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A.R. Montazemi

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Faculty of Business
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ABSTRACT

This article presents the result of a field study that examined the environment of computer based information systems of small business firms. The findings indicate a lack of appropriate policies designed towards the selection and use of information systems resources. Consequently this has resulted in an incompatibility between the information requirements of the decision makers and the organization's information systems.

1. INTRODUCTION

Increasingly small firms are becoming attracted toward computer based information systems (Farhoomand and Hrycyk, 1985; Mahmoud and Malhotra, 1986). Farhoomand and Hrycyk identified several factors which have influenced this trend. First, the cost of equipment (software and hardware) has declined rapidly, thereby making it more affordable. Second, computer equipment is becoming more accessible and more easily purchased through retail stores. Third, the trend toward user-friendly software has made it possible for naive users to develop their own application systems, and this is expected to reduce the reliance of end-users on information analysts and systems designers. As well, the competitive environment in which the small business exists forces a search for feasible ways of cutting operating costs. One attractive routes towards this has been the reduction of clerical work and the better management of organizational resources through computer based information systems (CBIS).

Success of a CBIS in any organization depends on the careful identification and assessment of available information technology (Huff and Munro, 1985). As defined by Huff and Munro, information technology includes the broad range of technologies involved in information processing and handling, such as computer hardware and software, telecommunications, and office information, as well as new systems methodologies. Whereas, assessment and adoption has been referred to organizational policies, strategies, processes, and tasks employed, either explicitly or otherwise, by an organization in its efforts to identify, acquire, and diffuse appropriate information technology (Huff and Munro, 1985, p.328).

The CBIS environment of small business firms is believed to differ from that of large organizations (Ein-dor and Segev, 1987; Delone, 1981), and several attempts have been made to explain information technology assessment and adoption (ITAA) in the context of the former (e.g. Delone, 1981, 1983; Griese and Kurpicz, 1985; Mahmoud and Malhotra, 1986; Raymond, 1985). The goal of this paper is to build upon previous work by further investigation of the characteristics of ITAA within the small business environment. To this end, a series of face-to-face interviews was conducted in eighty-three small businesses. The purpose of the interviews was to analyze the characteristics of end-users, data processing staff, hardware and software systems, and organizational policies. The findings of this study indicate areas that need special attention to allow better utilization of information resources in small business environments.

2. THE STATE OF INFORMATION SYSTEMS IN SMALL BUSINESS

In recognition of the specific environments of small business firms, some investigators (e.g. Delone, 1981, 1983; Mahmoud and Malhotra, 1986; Raymond, 1985) have attempted to identify factors that influence the success of CBIS in these settings. Mahmoud and Malhotra (1986), in search of guidelines for selection and better utilization of information resources in small businesses, collected data about how small business CBIS users perceived the relative importance of criteria for selecting hardware and software. On the one hand, they found that, in relative descending order of importance, criteria for selecting hardware were as follows: reliability, vendor support, size of memory, upgrading equipment, compatibility, training, ease of use, speed, and cost. On the other, the relative

descending order of importance of criteria for selecting software was indicated as vendor support, ease of use, documentation, cost, needs, availability, and training. Furthermore, Griese and Kurpicz (1985) contend that the intensity of the planning and requirements analysis performed by firms prior to purchase of information systems has a direct effect on the usage of the subsequent systems. Raymond (1985) studied the factors that affect CBIS success in the small business environment. The two dependent variables used as surrogate measures for CBIS success were (1) user information satisfaction and (2) level of system utilization. Raymond used a twenty-item questionnaire with a seven-point semantic differential rating scale in order to measure the user satisfaction. The result of his study indicates that the level of CBIS success in a small firm can be increased by a greater level of sophistication in terms of the number and types of applications available, and by allowing the organization and the user to be more autonomous in terms of the development, the operation, and the utilization of these applications.

The findings from previous studies including the ones reported above, are important in their own right since they highlight, at a macro level, the factors that affect the utilization of CBIS in small business environments. However, in spite of this work, we know little about the characteristics of end-users, about data processing personnel, and about strategies and tools adopted for the development of information systems required in small business firms. In order to clarify this situation in eighty-two small business firms with CBIS, a series of face-to-face interviews were conducted; in all, 85 end-users and 68 information systems personnel were interviewed. The status of those interviewed was as follows: 146 had managerial positions, six were white collar employees, and one was a

secretary. The procedure followed in collecting the required information is presented in the next section.

