

An Introduction to
Small Business, Information Management, and Computers

by

Johannes Petrus Broere

A Thesis
presented to the University of Manitoba
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Master of Business Administration
in
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ABSTRACT

Until recently small business in Canada has been largely overlooked by the public and private sectors of the economy. Yet the fact remains that small business is a dynamic and significant component of the Canadian economy. Recent developments in the data processing industry have generated a new and powerful tool with which small business can increase its operating efficiency and effectiveness. The small business computer offers an opportunity to offset the managerial incapacity and poor record keeping characteristic of the small business through improved transaction processing and assistance in management decision making. This thesis will describe the above opportunity through an investigation and discussion of the nature of small business, developments in the computer industry, the use of a conceptual information management framework, and an exploratory study of several local small businesses.

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Chapter I

INTRODUCTION TO SMALL BUSINESS

Small business has only recently attracted renewed interest from the private and public sectors. Though a crucial element in the Canadian economic scene, its importance has been inappropriately understated by an overemphasis on the merits of large scale organizations. The economies of scale required to sustain the Canadian economic reliance on natural resources has fostered an environment characterized by large business domination. Academic institutions have contributed to the accentuation of large business consequence through the neglect of the role of small business in their curricula (Marchand 1977; Buchele 1967). To assume that this focus on large firms has been accompanied by a corresponding decrease in the importance of small firms is unwarranted. A government profile of Canadian small business concludes that these firms have a strong presence in the Canadian economy (Marchand 1977). Small business accounted for close to 96% of all Canadian businesses, contributed approximately 20% of all business sales, and yielded an average return on sales of 13.3% as compared to an average of 9.0% for all businesses.

1.1 DEFINITION OF SMALL BUSINESS

The line of demarcation between small business and the remainder of the business sector is blurred by a plurality of definitions for small business. Sales volume, concentration of owner's equity, number of employees, and size relative to competitors have been suggested as legitimate criteria. A general framework described by Steinhoff (1978) recommends that a small business must possess at least two of the following characteristics:

1. Independent management (i.e. management that answers primarily to itself rather than stockholders or some other group with a capital interest).
2. Capital is supplied, and ownership held, by an individual or a small group.
3. The area of operations is mainly local, with the workers and owners living in one home community.
4. The relative size of the firm within its industry must be small when compared with the biggest units in its field.

Steinhoff (1978) emphasizes the latter condition as the dominant criteria in defining small business. Attempts to quantify relative size indicate that number of employees is accorded the widest support and use (Broom, Longnecker 1975; Siropolis 1977). Independence, in both management and own-

ership, appears to be the secondary criterion for small business definition (Tate et al. 1978; Siropolis 1977; Marchand 1977). As a measure of relative size, number of employees is popular since it exhibits the following properties:

1. It is inflation proof when compared to such monetary based measures as total assets and sales volume.
2. It has an inherent simplicity and subsequent ease of understanding.
3. It facilitates comparison between diverse business sectors.
4. Businessmen are less reluctant to release this information.

In considering the above observations, this study has adopted the working definition for small business delineated by the Ministry of Supply and Services, Canada. These are firms which are independently owned, and which have not developed the more mature managerial structure typical of large corporations (i.e. rigid reporting lines, departmentalization, etc.) Generally this applies to firms with fewer than 100 employees in the manufacturing sector, and fewer than 50 employees in other sectors (Marchand 1977). The discrepancy in the number of employees may be related to the economies of scale in the manufacturing and service

sectors (i.e. the fixed investment per unit of production, or per employee, is higher in the manufacturing sector).

1.2 ECONOMIC SCOPE OF SMALL BUSINESS

Deeks (1976) and Steinhoff (1978) have noted that in terms of number of business units, the small firm remains as the dominant factor in most of the western world. The estimated 600,000 small Canadian businesses accounted for 20% of all goods and services produced in Canada during 1974¹. During 1973, 88% of all Canadian businesses employed less than or equal to one hundred employees. This accounted for approximately 26% of the entire labour force.

The field of small business operations encompasses a wide spectrum of activities. Overall, the retail, service, and construction sectors demonstrate the highest proportion of small business presence relative to the size of the individual sectors. Table 1 summarizes the ranking of small business in nine business sectors according to the number of businesses, the number of employees, and the volume of sales². Each of these measures is taken as a percentage of

¹For a more detailed analysis of the economic contribution of small businesses see the CIBC Commercial Letter Issue No.2, 1978, which contains an analysis of data made available by the Small Business Secretariat, Department of Industry, Trade and Commerce. Note that this is the most recent source of available statistics on Canadian small businesses.

²The table is based on the results discussed in the above reference.

all businesses in the sector and then ranked relative to one another.

TABLE 1

Business Sectors Ranked by Measures of Small Business Presence

| Category | Number | Employment | Sales |
|-------------------------|--------|------------|-------|
| Primary Manufacturing | 7 | 8 | 9 |
| Secondary Manufacturing | 6 | 7 | 8 |
| Transportation | 1 | 5 | 5 |
| Construction | 5 | 2 | 2 |
| Wholesale Trade | 5 | 6 | 7 |
| Retail Trade | 4 | 3 | 3 |
| Services | 2 | 1 | 1 |
| Finance | 3 | 4 | 4 |
| Other | 3 | 9 | 6 |

As an illustration, Table 1 indicates that small business is dominant in the services sector when ranked by number of employees or by sales. However, when ranked by number of businesses, smaller firms are dominant in the transportation sector. These rankings are placed in perspective by the following observations:

1. Small business accounts for more than 75% of the number of businesses in each sector.
2. Small business accounts for over 55% of employment in the services sector and approximately 5% in the primary manufacturing sector.
3. Small business accounts for over 55% of sales in the services sector and approximately 4% in the primary manufacturing sector.

1.3 IMPORTANCE OF SMALL BUSINESS

Although small firms demonstrate economic prominence in most business sectors, their importance is not solely a function of the quantifiable measures outlined in Section 1.2 of this chapter. Small business is characterized by a host of nonquantifiable contributions which taken in conjunction with economic aspects produce a synergy of significant proportion. Deeks (1978) provides a generalized statement of small business importance in his discussion of the British Bolton report. Some of Deeks' more distinctive observations are discussed in the following paragraphs.

Despite low expenditures on research and development, small businesses are considered a major source of innovation for products, processes, and services. The interaction between sheer numbers and the entrepreneurial spirit may provide a partial explanation for this phenomenon. Further

explanation may be found in the reluctance of large business to introduce innovations which will cater to small or specialized market segments. Since small firms flourish in these untapped market niches, they are able to effectively introduce an innovative offering to the consumer. This results in a proliferation of goods and services which enrich consumer alternatives.

Large and small firms do not operate in mutually exclusive environments. There is often a critical interdependency. Larger firms are clearly reliant on small businesses to facilitate the distribution of their outputs. The extent of small business participation in the retail sector is an obvious substantiation. Although larger concerns are able to undertake endeavours of greater economic magnitude, it is often more profitable to subcontract select component tasks to the small business specialist. Many market segments ignored by larger firms would likely remain unattended if not for small business. Small business consumes raw materials, equipment, and supplies produced by their larger counterparts. In turn, larger firms avail themselves of small business output (professional services are an example).

From a macroeconomic perspective, the existence of a high ratio of small businesses may tend to check the development of monopolies. As concern over corporate concentration grows, the small business, in offsetting the inequita-

ble profit distribution and operating inefficiencies associated with monopolistic practices, contributes to the efficient working of the economy as a whole. Simultaneously, the small business provides the point of origin for corporate regeneration. Corporations do not exist for infinite lifespans, and there must be some mechanism to channel and nurture both entrepreneurial talent and investment capital. Small business acts as a sounding board in this process (i.e. only the competitively fit will survive to replace dying corporations).

Small businesses enhance the quality of the social environment. Their presence can reduce the impact on poorly diversified economic centers in the event a major entity reduces or ceases operation. Small businesses are an effective tool in attempting to achieve regional parity for national income distribution. An increase in rural small businesses may provide the employment opportunities necessary to stem the youth migration to urban centers. Since small firms are relatively labour intensive, they produce on the average more jobs per unit capital invested than larger firms³. Ultimately, the motivation and drive characteristic of the small businessmen are vital components in the civic health of many communities.

³For a more detailed discussion see Small Business in Canada: Perspectives, Minister of State, Small Business, (Ottawa: Minister of Supply and Services Canada, 1977)

1.4 SMALL BUSINESS FAILURE

The root cause of small business failure is managerial incapacity (Broom-Longnecker 1975; Buchele 1967; Tate et al. 1978; Steinhoff 1978; Siropolis 1977). Management deficiency manifests itself in a variety of ways. Often the small businessman is saddled with the entire continuum of management functions (i.e. production, marketing, finance, personnel, etc.), but it is rare to find an individual displaying competence in all these areas. This may explain the preoccupation with operating aspects of the business while leaving other important managerial functions, such as planning, neglected.

Given a tendency for small business managers to be preoccupied with the operating level, a summary of indications of managerial weaknesses related to this observation is warranted. Increased effectiveness of the competition, poor capital management, inadequate market research manifested by poor location and market ignorance, premature expansion, inventory problems, poor personnel practices, excessive fixed costs and bad debts are examples of lack of proper management. These are products of decisions based on inadequate, or nonexistent, information. In certain instances, excessive information may undermine the quality of decisions⁴. To avoid these problems, it is imperative to be

⁴For a detailed discussion of this problem see Information, Communication, and the Paperwork Explosion, Trevor J. Bentley, (London: McGraw-Hill Book Company, 1976)

able to monitor business progress and instigate corrective action. In the absence of relevant information this becomes a difficult, if not impossible, task. Managers may be reduced to an almost exclusive reliance on intuition and firsthand observation, which implies that the need for an information system may be related to the size and scope of the organization. Intuition and observation may only be adequate for the smallest of businesses.

The second classical reason for small business failure is the lack and misuse of business records (Broom-Longnecker 1975; Buchele 1967). Many of the previously mentioned manifestations of management inadequacy could often be effectively combatted through a regular study of the profit, sales, asset utilization, working capital, and debt positions. A corollary effect would be improved access to scarce working capital, a longstanding small business problem.

The narrower range of business activity and the limited market exposure characteristic of small business increase understanding and expertise in the product and market, but expose the small business to greater risk in the event the nature of the business or the demands of the market shift unnoticed. The close proximity to the customer and market may provide a competitive edge through regular contact while leaving the firm blind to potential business opportunities.

The smaller the business the greater the susceptibility to adverse environmental change. If such changes remain undetected by the small business for an extended period, the result may be a discontinuance of operations. Shorter product life cycles and shifting public expectations and consumer preferences provide the small business with an opportunity to utilize the flexibility associated with an entrepreneurial environment to respond to recognized change with a minimum of organizational activity. As the size of the firm increases, the organizational activity required to adapt the firm to accommodate change escalates.

Each of these competitive strengths is contingent upon the recognition of environmental change or opportunity. This is accomplished through the analysis of selected environmental inputs. Leifer and Delbecq (1978) have formalized the interchange between the organization and the environment as a boundary spanning model. Planning has been defined as a synonym for boundary spanning (Leifer-Delbecq 1978) which is a concept that relates the organization to its environment. Boundary spanning activities facilitate the transfer of information concerning relevant environmental parameters to the organizational decision maker. The primary advantage of this conceptualization is that it provides for and regulates the flow of information between the organization and the environment. The essence of boundary spanning is the collection and processing of accurate, timely, and relevant

environmental data with the specific purpose of mitigating any negative impact of the environment upon the organization. Consequently, the magnified effect of the environment on smaller businesses suggests that the need for the boundary spanning function is fundamental to the existence of the small business enterprise. As an example, consider the decline of the full service garage station. The owners of these stations relied on gasoline sales to cover fixed overhead, while profit was primarily derived from the garage services. As the selfserve stations increased their share of gasoline sales, the full service stations saw their profit margins drastically decrease.

1.5 SUMMARY

Small business is an important component in the economic and social dimensions of this country. Though small business failure appears to fluctuate in accordance with national economic cycles, the Federal Development Business Bank has steadily increased its investment in small business by approximately 180% over the period 1971- 1977⁵. Due to their size, it becomes difficult for small business to employ buffering (stockpiling inventory), smoothing (regulating demand), or rationing (selective distribution of finished goods or raw materials) in coping with the business

⁵ For a more precise description see CIBC Commercial Letter, Issue No. 2, 1978. Small business susceptibility to environmental change is demonstrated in the section relating small business failures.

environment. Their chief strength lies in adaptation through specialization. The causes for small business failure can often be distilled to the absence of adequate information and the lack of proper application in the decision making process. An improvement in the availability of accurate, timely, and relevant information, coupled with more sophisticated application techniques may allow small businesses to more gainfully exploit their potential to adapt.

Chapter II

INTRODUCTION TO COMPUTERS IN SMALL BUSINESS

Several societal trends have accelerated the growth of the data processing industry to the point where it is becoming the single largest industry in the world. Kast and Rosenzweig (1974) describe the steady erosion of the pure capitalistic work ethic since the late nineteenth century. As an indirect result, skilled labour has become less available and more expensive, making automation an increasingly attractive alternative. Toffler (1970) has studied change and its social effects, concluding that the rate of change is increasing at a pace which threatens the individual's ability to cope. Both Starr and Rudman (1973) and Quirin et al. (1977) corroborate the contention that technological growth is geometric, as opposed to constant or arithmetic. This suggests a dramatic expansion of information processing capability. Dolatta et al. (1976) emphasize the growth in the amount and concentration of data as a significant factor in the rise of the computer industry. Expanding government programs, the advent of multinational corporations, and increasing government intervention also exemplify the developments which are partially responsible for this propagation of data. In each case, the computer offers some relief from the pressure of these issues. Using the framework for tech-

nological forecasting described by Martino (1972), computers have advanced to the final stages of having a pronounced social and economic impact. Automated information processing has become an inexorable part of the production of the goods and services produced in this country.

2.1 THE OPPORTUNITY

However, it is only within the last seven years that the computer has become a viable resource for the small business⁶. These enterprises now find themselves in a position similar to that of the larger firms in the mid 1960's. McLaughlin (1966) termed the electronic information processing machine the herald of a second industrial revolution : an information revolution. He stressed the need for large firms to incorporate this information technology into the organization as means of survival. Drucker (1970) summarized the link between information and the technology as follows :

One of the most potentially earth-shaking forces in our economy is the technology of information. I don't mean simply the computer. The computer is to information what the electric power station is to electricity.

This is the environmental issue with which small business, as did the larger enterprises over the last twenty years, must now contend. Trends in the data processing

⁶This study has assumed the introduction of the IBM System/32 to be the beginning of truly affordable small business computers.

industry have made information processing cheaper, have remedied the imbalance between the capacity to compute and store information and the capacity to use this information, and have generated a dissatisfaction with the simplistic applications of the past two decades.

However, small businesses are in a position to avoid the problems encountered by the larger organizations as they attempted to adjust to this information explosion. As the methodologies for applying raw computing power and the associated peripherals evolved, these larger organizations became increasingly disillusioned. Diebold (1970) states that this was due to the use of inappropriate criteria in determining the worth of the systems developed. Organizations continued to use a cost-displacement approach. The focus should have been on the gains derived from the uses of the information which could be generated.

