


MANAGING INFORMATION TECHNOLOGY:
A CORPORATE INFORMATION SYSTEMS STRATEGY
FOR THE CITY OF WINNIPEG

by

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In Partial Fulfillment of the Requirements for the Degree of
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ABSTRACT

This study examines the issues involved in managing information technology in local government, using the City of Winnipeg as its central focus. The objective of the study is to develop a number of policy recommendations for the City's corporate information systems strategy. Two of the major issues facing the City are the fast pace of information technology change and end-user computing. These issues are highlighted by examining the organizational impact of microcomputers, which forms the principal focus of the thesis. In addition, current literature on managing information technology, data integration, and centralized versus decentralized computing are also examined. The policies of other municipal jurisdictions, as well as the current policies of the City of Winnipeg, either stated explicitly in documents, or implied through action, are investigated. This study concludes by recommending a policy of distributed data processing and a stronger departmental role in managing information technology.

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MANAGING INFORMATION TECHNOLOGY:
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FOR THE CITY OF WINNIPEG

CHAPTER 1.
INTRODUCTION

This study examines the issues involved in managing information technology in local governments. The study focuses on the City of Winnipeg, and the problems it has encountered as a result of changes in information technology. The City's current information technology policies and direction will also be examined and commented on in relation to the information technology issues. The objective of this thesis is to develop a corporate information systems strategy for the City of Winnipeg. This strategy will be presented in the form of policy and organizational change recommendations for the City of Winnipeg to realize the new information technology opportunities. Information technology includes the computer hardware (machines and peripheral equipment such as printers), and software (computer programs) used to support computer-based information processing.

RESEARCH METHODOLOGY

The following summarizes the key information sources which were used in the development of this thesis:

1. Literature Review: The literature dealing with the impacts of microcomputers on organizations, distributed data processing, information management, and organization change resulting from new technology was reviewed. This information covered both the public and private sectors, although the emphasis was on the public sector and the issues which are common to both.
2. Existing Policy: The existing computer policy and long range computer strategy for the City of Winnipeg was examined. This

included explicit policy stated in documents and implicit policy based on actions and events. An examination of information management policy in a limited number of other municipal jurisdictions was also conducted for a comparative basis.

3. Specific Interviews: Interviews were conducted with key personnel in both the computer department and user departments to solicit their views on a corporate information management policies. Departments were selected based on their experience with information processing.

4. Personal Involvement: Information for this study was also based on my personal experience gained from working for a "user department" - Environmental Planning - developing microcomputer systems and dealing with the Computer Services Department. My current employment with the Computer Services Department has also provided an insight into the issues of managing information technology from a "central service department."

CITY OF WINNIPEG - BACKGROUND INFORMATION

The population of the City of Winnipeg at present stands at about 600,000. In 1972 the City of Winnipeg Act established the present structure of the City of Winnipeg by combining a number of surrounding municipalities with the former City of Winnipeg, and the Metropolitan Corporation of Greater Winnipeg into a unified City of Winnipeg.

The City of Winnipeg Act provides that the powers of the City shall be exercised by Council and further provides that Council may delegate its powers and duties to the Executive Policy Committee or any Standing Committee established by Council. The administration of the City is delegated to the Board of Commissioners. The Executive Policy Committee gives direction to the Board of Commissioners on policies relating to the civic personnel which include changes in the civic establishment.

The Board of Commissioners consists of five administrative divisions headed by a Commissioner. Each division consists of the following departments:

1. The Chief Commissioner's Division
 - a. Budget Bureau
 - b. City Clerk's Department
 - c. Law Department

2. Finance and Administration
 - a. Assessment Department
 - b. Civic Properties Department
 - c. Computer Services Department
 - d. Finance Department
 - e. Land Surveys and Real Estate Department
 - f. Personnel Department
 - g. Purchasing Department

3. Planning and Community Services Division
 - a. Environmental Planning Department
 - b. Health Department
 - c. Library Department
 - d. Social Services Department

4. Protection, Parks and Culture Division
 - a. Ambulance Services Department
 - b. Fire Department
 - c. Parks and Recreation Department
 - d. Police Department

5. Works and Operations Division
 - a. Hydro Electric Department
 - b. Operations Department
 - c. Streets and Transportation Department
 - d. Transit Department
 - e. Waterworks Waste and Disposal Department

As the focus of this thesis is on managing information technology, the only City department which is of particular interest is the Computer Services Department. This study will focus on the policy direction or actions of the Computer Services Department and the Board of Commissioners, which sets official City direction, in relation to managing information technology. The Computer Services Department's mandate is to "develop, coordinate, maintain and control computer systems and maintain data bases for the City as well as provide microcomputer facilities and appropriate office automation and data communication environment." (1)

The Computer Services Department is divided into four main branches: Application Development and Support, Operations, Technical Services, and Corporate Data Resources.