3. METHODOLOGY

3.1 Environment

Firms with fewer than two-hundred and fifty employees, as defined by the Canadian Small Business Guide, were identified as being small businesses. Within this environment, two hundred and forty-two firms located in Southern Ontario were contacted by telephone and asked to participate in the study. To encourage participation, each firm was promised a brief written report of the analysis of the information systems specific to its organization. As well, participants were to receive a report based on the overall findings of the study.

Of the 83 small business firms that participated in this study, 47 were service industries and 36 were manufacturing firms. The number of employees in these firms ranged between 1 and 250; the average number of employees was 73.

3.2 INSTRUMENT

Other studies have used structured questionnaires to the identify information needs of small business firms. The advantage of a structured questionnaire is its ability to reach a large number of organizations with relatively little expense both in terms of time and manpower. There are however, at least two problems inherent in using this type of tool. First, because of their rigid nature, structured questionnaires cannot identify the idiosyncratic nature of an individual organization. Second, respondents with different backgrounds may interpret the questions differently, and this

can cause a significant distortion in the final analysis of the results. Furthermore, in order to reduce the possible response error contributable to variations in [redacted] individual respondents technical knowledge, the structured questionnaire can address only basic issues that are pertinent to the CBIS environment within an organization.

However, face-to-face interviews make it possible to carry out an in-depth information requirements analysis for each firm. As well, interviews significantly reduce possible causes of error due to misinterpretation of questions by subjects. Furthermore, since we were not limited by the technical knowledge of the subjects about computer systems, systems specification can be analysed in detail. A semi-structured questionnaire was developed as a systematic tool for the collection of data during the face-to-face interviews. Eleven employees from the first four firms were used to test and modify this questionnaire (see the Appendix). The modified questionnaire was used for the rest of the study. Analysis of this data will be noted later.

The questionnaire comprised of three parts as follows:

I. Part one utilized "critical success" methodologies (e.g. see Boynton and Zmud, 1984; Munro and Wheeler, 1980) in order to understand the operations of the organization. This was used to gain a general perspective of the possible information requirements for a given organization. It also facilitated the choice of key personnel for subsequent interviews.

II. The intention of part two of the semi-structured questionnaire was to collect information about hardware and software. Hardware information was classified into three categories: mainframe, mini- and micro-computers. Statistics collected were size of the primary and secondary storage units and the number and type of CRTs (display units) in operation. Nine

dimensions were used to identify the nature of the application software used at the time of interview. The same criteria applied to software deemed to be required in the future.

III. Part three of the semi-structured questionnaire was designed to collect information from the specific end-users in the organization. an attempt was made to interview at least one end-user who was a major user of the organization's CBIS. For firms with data processing personnel, the senior data processing personnel were also interviewed.

4. FINDINGS

The findings of this research can be grouped into four major areas as follows: the nature of end-users and data processing staff, the characteristics of hardware and software, and finally, the organizational issues. Each of these will be discussed in turn.

4.1 End-Users

The Codasyl end-user facilities committee (1979) has classified end-users into three categories. Categories include "indirect" end-users who use computers through other people (e.g. users who obtain the address of a restaurant through a telephone operator); "intermediate" end-users who specify business information requirements for reports they ultimately receive (e.g., payroll staff); and "direct" end-users who actually use terminals. It is only the last two categories that are of interest to us here.

Rockart and Flannery (1983) further broke down the "direct" end-user category. Based on an empirical study, they observed six distinct classes

of end-users who differed significantly from each other in computer skills, method of computer use, application focus, education and training requirements. These six categories include: "command level users", "end-users programmers", "functional support personnel", "end-user computing support personnel", and "data processing programmers".

As a result of the special organizational environment of the small business firm, only the following four categories of end-users were observed in the present study.

I. Intermediate end-users who had never use computer systems directly, but receive required information through an intermediary such as a data processing analyst.

II. Nonprogramming end-users whose only access to computer-stored data is through software provided by others. Access to computerized data is through a limited, menu-driven environment or through a strictly followed set of procedures.

III. Command level end-users who need to access data on their own terms. This type of user understands the available database(s) and is able to specify, access, and manipulate information. Most often command level users utilize report generators and/or a limited set of commands from languages such as FOCUS, SQL, SAS, LOTUS 1-2-3, or DBaseIII.

IV. End-user programmers who utilize both command and procedural languages directly for their own personal information needs. They develop their own applications, some of which are used by other end-users. This latter facility is an incidental by-product of what is essentially analytic programming performed on a "personal basis" by quantitatively oriented actuaries, planners, financial analysts, and engineers.