Current concepts such as management information systems, information centers, and decision support systems are variations of this theme. This conceptualization of the relationship between the decision making process and the technology, combined with advances in the data processing industry (both equipment and techniques), yields a sound foundation on which small businesses can begin to integrate information processing technology and the operation of the firm. However, a major barrier to computer utilization in

small business is owner/management ignorance, fear, and concern about the mystique of computing technology. Some of this observed owner/management behaviour is founded in genuine concerns about the impact of computers on organizational dimensions such as job security and authority.

2.2 DATA PROCESSING INDUSTRY TRENDS

The overwhelming advances in computer hardware technology are well documented⁷. It is the resultant dramatic improvement in performance/price which has made physical computing equipment affordable to the small business. This has been accompanied by parallel advances in the software (i.e. the means of encoding instructions in a computer understandable format) to the point where readily usable high-level computer languages have supplanted the cryptic machine-level languages prevalent in the early years of data processing. Markland (1972) found cost to be a significant deterrent to the small business in acquiring computing devices. Inability to understand the computing process, and a perceived difficulty in using the computer were additional major negative factors.

Cost advantages alone are not sufficient justification for the acquisition of a computer. Datapro Research Corporation (1976) and Dolatta et al. (1976) summarize user

⁷For a brief overview of trends in computer hardware see Appendix A. For a description of a typical small business computer configuration see Appendix D.

expectations under the following scheme:

1. Reliability and availability of the system. The machine must be operational when, and as needed.
2. Ease of operation and consistency of the entire user interface. The machine must be usable without extensive training or experience.
3. Simplicity and naturalness in protocols, protection, and documentation. These, and associated considerations, must be designed to accommodate the user's approach to problem solving.
4. Control of the flow of processing. Users must have the ability to intervene and verify during all processing stages.

Small business acceptance of computers, as outlined in the following section, indicates these needs are currently being satisfied. The root cause for this satisfaction lies in the recent proliferation of companies catering to the computer markets. Science Council of Canada (1973) itemized the trends which allowed this healthy increase in competition to materialize. During the early years of this decade, suppliers embarked on a new marketing strategy. This was the practice of "unbundling", or the separation of hardware and software into discrete purchasable components. An immediate ramification was the ability of purchasers to

select a mix of individual components resulting in a configuration more tailored to their needs. This fragmented market allowed entry to a host of suppliers which concentrated their resources in narrow market segments. Consequently, each of the component areas developed at a rate otherwise unexpected. Innovation was the basis for these advances, generating a wider diversification of industry product lines. The existing base of computing systems and the industry's improved ability to match product development to consumer requirements accelerated the acceptance of these innovations.

Small businesses now find themselves the target market of both the traditional large suppliers who have expanded their product lines to include this untapped source of revenue and the independents which spearheaded the product development in this sector. A comprehensive selection of high quality, low priced, equipment is the direct result. Efforts to improve competitive posture prompted vendors to expand their breadth of service. Improved documentation, training programs, program package design, and general customer support are evidence of a new evolving marketing strategy: a focus on end-user support. System components are being designed to be readily usable by the ultimate user, as opposed to a data processing professional. Both the hardware and software aspects of systems can be designed to be more compatible with the specific needs of small businesses.

The appearance of less complex man-machine interfaces reduces the need for small business to rely on internal expertise. This new marketing philosophy permits small businesses to employ the resources of the vendor in solving problems which were previously the sole responsibility of the purchaser.

An inherent disadvantage of this increased flexibility is that the consumer must now choose from a larger set of options. This negative consideration has been partially offset by a growing awareness, in the industry and the marketplace, of the need for standardization and professionalism. Continuance of a particular market segment is contingent upon vendors being able to ensure that their products will interface with the complementary product offerings of competitors. Both government and industry are committed to establishing such standards. Members of the data processing field are becoming increasingly concerned with the need for a consistent level of performance⁸. Small businesses benefit because of their need to rely on external expertise. The rise of the "third party" element to facilitate the acquisition and application of computer systems provides a powerful alternative to reliance on the vendor or internal

⁸Ten major professional organizations in the data processing area have formed the Institute for the Certification of Computer Professionals. The ICCP currently holds an annual examination which is not mandatory. However, the American government has designated this organization as the vehicle for the establishment of a certification procedure for data processing professionals.

expertise. Small businesses can balance the cost of technical support against the control they wish to exercise through the use of these service companies.

There has been a progressive integration of various applications (i.e. distinct computing tasks as defined by the user) into more complete and meaningful sets. In a survey of 24 of the top executives of major independent software suppliers, Datapro Research Corporation found that 67% of the respondents expected this trend to increase dramatically, while 33% felt it would increase slowly⁹. A notable achievement is the availability of powerful data base management systems on small computers for a total purchase cost of approximately \$150,000. These systems are the functional equivalents of three to four year old systems running on larger mainframes costing a minimum of \$1,000,000¹⁰.

2.3 SMALL BUSINESS COMPUTER MARKETPLACE

The small business computing market is served by four distinct types of suppliers which represent close to ninety participants. A general classification of these types follows:

⁹For a complete description of the results see "Leading Software Vendors Analyze Industry Trends", EDP SOLUTIONS, Datapro Research Corporation, April 1978, Brief E30-152-151

¹⁰This information was taken from "Direction for the Future: Minicomputer DBMS", EDP Management Newsbriefs, DATAPRO Research Corporation, Vol. 3, No. 10, October 1978.

1. Large corporations who have been involved in the computing industry since its inception and have historically concentrated their efforts in the larger mainframe market.
2. Minicomputer manufacturers which offer the same services as the larger members of the industry, but have used the reduced size and flexibility of their products as a means of market differentiation.
3. Independents who have enhanced the equipment of other suppliers with prepackaged software to produce turnkey systems.
4. Microprocessor companies which specialize in very small business applications.

Between them these suppliers have managed to tap only 10% of the estimated market population in North America¹¹. The Evans Research Corporation estimates that by 1980, 85% of all installed computers will be small business systems or minicomputers. Table 2 describes the phenomenal growth in this market¹².

¹¹ For a more complete description see The Trend Towards Small Business Computers, EDP In-Depth Reports, Evans Research Corporation, March 1978.

¹² The table was taken from the above source and amended to include the most recent statistics. All data is taken from the CIPS annual computer survey with the exception of the less than \$1,000 rental class. These figures were

TABLE 2
Small Business Computer Growth

| Growth Period | Monthly Rental | | |
|---------------|------------------|-----------------------|-----------------------|
| | Under \$1,000 | \$1,000 to \$1,999 | \$2,000 to \$4,999 |
| 1977-1978 | 25% | 21% | 24% |
| 1976-1977 | 25% | 19% | 11% |
| 1975-1976 | 36% | 35% | 16% |
| 1974-1975 | 48% | 48% | 26% |
| 1973-1974 | 84% | 35% | 17% |
| 1972-1973 | 66% | 23% | 17% |
| 1971-1972 | 38% | 46% | 21% |
| 1970-1971 | 100% | 52% | 12% |

In an effort to determine user satisfaction with current minicomputers and small business computers, Datapro Research Corporation (1978) surveyed 816 users with a total of 2362 installed systems. Responses were graded on a four point scale, with a rating of 4 equivalent to excellent, and a rating of 1 equivalent to poor. Table 3 summarizes the results of the attitude survey¹³.

estimated by the Evans Research Corporation.

¹³This information was taken from "User Ratings of MiniComputers and Small Business computers", EDP SOLUTIONS, Datapro Research Corporation, February 1978, Brief E90-100-201.

TABLE 3

User Attitudes Towards Small Computers

| System Characteristic | Weighted Average User Ratings |
|---------------------------------------|----------------------------------|
| Ease of Operation | 3.4 |
| Reliability of Mainframe | 3.4 |
| Reliability of Peripherals | 3.0 |
| Responsiveness of Maintenance Service | 3.0 |
| Effectiveness of Maintenance Service | 3.0 |
| Technical Support | 2.6 |
| Manufacturer Software: | |
| Operating System | 3.0 |
| Compilers/Assemblers | 3.0 |
| Application Programs | 2.7 |
| Ease of Programming | 3.1 |
| Ease of Conversion | 3.0 |
| Overall Satisfaction | 3.1 |

These results are in general agreement with the observations made in the second section of this chapter and corroborate the expected continuation of growth in small business computer sales.

2.4 SUMMARY

Although automated information processing is a potentially powerful tool, it is not a panacea for the ills of

small business. The Science Council of Canada (1973) has succinctly placed the computer in the proper perspective.

The application of a computer is fundamentally different from the application of most other tools that organizations use. Other tools are usable as delivered. A newly delivered computer, however, is simply the hardware component of a potentially useful tool..... In many cases the entire operating procedure of a company must be analyzed and possibly amended.....

The primary advantage of computers to small business is in the prerequisite definition and understanding of operating processes. During this definition phase, powerful new management techniques can be effectively introduced with relatively minimal marginal effort. Proper use of the computer will allow the small business manager to automate the routine aspects of the decision making processes and free him to cope with the crucial task of using the resulting information to deal with the nonquantifiable parameters affecting the business.

Moreover, the small business computer systems currently appearing in the marketplace are increasingly sophisticated in terms of transaction processing and the information manipulation designed to support operational, control, and planning activities. Consequently, a growing number of small businesses with primitive data processing and information systems are presented with the opportunity to make a quantum leap forward to a much more sophisticated level of information processing.

Chapter III

A FRAMEWORK FOR INFORMATION MANAGEMENT

To discuss information management and the small business effectively, it is necessary to establish a broad conceptual framework which interrelates the environment and the organizational processes or subsystems. This framework should be independent of the means by which it is operationalized. Unfortunately information management seems to connote such concepts as "total systems" and "information management systems" which appear to revolve around the common myth that the study of information systems is about the use of computers (Tricker 1976). The subject of information management centers on the need for information throughout an organization. This chapter discusses the subject of information management without any assumptions as to the vehicle of implementation. Whether the processing technology is manual or automated is determined by the characteristics of operating procedures and economic considerations. Figure 1 represents an information management framework which explicitly describes the underlying need for information through the interrelation of the business processes and the environment¹⁴.

¹⁴This diagram was taken from Managing Computer-Based Information Systems, Dearden et al., (Homewood, Illinois: Rich-

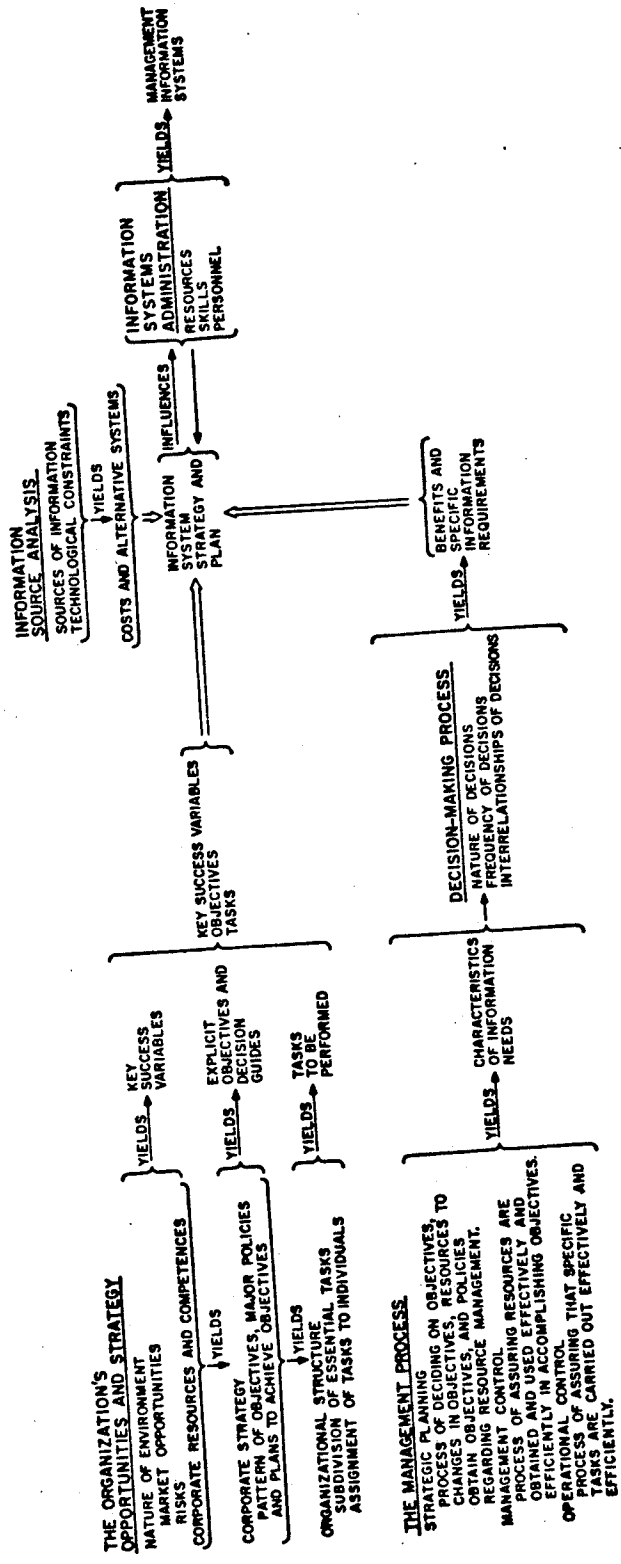


Figure 1: Framework for Information Management

3.1 BUSINESS STRATEGY AND POLICY

Whether large or small, strategic planning is fundamental to the survival of a business enterprise. Stegall et al.(1976) emphasize the importance of planning to small business in particular, and suggest that small firms have a tendency to expend a superficial amount of effort on this activity. As a means of accounting for environmental variables, they suggest a management by objectives approach. Motivation for planning may lie in the fact that the real profitability for smaller companies lies in the future. Wortman(1976) warns against restricting the scope of planning to the balance sheet and income statement. This tends to focus attention on internal information, while excluding potentially useful external signals. On the other hand, small businesses exhibit characteristics which may make planning less demanding than in a larger company. Golde(1965) identifies fewer layers of management, less data to gather, and less dispersed operations as examples.

In establishing a plan, the small business manager must first assess the nature of the environment (Tate et al. 1978; Siropolis 1977; Wortman 1976; Buchele 1967). Linneman and Kernell(1977) describe a practical approach to strategic

ard D. Irwin Inc., 1971). Though the title of the book suggests an emphasis on the use of computers in implementing information management systems, the framework is sufficiently general as to accommodate a natural division between the organization's need for information and the specific aspects of designing the system for the organization.

planning based on a statement of assumptions about the business and the subsequent development of scenarios to incorporate the environmental component. A more comprehensive and detailed scheme (Uyterhoeven et al. 1977) is summarized below:

1. PHASE 1: Determination of the strategic profile.

a) Definition of the business in terms of:

- i) Product scope.
- ii) Degree of vertical integration.
- iii) Geographic coverage.

b) Definition of competitive posture in terms of:

- i) Choice of competitive weapons.
- ii) Company's relative competitive position.

c) Definition of company's concept of itself in terms of:

- i) Performance goals.
- ii) Social orientation and culture.

2. PHASE 2: Determination of the relevant environmental dimensions.

a) Political, social, and economic trends.

b) Definition of the market dimension in terms of:

- i) Market demand.
- ii) Market requirements.
- iii) Distribution requirements.

c) Definition of the product and technological dimension in terms of:

- i) Products.
- ii) Process innovation.
- iii) Raw materials.

d) Definition of the competitive dimension.

3. PHASE 3: A strategic forecast which attempts to determine whether conditions are cyclical or structural in nature, and which employs predictions rather than projections.