Two of the major issues facing the City of Winnipeg regarding the management of information technology are the fast pace of information technology change and end-user computing expectations. These two issues are discussed in more detail in the following sections to provide some background to the current issues facing the City of Winnipeg in this field.

CHANGES IN INFORMATION TECHNOLOGY

Information technology started as punched card tabulators and sorters in the mid 1950's and evolved into the first primitive computers in the early 1960s. As technology advanced, more sophisticated computers were developed and used in local government for large financial based systems such as tax collection and payroll processing. Computers were used in local governments to either reduce costs or undertake new activities which could not otherwise be accomplished. "This technological evolution transformed public administration that had, over time, become a collection of geographically and functionally dispersed, manually supported activities, into operations that had, as their main support, remote centralized monolithic computing operations." (2)

The early large mainframe computers, which required a team of experts to operate, occupied a large climate controlled area, and were very costly to purchase and operate. These factors combined with the desire for efficiency required that a centralized information management authority be established and located where the information was processed. This authority was typically located in the finance department, as the early computer systems were based around financial transactions. Eventually, the computer operation was split into an independent unit reporting to the chief executive officer.

The City of Winnipeg's historical computer development is similar to this scenario. The City acquired its first large computer in 1956, which was managed in the Accounting Branch of the Finance Department. The Computer Services Department became a separate department in 1972. At this time staff was combined with other computer operations resulting from the combination of a number of municipal jurisdictions. The Computer Services Department was not assigned to report to the Chief Commissioner (the chief executive officer) until 1978. However, in 1987, the reporting relationship of Computer Services Department was changed to the Commissioner of Finance.

Winnipeg's computing experience and its strong reliance on mainframe computers is not unique. Other local governments have followed a similar computer processing development:

Large computer mainframes have predominated in computing use by local government since the first computers were introduced in the early 1950s and, despite the introduction of small less expensive computers, they will continue to figure high on the agenda of computing decision making throughout much of the 1980s. This is because the purchase of a mainframe is still costly and usually represents a major decision affecting the near future of the computing activity. (3)

During the late 1970's and early 1980's, research in miniaturization and large-scale circuit integration led to the development of electronic chips and microcircuitry. These two developments, combined with improvements in telecommunications led to the introduction of mini and microcomputers which have the capability of being "networked" together to exchange data and share software. The development of microcomputers has resulted in fundamental changes in the way computers and information are used in local government. This development of inexpensive, small computers has enabled the distribution of computing power to City departments, which can provide a number of their local computer requirements economically without relying on computer resources located centrally in the Computer Services Department. The development of microcomputers has opened up new opportunities for information processing and automating office functions (i.e. word processing), which because of

their scale, were not economical on the central mainframe computer. Recent advances in data communications have enabled these distributed microcomputers to not only be connected to each other in "local area networks" (LANS), but also to communicate with the central mainframe computer.

Minicomputers are also starting to play a large role in local government information processing and communications by serving as intermediaries in communication networks. When first developed, minicomputers were only used as "stand alone" smaller versions of mainframe computers. However, in the City of Winnipeg's case, minicomputers have not typically been purchased for stand alone departmental systems, partly due to their cost, but mainly because the City's direction has been to consolidate computing on the mainframe computer in a single centralized computing installation. However, some minicomputers have been purchased for specialized departmental functions such as Police Computer Aided Dispatching (CAD) and Transit's Telebus system.

One positive condition in the information processing industry is the continued reduction in the cost, and increase in speed of both computers and storage devices. "These decreasing unit costs are remarkable in an economy in which virtually every other sector is experiencing only cost escalations." (4) This increased capability and cost reduction has fueled the demand for computer applications on the different ranges of computers - micro, mini or mainframe. Other computer developments are also fueling the demand: user-friendly fourth generation programs (software), devices for sophisticated information storage and retrieval (such as laser disks), and image and voice handling capabilities. Traditional information processing (data processing) is also undergoing its own rapidly developing technology as indicated by its merger with communications, text, and graphics processing technologies.

Because the information technology is changing rapidly, it is difficult for the Computer Services Department to keep up with the knowledge required to manage it, while at the same time responding to

pressures for system development. It is also difficult to plan for new system implementation and second guess what technology platform to use.