Based on the above categories, the distribution of the end-users who were interviewed in this study is shown in Table 1. The distribution is not representative of the entire user population in the participating companies, but rather reflects the bias inherent in the selection of end-users who were the "major users of the CBIS." Even with this biased sample, one notes that the majority of the end-users lack computer literacy. To some extent this low level of computer literacy may be explained by the age factor (the average age of interviewees was 42 years), and the fact that the data indicated a discordance (negative relationship) between age and computer experience (Kendall's tau = -0.24, significant at $p<0.005$). The characteristics of available software provides another possible explanation for the skewed end-user class distribution. We will return to this in a later part of this section.

Table 1

4.2 Data Processing Staff

Few organizations had access to qualified data processing staff; the total number of such for the 79 participating small business firms in the study was 347, and the number of data processing personnel in each firm was between one half-time employee to 34 employees. Nineteen percent of firms had at least one part-time analyst; 14 percent of firms had at least one part-time programmer, 57 percent of firms had one part-time operator, and 72 percent of firms had at least one part-time data-entry person. The part-time personnel in the data processing department usually had other duties.

For example, a data-entry person might also be responsible for computer operation and/or a secretarial job. Therefore, one person could act in a firm as analyst, programmer, computer operator, and data-entry person. If a person was responsible for different activities in the data processing department, then the fraction of his/her time spent on each specific activity was recorded. The Kendall's tau = 0.30 (significant at $p<0.005$) indicated concordance between the number of white collar employees and the number of programmers and systems analysts employed by the firm. There was also concordance between the size of the installation and the number of programmers and system analysts employed by the firms (Kendall's tau = 0.42, significant at $p<.005$).

Formal education of the data processing personnel was as follows: 4 percent had a Master's degree, 17 percent had a Bachelor's degree, and 19 percent had a community college diploma. The remaining 60 percent had finished high school. The educational background of the data processing personnel was related to the organizational complexity of the firms. For example, the Kendall's tau for the number of firms with university graduate data processing personnel in relation to the number of functional areas in the firms was 0.29 (significant at $p< 0.005$).

Hardware

Hardware acquisition and planning in the firms visited can at best be identified as "opportunistic" (Huff and Munro, 1985). Due to resource constraints, these firms generally had no long range plan on policy for the acquisition of the hardware, and none made use of main-frame computers. Forty-six firms used 47 mini-computers. The average main memory size of the mini-computers was one mega byte and the average secondary storage was 299

mega bytes. Between 3 to 56 dumb terminals were connected to these mini-computers.

In total 157 micro-computers were owned by 42 firms. Among these firms, only seventeen companies owned both mini and micro-computers.

4.3 Software

Little resources had been spent in analysing the information requirements of any one organization. Furthermore, none of the small business firms had a specific policy towards the development of required application software. This created a mismatch between the user requirements and the application software, as well as a difficulty in integrating among different application systems. We will return to this in the later part of this section.

One hundred different application systems were used by the 79 small business firms. Table 2 presents the most popular application software, which made up 79 percent of the application software in use by all the firms. The rest of the application software was company specific and used by individual decision makers. It is interesting to note that 90 percent of the company-specific application software was developed by utilizing general purpose commercial software such as DBASEIII or Lotus 1-2-3. The characteristics of the file organizations used by the application systems made them inflexible and difficult to integrate. Seventy six percent of the application software used conventional file organizations (e.g., indexed sequential) and 24 percent used a Data Base Management System filing structure.

Table 2

The majority (i.e. 65.5 percent) of the application software was being used on daily basis, and 14 percent was being used monthly. There was a strong relationship between the number of applications used and the number of terminals connected to the mini-computers (Kendall's tau = 0.42, significant at $p<.005$). As expected, there was also concordance between the number of application software in use with the number of systems analysts and programmers employed by the data processing center (Kendall's tau = 0.31, significant at $p<.005$).

The future application software requirements of the 79 firms was diverse. Table 3 shows the fifteen most popular required application software. Most of these applications can be categorized as "production" systems with a low intended frequency of use. The other 44 types of application software were mainly specific to the needs of the individual firms and included systems such as material requirements planning, market forecasting, and map generators.

