A Comparative Analysis of Information Systems Issues Facing Canadian Business

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Abstract

A national survey of 158 Canadian IS personnel at various organizational levels was conducted using a modified Delphi technique and follow-up interviews to identify the critical issues in information systems during the next three to five years. Critical information systems issues were identified including 1) building a responsive IT infrastructure, 2) improving IS project management practices, and 3) planning and managing communication networks. Significant differences in the rating of the importance of these issues were reported between small and large firms, private and public sector firms, IS executives and lower levels of IS personnel. A comparison of the current results with previous U.S. and Canadian studies revealed that Canadian IS personnel are currently placing a stronger emphasis on the need to address technology-related issues rather than managerial issues. Qualitative data to be collected in follow-up interviews will be reported at the conference to cast some light on the reasoning behind the ratings and the sources of information that were used in the assessment of their importance.

1. Introduction

During the past 20 years, the overall business environment and the technology embedded within it have undergone tremendous changes. Information technology has grown by orders of magnitude in computing capacity and speed and the importance of information as a corporate resource has increased dramatically. Personal productivity and decision making tools are now accessible to enhance most business functions. New technologies on the horizon promise to enhance the richness of electronic communications and automate the development of even more systems.

This flourishing capability of information technology coincides with growing changes in the business environment exemplified by familiar business themes of the 1980s, including mergers, leveraged buyouts, downsizing, strategic alliances, globalization and commitment to total quality management and empowerment [1]. These environmental changes present demands on personnel in all levels of IS departments to provide timely, high-quality information and to support innovative products, production techniques and organizational designs. IS executives are particularly challenged because they operate at the intersection between information technology and their organization. In the face of rapid change, IS executives must be able to interpret trends in information technology and assess current and future impacts on their organization, while also managing day-to-day operations. Information systems vendors, professional societies, consultants, educators and researchers need to be aware of these key IS issues to inform and educate their markets effectively.

Although research studies of IS issues have been published based on data collected in the United States and other countries, there are indications that the issues these researchers have identified are not necessarily representative of the Canadian business environment [2]. Given the introduction of the Free Trade Agreement and the rapidly increasing trade between the U.S. and Canada it would appear to be important to update the IS issues that are being faced by Canadian organizations. Does Canada lead or lag the US? Perhaps Canada has a completely different set of IS issues due to its geographical make-up, resources or governmental regulations.

The scope of this study expands on that of prior studies in this area of research in two ways. First, very little work has been done to examine whether a shared vision of critical IS issues exists at different levels of the organization. Previous researchers [1] admit that their survey results cannot be claimed as representative of the IS population in general as their data collection was limited to IS executives. This study examines the "vision" of top IS executives to that of IS professionals at other organizational levels to determine if a shared vision exists. Second, there is a lack

of research examining the reasons for the differences in the assessment of the importance of critical IS issues.

Specifically, we seek to answer the following managerial questions:

1. What are the ten most critical managerial and technical issues IS personnel in Canada perceive that they will face over the next three to five years?
2. What is the order of importance of these issues?
3. How much agreement is there among the different levels of IS personnel on the key issues and their importance?
4. How closely do corporate organizations agree with government organizations on the key issues and their importance.
5. How closely do large organizations agree with small organizations on key issues and their importance?

Corporate managers and consultants can use the results of this research study to help determine the issues that are most deserving of time and resource investment and accelerate the transfer of technology and management skills among their employees and clients. IS managers may use the results to better understand the motivation and direction of their personnel. Vendors may use this information to develop and market products and services. Professional societies may use this information to plan the content of business conferences and seminars as well as regulate the dissemination of relevant knowledge through their publications. And, educators may plan the content of educational IS curriculum and training.

2. Previous research

Work already done in this area has shown that the key issues facing IS management are not static, but change over time. A number of studies conducted over the past 15 years in the U.S. report a changing focus from largely technological issues in the earlier studies [3, 4, 5, 6] to a greater focus on management of technology [1].

For example, in 1986, the Society for Information Management (SIM) in a joint effort with the MIS Research Centre (MISRC) at the University of Minnesota, conducted a modified Delphi survey of its membership to determine the importance of the most critical issues in IS Management in the United States. To keep the "key issues" framework current, SIM and MISRC conducted a second study in 1989 to reassess this framework. The purpose of these studies was to determine: which IS management issues were expected to be most important over the next three to five years and therefore most deserving of time and resource investment; how much consensus exists about the relative importance of specific issues, and why some issues deserve more attention than others.

In the 1989 survey of senior IS executives from large private corporations in the US [1], the ranking of the top ten issues was: information architecture; data resources; strategic planning; human resources; organizational learning; technology infrastructure; IS organization; competitive advantage; software development; telecommunications systems planning. Only six of the ten issues from the 1986 survey remained in the 1989 top ten. It appears that greater attention is being paid to infrastructure issues; communications networks; data sharing mechanisms; and application development processes.

A previous Canadian MIS issues study reported some interesting findings. Rivard, Boisvert and Talbot [2] surveyed 188 IS managers across Canada. They reported a mix of operational and strategic issues that, when compared with those of the 1987 U.S. studies conducted by Brancheau and Wetherbe [6] showed marked differences in both content and prioritization. The U.S. and Canadian lists agreed on the prioritization of only the top two issues: IS Planning and Competitive Use of IT. Of the remaining 18 of the top 20 issues, 8 that appeared in the Canadian list (i.e., training users; communication with users; managing microcomputers; user participation in IS development; control of IS budget; implementation of new technologies; user friendliness of communications software, and software costs too high) had not been previously mentioned in any of the U.S. studies. The prioritization of the remaining issues differed considerably. In light of these facts, a reappraisal of the Canadian findings would appear to be necessary, given that almost ten years have elapsed since the last Canadian study and their implication that recent U.S. results [1] may not provide accurate guidance for IS managers in Canada.