4. PHASE 4: A resource audit which focuses on the field of endeavour and attempts to determine strengths and weaknesses by relating internal resources to phases 1-3.

a) The operational dimension is concerned with the key success variables, or those activities which are crucial to the success of the firm.

b) The logistics dimension is concerned with the management and the allocation of the firm's resources.

c) The management dimension is less tangible and relates to the ability of management to adhere to the strategic plan.

5. PHASE 5: Strategic alternatives are identified. Specialization is attractive to small business since it offers a competitive edge through the exploitation of a narrow market segment.

6. PHASE 6: A test of consistency is required to relate what the company is able to accomplish given its resources, to what it is possible to do given the environment. The objective is to match strengths with opportunities, while minimizing external threats and internal weaknesses.

7. PHASE 7: Ultimately the manager must make a choice. In addition to the preceding exercise, individual goals and ambitions, and the degree of risk aversion will influence the final choice. For the small business manager, management has not been divorced from ownership and the less tangible considerations mentioned above will carry considerable weight.

As is implied in the above taxonomy, policy and strategy development is a continuing effort centered on the collection and synthesis of information. Strategy formulation forces the small business manager to deal explicitly with environmental opportunities and threats. The accomplishment of objectives is dependent upon the ability of the organization to recognize and monitor key success variables. As an example, consider retail grocery outlets which combine a low profit margin with high volume to generate profits. The low margin is a function of competitive pressure, while the volume component is required to magnify the margin parameter to acceptable profit levels. Objectives, with their associated success variables, are operationalized through the organizational components of structure and process. Zani (in Coleman and Riley 1973) succinctly defines these success variables as those company tasks at which the organization must excel in order to succeed. These will assist in determining the priorities for information system development.

3.2 THE MANAGEMENT PROCESS AND DECISION MAKING

Much of information management's importance is derived from the fact that it acts to enhance management's ability to expedite its functions. The longstanding definition of these functions can be traced to 1916, when Henri Fayol introduced planning, organizing, co-ordinating, commanding, and controlling as the global set of managerial activities.

In attempting to deduce and systematize the information needs of an organization, many individuals have unwaveringly formulated their analysis based on this concept of POSDCORB¹⁵. Blumenthal (1969) and Donkin (in Coleman and Riley 1973) are typical examples of this approach. Stegall et al. (1976) also address small business management through this scheme. The benefit of this taxonomy lies in its normative nature, and has spawned the moderately successful subsystem approach to information management. Kanter (1972) places such systems on a two dimensional grid where the level of management is the vertical dimension and the subsystems the horizontal dimension. Planning is essential to the survival of the small business, yet the small business manager will have difficulty in determining when he is planning as opposed to co-ordinating. In actual practice there is only a tenuous relationship between these categories and day to day managerial activities.

Mintzberg (1973) provides an excellent review of alternate approaches to the problem of defining managerial work. Microeconomic theory, which profiles the manager as exclusively a decision maker, assumes a rational decision based on known alternatives but does not provide for unstructured events. Cyert and March (1963) placed decision

¹⁵This acronym was coined by Luther Gulick in 1937 and distills management activities into the fractional components of planning, organizing, staffing, directing, co-ordinating, reporting, and budgeting.

making on an unprogrammed-programmed continuum¹⁶. They argue that since alternatives and their consequences are often ill-defined, the emphasis in decision making should be on problem identification and definition. A corollary is the tendency for managers to be reactive and to satisfice given a complex set of constraints. Simon (1957) elaborates on this predilection to satisfice through his concept of "bounded rationality" - limited skills and knowledge are most effectively used when emphasis is placed on heuristic rules of thumb and the search for solutions is confined to those that are "good enough"¹⁷.

Other schools of thought have focused on leadership to the exclusion of POSDCORB and decision making. These individuals have studied the person holding the position, rather than the dimensions or activities inherent in that position, and center on the concepts of authoritative versus participative management and the theory of leadership power¹⁸. No attempt has been made to describe the entire spectrum of methods used to define managerial activity. Rather, these are representative of the research in this area. However, it

¹⁶ See A Behavioural Theory of the Firm, R.M. Cyert and J.G. March, (Englewood Cliffs, N.J.: Prentice-Hall, 1963)

¹⁷ This interpretation is taken from Decision Support Systems: An Organizational Perspective, Peter G. W. Keen, Michael S. Scott-Morton, (Philippines: Addison-Wesley Publishing Co., 1978).

¹⁸ As an example see New Patterns of Management, R. Likert, (New York: McGraw-Hill, 1961)

is clear that the problems in information management systems are compounded by the lack of common understanding of managerial functions.

Mintzberg (1973) is a proponent of the work activity school. This methodology is diametrically opposed to the POSDCORB school in that its conclusions are founded in empirical evidence. Both the characteristics and the content of managerial work are studied. Analysis and subsequent categorization of the content component has resulted in the emergence of a new definition of management functions or roles. Mintzberg has assigned the manager a set of ten working roles and discovered several significant characteristics of managerial activities¹⁹. These are summarized below:

1. Managerial activity is characterized by brevity, fragmentation, and variety. This in itself is not astounding. The fact that managers choose to work in this environment is upsetting to those system designers who have strived to relieve managers of this environment. Chief executives studied by Mintzberg averaged 36 written and 16 verbal contacts per day, almost all of which dealt with distinct issues.

¹⁹ See Appendix B for a more complete description of this set of ten roles and the study from which they were derived.

2. Managers are preoccupied with the more dynamic items on their agendas: activities which are current, specific, and well-defined, and those that are non-routine. Mintzberg found that 13 of every 14 verbal contacts were initiated on an impromptu basis, and often occurred in response to a situation which was developing at that specific point in time.
3. Managers are attracted to the verbal media. This is related to the short feedback delay characteristic of verbal interaction. The subjects of Mintzberg's study devoted 78% of their time to tasks characterized by verbal interaction. Scheduled and unscheduled meetings comprised the majority of these activities.
4. Managers interact with a wide network of contacts and often bypass formal lines of authority or procedures to maintain these contacts.

These observations have particular relevance for successful information management systems design. Managers obviously wish to maintain a flow of current information and do not consider themselves bound by existing channels in the acquisition of this information. Systems architects cannot solely rely on a well-defined set of reports to satisfy management information needs since this approach is not consistent with the above characteristics. Many of the misgivings

discussed by Ackoff (in Coleman and Riley 1973) and Tolliver (in Coleman and Riley 1973) are given an air of credibility by Mintzberg's findings. Lucas (1976) describes a scheme for the analysis, design, and implementation of information systems which first considers the roles of the manager when using the information (Will the manager be able to relate to the system output at the time he uses it ?), then the nature of the problem (What information is necessary to assist in affecting a solution?), and finally the kinds of decisions being supported (What are the characteristics of the information?). Table 4 describes a trichotomy of the types of decisions²⁰. The above table uses source, accuracy, level of detail, frequency, time horizon, and use as the pertinent dimensions of this information.

This subdivision of managerial activities is based on arguments forwarded by Anthony (1965). Strategic planning in this context can be considered synonymous with the business policy and strategy formulation discussion of the first section. Management control ensures the attainment and use of resources in support of the organization's objectives. The emphasis is on efficiency and effectiveness and requires considerable interpersonal contact. Operational control is task oriented and concerned with completing predefined activities. This predefinition reduces the need for -----

²⁰The contents of the table are taken from The Analysis, Design, and Implementation of Information Systems, Henry C. Lucas, (New York: McGraw-Hill, 1976), pp.26

TABLE 4

Types of Decisions By Information Characteristics

| Strategic Planning | Managerial Control | Operational Control |
|------------------------------|-----------------------|------------------------|
| External environment | Internal controls | Internal records |
| Reduced need for accuracy | Accuracy vital | Accuracy vital |
| Summaries | Detailed data | Detailed data |
| Periodic | Frequent | Frequent |
| Long range | Medium range | Short range |
| Predictive | Control | Action |

managerial judgement. Though there are no clear dividing lines, each of these classes of managerial work require information having different characteristics.

This trilevel design scheme of relating the information needs to the particular role of the manager, the demands of the problem, and the nature of the decision is a positive shift from the more traditional methods of information system conceptualization and design. Keen and Morton (1978) have further refined this perspective on information management to produce one which concentrates on decision support. The primary thrust of decision support systems implies the use of computers to²¹:

²¹This definition is taken from Decision Support Systems: An Organizational Perspective, Peter G.W. Keen and Michael S.

1. Assist managers in their decision processes in semistructured tasks.
2. Support, rather than replace, managerial judgement.
3. Improve the effectiveness of decision making rather than its efficiency.

Decision support theory is based on research and ideas originating from computer science, information theory, artificial intelligence, information economics, management science, behavioural science, and management itself. Integration of these adjuncts to information management is accomplished by extending, rather than replacing, their unique contributions to form a cohesive whole. The net effect is to shift the level of attention from operations to the intricacies of managerial problem solving. Mason and Mitroff (1973) present a central theme of decision support systems in the following observation²²:

What is information for one type will definitely not be information for another. Thus, as designers of MIS, our job is not to get (or force) all types to conform to one, but to give each type the kind of information he is psychologically attuned to and will use most effectively.

Scott-Morton, (Philippines: Addison-Wesely, 1978), pp.1

²²The quotation is taken from "A program for Research on Management Information Systems", R.O. Mason and I.I. Mitroff, Management Science, Vol. 19, No. 5, January 1973, pp.475

This specifically addresses the impact of cognitive style (analytical versus intuitive, systematic versus divergent etc.) on the framework for information management. Both descriptive realism and normative realism are essential concerns of the system architect. This suggests a reconciliation, or at best an inexact equilibrium, between the traditional POSDCORB and the contributions of the work activity school. The following summary delineates the complementary nature of the evolutionary stages in perspectives on information management²³:

1. MANAGEMENT INFORMATION SYSTEMS:

- a) IMPACT: Structured tasks where standard operating procedures, decision rules, and information flows can be reliably defined.
- b) PAYOFF: Improving efficiency by reducing costs, turnaround time, and so on, and by replacing clerical personnel.
- c) RELEVANCE: Mainly indirect by providing reports and access to data.

2. OPERATIONS RESEARCH/MANAGEMENT SCIENCE:

²³This summary is taken from Decision Support Systems: An Organizational Perspective, Peter G.W. Keen and Michael S. Scott Morton, (Philippines: Addison -Wesely, 1978), pp.1-2

- a) IMPACT: Structured problems where the objective, data, and constraints can be prespecified.
 - b) PAYOFF: Generating better solutions for given types of problems.
 - c) RELEVANCE: The provision of detailed recommendations and new methodologies for handling complex problems.
3. DECISION SUPPORT SYSTEMS:

- a) IMPACT: Decisions in which there is sufficient structure for computer and analytic aids to be of value but where managers' judgement is essential.
- b) PAYOFF: Extending the range and capability of managers' decision processes to help them improve their effectiveness.
- c) RELEVANCE: The creation of a supportive tool, under managerial control, which does not attempt to automate the decision process, predefine objectives, or impose solutions.

Profiling each of these stages by impact, payoff, and relevance demonstrates that each is most effective in differing circumstances. The values of these parameters sug-

gest that three perspectives can be superimposed on a continuum which ranges from specific to nonspecific. Impact ranges from tasks, to sets of tasks, culminating in the least definable area, that of decision making. Payoff evolves from cost displacement to a qualitative enhancement of the solution set (i.e. that group of alternatives identified as potential solutions to a specific problem). Relevance begins with a tangible output, reports and access to data, and terminates as an integral supportive component of the decision process. Sisson and Canning (1967) estimate that 20 to 40 per cent of business decisions, by type, can be rigorously defined. When considering the number of decisions made in a given enterprise in a year, this percentage probably lies in the 80 to 90 percent range. This underscores the importance of each of these classes of systems. One should not be considered to the exclusion of the others in designing an information management system. Table 5 illustrates a composite method for information system design²⁴.

²⁴The table is adapted from Decision Support Systems: An Organizational Perspective, Peter W.G. Keen and Michael S. Scott-Morton, (Philippines: Addison-Wesely, 1978), pp.87

TABLE 5

A Composite Framework for Information Management

| Management Activity | Type of Decision/Task | | |
|---------------------|----------------------------|------------------------------|-----------------------------|
| | Structured | Semistructured | Unstructured |
| Operational Control | Inventory Ordering | Bond Trading | Selecting a Company Logo |
| Management Control | LP for Resource Allocation | Establish Marketing Budget | Hiring Personnel |
| Strategic Planning | Location of Business | Capital Acquisition Analysis | Selection of Market Segment |
| Support Needed | OR/MS/MIS | DSS | Human Intuition |

3.3 SUMMARY

This chapter began with a comprehensive framework for information management. It emphasized the importance of integrating the environmental inputs into the method of design. The scope was narrowed by the realization that the business operationalizes its interaction with the environment through the management process. As this aspect was discussed, it became apparent that the information management framework is dependent upon the characteristics of the management process. Thus, the degree of programmability inherent in the task or decision, the class of the task or decision, and the attributes of managerial activity are crucial considerations in formulating a conceptual framework for information management system design. Decision support

systems accentuate the synergistic effect of a man-machine team, and the fact that more than one level of impact is desirable within an information management framework.

Chapter IV

COMPUTERS AND SMALL BUSINESS OPERATION

The preceding chapters have discussed the nature of small business, the accelerating growth of small business computers, and the complex interaction of variables in the information management process. Within the framework described, three distinct levels of potential improvement were identified: transaction processing, superior solution sets, and assistance in decision making²⁵. These potential improvements are contingent upon management's ability to define and understand the flow of business information and use scientific techniques to analyze available data. Failure to realize these considerations is a fundamental cause of small business problems as manifested by poor record keeping and subsequent managerial incapacity. This chapter will examine the implications of selecting a computer to implement an information management scheme in a small business. Projected growth in small business computer sales underlines the importance of examining the impact of electronic data processing on the small business.

²⁵"Superior solution sets" is used to refer to the set of alternatives from which the manager can choose an appropriate solution. The adjective superior is used since this solution set is based on improved analytical tools which provide more extensive breadth and depth in solving problems.

4.1 MOTIVATION FOR ACQUIRING A SMALL BUSINESS COMPUTER

Small and large businesses exhibit significant differences in their approaches to information processing. West (1975) provides an introduction to some of the disparities that exist. The limited resources of smaller firms often result in a lack of personnel and appropriate computer hardware. The monthly rental of the computer configuration may be a large portion of the business's operating expenses. A tendency towards centralized management in small firms has two adverse consequences. Responsibility is delegated without the corresponding authority, making it difficult to attract and keep competent personnel. The second effect is the absence of a scientific approach to business operations, largely due to an over-reliance on management intuition.

Render and Stair (1977) indicate the potential benefits of management science in the small business under any of the following circumstances:

1. The problem is very important and merits a serious analysis prior to a final decision.
2. The problem is new and previous experience does not help in providing a solution.
3. The problem is too complex to solve without the help of management science tools.

4. The problem is repetitive and a quantitative procedure can assist in making a routine decision.

The direct benefits of management science to the manager are closely linked to small business problems. The manager's knowledge and insights into the characteristics of his business are increased. He is provided with better and more timely information with which to help in controlling his organization more effectively, and the time allocated to routine decisions is reduced. The localization and predefinition of data inherent in an information system, combined with the speed, accuracy and versatility of the computer allows small business the opportunity to employ these techniques.