Today, managers may start a project on a mainframe; part way through the technology and economics change they start looking for distributed mini-computers. Within one or two years or even a few months, they can look at networked microcomputers or supermicros to do the same job they originally would have to do on the mainframe.
(5)

Sometimes the opportunities of new information technology are overlooked because of resistance to change among computer systems personnel, who prefer to develop systems on the mainframe computer where they are comfortable with the technology. In addition, opportunities could also be overlooked because of senior management's ignorance of information technology and its potential uses. (6) However, even if new information technology is applied as rapidly as it is developed, the problems do not disappear. As the use of information technology increases in organizations, problems with the technology and its impacts also increase. "Local governments with the most advanced uses and the most comprehensive policies for managing information technology generally have greater payoffs from their system, but they also have the most problems with and from these uses." (7)

The one area of information technology which has potentially had the greatest impact on information processing, and end-user computing in the City of Winnipeg is the microcomputer. The use of microcomputers is relatively new in the City of Winnipeg and policies for its use are still evolving. Microcomputers have had a significant impact on departmental storage and processing of information, which until recently was restricted entirely to mainframes. One of the major issues in the management of microcomputers is the scope of the systems that are being developed. Microcomputers have the advantage of being independent of the mainframe computer and the weakness of lacking access to central corporate data. For example, if many departments need access to a system or the information contained in the computer, the microcomputer is not the best information technology tool to use. This issue of information

access and user independence creates problems of control and management of the systems which are developed on microcomputers. Management has to make some difficult choices and establish rules for corporate systems. The introduction of microcomputers in the City of Winnipeg is not as simple as purchasing the equipment and letting users develop systems.

The problem is that we have no rules to follow which can tell us how to build and link the right systems. We are coming to realize that the answers lie not in the imposition of ever more highly technological solutions but in an intelligent application of available technology to the process of government, which will permit the optimum movement of data within a network of public administration systems. Our current organizations to manage this change are probably not adequate. (8)

END-USER COMPUTING

The development of "end-user computing", which enables users to develop their own applications independent from the central computing department, has had a significant impact on the traditional "specialist" development of computer systems. Several factors have led to the development of end-user computing.

Prior to the 1970's the use of computers was reserved for the "computer specialists" who developed computer applications more or less in isolation from the "users". Contact with the computer was also restricted by the input medium of the day - punch cards. At the end of the 1970s, with the initial distribution of so-called "dumb" terminals, users could gain access to centrally located information. However, because the forerunners of today's user-friendly languages were not available, the users had to learn complex commands to perform even the simplest functions. When problems were encountered, or when complex inquiries were required, users had to rely upon the central computing department. By the early 1980s many user-friendly mainframe languages were developed to allow users easier access their data.

The most significant developments towards end-user computing also occurred in the early 1980s with the development of the microcomputer.

End-user computing or personal computing emerged outside central computer departments, as users independently purchased their first low-cost hardware and software. The new microcomputer systems were easy to learn, and users did not have to rely upon the central computer department to develop computer applications. However, the lack of communications capability on the first microcomputers meant that users could not exchange data with other microcomputers, nor could they freely access and manipulate data on the organization's mainframe. (9) Recent developments in communication technology have rectified this initial shortcoming.

The question whether the technology or the user has been the driving force arose early and often in the discussions. To this time it seems fair to say that the "technologists" along with the technology have been the driving force. In government, computers have in the main been applied to existing standard operations such as payroll, financial reports, social welfare payments, tax collection, research calculations and the support of weather forecasting. The operations were there to see and key persons familiar with them came also to have a familiarity with and a keen interest in computer technology, thus becoming technologists for purposes of this argument. They then devote their energies to convincing those in authority of the advantages, if not the utter necessity, of conversion to computers. (10)

Whether the user of the technology has been the driving force in development and implementation of information technology in the City is not important. What is important is a recognition that the industry has moved towards end-user computing because, "in the final analysis, it is the only strategy that will meet the growth in systems demand by end-users." (11) Some cities have already recognized this trend and have made the main feature of their overall information strategy the development and support of end-user computing. The City of Toronto, for example, has recognized the benefits of end-user computing and adopted policies to provide users with:

- the skills and knowledge to make effective use of the technology.
- an accessible hardware and software network.
- the means to manipulate and update their own data.
- the ability to access and work with corporate data. (12)

The impact of rapid developments in information technology combined with increases in user expectations and awareness brought on by end-user computing, indicate the need for a Corporate Information Systems Strategy for the City of Winnipeg. This strategy should address the impacts of changes in information technology and its application on the City's organization and information management direction (or lack thereof). Some of the specific developments which have had a significant impact on the City of Winnipeg are:

1. The development of the microcomputer, and its impacts on system development in departments which formerly required development by computer system experts;
2. The changes in business software such as "4th generation" and "user friendly" software both on the mainframe and microcomputer, which give more tools to non-data processing personnel.
3. The technology has created more options for computer processing and data access such as "distributed processing" where microcomputers and minicomputers can be used for local processing needs in a Department, as opposed to a centralized mainframe environment.
4. Users have become more knowledgeable in computer technology and are demanding more access to the technology.
5. Some departments have developed internal computer competence and resources with the capability to develop systems independent from the Computer Services Department.