Table 3

Table 4 shows one classification of interest, which is the primary focus of the application. It shows that the majority of the in-use applications were either "production" oriented such as payroll and inventory systems, or merely able to extract particular data items from a database for

simple queries. These systems had been mainly coded in Basic or Cobol. To increase the usefulness of the in-use applications, the end-users indicated that 20 percent of the operational systems would have served them better if modified to a "what-if" mode of operation that could be utilized for inquiry and simple analysis. Furthermore, as can be noted from Table 4, the primary purpose of the application software required in the future shifted from operational and simple report generation to simple and complex analysis. This is evidence of end-users CBIS maturity, which has also been noted in large organizations (Nolan, 1979; Rockart and Flannery, 1983).

Table 4

The sources, both currently in-use and intended for future use, for development of the application programs are shown in Table 5. Fourth generation application generator such as Lotus 1-2-3 were popular in the development of application software. Its ease of operation made it possible to develop applications in a short time with fewer (or no) requirements for data processing (DP) staff. However, these types of tools were either not powerful enough for complex tasks or required skilled professional application developers. Furthermore, there were concerns over problems faced with integration of the individual systems which had been developed through the fourth-generation application generators. As an alternative, when developing complex systems based on more powerful programming languages, the organizations visited had to either rely on their DP staff or purchase special purpose commercial software. The use of the latter was

especially attractive since the small business firms that we visited did not have either access to skilled systems analysts and programmers or the lead time, and thus the development costs made the internal development of complex systems infeasible.

Table 5

It was indicated by the end-users that the output presentation of the application software in-use was restrictive. The most popular means of documenting the output was hardcopy, and this accounted for 99.1 percent of the application software in use. A common practice was to tabulate the outputs of the application software [redacted]. This accounted for the 90.2 percent of the cases. To further enhance the information content of the tabulation outputs, 57.3 percent of application software used table-text, 4.9 percent used table-graphics, and 4.4 percent used a combination of table-text-graphics. In order to extend usefulness, end-users were in favour of adding graphical capabilities to the output presentation of 18.5 percent of the application software.

4.4 ORGANIZATIONAL ISSUES

In describing information technology assessment and adoption (ITAA), Huff and Munro (1985), have distinguished six phases which they categorized as awareness, interest, evaluation, trial, implementation, and diffusion.

An evaluation of these phases in the firms that participated in the present study is as follows:

I. Awareness of the end-users about the information systems technology was low. Generally, they had ability to interact with only a simple interactive applications system. Only 32 percent had ever written a simple program or had been involved in the design and development of a computer system. There was a positive correlation between the level of the "end-user's computer literacy" and the "user participation in information requirements analysis", and the "degree of the information requirements analysis performed" (see Table 6).

II. Interest in initiating computerization in the organization was mainly attributed to the president of the company. The initiators included the president (65 percent), accounting section (10 percent), the managers of all divisions except accounting (15 percent), and 10 percent of the companies were not able to identify the exact source of CBIS initiation. Furthermore, the on going managerial involvement in CBIS activities was fairly strong among these firms. The level of direct support included president (37 percent), accounting section (25 percent), managers of divisions except in the accounting division (38 percent). User participation towards design and development of information systems was highly correlated with the level of information requirements analysis performed (see Table 6).

III. Evaluation of the required technology was based mainly on deficient analysis. Only 9 percent of the firms engaged in a complete information requirements analysis that included extensive information analysis, data flow analysis, and long range planning of information requirements. There were six firms (8 percent of the sample) that

carried out data flow analysis. While, 42 percent of the firms analysed the data requirements for each individual applications, 19 percent of the firms copied systems used by other similar organizations without any considerations of their own specific needs, and 22 percent of the firms simply automated their manual systems.

IV. The trial and implementation of the systems was mainly carried out with little participation of the users of the systems. Users in 10 percent of the firms participated in all stages of the systems' life cycle including the implementation phase. The rest of the organizations either did not consult the users at the implementation phase (21 percent), or only consulted them during the design phase (34 percent), while a significant number did not consult the end-users at all (35 percent).