When mechanizing, or automating, the small firm implements the system from a narrow perspective. There is seldom any attempt to systematize based on a global analysis of the business. An information management framework injects this vital ingredient. However, implementation of this type of scheme demands competent personnel. The small business predilection to focus on cost may negatively influence the selection of personnel. The use of a third party (i.e. management consultant) offers small business an alternative which neutralizes this problem.

Marchand (1977) notes that small business managers have a strong belief in the profit motive and the value of profit as a measure of efficiency and success. In addressing this

specific aspect of small business operation, Wood (1972) suggests that there are only five avenues to increase profits: raising prices, reducing costs, improving the product mix, reducing the capital employed, and increasing sales volume. Which of these alternatives is most appropriate at a given instance can only be determined from a comprehensive set of business records. In selecting the most suitable strategy, the small business manager must avoid excessive credit to customers, poor inventory control, the impact of seasonal fluctuation, and the use of an improper amount of credit from suppliers. The desire for profit maximization has downside risks which must be considered in the course of operating the business. The extent of these risks can be deduced from business records. Grieco (1975) itemizes specific examples of using the computer as a means to these ends. Table 6 depicts some specific application areas where the use of a computer may lead to improved profits²⁶.

However, it is imperative to note that the existence of such a record base is not sufficient in itself. These records only become useful when they relate to the operation of the business in a consistent fashion, when they can be analyzed through semi-rigorous algorithms or procedures for which the objectives and assumptions are well defined, and when they are designed to support rather than replace the

²⁶The contents of the table are adapted from Management of Small Business, V. A. Grieco, (Columbus, Ohio: Charles E. Merrill Publishing Company, 1975), pp. 174-175

TABLE 6

Examples of Benefits of Computing to the Small Business

| Application | Potential Small Business Benefits |
|-------------|---|
| Billing | Quicker paying cycle; improved control of buying and selling; valuable data concerning customers, products, costs, prices, and sales statistics. |
| Inventory | Establish economic order quantities and order points; turnover statistics by item; holding costs. |
| Payroll | Automatic payroll accounting system; labour cost variances; workload smoothing. |
| Purchasing | Performance figures by item, supplier, and buyer in terms of cost, quality and delivery; improved use of supplier credit; simplified analysis of historical data. |

manager's decision. Selecting a computer as the vehicle for implementing this record base generates an environment which is conducive to exploiting the full potential of business records.

Using the computer in the above fashion may increase small business profits by reducing costs, strengthening the basis for management decisions, and improving customer service. Since the computer replaces an alternate method of information processing, costs may be reduced through a need for less clerical support, improved asset management (accounts receivable, inventory, fixed assets) and the provision for more effective cash flow management. Management

decisions are strengthened by three characteristics of computer generated information²⁷:

1. It is a byproduct of normal accounting procedures. Minimum marginal effort is required.
2. The information can be easily represented in many formats to provide ease of understanding and to accomodate different perspectives of the same problem.
3. It can be easily condensed and summarized to focus on trends or specific issues. Thus management can concentrate on irregularities or exceptions.

Small business strength lies in its ability to adapt to narrow market segments. Due to the limited size of the market segment, failure to adapt can be disastrous. Customer service can be considered one of the boundary spanning activities which facilitates the adaptation process. The use of computers can improve the response time and accuracy of customer service tasks.

Although computers, in conjunction with an information management perspective, may offset the development of the classic small business problems with the net result of

²⁷This information is taken from Small System Solutions: An Introduction to Business Computing, International Business Machines Corporation, (Rochester: International Business Machines, 1979)

improved operating effectiveness and efficiency, there are several risks in developing management information systems in small companies. The overriding risk is the failure to place the small business in a total perspective which incorporates external parameters and internal dimensions with the purpose of generating a set of key success variables. Neu (1976) has identified several other high risk dimensions.

1. Improper hardware configuration and selection.
2. Too little attention given to the "human" element inherent in the system.
3. An overdependence on the individual(s) at the core of the information system development effort.

The computer can act as a catalyst, in that it demands the use of an information management perspective to become effective, and encourages the application of management science techniques in the initiation of solutions to small business problems. However, it is not universally applicable. Evans Research Corporation (1978) describes a series of general indicators which assist in determining when a small business computer should be considered. These conditions are summarized below²⁸:

²⁸This information is taken from, "Selection Criteria for SBC's: Part 1", EDP In-Depth Reports, Evans Research Corporation, Vol. 8, No. 2, October 1978

1. ACCOUNTING CONDITIONS.

- a) More than 100 orders and invoices are processed daily.
- b) More than 200 accounts payable cheques are prepared monthly.
- c) Delays in invoice preparation: goods shipped without invoices.
- d) Late accounts receivable statements.

2. CUSTOMER SERVICES.

- a) The organization has more than 500 customers.
- b) Customer service is inadequate, with resultant complaints over delays.
- c) Distribution costs are high.

3. INVENTORY CONDITIONS.

- a) Inventory holding costs exceed 20% of the inventory valuation.
- b) Inventory items exceed 2,000.
- c) Excessive inventory is stockpiled.
- d) Fast moving items exceed 20% of inventory, with more than 10 items active each day.

4. PERSONNEL.

- a) Difficulties or delays in payroll preparation.
- b) Clerical salaries exceed \$2,000 per month.
- c) Excessive clerical overtime expenses.
- d) High turnover rate in clerical staff.

5. PRODUCTION CONDITIONS.

- a) Inadequate scheduling.
- b) Frequent changes in labour requirements.
- c) Many variations in product lines.
- d) Inefficient use of manpower and machines.

6. MANAGEMENT INFORMATION.

- a) Data is available but not in an organized flow.
- b) Inadequate information for analysis and planning.

These are representative of the areas of potential saving to the small business but presented in a form which is more obviously related to the operating characteristics of the business. No attempt has been made to define the exact conditions under which the small business should acquire a computer. The weight assigned to the importance of each of

these indicators will vary from business to business depending upon the area of activity and relative size of the firm. However, the indicators should be considered in a manner which is descriptive of the operating processes and key success variables of the business.

4.2 ORGANIZATIONAL IMPACT

The bulk of the research on the impact of computerized information systems on organizational structure and processes has been limited to large corporations (Stewart 1971; Grochla and Szyperski 1975; Hofer 1970; Whisler 1970). Nevertheless, the essence of many findings can be productively applied in the small business environment. Tomeski (1975) and Carper (1977) stress that the ultimate success or failure of a computer based information system is dependent upon its acceptance or rejection by members of the organization. Morton and Keen (1978) devote a substantial portion of their text to a discussion of the significance of human factors in information systems design and implementation. Argyris (in Coleman and Riley 1973), based on his study of a twenty member management science-operations research team operating as a management information group, aptly concludes that the introduction of sophisticated information processing technology poses two distinct problems: technical barriers and human barriers. The problems inherent in the human element may be aggravated in the small business due to its

characteristic desire for independence and strong dislike of hierarchial structure.

If the small business is to reap the technical benefits of a computer based information system, it must remain fully cognizant of the human factors which may foster resistance and lead to dysfunctional behaviour. Carper (1977) identifies feelings of insecurity or uncertainty, increase in job complexity, job or role ambiguity, changed interpersonal relationships or work patterns, threat to status or power, and threat to economic security as causes for resistance²⁹. Radford (1973) attributes many of the above to the increased emphasis on quantitative factors, the more precise specification of processes, and the expanded availability of data throughout the organization resulting from the use of computers. The work of the Tavistock Institute clearly demonstrates the potential counterproductive effect of altering interpersonal relationships or work patterns³⁰.

²⁹This is based on work done by Dickson and Simmons which is discussed further on in this section.

³⁰Based on the introduction of the longwall method in the nationalized coal mines of Great Britain, Trist and his associates observed a marked decrease in productivity among the workers. The fundamental problem was that the previous method of mining relied on autonomous work groups and was characterized by task variety. Introducing the longwall method demanded task specialization and broke down the strong sense of group identification previously experienced by the workers.

Dickson and Simmons (in Dock et al. 1977) interrelate organizational subgroups, reasons for resistance, and the anticipated dysfunctional behaviour. Resistance is defined as manifesting itself in one of three modes:

1. Aggression: This is the most tangible form of dysfunctional behaviour and constitutes a premeditated attempt to undermine the system.
2. Projection: The system is used as an object on which to transfer blame regardless of other relevant factors.
3. Avoidance: System outputs remain unused by those for whom they were intended.

Table 7 relates dysfunctional behaviour to the information system through the organizational subgroups, while Table 8 links the reason for resistance to these subgroups³¹.

In the small business, labour tends to be a more dominant productive asset than capital. This inflates the need to contend with the human considerations of computerized information systems in the small business environment. A global effect of computers is the reversal of the tendency towards decentralized decision making as the firm grows

³¹The contents of these tables are adapted from, MIS: A Managerial Perspective, Thomas V. Dock et al., (Chicago: Science Research Associates Inc., 1977), p.292 and p.295 respectively.

TABLE 7

Dysfunctional Behaviour Related to Organizational Subgroups

| Organizational Subgroup | Dysfunctional Behaviour | Relation to MIS |
|-------------------------|---------------------------------------|--|
| Operating Personnel | Nonclerical | Aggression Provides system inputs. |
| | Clerical | Projection Particularly affected by clerical systems; job eliminated, job patterns changed. |
| Operating Management | Aggression Avoidance Projection | Controlled from above by information systems; job content modified by information-decision systems and programmed systems. |
| Technical Staff | Little | Systems designers and agents of systems change. |
| Top Management | Avoidance | Generally unaffected and unconcerned with systems. |

(Hertz 1969). Thus the small business manager can maintain a more simplified organizational structure for a greater length of time at the expense of the disadvantages described in the first section of this chapter.

The introduction of information processing technology can be defeated by the human barrier. There are two mutually dependent mechanisms through which the human element can be effectively accounted for: design of the information

TABLE 8

Reasons for Resistance Related to Organizational Subgroups

| Subgroup | | | | Reason for Resistance |
|----------|---|---|---|-------------------------------------|
| 1 | 2 | 3 | 4 | |
| | X | X | | Threat to economic security |
| | X | X | | Threat to status/power |
| X | | X | X | Increased job complexity |
| X | X | X | X | Uncertainty/unfamiliarity |
| | X | X | | Altered work patterns/relationships |
| | X | X | | Altered line of authority |
| X | X | X | | Increased rigidity/time pressure |
| | X | X | X | Role ambiguity |
| | X | X | X | Feelings of insecurity |

NOTE: 1=Nonclerical, 2=Clerical, 3=Operating Management,
4=Top Management

system and management involvement. Definition, participation, and orientation are the key dimensions of the first component. The proposed design must be based on a distinct set of objectives which are understood by those individuals which will be required to interface with the system. Orienting the system towards the characteristics of user procedures, combined with active encouragement of user participation in the design phase, will enhance the chance of success. Management involvement is a corequisite as it is the organizational parameter through which this atmosphere is generated and sustained. This is predominantly a

function of effective communication and an understanding of the informal organization. Operationalization of the desired organizational climate is largely accomplished through managerial style and the use of power or authority (Tricker 1976).

Lucas (1976) summarizes the importance of recognizing potential organizational conflict which may result from the ineffective introduction of an information system through the following set of considerations:

1. It is necessary to examine the impact of any system on the organization as a whole. Changed vertical and lateral relationships and power transfers are two keys areas requiring investigation.
2. It is necessary to examine the impact of any system on work groups and individuals. The informal organization must accept the new system or it is doomed to failure.
3. It is necessary to determine how individuals will react to change. Due to the variety of reasons for associating themselves with specific organizations, different individuals can be expected to respond in a nonhomogeneous manner.

4.3 SELECTION PROCESS

A critical phase in the course of implementing an effective computer based information system is the computer acquisition process. Proper execution of this function can be costly in terms of both money and time. This cost should be considered a portion of the investment required to select and obtain the appropriate computer configuration. For the small company, with its limited size and resources, the impact of the ensuing decision may be more extreme than in a larger firm. If the acquisition process is only superficially discharged, a poor decision is much more probable and the firm may suffer severe financial consequences. Once an opportunity has been identified, the small business should proceed in its efforts to acquire a computer subject to a firm commitment to perform a thorough and careful evaluation of available computing alternatives and how they relate to the firm's computing needs.

Thus, the acquisition function entails a dual perspective. An audit of existing company procedures is the prerequisite activity. The outcome of the audit serves as input for two subsequent activities: system design and computer configuration selection. System design and implementation are more fully discussed in the next section. In the jargon of computer selection, this audit is often labelled a feasibility study. The Evans Research Corporation (1978) suggests a five part approach to the feasibility study³².

1. COMPANY ANALYSIS: This involves the determination of a strategic profile and resource audit as introduced in Chapter III.
 2. DATA PROCESSING ANALYSIS: The strengths and weaknesses of current processing methods are documented. Further insights can be obtained by relating these to projected workloads determined in the previous analysis.
 3. TECHNICAL ANALYSIS: The purpose of this dimension is to examine the viability of automating the current procedures, identify alternatives to a small business computer, and delineate the changes which will be required to accommodate the introduction of new technology.
 4. COST ANALYSIS: Current processing costs are compared to the costs expected from a computer based system. The difference should be an approximate quantitative statement of the anticipated benefits. Costs are related to the acquisition of a computer and include the rental/purchase price, employee training/hiring, forms/supplies, and one time fixed costs such as file conversion, taxes,
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³² For an example of a feasibility study questionnaire see Appendix C. The example in the appendix is taken from, "Selection Criteria for SBC's: Part I", EDP In-Depth Reports, Evans Research Corporation, Vol. 8, No. 2, October 1978.

and delivery costs.

5. IMPACT ANALYSIS: This aspect of the feasibility study focuses on the organizational impact of automated data processing. An attempt is made to predefine organizational response to the introduction of information processing technology.

Completion of a feasibility study will precipitate a set of guidelines to be applied in the selection process. At this stage, the small business can narrow the field of suitable vendors by making some fundamental decisions about the desired characteristics of the computing resource. Will the computer be local to the firm, or will computer resources be purchased from a service bureau? Should a turnkey system be acquired, or should the hardware and software be secured from independent suppliers? Similiar issues will be limited, and subsequently resolved, by the contents of the feasibility study. Examples of general guidelines to be used in the selection procedure follow:

1. Does the configuration have a growth path which is consistent with that of the company? Since it is unlikely that all applications will be implemented at a single point in time, the expandability of the configuration may be a key aspect of the final decision.

2. Computational speeds may be a secondary consideration in the small business environment. The speed, and ease of use, of the input and output devices are likely to be more important.
3. Different configurations have varying environmental demands. In some cases, the cost to provide a suitable environment may prove to be substantial.
4. Is there a high correlation between the firm's desired applications and the software available to implement these applications? This involves three levels of investigation: software utilities, system control or resource management programs, and software languages.

Given this rough set of selection criteria, the small business can solicit vendor proposals through two methods. If the firm has determined exactly what it requires, then it should prepare a request for proposal to which the vendors will respond. However, firms are seldom in a position where they can specify their requirements at the level of detail demanded by an RFP document³³. In this case the vendor will take the initiative and provide a recommended solution based on his perception of the business's computing needs. This

³³The RFP document should be a detailed representation of the firm's processing requirements which is based on an in-depth study of the organization's character and systems. In most cases the RFP is a refined statement of the feasibility study.

does not necessarily reflect what the business wants, and individual vendor biases should be accounted for during the evaluation of the proposals.

