
<tr>
<td>8. Install remote videotex terminals.</td>
<td>05/01/86</td>
<td>05/15/86</td>
</tr>
<tr>
<td>9. Fully utilize and test system.</td>
<td>05/01/86</td>
<td>06/30/86</td>
</tr>
<tr>
<td>10. Obtain feedback from users and prepare recommendations to management</td>
<td>05/01/86</td>
<td>06/30/86</td>
</tr>
<tr>
<td>11. Submit recommendations to management.</td>
<td>07/10/86</td>
<td>07/10/86</td>
</tr>
</tbody>
</table>
GLOSSARY

Alpha-geometric
A method of displaying graphic characters and shapes generated from transmitted geometric instructions, called picture description instructions, or PDI's.

Alpha-Mosaic
A method of displaying graphic characters and shapes generated from a limited number of basic mosaic elements.

Antiope
A videotex standard in Europe.

Application
1) One or more computer programs designed to perform a specific function.
2) The entire implementation of a videotex system, eg. customer quotations/order entry.
3) The data processing portion of a videotex system, including the videotex, non-videotex, and related training procedures.

ASCII

Background Color
The base color of a screen, over which text and graphic images are overlaid in a different (foreground) color.

Byte
The basic unit of data handled by most systems, representing one character.

Closed User Group
A supported feature of a videotex system whereby only a specific group of users will have access to data. This data is unavailable to other users of the system.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database</td>
<td>A structured array of data. 1) One or more individual data files, usually organized in a hierarchical or tabular manner. 2) A hierarchical array of pages in a videotex service.</td>
</tr>
<tr>
<td>Decoder</td>
<td>A device and/or software used to unscramble data signals for display on a video screen.</td>
</tr>
<tr>
<td>Electronic Mail</td>
<td>A mail or message distribution service using electronics and telecommunications substituting for the physical documents and delivery.</td>
</tr>
<tr>
<td>End User</td>
<td>The ultimate consumer of a videotex service.</td>
</tr>
<tr>
<td>Frame</td>
<td>A file (or record) containing text and graphic commands. A screen full of videotex information. See page.</td>
</tr>
<tr>
<td>Gateway</td>
<td>A link between remote computer systems. A method that allows communication from a terminal to be channelled through a videotex host to a third-party database or to pass directly from the terminal to the third-party database without passing through the videotex host.</td>
</tr>
<tr>
<td>Hierarchy</td>
<td>A tree structured relationship, in which specific paths exist between objects of successive levels. An object may have several descendents (children), but only one antecedent (parent).</td>
</tr>
<tr>
<td>Host</td>
<td>A main computer, usually a mainframe, to which remote computers or terminals may be connected.</td>
</tr>
<tr>
<td>Information Provider</td>
<td>One who offers a service or services on a videotex system. Often referred to as an IP. The IP populates the database.</td>
</tr>
<tr>
<td>Information Retriever</td>
<td>One who accesses a videotex system for the purpose of retrieving information from a videotex database. Synonymous with end user. Often referred to as an IR.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>In-House</td>
<td>A videotex system installed on a private computer for use only within a particular company or organization.</td>
</tr>
<tr>
<td>Keyboard</td>
<td>A device for entering data, including full alphabetic and numeric keys with other special function keys.</td>
</tr>
<tr>
<td>Keypad</td>
<td>A partial keyboard, such as a touch-tone set or calculator face pad, containing the numbers 0 through 9 and the characters # and *.</td>
</tr>
<tr>
<td>Kiosk</td>
<td>A videotex terminal enclosed in a specially constructed cabinet designed for use in public places.</td>
</tr>
<tr>
<td>Modem</td>
<td>Modulator/DEModulator. A device used in the transmission of digital signals across analog communication lines.</td>
</tr>
<tr>
<td>Mosaic</td>
<td>A rectangular matrix of pre-defined elements that can be used to construct block-style graphic images.</td>
</tr>
<tr>
<td>Network</td>
<td>Two or more pieces of interconnected equipment engaged in communication.</td>
</tr>
<tr>
<td>Page</td>
<td>A single screen of information in a videotex system. See frame.</td>
</tr>
<tr>
<td>Prestel</td>
<td>A videotex standard in Great Britain, and the videotex system of the same name. A registered trademark of British Telecom.</td>
</tr>
<tr>
<td>Protocol</td>
<td>A set of conventions or rules employed for the exchange of data at any given level of a communication session.</td>
</tr>
<tr>
<td><strong>Service</strong></td>
<td>A collection of related pages and application programs within a videotex system.</td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td>A collection of computer programs used to instruct the computer to perform specific functions.</td>
</tr>
<tr>
<td><strong>Teletext</strong></td>
<td>A one-way electronic service for information retrieval. It is either broadcast using the vertical blanking intervals of a television signal or full channel. Pages are cycled and users request pages, using a decoder, which are captured and displayed on a television screen.</td>
</tr>
<tr>
<td><strong>Telidon</strong></td>
<td>A videotex standard in Canada using alpha-geometrics. A forerunner of the NAPLPS standard.</td>
</tr>
<tr>
<td><strong>Tree Structure</strong></td>
<td>The arrangement of a videotex database into a number of hierarchical levels with each descending level presenting information of increasing detail.</td>
</tr>
<tr>
<td><strong>User</strong></td>
<td>See end user.</td>
</tr>
<tr>
<td><strong>Videotex</strong></td>
<td>An easy to use, low cost method of interactively communicating among organizations and end users via computers. Videotex may include color and graphics media for the presentation of information.</td>
</tr>
</tbody>
</table>
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