V. None of the organizations had reached the stage of diffusing the available technology throughout the firm.

Table 6

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5. DISCUSSION

The above findings indicate that the majority of small business firms are following the path of opportunistic strategy to guide their ITAA (Huff and Munro, 1985). This means that their goal is to automate as many applications as possible without paying attention to the overall information needs of the organization. Such a strategy will become difficult to

maintain when the demands of end-users for adoptive user-friendly systems increase (Nolan, 1979). The low level of information requirements analysis may be attributed to the financial constraints under which small business operate. To reduce further the cost of information systems, the small business firms seem to be heavily committed to the use of commercial software, and this is a policy that can be beneficial when integration of an individual system is well planned. However, in this study, there were only ten organizations that had some strategic plans towards the eventual integration of their individual systems. The firms, by and large, indicated their desire to increase an already present reliance on outside software houses to acquire special purpose software tailor made to the specific needs of the organization. This was mainly attributed to two factors: the first was the difficulty experienced by the organizations in developing complex application systems (especially when micro-computer based fourth generation application generators had been directly used by the end-users); the second was the lack of integration among the application systems generated by the commercial application generators. The problem of integration was caused by the lack of adequate systems analysis and incompatibility among the different application generators in use.

The identification and assessment of the available technology is an important base for the successful implementation of CBIS in any organization. This issue is especially important to the existence of small business firms since they have only a minimal financial capacity to absorb technology by the method of trial and error. However, small business firms tend to spend insufficient resources on both information requirements analysis and on information systems planning. The computer literacy [redacted] of end-users is ignored and requirements for the qualified information

systems analysts is not apparent. The presence of inexpensive user-friendly application generators and/or special purpose commercial systems may provide the incentive to overlook the longterm benefit of information systems policies. However, the eventual lack of integration among the application systems would have adverse effects on the utilization of the organization's information resources.

Obviously one needs to perform similar analyses in different environments in order to generalize on the findings reported here. Furthermore, there are other related issues that are worth an investigation in more depth. For example, it would be interesting to find the level of task complexity that can make a fourth generation application generator unattractive to the end-users. It is also necessary to further investigate a suitable means for improving end-user knowledge of CBIS technology. The results of this study indicate that information requirements analysis and policies towards acquisition of the application software have strong impact on the successful adoption of the information technology. Assessment of the information technology towards the requirements of the organization is a highly complex issue and require direct involvement of senior systems analysts (Huff and Munro, 1985). However, small business firms have minimal financial capability to invest in employment of senior systems analysts. A set of guidelines is needed to help the small business firms towards policy planning and choice of information systems.

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Table 1

Distribution of End-Users Interviewed

User Class	Percentage
Intermediate	20
Non programming End-User	47
Command-Level End-User	20
End-User Programming	13

Table 2

Application Programs in Use by 79 Small Business Firms

Name of Application	No. of Firms Using the Application Program (%)	Total Application (%)	Freq. use**	No. of Depts***
Account Receivable	50	8.8	4.2	1.8
General Ledger	43	7.6	10.4	1.6
Account Payable	40	7.0	4.6	1.6
Inventory	40	7.0	3.5	2.3
Word Processing	33	5.8	2.3	3.2
Payroll	30	5.3	5.4	1.5
Sales Analysis	26	4.6	17.8	1.7
Order Entry	25	4.4	1.0	2.3
Financial Analysis	24	4.2	23.3	1.8
Budgeting	21	3.7	47.8	2.5
Invoicing	19	3.3	1.4	1.9
Costing	17	3.0	4.8	2.7
Engineering	17	3.0	5.7	2.4
Production	14	2.5	1.9	1.9
Estimation	13	2.3	3.7	1.9
Billing	11	1.9	6.6	1.8
Scheduling	10	1.8	1.6	3.1
Purchasing	9	1.6	1.0	1.8
Cash Flow	7	1.2	30.0	1.5
Others	120	21.0	1.5	2.5

Notation used:

** This column represents the average frequency of use of an application program. The unit of time is days.

*** This column represents the average number of different functional areas in an organization that share the same application program.

Table 3

Application Programs Required in the future by
79 Small Business Firms

Name of Application	No. of Firms Using the Application Program	Total Application (%)	Freq. use**	No. of Depts***
Inventory	18	10.5	2.3	2.0
Account Payable	13	7.6	4.7	2.0
Word Processing	13	7.6	1.0	2.8
Budgeting	10	5.8	21.3	1.9
CAD/CAM	10	5.8	1.0	2.1
Costing	10	5.8	17.0	1.4
Sales Analysis	8	4.7	16.3	2.6
Account Receivable	6	3.5	3.0	1.3
Financial	6	3.5	20.3	1.3
Accounting	6	3.5	2.0	1.8
General Ledger	5	2.9	9.2	1.6
Estimation	4	2.3	10.3	1.8
Scheduling	4	2.3	1.0	1.3
Customer File	3	1.8	3.0	1.7
Production Planning	3	1.8	3.0	1.3
Others	52	30.1	2.3	1.6

Notation used:

** This column represents the average frequency of use of the application program. The unit of time is days.
*** This column represents the average number of different functional areas in an organization that share the same application program.