Datapro Research Corporation (1977) suggests that the preliminary evaluation of the proposals be done in such a manner as to satisfy four basic objectives³⁴. The completeness of the proposal must be verified. Some vendors may overlook certain requirements, while others may supply responses which conflict with the firm's objectives. The reliability and accuracy of the information contained in the proposals should be validated. A demonstration of the equipment operating under the expected workload, contacting other vendor clients, and the use of trade literature and consulting groups are means to effecting this end. A document itemizing any outstanding questions or omissions should be prepared. This information, together with standardized summaries of the technical content of each proposal, is used to narrow the field to a final qualifying set of suppliers.

It is impossible to predetermine the relative importance of the selection criteria. They are directly related to the requirements of the particular organization. During the evaluation process the small business may employ a blend

³⁴This information is taken from EDP Solutions, "How to Select and Install a Small Business Computer", Datapro Research Corporation, April 1977, Brief E80-300-401

of internal, third party, and vendor expertise. However, it is imperative that the internal component be consistently involved to ensure a full appreciation of why the particular selection was made, and to gain the benefit of business insights which may materialize during the feasibility study.

In the final analysis, more than one vendor may appear to offer the correct solution. This is a function of the multiplicity of vendors and fierce competition characteristic of the small business computer marketplace. Qualitative considerations and business acumen will dictate the final selection criteria in this situation. The quality, quantity, and price of conversion assistance, training/education, hardware/software maintenance, and the level of continuing vendor support become the most important considerations. Easily overlooked questions such as the extent of software documentation, the location and availability of backup equipment, and pre-implementation machine test time impact the final decision. The lease/purchase/rent options offered in vendor contracts can be profitably utilized by the small business. The appropriate financial arrangement is affected by the availability of capital, planned length of system usage, and tax implications. The flexibility, the provision for a hedge against technical obsolescence, and the relative low capital outlay of a lease arrangement suggest that this may be the most efficient method of financing a computer for the small business.

4.4 SYSTEM DESIGN/IMPLEMENTATION

Siegel (1975) describes a management information system as a philosophy of viewing the organization as a whole within its environment, rather than something that can be purchased from a computer vendor. This is the driving force behind the design phase of an information system. In attempting to define a marketing information system, Axelrod (in Coleman and Riley 1973) refers to the following quotation:

A structured interacting complex of persons, machines, and procedures designed to generate an orderly flow of pertinent information collected from both intra and extra firm sources for the use as a basis for decision making in specified areas of marketing management.

If the words "small business" are substituted for "marketing" in the definition, this generalized statement becomes a summary of a small business information system and embodies the key variables of system design: people, machines, procedures, information, and decision making. The information management framework outlined in Chapter III establishes the foundation for the design process. Systems design and implementation involve the application of this perspective, or philosophy, of information management.

The feasibility study is the vehicle which translates the conceptual framework into the raw input for the system design phase. If it is related to Figure 1, then its contents deal explicitly with the following:

1. Business policy in terms of key success variables, organizational objectives, and component tasks.
2. Decision making process in terms of nature of decisions, frequency of decisions, and interrelationships of decisions.
3. Information source analysis which combines the physical attributes of the information with technological constraints to produce costs and a set of alternate systems.

These represent a simplification of the previously discussed parameters in an information management framework. System design attempts to mold these dimensions into a cohesive unit which will reflect the organization as a whole. The specific methods employed to accomplish this end are well documented. Kanter (1975) provides a comprehensive overview of the system design process. Hodge and Hodgson (1969) and Tricker (1976) describe similar schemes. A much simpler framework is suggested by Tomeski (1975). The system architect formalizes the information management framework by focusing on three aspects of the decision making process: the information inputs for the decision, the decision process, and the decision outputs and the manner in which they affect a response. When these approaches are operationalized, they can be distilled to a common set of activities. Lucas (1976) states that the following taxonomy is descriptive of commonly used methods:

1. MOTIVATION

- a) The existing system.
- b) Preliminary survey of system objectives, requirements.
- c) Decide to proceed with the feasibility study.

2. FEASIBILITY STUDY

- a) Sketch existing procedures or systems.
- b) Formulate rough alternate system.
- c) Estimate costs.
- d) Decision to proceed with system.

3. SYSTEM ANALYSIS

- a) Detailed study of the present approach.
- b) Collection of data on volumes, input/output, files.

4. AN IDEAL SYSTEM

- a) System unconstrained by cost.
- b) Revision to the ideal system to make it acceptable.
- c) Decision on system alternatives.

5. DETAILED SPECIFICATIONS

- a) Input/Output.
- b) File design.
- c) Processing logic.
- d) Manual procedures.
- e) Programming requirements.

6. IMPLEMENTATION

- a) Programming and testing.
- b) Documentation.
- c) Training.
- d) Conversion
- e) Installation.

Variations of the above scheme are commonly used by many organizations. Note that the initial two activities are restatements of the first and third sections of this chapter. The third step allows for the introduction of new processing techniques and results in a definition of the global relationships of the organization's information. Unfortunately, the result of the system analysis step must be tempered with business realities. There is a tradeoff

between what would be considered an ideal system and what resources are available. Kanter (1975) emphasizes this issue in his discussion of the marginal value of data. Figure 1 implies this consideration in its depiction of a two way interaction between information systems strategy and information systems administration. More practically stated, the greater the delay due to the acquisition of relevant data, the less the uncertainty inherent in the resultant decision. Nicholson (in Coleman and Riley 1973) suggests the design should minimize the sum of the costs associated with data acquisition (delay) and quality of the decision (uncertainty).

The importance of management involvement in system development cannot be overemphasized. Shollenberger (1971) stresses this point and provides several formal approaches to obtaining management commitment. The essence of these methods lies in the use of a team approach to direct the development effort. Axelrod (in Coleman and Riley 1973) forwards the need for management involvement as the first of fourteen rules for building a management information system. Section 2 of this chapter implies the interdependence of management co-operation and system design in coping with the human element of an information system. Hodge and Hodgson (1969) denote management participation to decrease as the system development effort advances through the phases described by Lucas (1976). The level of involvement is at a

minimum during the final phases of detailed specification and implementation. These activities are dominated by technical specialists and the content of nontechnical contributions is limited to those aspects which interface employees with the system: documentation and training.

4.5 SUMMARY

The bounded resources and relative vulnerability of the smaller business augment the risks and enhance the benefits of exploiting available information processing technology. Effective, and hence profitable, use of computers is contingent upon the adoption of an information management framework perspective. Selection of the proper hardware and software configuration, and a thorough understanding of the dormant organizational impact are considerations which, when superficially discharged, can precipitate failure. Since management in the small business is typically more concentrated than in the larger firm, the chronic problem of lack of management involvement can be readily addressed. If the small business community is to successfully apply the products of the small business computer marketplace, it must adopt a global perspective and realize that many of the mistakes to be made have already been discovered by larger enterprises during the last two decades. The pitfalls do not lie in the information management framework, or in the information processing technology, but in the merging of the two.

Chapter V

SMALL BUSINESS EXPERIENCES WITH COMPUTING - AN EXPLORATORY STUDY

The tone of the discussion concerning small business, information management, and computers has been, for the most part, academic. In an effort to determine the small business manager's perspective, based on experience acquired through the installation of a computer, the general managers of three local small businesses were interviewed. The set of firms selected exhibited two significant common characteristics. First, each of the companies had selected hardware from the same vendor. The significance of this lies in the importance of avoiding bias which may be due to the difference in degrees of satisfaction associated with a multiple vendor situation. Second, each of the firms was chosen from similar areas of business activity in an effort to filter out gross differences in the computer hardware required, and to avoid the difficulties inherent in comparing and contrasting manufacturing and service industries. The definition of small business adopted in Chapter I implies the existence of such problems. An additional benefit of these restrictive criteria was that they permitted the interview to emphasize the nonhardware dimensions of the computing application experience gained by these enterprises.

5.1 PRIMARY DATA COLLECTION

In order to profile the small business experience with computing, it was necessary to elicit a substantial amount of general subjective data from the respondents. To accomplish this end, the author selected a partially structured interview approach based on the schedule in Appendix E. Zaltman and Burger (1975) describe the following advantages and disadvantages of the personal interview:

1. ADVANTAGES

- a) It affords the most flexible means of obtaining data.
- b) The identity of the respondents is known.
- c) The nonresponse rate can be kept to a minimum.
- d) Distribution of the sample is controllable in all respects.

2. DISADVANTAGES

- a) It is the most expensive of the available options.
- b) There are problems with interviewer supervision and control.
- c) There is a possibility of interviewer bias, fabrication, and omission.

The advantages far outweigh the disadvantages under the circumstances of this study. Funding was an irrelevant consideration. Supervision and execution of the interviewing process were confined to a single individual, the author. However, the remaining disadvantage could prove detrimental to the success of the interviews.

Standardization is an effective technique with which to reduce the two main sources of interviewer bias:

1. Attitudes or perceptions of the interviewer.
2. Respondent's perception of the interviewer.

In an effort to combat the first source of bias, each of the interviews was recorded on a cassette tape player. By having the capability of reviewing the interviews, the author hoped to improve the objectivity and completeness of their content which is summarized in the succeeding section.

Efforts to mitigate the second source of interviewer bias concentrated on the consistency of procedures employed in conducting and bringing the interviews to a successful conclusion. Zaltman and Burger (1975) identify the purposes for which the information is to be used, the content of the questions to be asked, and the length of time the interview will take as the chief concerns of potential respondents. During the initial telephone contact, which established the time and date of the interview, the respondent was given the

above information. The interviews were held in similar environments (the general manager's office).

The interview schedule relies heavily on open-ended questions. Zaltman and Burger (1975) state that this is the most effective approach when undertaking exploratory studies. Several questions address the same material in support of continuity and to avoid misinterpretation or misunderstanding. The use of open-ended questions offers the following relevant advantages:

1. Underscores the role of the interviewer as a catalyst.
2. Assists in generating a less regimented atmosphere.
3. Permits the respondent to answer within his own frame of reference, and in terms consistent with his experience.

The net result is a more dynamic exchange of ideas and attitudes, and the ability to elicit more information, if necessary, through followup and probe questions. To maintain continuity during the interviews and to maximize the amount of information obtained, the interviewer used his own judgement in rewording, rephrasing, resequencing, including, or omitting the questions in the schedule. The respondents demonstrated minimum difficulty in interpreting the questions as intended.

5.2 SUMMARY OF RESULTS

The content of the interviews is categorized, summarized, and discussed in this section. Since an attempt was made to conduct the interviews from the respondents' frame of reference, a common denominator was necessary to interrelate the results. In an effort to satisfy this condition, many of the points mentioned in the preceding chapters were selected. However, exclusive reliance on this solution would dilute the relevant insights which the respondents contributed through their personal observations. To guard against this outcome, specific examples are provided to elaborate on the more significant aspects of their individual experiences with small business computers. Table 9 describes the businesses included in the study.

TABLE 9

Respondent Profile

| Attribute | Company X | Company Y | Company Z |
|---------------------|-------------------------|-----------------------|-----------------------|
| Number of Positions | 14 | 20 | 15 |
| Sales Volume | \$1,500,000-\$5,000,000 | More than \$5,000,000 | Less than \$1,500,000 |
| Nature of Business | Retail/ Mail Order | Wholesale | Retail/ Service |
| Years in Business | 55 | 35 | 7 |

Two of the respondents had previous exposure to automated data processing methods. Company X began using an inhouse punched card inventory control system in 1960. In the late sixties the firm experienced substantial growth and elected to use a service bureau to satisfy their data processing requirements. By 1974 this arrangement proved unsuitable, and a MAI Model 400 was purchased. In March of 1978 this was replaced by a MAI Model 700. Company Y had used a magnetic card book keeping device prior to its purchase of a MAI Model 500 in 1976. Company Z had only recently acquired a small business computer. The MAI Model 200 was purchased during the first quarter of 1979. The relative size and costs of these systems can be deduced from the information contained in Table 17, Appendix D. None of the respondents felt that the monthly expense of the computer was inordinate relative to their current operating expenses.

Prior to the purchase of the respective systems, each of the respondents exhibited symptoms which indicated that the acquisition of a small business computer may have been warranted. Examples of these symptoms are delineated in Table 10 .

When considered individually, these observations seem to constitute a marginal argument for the acquisition of a small business computer. However, when viewed in conjunc-

TABLE 10

Determinants in Acquiring a SBC

| Company | Symptoms |
|---------|---|
| X | More than 500 customers; Inventory items exceeded 2,000; Many variations in product items; Difficulty in determining status of customer accounts. |
| Y | Delays in invoice preparation; Goods shipped without invoices; 4,500 inventory items; Late issue of accounts receivable statements; Inadequate information for analysis and planning. |
| Z | Delays in invoice preparation; Late issue of accounts receivable statements; High turnover in clerical staff; 2000 items in inventory; 1000 customer accounts. |

tion with the nature of the firms' business activities the argument becomes considerably more persuasive. As a mail order business, it was essential that Company X be able to maintain a current and accurate mailing list. This index was stated to be "the backbone of the business". Having the ability to interrelate the mailing list, the inventory records and the customer records would improve the company's ability to capture sales lost due to an out-of-stock condition. As the item in question would become available, the customer would be informed and offered a second opportunity to purchase from the organization. An identical manual system would have proven unwieldy as 40-50 hours/week were required to maintain the mailing list alone. Company Y, as

a wholesale company, referred to order entry and processing as "the blood and guts of the company". It was crucial to be able to include invoices at the point of shipping since the customer used this information in establishing pricing policies. Company Y further observed that "accounts receivable and inventory ARE the company". As a relatively young firm, Company Z was experiencing cash flow problems. Consequently, late accounts receivable statements had a magnified impact on the firm's operation. The ability to invoice on a daily basis would improve the stability of the business.

The above discussion illustrates that each of the respondents was concerned with activities vital to the success of the firm: key success variables. Only one of the respondents, Company X, linked the evolution of the firm's data processing methods to a change in the nature of the business activities. This broader vision suggests that the company attempted to systematize the information management function from an organizational perspective. This recognition of key success variables surfaced again in the benefits which the firms expected to realize from the installation of a small business computer. Table 11 summarizes these benefits.

In assessing the attitude of the respondents towards the nature of the benefits, the author concluded that the firms lay on a continuum with one extreme being cost displacement and the other extreme the gains to be derived.

TABLE 11

Expected Benefits of Installing a SBC

| Company | Expected benefits |
|---------|---|
| X | Improved customer service through increased transaction processing and followup on lost sales; Use of computing power to preclude the need for additional staff as sales grow; Establishment of an inhouse data processing facility to increase management control over this function; Improved mailing list maintenance. |
| Y | Reduction in existing staff; Improved pricing policies; Improved inventory control; Improved accounts receivable handling; Improved order entry and processing. |
| Z | Reduction in staff; Invoicing on a daily basis; Reduction in processing errors; Improved inventory control; Rapid access to general business information; Sales analysis information; Provision for a system which would accomodate anticipated growth of the company. |

Company Z, as expected, was primarily occupied with cost displacement. As the smallest of the participating firms, and one that felt it was undercapitalized at the time it acquired the computer, Company Z anticipated cost savings as the primary characteristic of the expected benefits. Perhaps this helps to explain the uncertainty expressed by this firm when asked if the expected benefits would be realized. Company Y occupies a central position on this continuum. In this case the respondent felt that the computer would improve operating efficiency through more effective manage-

ment control. Operating efficiency, in the context of this interview, was defined as accomplishing more work with less staff. The respondent attributed the improved management control to availability of relevant information. Company X focused almost exclusively on the less tangible gains which would result from the installation of a small business computer. Examples are the enhanced level of customer service, the desire to exercise internal control over the data processing function, and the recognition of the fact that many of the operating procedures lent themselves to more mechanized implementation methods. Both Company X and Company Y found little difficulty in financing a small business computer relative to that experienced by Company Z.