End-user expectations are increasing as users gain more understanding of computers and information technology. This increase in end-user expectations without a City wide strategy and direction could lead to a number of problems. End-users expect early results from computer systems which puts pressure on the systems developers located

in the central computer department. (13) System developers are also facing pressures to reduce the cost of systems development, implementation and maintenance to satisfy the organization's demand for efficiency. This demand for new systems requires that an implementation and prioritization plan be developed for computer systems. This plan should also address the sharing and integration of information. The number of end-users will increase as more of the City's functions are automated, which will in turn increase the demand for more computer services. An additional problem which impacts on the ability of the computer department to respond to the increased user demand is that systems developers spend more and more time monitoring and controlling systems. "More time is needed for maintenance and, as the use of systems expands, many budgets come to have a major maintenance component that leaves little for new systems development - another squeeze to contend with." (14) A fundamental risk is not recognizing "end-user" concerns when developing new computer systems. This could result in the development of expensive systems which do not meet the needs of the organization.

With the recognition of the value of the technology, and its integration into the workplace, the use of micros, minis, and time sharing terminals is growing rampantly, and the demand for data processing services is beyond the capacity of the available data processing resources. Not only is there a demand for more on-line services, there is also an increased demand for data sharing and integration of systems requiring more centralized control. Into this environment enters a more sophisticated but frustrated user, who wants more of the data processing services, wants improved access to information, but also wants more control of his or her data processing destiny. (15)

In addition to the internal pressures brought on by rapid developments in information technology and end-user computing, the City also faces external pressures. Like other government bodies, the City of Winnipeg is under heavy pressure to rationalize its services, reduce operating costs and increase the effectiveness and quality of the programs it delivers to the taxpayers. (16) The City will face even more constraints while trying to meet ever-escalating demands for service or demands for the same level of service, while also facing demands to keep tax increases at a minimum. In order for the City to

survive in this environment and keep services up and costs down it will require efficiency enhancements. The requirement for improved efficiency will inevitably have an impact on all parts of the City, including how it manages its information.

It is clear that the public sector situation presents a scene where there is a great need for streamlined, efficient information management systems, the greater exploitation of automation and the enhanced ability to move with rapidly changing technology. Such a scene demands effective strategic systems planning. The main purpose of any strategic plan is to set the direction in which the organization wishes to go. Once this overriding direction is set, it becomes easier to assign priorities (and resources) to the organization's various tasks. (17)

THESIS OUTLINE

One of the principal focuses of this thesis is on the organizational impacts of microcomputers which have had the most influence on the recent direction of information technology. The introduction of microcomputers into civic departments represents the movement of information technology from one central mainframe computer in the Computer Services Department to a number of computers distributed throughout the City departments. With the movement of the computer hardware also comes the local development of computer systems and the end of the reliance upon the programmers in the Computer Services Department to develop systems. This technology transfer is also creating, or has the potential to create, a number of organizational problems within the departments. The distribution of information technology to departments raises issues such as the importance of corporate versus departmental data, and the necessity of central data processing. This distributed information technology also raises the issue of the need for central "corporate" information technology policies and control versus departmental independence.

This study goes beyond the impacts of microcomputer acquisition to examine some of the broader corporate information management issues associated with corporate data bases, and integrated systems. These issues are discussed in Chapter 2 to provide some background information

on the need for information management. These broad themes frequently reappear in subsequent chapters.

Chapter 3 provides background information on the advent of micro-computer technology. It also introduces the impacts of microcomputers on organizations. Some of the issues discussed in the chapter arise with respect to forms of information technology other than microcomputers. The introduction of microcomputers into a large number of City departments will probably bring the following issues to the surface:

1. The organizational impacts of technology such as staff changes, management's use of the technology, and the need for local control,
2. Human resource issues such as stress issues, staff reductions, training needs, and possible effects on classification and pay,
3. Union concerns and bargaining issues.

Chapter 4 discusses the problems of uncontrolled microcomputer proliferation and the need for City wide central control. This Chapter presents examples of problems encountered by a City Department in dealing with the introduction of microcomputers. In addition, the need for local management involvement, and their requirements to manage the information technology, specifically regarding the introduction of microcomputers are also discussed.

The distribution of information technology in the form of micro-computers to Civic departments has resulted in alternate data processing arrangements such as centralized versus decentralized processing and distributed processing (computer staff and equipment located in "user departments"). These alternatives are examined in Chapter 5.

Chapter 6 examines the City's existing information technology policies, such as the Long Range Plan for information systems development. In addition, the City's policy on corporate information and data integration, office automation and microcomputers, and the location of computer programming personnel are also reviewed.

Finally, recommendations for a corporate information systems strategy for the City of Winnipeg are presented in Chapter 7 based on the findings of the preceding chapters. Particular structures and processes for the management of information technology, it will be argued, should be part of a system-wide strategic plan for information management within the City. The case for a Corporate Information Systems Strategy will be presented.

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