Table 4

Applications Classified by Primary Purpose

Purpose	In Use (%)	New Requirements (%)
Production Systems	37.40	7.60
Report Generation	45.70	37.20
Inquiry/Simple Analysis	16.40	47.60
Complex Analysis	0.50	7.60

Table 5

Sources Used for the Development of the Application Programs

Source	In-Use (%)	New Requirements (%)
General Purpose-Application Generators	41.70	27.10
Special Purpose-Commercial Software	39.60	55.90
Custom built by-a systems house	11.90	11.80
Internally Developed-by DP staff	6.70	5.20

Table 6

Association of the Level of User Participation , Information Requirements Analysis, and the Level of User Computer literacy

	USER-Part	IRA	USER-LIT
Level of User Participation (USER-PART)	1.00** (0.00)	0.69 (0.0001)	0.33 (0.003)
Level of Information Requirements Analysis (IRA)	0.69 (0.0001)	1.00 (0.00)	0.38 (0.0005)
Level of User Computer Literacy (USER-LIT)	0.33 (0.003)	0.38 (0.0005)	1.00 (0.00)

** Kendall's tau (level of significance)

APPENDIX

Semi-Structured Questionnaire Used During Face-to-Face Interviews for Information Systems Analysis of Small Business Firms

Part One: General Information

Name of the organization: Date of Interview:

I.1 Type of business: Describe the business in terms of services and/or products?

I.2 Organizational objectives:

I.3 Organizational structure: How is the organization structured to achieve these objectives (ie. responsibilities of functional areas)?

I.4 Size of the company:

Number of employees: Total____

Management____ White Collar____ Secretarial____ Blue Collar____

Part Two: Information Systems Environment

II.1

	Mainframe	Yrs.	Mini	Yrs.	Micro	Colour?	Yrs.
Name:							
Memory:							
Storage:							
Languages:							

II.2 Number of dumb terminals?_____

II.3 Application Programs:

A - (1)In House, (2)Commercial, (3)Custom, (4) Customized commercial
B - (1)DBMS, (2)Classical filing system
C - No. of functional areas using the system
D - Frequency of Usage
E - Degree of Computation: (1) Retrieval, (2) Simple, (3) Spread Sheet (4) Complex
F - Degree of interaction: (1) Transaction, (2) Query, (3)Spread Sheet, (4) DSS
G - Types of Presentation:(1)Text, (2)Tabular, (3)Graphic, (4)Hardcopy
' - Extensions required for the present systems

Application	A	B	C	D	E	F	G	F'	G'
In use									

II.4 Other Application Systems Required

II.5 Number of data processing employees: Total_____

Analysts_____ Programmers_____ Operators_____ Data Entry____

II.6 Level of Education of data processing employees:

Number: -------

High School....._____
Community College....._____
University....._____
Post-graduate....._____

II.7 Level of user participation in the design and development of the system: (circle one)

None | Consulted | Highly Involved

II.8 Rate the information requirements analysis performed for the design and development of the system:

Reactive | Emulation | Data Analysis | Data Flow | IRA

II.9 Rate the average computer literacy of the users:

None | Simple Query | Report Generation | Spread Sheet | Interactive Modelling

II.10 The initiator of computer automation:

Name_____ Dept._____ Title_____

Date_____

II.11 Why did the company decide to use computers?

_____

II.12 Who is currently responsible for new directions or initiatives?

Name_____ Dept._____ Title_____

Part Three: Information About Individual End Users

III.1 Name:_____Code:_____

III.2 Department:_____

III.3 Status:

Management____ White Collar_____ Secretarial_____ Blue Collar_____

III.4 Computer Experience:

Never used a computer _____

Used a computer but have no programming experience _____

Programming experience: Can Develop:

Small programs_____ Medium programs_____ Extensive programs_____

III.5 Formal Education:

High School_____ College_____ University_____ Post-Graduate_____

III.6 Area of expertise (background):_____

III.8 Application Programs currently used as well as required in the future

F' - The required extension for the degree of interaction: (1)Batch, (2)Query, (3)Spread Sheet, (4) DSS

G' - The required extension for the types of presentation: (1)Text, (2)Tabular, (3)Graphic, (4)Hardcopy

Application	Frequency of Use	Improvements needed	F'	G'

Faculty of Business

McMaster University

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