There are two additional significant observations concerning the expected benefits and the manner in which they were perceived by the respondents. The computer was applied to both structured tasks (inventory control, mailing list maintenance, invoice preparation) and semistructured tasks (catalogue layout, pricing policies), but confined to operational and management control. This coincides with the top left four cells of Table 5, Chapter III. However, the emphasis was placed on tasks which were structured and related to operational activities. Consequently, the primary orientation of the respondents appeared to be that of management information systems, which is the initial step on the evolutionary path to decision support systems. Secondly, there was a noticeable absence of any proactive

attempt to introduce innovative techniques or systems which could be accommodated by the computer. Company X proved to be a slight exception. In this instance, sales by page in the company's catalogue were analyzed to assist in optimizing the layout. Company Y stated that there was a one-to-one mapping of the manual systems onto the computerized systems. Only Company X exhibited any reactive attempt to introduce new techniques or systems. Recent government legislation stipulated that the company was to maintain additional records for the sale of specific items. The respondent estimated that this would require 3-4 hours/day if implemented through a manual procedure. By computerizing this function, and using existing files, the company was able to satisfy this new business constraint as the direct result of normal day-to-day processing activities. Table 12 provides a summary of these observations.

With the exception of Company Z, the respondents felt that they had realized, or still expected to realize, the aforementioned benefits. Company Z was still in the throes of placing the required systems online and stated it now had more reservations than before the project was initiated. The respondent suggested that a possible cause for these misgivings was the tardiness of the company in accommodating the computerized systems due to the firm's limited resources. However, the company was satisfied with the information generated by the computerized system. Concern

TABLE 12

Attributes of Expected Benefits

| Attribute | Company X | Company Y | Company Z |
|--|-----------|----------------------|----------------|
| Primary Focus of Expected Benefits | Gains | Gains/Cost Displace. | Cost Displace. |
| Primary Orientation towards Information Management | MIS | MIS | MIS |
| Proactive Introduction of New Systems | Yes | No | No |
| Reactive Introduction of New Systems | Yes | No | No |
| Some Computerization of Structured Tasks | Yes | Yes | Yes |
| Some Computerization of Semistructured Tasks | Yes | Yes | No |
| Some Computerization of Operational Activities | Yes | Yes | Yes |
| Some Computerization of Managerial Activities | Yes | Yes | No |

was limited to the procedural difficulties of integrating the computer with existing systems. Company Y indicated that the hardware did not perform as expected. The reduced processing speed negatively impacted the level of benefit anticipated in the order processing function. Though the respondents could not easily relate specific cost increases, or savings, to the acquisition of the computer, they intuitively felt that the net result was overwhelmingly favourable. The common frame of reference was that more work was

being accomplished without staff additions: increased productivity of assets. Company Z abstained from commenting on this aspect.

Purchase and maintenance charges were not the sole costs identified by the respondents. A single respondent, Company Z, indicated the initial expenditure as a major disadvantage to the organization. Each of the respondents referred to other less tangible costs incurred by the company as a direct result of installing a small business computer. These costs are summarized in Table 13 .

TABLE 13

Non-monetary Costs Associated with a SBC

| Company | Costs |
|---------|---|
| X | The need to become more methodical in the course of carrying out processing activities; Greater level of detail necessary in completing transactions. |
| Y | The possibility of hardware failure makes the company more vulnerable; This is an event over which the general manager has little or no control. |
| Z | The need for effective manual backup system; I/O equipment can bottleneck the full potential of the systems. |

A hidden cost, not explicitly included in the above, is the investment of managerial time during the system selection and development phases. Two of the respondents,

Company X and Company Z, felt that the idea to acquire a small business computer had originated with themselves. Consequently, each experienced a compulsion to personally see the project through to completion. However, the end result was an unplanned continuing involvement in this aspect of the company. Company Y stated that a general company awareness had prompted the purchase of the current computing system. In this case the respondent was intensively involved during the installation phase to the point of "acting like a shop foreman" as he directed clerical personnel in the use of the machine. Fewer levels of management in smaller businesses may increase the intensity and length of management involvement beyond that experienced by their larger counterparts when developing a computerized system.

Management involvement was a key issue which each of the respondents emphasized. Their positions on this subject are best described by the quotations found in Table 14 .

The high priority assigned to management involvement by the respondents may partially explain the fact that employee resistance was not considered a problem. The size of the participating companies implies that top management is close to all areas of the operation. Company X and Company Z encouraged those employees who would be affected by the acquisition of a small business computer to actively participate in the systems design and development efforts. The minimum levels of employee resistance which were observed by

TABLE 14

Attitudes towards Management Involvement

| Company | Manager's Statement |
|---------|--|
| X | "Somebody who knows the business very well has to be (involved)." |
| Y | "The number one guy should be involved." |
| Z | "As the general manager I understand the flow of the whole company and my input is important..." |

the respondents manifested itself as "fear of the unknown", or fear of damaging the computer system in the event an error was made during its use. The respondents had avoided the potentially more damaging fear of job security through the means they chose to affect the expected staff reduction. Company X had addressed this problem at the time the purchase of the machine was being assessed. The firm made an "either or" choice: either additional staff were hired, or a computer was acquired. Thus the existing staff complement did not have to be reduced. Company Y realized the expected staff reduction through attrition and a reassignment of job tasks. Company Z anticipated a reduction of one staff member. However, the firm found it necessary to employ an additional staff member. The respondent did not directly attribute this increase to the acquisition of the computer, but suggested that a growing sales volume made the addition

inevitable. Work tasks were redistributed to accommodate the computerized system and the increase in sales. The respondents indicated that the following had a positive impact on minimizing employee resistance:

1. Ease of use of the computerized systems.
2. Company "esprit de corps" fostered a unified effort to accept the new system.
3. The purpose of the computer was explained to those employees who would be directly, or indirectly, involved.

Company Y employed a third party to facilitate the acquisition and installation of the computer. As part of the contractual arrangement, the consulting firm was to train the employees in the use of the system. However, the third party defaulted on this obligation and the company was left in a difficult situation. Top management was forced to fill this education vacuum. The relative size of small business appears to generate two interdependent conditions which are conducive to an enhanced quality of management involvement: fewer layers of management and a more favourable proximity to the informal organization.

The respondents demonstrated considerable variety in their approaches to selecting and installing a small business computer. Company X was in the unique position of knowing exactly what it required. After contacting the major

vendors, the firm requested a demonstration of a system in a similar environment and running similar applications. Through an industry contact, the respondent was able to visit such an installation. The demonstration proved to be a deciding factor in the company's selection. Company Y employed a management consulting firm to analyze the firm's data processing activities, select the appropriate hardware, develop the systems, and train the staff. Management approved of the third party recommendation based on the outcome of a hardware demonstration. Company Z selected its supplier on the basis of a market survey and unofficial consultation with an associate in the data processing industry. It is interesting that two of the respondents, Company X and Company Y, initiated their computer acquisition through contact with their auditing firms, and that they attached such importance to a physical demonstration of the equipment they intended to purchase. Auditing firms may be forced to offer this type of service, rather than act as a referral agency, to ensure the integrity of the systems which are implemented. For Company Y a demonstration proved to be misleading. A mock order inquiry program based on 15 customers and 50 products was developed to demonstrate the capabilities of the hardware. However, the company had 4,500 inventory items which were typically referenced by product name rather than a product code. Under actual conditions the hardware performed much slower than demonstrated.

Each of the respondents alluded to experiencing difficulty in communicating the firm's needs due to a lack of familiarity with computing devices. Company X overcame this difficulty by rigorously establishing its requirements prior to contacting vendors. Company Z chose to rely heavily on the advice and guidance of the supplier. The use of a third party complicated the situation for Company Y. The respondent felt that the implementation procedure suffered from this arrangement but was satisfied with the end result. The author observed a deficiency in the extent of the analysis which preceded the selection of the computer. However, when tempered with business realities (cost, time, inconvenience), the attempts made can be viewed as sufficient.

Though the respondents chose opposing methods in obtaining their software, they arrived at an identical conclusion: the purchase of packaged software is superior to undertaking a custom programming effort. Company X had intended to acquire a packaged system but was unable to discover a suitable candidate. The firm was forced to rely on the vendor for custom programming support. Company Y intended to develop a custom system since it felt that packaged programs were too general to be useful, and suggested that businesses which purchased them were "bent and twisted" to fit the package. As the project progressed, it became apparent that deadlines could not possibly be met and an accounts payable package was purchased to relieve the pres-

sure. Company Z purchased a package as the initial solution to its software problem. Note that the use of a packaged program invariably entails modifications. The respondents identified the following as advantages of packaged programs over custom programs:

1. The total cost of a packaged program, including initial purchase and modifications, is less than that of a custom program.
2. It takes considerably less time to implement a packaged system.
3. Packaged software has been extensively pretested in similar environments and many of the more obscure business conditions have been correctly detected and processed.

None of the respondents felt that their company had the resources to support a parallel operation of the manual and computerized systems. Subsequently, the firms were limited to a direct cutover which magnified the importance of pretested software due to the expenses incurred in oscillating between systems as errors were corrected. Table 15 summarizes the preceding observations.

Much of the previous discussion, and the observations on which it is based, is reinforced by the nature of the advice which the respondents would give to other firms who

TABLE 15

Summary of Implementation Characteristics

| Attribute | Company X | Company Y | Company Z |
|---------------------------|-------------------|-------------------|-----------|
| Technical Expertise | Vendor | Third Party | Vendor |
| Software Type | Custom Program | Custom Program | Packaged |
| Staged Applications | No | No | Yes |
| Management Involvement | High | Medium | High |
| Employee Resistance | Low | Low | Low |

were about to install a small business computer. The content of the advice is a function of the individual experiences. The summary which follows obviously reflects this fact.

1. COMPANY X

- a) If the enterprise can afford a small business computer and the business is committed to its use in solving operating problems, then the end result will be positive.
- b) Avoid implementing the entire set of applications at a single point in time. The computerization of the different applications should be staged.

2. COMPANY Y

- a) The general manager, or chief executive officer, must be vitally involved in the selection and development phases of acquiring a small business computer.
- b) Key company personnel must be included as representatives of their respective areas in the above effort.
- c) The firm should exercise caution in dealing with the hardware/software vendor(s) to ensure that they fully understand what the firm requires.

3. COMPANY Z

- a) Adequate funding is an essential prerequisite to any attempt to install a small business computer. A poorly capitalized company exposes itself to a situation fraught with risk.
- b) Purchase packaged software and effect the ensuing modifications through the vendor.

The culmination of the respondents' experiences with small business computing is best expressed by the statements found in Table 16 .

TABLE 16

Summary of Respondent Experiences with SBCs

| Company | Statement |
|---------|--|
| X | "A computer is stupid as hell, but it has a memory you would not believe.....I am sold on computers.....If I could think of any other (application) that would be useful to us, we would be doing it." |
| Y | "As a businessman, at the end of the night, I can go home and feel confident that we made X number of dollars today. I did not know that before.....there is definite information.....we have a thumb on the pulse of our business, on a daily basis." |
| Z | "I have not been overjoyed at what's happened so far. If now was a year ago, and I had my priorities straight, I might not have gone into it (computing) at the time. I would have waited a couple of years." |

5.3 FINAL REMARKS

The exploratory nature of this study precludes a statement of specific conclusions which can be demonstrated to be empirically valid. The author's primary purpose was to provide descriptive insights. However, some of the relevant issues discussed in the preliminary chapters were observed to have a basis in reality. The unique characteristics of small business do underscore a set of problems not experienced by larger firms. As an example, the limited resources typical of the small business enhance the risk involved in acquiring a computer. However, limited size appears to have compensatory advantages such as reduced employee resistance and a more natural management involvement.

Management involvement is recognized as essential to the successful development, implementation, and integration of a computerized system. Although pseudo-participation (i.e. token attendance at meetings, etc.) has been implied to be a problem, little academic work has been done to define the nature and extent of this involvement. Management participation is a continuous function and cannot be achieved by discharging several discrete activities intended to provide this participation. Company X demonstrates this continuous involvement, from the determination of the required systems through to post-implementation aspects, and appears to have been the most successful of the respondents in matching the potential of the computer to the needs of the company.

Whether or not small business management makes a conscious effort to conceptualize an appropriate information management framework remains a hazy issue. However, a predilection to focus on key success variables was observed. The potential contribution of the computer may be accompanied by significant non-monetary costs. Nonetheless, there appears to be sufficient cause to assume that the computerization of the record keeping functions can lead to increased operating efficiency and effectiveness, and the accrual of subsequent benefits such as improved customer service, for the small business. The promise of small business computing has become a reality.

Appendix A

COST/PERFORMANCE TRENDS IN COMPUTER TECHNOLOGY

A.1 HARDWARE TECHNOLOGY

A computer has three basic hardware components: a central processing unit, main storage, and input/output devices. To avoid the unnecessary confusion which would arise from a discussion of the nuances of particular models and versions of these components, the author has elected to profile developments in computer hardware with the cost/performance trends of these components. No attempt has been made to provide a definitive description, merely to demonstrate the direction of these trends.

The central processing unit performs the arithmetic and logical operations designated in the software. Figure 2 depicts the decreasing cost per 100,000 calculations³⁵. This cost improvement reflects the decreasing size and power requirements, and the increasing speed and density of the logic families from which the electronic components are constructed. The technologies now available provide a range of central processing units from maxiprocessors to

³⁵The figures in this appendix are adapted from Waves of Change: A Techno-economic Analysis of the Data Processing Industry, Charles P. Lecht, (New York: Advanced Computing Techniques Inc., 1973)

microprocessors. A microprocessor typically costs \$50-\$250, while the maxiprocessor range is \$3,000,000-\$5,000,000. However, the cost/performance ratio of central processing units of all types is decreasing dramatically. Main storage trends are closely linked to that of the central processing units. Figure 3 indicates the improvement in the main storage cost/benefit ratio.

Input/output devices are commonly referred to as peripheral devices. Thus, auxiliary storage components are often implied in this class of computer elements. Developments in disk drives, line printers, and magnetic tape drives are profiled in Figure 4, Figure 5, and Figure 6 respectively.

In each of the examples provided, two dimensions remain consistent: prices are decreasing and performance is increasing. The impact of these trends is magnified by the ever widening variety of peripheral equipment. Point of sale terminals, graphics devices, and computer output microfilm equipment are examples. Technologies such as lasers, fiber optics, and cryogenics are being applied to computers and their associated devices. This suggests further improvements in price/performance and an extended field of potential applications.

A.2 SOFTWARE TECHNOLOGY

Software technology (i.e. the means of encoding instructions in a computer understandable format) has historically lagged behind the advances in hardware technology. During the early years of computing, programmers represented machine instructions as a series of binary, octal, or hexadecimal digits (depending on the architecture of the computer). A major advance in computer programming was the introduction of assemblers. The use of an assembler allowed programmers to specify machine instructions as mnemonics and introduced decimal constants. However, there was still a one-to-one relationship between a line of assembly code and a machine instruction (i.e. addition, subtraction etc.). This limited the ability of organizations to exploit the computational power at their disposal. Compilers alleviated this problem by allowing programmers to write in high-level languages (i.e. the basis of modern computer software) in which one instruction was translated to many machine instructions.

Though advances in the approach to programming languages improved the efficiency with which organizations could instruct computers, many peripheral problems impeded the development of effective software. A major stumbling block was the need to handle the "housekeeping" tasks associated with electronic computing devices (i.e. transmission of data, formatting of data etc.). Operating systems, which appeared in the late 50's and early 60's, met this need.

During the last decade, the concept of computing underwent a dramatic change - from "batch" computing to "online" computing. Online processing introduced realtime processing (as perceived by the user) in that computing tasks provided immediate feedback to the user. This permitted organizations to apply computers to systems which required this feedback characteristic (i.e. order entry, customer inquiry etc.). By the late 60's, organizations recognized that a lack of standardization (in both programming languages and implementation methods) was diluting the potential of the software technology available. Industry and government groups were formed to combat this problem. The net result has been more transportable programs, better supporting documentation, and more easily maintained programs.

These, and similar, developments generated the concept of the application package. An application package is a prewritten computer program, or set of computer programs, designed to accomplish specific tasks (i.e. payroll package, inventory control package etc.). Over the last ten years, the use of these packages has increased as they improved in scope, reliability, and flexibility. The most recent advance in the application package field combines both hardware and software technology: the "turnkey" system. Turnkey systems consist of a small scale computing device coupled with application programs tailored to the organization's requirements. This has effectively removed the need for any user

programming, and should theoretically function as specified when the user "turns the key".

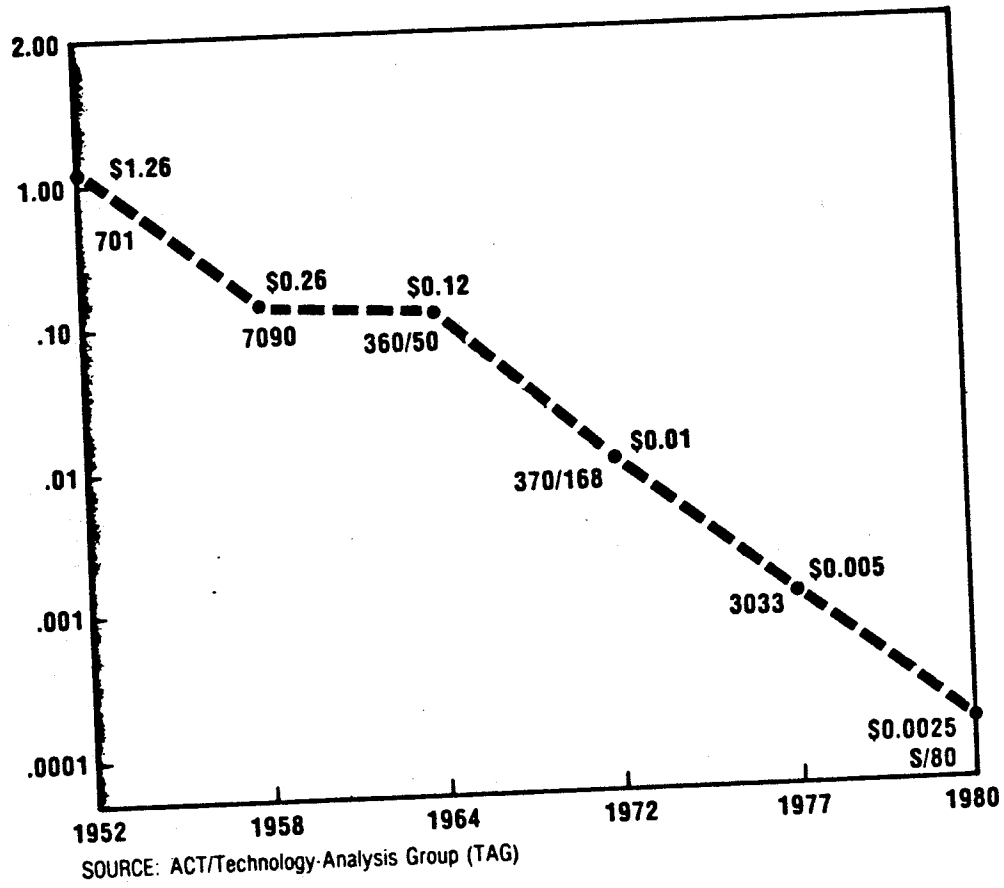
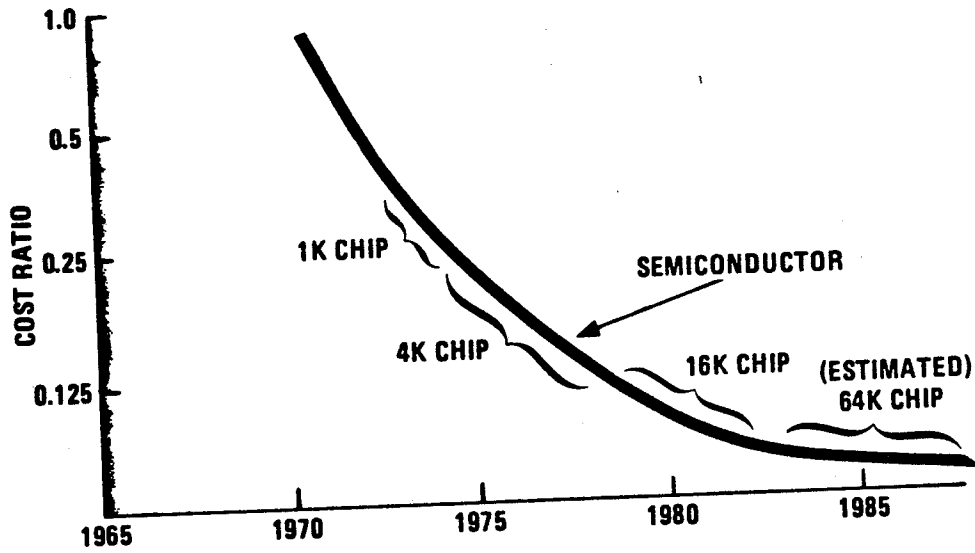
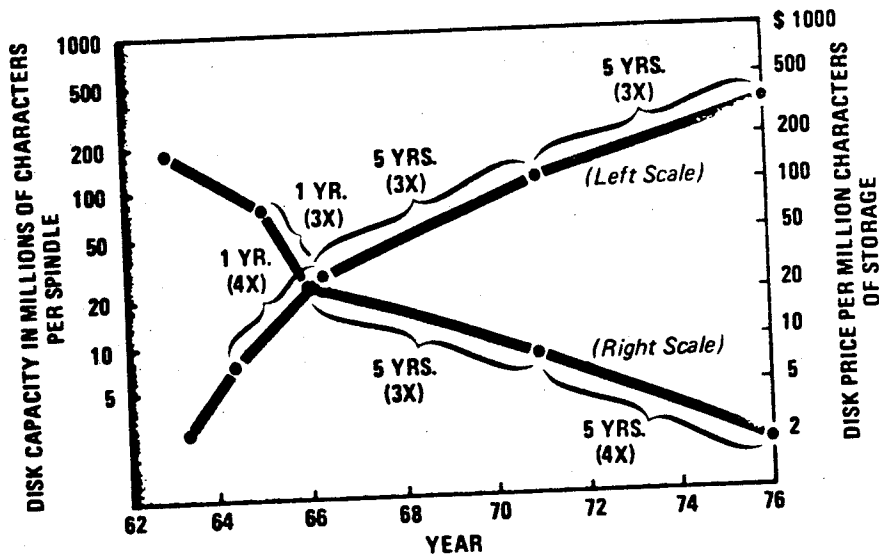


Figure 2: Approximate Cost Per 100,000 Calculations



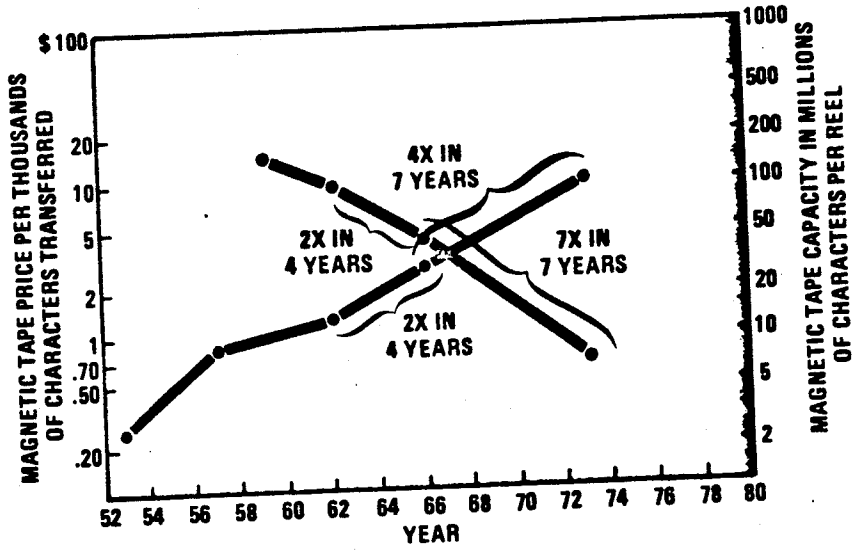
SOURCE: ACT/Technology-Analysis Group (TAG)

Figure 3: Main Storage Cost Ratio



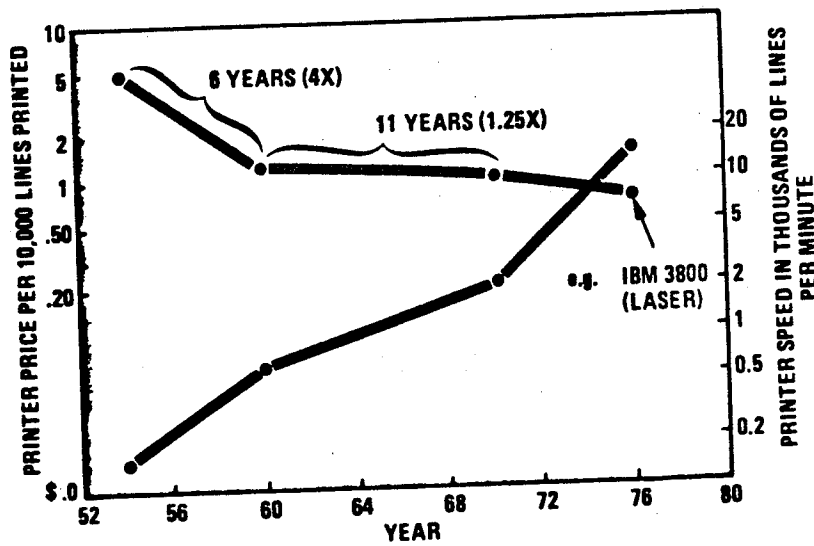
SOURCE: ACT/Technology-Analysis Group (TAG)

Figure 4: Disk Drive Price/Performance Trend



SOURCE: ACT/Technology Analysis Group (TAG)

Figure 5: Magnetic Tape Drive Price/Performance Trend



SOURCE: ACT/Technology Analysis Group (TAG)

Figure 6: Line Printer Price/Performance Trend

Appendix B

A NEW PERSPECTIVE ON MANAGERIAL FUNCTIONS

B.1 THE STUDY

Mintzberg (1973) studied five managers of medium to large organizations for a period of one week each. Of the several different research methods which have been used to study managerial activity, structured observation was chosen as it allowed the researcher rather than the manager to record the data, and permitted categorization schemes to be developed both during and after observation. Since the study was designed to generate descriptive material on the content of managerial work, the focus was on the job rather than the man, on similarities in work rather than differences, and on the basic content of the work rather than the characteristics.

The field study was subdivided into three phases. During the preliminary data collection stage, the researcher acquired background material consisting of one month of calendar appointments, information about the organization, and information about the manager. In recording and coding the data, two types of observations were noted: anecdotal and structured. The former consisted of material on specific

activities, while the latter profiled the pattern of activity. Structured data were recorded in three records:

1. The chronology record noted the time and nature of the activity and was cross-referenced with the other records.
2. The mail record described the type, origin, and purpose of both incoming and outgoing mail.
3. The contact record described the medium, purpose, participants, source of initiation, duration, and location of contacts within, and external to, the organization.

This coded data was distilled until the researcher arrived at five major types of activities from the chronology record, twelve categories describing the purpose of the managers' mail, and thirteen categories which profiled the contents of the contact record. Mintzberg, in discussing the reliability of the results, indicates that both the work of others and his own suggest that the participants were representative of others in their position and that the one week observation period provided a typical mix of work.

In developing the basic framework of ten managerial roles, Mintzberg primarily relied on the analysis of the mail and contact records. The resultant theory was formulated to satisfy a twofold objective: the presentation of the material in an easily understood fashion, while ensuring

a scientifically valid development of the hypothesis. The researcher recognized that the contradictory demands of the objective forced a compromise situation. Since the categorization process is a somewhat arbitrary division of the observations into groups of like activities, it is important to realize that Mintzberg's framework is only one of many possibilities and that its worth lies in its utility. This framework is summarized below³⁶:

1. **INTERPERSONAL ROLES:** Interpersonal contact is the key aspect of the activity and links directly to the status and authority of the manager.
 - a) **Figurehead:** As the symbolic head has an obligation to perform a number of routine duties of a legal or social nature.
 - b) **Leader:** Responsible for the motivation and activation of subordinates; responsible for staffing, training, and associated duties.
 - c) **Liaison:** Maintains selfdeveloped network of outside contacts and informers who provide favours and information.

³⁶This information is adapted from The Nature of Managerial Work, Henry Mintzberg, (New York: Harper&Row, Publishers, 1973), pp. 92-93

2. INFORMATIONAL ROLES: Transmitting and receiving of information is the key aspect of the activity.

a) Monitor: Seeks and receives a wide variety of special information (much of it current) to develop thorough understanding of organization and the environment; emerges as the nerve center of internal and external information of the organization.

b) Disseminator: Transmits information received from outsiders or from other subordinates to members of the organization; some information factual, some involving interpretation and integration of diverse value positions of organizational influencers.

c) Spokesman: Transmits information to outsiders on organization's plans, policies, actions, results etc.; serves as expert on organization's industry.

3. DECISIONAL ROLES: This is the most crucial aspect of managerial work and involves those activities where decision making is the key dimension.

a) Entrepreneur: Searches organization and the environment for opportunities and initiates "improvement projects" to bring about change; supervises design of certain projects as well.

- b) Disturbance Handler: Responsible for corrective action when organization faces important, unexpected disturbances.
- c) Resource Allocator: Responsible for the allocation of organizational resources of all kinds-in effect the making or approval of all significant organizational decisions.
- d) Negotiator: Responsible for representing the organization at major negotiations.

B.2 THE IMPLICATIONS

Though Mintzberg suggests that these roles form an integrated whole, it is not a whole consisting of entirely discrete components. Certain activities may lie on the periphery of several roles. From an information management perspective, Mintzberg charges the manager with the responsibility for developing his own information system through his informational roles. However, if this information is not related to the demands of the decisional roles, a dysfunctional system is inevitable.

Merging this understanding of managerial activities with the formal information system provides further insights into many of the adverse consequences which have resulted from current information system designs. In a later study undertaken to address the problem of "Why do managers not

use information as they apparently should?", Mintzberg (1975) indentifies three problem areas: attributes of formal information systems, organizational atmosphere, and the design of the human brain. The specific observations made by Mintzberg (1975) are summarized below:

1. PROBLEM AREA: Attributes of the formal information.

a) Inherent limits in the formal information do not discourage the use of information, but force managers to seek out other sources of information.

b) Since formal systems aggregate the data, much of the outputs are too general for the manager. The specifics which can isolate causes for an event are lost to the manager.

c) The timeliness of formal information may leave much to be desired.

d) Formal information may be unreliable in that it tends to obscure underlying relationships through the use of surrogate measures.

2. PROBLEM AREA: Organizational atmosphere.

a) Goal incongruity and dysfunctional objectives may force the manager to subvert the original intent of certain information.

- b) The manager's relative degree of authority and political situation may cause him to manipulate information in such a fashion as to impede overall organizational effectiveness.
 - c) The characteristics, or nature, of managerial work encourage verbal interaction and only cursory attention to documented sources of information.
3. PROBLEM AREA: Design of the human brain.
- a) The manager exhibits cognitive limitations that restrict the amount of information that can be constructively applied in the decision process. Too much information can be as damaging as too little information.
 - b) The subset of information selected by the brain is often predetermined by past experience. Managers may demonstrate a subconscious affinity for particular information under particular circumstances.
 - c) If the content of the formal information is perceived to represent a threat, the brain's psychological reaction may cause this information to be deleted from consideration.

Mintzberg (1975) has drawn several significant conclusions from these observations. Information systems and computers should be independent components. They should be conceptually removed from one another until that point in time when it is determined that the computer is the appropriate tool to support the formal information system. Individuals attempting to design effective information systems must alter their conceptualization of the managerial function: the abstract POSDCORB model hinders the development of relevant information systems. The output of these systems should be controlled with respect to volume, and designed to complement the existing information inputs available to managers. Historical reliance on documentation to communicate the output is not consistent with the nature of managerial work. Alternate channels of communication, preferably verbal, should be incorporated in the design. Finally, the design of the information system should accommodate the information needs of individual managers. Each is characterized by a different goal set and each functions in a unique organizational climate defined by personal limitations, political stance, and degree of authority and power. This will assist in minimizing the disruptive behavioural effects which may accompany the introduction of formal information systems.

Appendix C

SAMPLE FEASIBILITY STUDY QUESTIONNAIRE

C.1 COMPANY ANALYSIS

1. What are the current annual revenues?
2. Revenues next fiscal year?
3. Projected revenues in 5 years?
4. What are the strategic goals for the next fiscal year?
5. What are the long-range goals for next 5 years?
6. Will the company be changing location within 5 years?
7. Will the company expand operations to other locations within 5 years?
8. Will the company diversify, add new products within 5 years?
9. Current number of employees?
10. Projected number of employees in 5 years?

C.2 DATA PROCESSING ANALYSIS

1. Describe in detail the current manual method.
2. What is the error rate?
3. Are there processing delays? Where and why?
4. What improvements can be made to speed up manual methods?
5. What is the current data processing workload?
6. What new applications will be required to meet long-range company plans?
7. What will be the estimated processing workload in 5 years?

C.3 TECHNICAL ANALYSIS

1. Will the present manual method adapt easily to an SBC system?
2. What changes are required?
3. How extensive a system is required to meet current workload?
4. What kind of system will be required in 5 years?

5. Have alternative processing methods been thoroughly examined?
6. Will there be additional technical support required for service and maintenance?

C.4 COST ANALYSIS

1. What is the current cost per transaction?
2. What are the estimated transaction costs of the new system?
3. What percentage of budget is currently allocated to data processing?
4. What is the estimated budget percentage using an SBC?
5. What is the affordable price range for SBC equipment?
6. What is the estimated annual cost of running the system?
7. What are the projected dollar savings by using SBC system?
8. Will the system pay for itself?

C.5 IMPACT ANALYSIS

1. From interviews with personnel, what is the prevailing attitude to SBC acquisition?
2. Are there foreseeable problems with staff attitude?
3. What level of training is required for new users?
4. What changes are expected in business operations?
5. Can customers be protected from computer errors?

Appendix D

TYPICAL SMALL BUSINESS COMPUTER CONFIGURATION

The Evans Research Corporation has identified 89 vendors offering a total of 250 small business configurations in the small business computer market segment³⁷. This multiplicity of suppliers tends to undermine the notion of a typical small business computer configuration. According to the Evans Research Corporation, a small business computer can be defined as "a small stand-alone system designed around a general purpose computer with the software necessary for processing standard business applications (payroll, accounts receivable, general ledger, order entry, inventory) and with the ability to handle mass storage (drum, disk, tape)³⁸. The total cost, including hardware and software, is typically less than \$100,000.

³⁷ Taken from "Selection Criteria for SBC's: Part 1", EDP In-Depth Reports, Evans Research Corporation, October 1978, p.1

³⁸ Taken from "The Trend Towards Small Business Computers", EDP In-Depth Reports, Evans Research Corporation, March 1978, p.1

D.1 THE HARDWARE

The Basic/Four Corporation, a subsidiary of Management Assistance Inc., offers a product line which fits these general criteria. Each of the product offerings consists of a central processing unit (CPU), a magnetic disk drive, an input/output device (video display terminal, or VDT), and an output device (line printer). The skeleton systems can be enhanced through the addition of various options. Table 17 describes the MAI line of small business computers. Note that the attributes described are minimum quantities and that each system can be increased to accommodate growth in the firm's data processing requirements.

TABLE 17

Basic/Four Corporation SBC Product Line

| System | Cost | Disk Capacity | VDTs | Printers | CPU Storage |
|--------|-----------|------------------|------|----------|----------------|
| 200 | \$35,000 | 10 MB | 1 | 120 CPS | 40K |
| 410 | \$41,000 | 14 MB | 1 | 120 CPS | 40K |
| 610 | \$74,000 | 35 MB | 1 | 160 CPS | 64K |
| 730 | \$138,000 | 150 MB | 4 | 300 LPM | 96K |

MB=megabyte (1,000,000 characters), K=1024 characters
CPS=characters/second, LPM=lines/minute

Each of these systems is designed to support an online application environment. Users can expand the potential of each system through field upgrades. However, a migration from a System 410 to System 610 must be performed at a location remote from the user's site. A small business acquiring one of the lesser systems is assured of a hardware growth path.

The characteristics of the System 610 will be discussed to elaborate on the above statements. Removable disk packs yield a theoretically unlimited offline storage capacity. The limiting factor is the physical number of available packs. Additional input and output devices can be situated at remote locations. These are connected to the CPU over conventional telephone lines and provide a transmission rate of 1200 baud, or approximately 120 characters/second. The maximum transmission rate from the CPU to a hardwired video display terminal is 9600 baud, or approximately 960 characters/second. Environmental constraints are minimal. The suggested operating temperature is 18C to 24C, while the humidity tolerance is 40 to 80 percent. The following options are available to extend the capabilities of the System 610:

1. A CPU upgrade yielding a 2.0-2.5 increase in the execution speed (30% increase in throughput) of application programs. This is normally exploited to accommodate the addition of VDTs.

2. A maximum of 12 VDTs can be connected to the system. Terminal controllers, each supporting four VDTs, are used to facilitate increases in the number of VDTs attached to the system.
3. A magnetic tape (cartridge or reel-to-reel) can be added to the system. These are typically used on a one disk system to supply a backup capability.
4. A 150 LPM, or a 300 LPM, printer with a plotting feature can be used to supplement the hardcopy output devices.
5. A 600 LPM printer is available to cope with increased volumes of hardcopy output.
6. A maximum of three 35 MB disk drives can be attached to the system. However, the 35 MB drive can be replaced by a 75 MB model with the single constraint that all drives be of identical capacity.
7. A communications controller which allows the System 610 to act as a host, or node, in a distributed data processing environment is available. This may be particularly significant for those companies that expect to become geographically dispersed as the result of anticipated growth.

D.2 THE SOFTWARE

The costs itemized in Table 17 include only the software which supports the allocation and monitoring of machine resources: the operating system. Since it is unlikely that the small business can fund a custom programming effort, or sustain the cost of a permanent programmer, packaged programs are commonly used to satisfy initial processing requirements. Phillips (1977) suggests that "the most flexible and cost-efficient small business systems are those whose software can be purchased from a vendor and modified to suit an existing application"³⁹. The Accounting System Package (ASP) offered by MAI is an excellent example of such software. The use of parameterization and modularization allows each firm to obtain a version of ASP which is tailored to its specific needs. In its entirety, the ASP system is comprised of the following modules:

1. MODULE: Order Processing.

- a) REPORTS: Orders, Shipping labels, Drop shipments, Special orders, Open orders, Picking sheets, Backorders by item, Backorders by customer, Invoices, Daily sales journal.

2. MODULE: Inventory Control.

³⁹ Taken from "Mini Systems for Mini Businesses", J. Donald Phillips, Journal of Systems Management, Vol.28, No.5, May 1977, p.30

a) REPORTS: Inventory master file by item, Inventory detail/history, Inventory receipts/adjustments/transfer register, Completed backorder, Physical inventory count sheets, Physical inventory count summary, Inventory reorder, Inventory price lists, Valued inventory, Inventory movements.

3. MODULE: General Ledger.

a) REPORTS: General ledger account master file, Chart of accounts listing, Financial statement linkage report, General journal entries report, Recurring journal entries report, Trial balance, Daily summary of posting, Statement of income, Monthly summaries, Balance sheet, Departmental expense reports, Budget analysis.

4. MODULE: Accounts Receivable.

a) REPORTS: Customer master files, Ship to address files, Customer cross reference number/name, Customer list by sales representative, Customer mailing labels, Aged trial balance, Sales summary, Statements, Cash receipts register, Sales representative master file.

5. MODULE: Sales Analysis.

- a) REPORTS: Sales representative commissions, Sales by customer, Sales by products, Sales by category/sales representative.
6. MODULE: Accounts Payable.
- a) REPORTS: Vendor master file, Vendor cross reference number/name, Invoice entry register, Manual check entry register, Payment selection register, Check register, Open invoice summary/detail, Aged open invoice summary/detail, Cash disbursement report.
7. MODULE: Purchase Order Processing.
- a) REPORTS: Purchase orders, Open purchase orders.
8. MODULE: Payroll.
- a) REPORTS: Employee master file, Employee cross reference list number/name, Employee earning history month/quarter/year-to-date, Payroll audit register, Deductions audit register, Manual check register, Precheck register, Payroll checks, Check register, Labour distribution, Workmen's compensation summary, Quarterly tax reports, T-4 forms.
9. MODULE: Fixed Assets.

a) REPORTS: Fixed asset master file, Fixed asset detail listing, Fixed asset actual/book/tax listing, Fixed asset cost and value listing, Investment tax credit analysis report, Fixed asset audit report.

Parameterization is accomplished through a series of predefined vendor questionnaires. The number, type, and size of data files are based on the results of these questionnaires. This aids in optimizing the allocation of the system's physical resources. Selecting the applicable subset of application modules permits the small business the opportunity of staging the development of its automated systems, and provides the ability to focus on those systems which are crucial to the success of the firm. The ASP system can be purchased for \$3,000. However, the customizing effort inflates the base cost to an average net cost of \$7,000-\$10,000.

Appendix E
STRUCTURED QUESTIONNAIRE

E.1 BUSINESS PROFILE

These questions examine the nature and size of the business.

1. Which of the following best describes the overall nature of your organization?
 - a) Manufacturing
 - b) Wholesaling
 - c) Retailing
 - d) Service
 - e) Other (Please Specify)
2. How many fulltime positions are currently held by the employees of your organization?
3. How many years has your organization been involved in its current line of business?

4. Into which of the following ranges does your annual sales volume fall?

a) Less than 1,500,000

b) 1,500,000 - 5,000,000

c) More than 5,000,000

E.2 COMPUTER ACQUISITION MOTIVATION

This section examines if the need for a computer was recognized by the organization and if the resulting benefits are related to the business problems.

1. Do you feel that the need to acquire a computer was externally, or internally, induced?
2. What benefits did you hope to realize in acquiring a computer?
3. What did you perceive to be the major business operating problems confronting your organization at the time the acquisition of a computer was being considered?

E.3 CURRENT EQUIPMENT PROFILE

This section details the type and future of the current DP equipment configuration.

1. What is your current configuration (Storage, I/O Hardware, Mainframe)?
2. How long has this configuration been installed?
3. Is this monthly rental/lease a significant expense in terms of your organization's overall monthly operating expense?

E.4 COMPUTING REQUIREMENTS/SELECTION PROCESS

This section examines how the computer selected was related to the company's information requirements.

1. In determining how the computer was to be applied did you rely heavily on the vendor(s) to assist you in defining this area?
2. In determining which computer, and how it was to be applied, did you rely on third party assistance?
3. Did you conduct a market survey as an integral part of your selection process?

4. Did you define the type and volume of the applications needed to generate the information your organization requires before the computer was selected?
5. In reviewing the vendor(s) proposal(s), did the vendor(s) make you feel at ease about the suitability of their product offering by relating it in terms of your business?
6. At the time of installation, did you feel the system met your specifications (whether or not documented)?

E.5 ORGANIZATIONAL IMPACT

This section deals with any changes in structure, behaviour, and operations that can be attributed to acquisition of the computer.

1. Referring to the benefits/business problems previously discussed, do you feel that the installation of a computer has had any significant affect on them?
2. Has the installation of a computer introduced any new major operating problems?

3. Can you relate specific cost increases/decreases to the installation of the computer, and is the net result favourable/unfavourable?
4. Did the installation of the computer result in the addition/deletion/change of any positions?
5. Was the real purpose/need clearly explained to those employees that would be affected by the installation of a computer?
6. Were the individuals that directly use the computer formally trained in its use?
7. How did you overcome employee resistance, if any, or is it still a problem?
8. What are the applications currently running on your computer?
9. Does this include all of the applications which you felt were desirable/important at the time of the installation?
10. Has the availability of the computer prompted you to develop new reports/applications which implement systems/techniques never before used in your company (if so, what are they)?

11. Do you feel that predeveloped and tailored packaged systems, or custom programming efforts are the most appropriate course of action for your company, and which do you currently use?
12. Do vendor(s), or third parties, play a significant part in your application development design and implementation efforts?
13. Do you think that it is necessary for you to become involved in defining overall system specifications (and to what extent)?
14. Are you satisfied that the current applications meet your information needs?
15. Do you feel that the applications perform as you expected?
16. Do you feel that the introduction of a computer has given you more time to devote to the less routine aspects of running your business?
17. Has the introduction of a computer in your organization changed the way in which you conduct your day-to-day activities (if so, how)?
18. Do you feel these changes are positive?

E.6 SUMMARY OF ATTITUDES

This section attempts to summarize the management perspective on the acquisition of the computer.

1. What are the major advantages (to your company) of having a computer?
2. What are the major disadvantages (to your company) of having a computer?
3. Do you feel that your computer has unexploited potential in its current range of applications (if so, what are they)?
4. Do you feel that the computer has become an integral part of your organization?
5. In selecting and applying the computer to your information needs and company business problems, what were the major problems you encountered?
6. Has your data processing capability allowed you, as top management, to devote more time to those activities which you feel are most important in performing your job?
7. Do you feel that the installation of a computer has improved your ability to collect and review relevant information about your business and its environment?