3. Methodology

In this paper, we report on a survey conducted across Canada to investigate information systems issues that are currently facing business management. Although a number of different data collection techniques have been used in this type of study, the Delphi technique, used in a series of issues studies in the U.S. [1, 3, 4, 6] appears particularly well-suited. Adoption of a consistent format for data collection is recommended so that international findings can better be compared [7].

In this way, national and regional differences can be examined, and a body of knowledge accumulated.

Our study began with the list of 23 issues in IS management and their supporting rationale developed in the Niederman et al. study [1]. A two-round, modified Delphi Method was employed in order to move the respondents to a reasonable level of consensus about the critical issues they were facing in information systems management. Although previous studies have used three-rounds of questionnaires, negligible differences were shown between second and third round questionnaires in the Niederman, et al. study [1]. This is consistent with the premise that the number of rounds is somewhat flexible and the Delphi process stops when a reasonable level of consensus is achieved [8].

3.1 Round one

In September 1994 , a mail questionnaire was sent to a total of 920 members listed in the National Membership Directory of the Canadian Information Processing Society (CIPS) and the Canadian membership listing of the Urban and Regional Information Systems Association (URISA). Respondents were randomly selected from the directories by Province and wherever possible by Job Category. In keeping with the policy of Canadian business to use English as its language of business, all questionnaires were in English.

Respondents were asked to consider what they felt were the most critical issues facing IS personnel over the next three to five years. To control for an ordering effect, the issues were presented in random sequence along with a rationale describing the issue in four different versions of the questionnaire (surveys were assigned randomly to participants). Members were asked to rate each issue on a 10-point scale, where 10 indicated the issue was "very important" and 1 indicated that it was "not at all important". Sixty-four responses were returned as "undeliverable". A total of 176 useable responses were received for an effective response rate of 21%.

3.2 Round two

In late February, 1995, all Round One respondents were sent feedback of Round One results, including their individual responses to use as a baseline comparison. In addition, in order to attempt to increase the response rate, a Round Two survey was also mailed to a random selection of 536 non-respondents. In total, 712 Round Two surveys were mailed. Four issues with low Round One ratings were dropped. Five new issues were added to the survey resulting in a total of 24 Round Two issues. The new issues were developed from a synthesis of related issues and rationale proposed by Round One respondents. All issues submitted by three or more respondents were included. After a listing of the new issues, Round One issues were listed in rank order of importance from highest to lowest average rating. Respondents were once again asked to rate all issues on a 10-point scale. Despite the clean-up of the original mailing list, based on the returned surveys from Round One, 59 Round Two questionnaires were returned as "undeliverable". The Round Two mailing initially resulted in the receipt of 130 useable responses.

Approximately 3 weeks after the second mailing, in an effort to boost the response rate, follow-up phone calls were made to a random selection of 100 non-respondents. When necessary, a copy of the questionnaire was faxed to those respondents who had "misplaced" the survey and respondents faxed completed questionnaires back to the researchers. The follow-up phone calls resulted in the receipt of an additional 26 questionnaires. In total, 158 useable Round Two questionnaires were appropriate for analysis, for an effective response rate of 24%.

3.3 Follow-up Interviews

The authors are in the process of scheduling follow-up interviews with a sample of typical and atypical respondents. These interviews are designed to probe "why" respondents rated the issues as they did, report on individual, managerial and organizational characteristics that may have influenced their ratings, and the sources of information that influence their perceptions.

3.4 The Respondents

Classified by job level, respondents consisted of 33 Senior IS Executives (21%), 55 IS Department Managers (35%), 36 Systems Analyst/Programmer (22.8%) and 34 Consultants (21.5%).

The distribution of the respondents by geographic location and industry type is shown in Table 1. All regions of Canada were represented, 77 respondents represented the Western provinces of Alberta and British Columbia (48.7%), 21 were from the Central provinces of Saskatchewan and Manitoba (13.3%) and 62 represented the Eastern provinces of Newfoundland, New Brunswick, Nova Scotia, Ontario and Quebec (38%). It should be noted, that given the higher population base of the Eastern provinces, the Western and Central provinces may be somewhat over represented.

Table 1: Geographic Location and Industry Type

Industry Type	N	%	Province/Territory	N	%
Manufacturing	8	5.1	Alberta	52	32.9
Government	43	27.2	British Columbia	25	15.8
Computer/Data Processing	10	6.3	Manitoba	9	5.7
Trade: Wholesale/Retail	3	1.9	New Brunswick	2	1.3
Petroleum	7	4.4	Newfoundland	1	.6
Utilities	14	8.9	Nova Scotia	3	1.9
Consulting	30	19.0	Ontario	42	26.6
Chemical	2	1.2	Saskatchewan	12	7.6
Educational	4	2.5	Quebec	12	7.6
Finance	12	7.6			
Medical/Legal Services	2	1.3			
Transportation Services	6	3.8			
Construction	6	3.8			
Unclassified	11	7.0			
OVERALL	158	100%		158	100%

Thirty-six of the respondents represented manufacturing companies, 64 represented service organizations, 47 represented non-profit organizations and 11 failed to classify themselves. A finer classification of industry types is shown in Table 1.

Classified by organizational sector, 89 respondents were from private business and 69 were from public agencies. Forty-three respondents represented small businesses (200 or less employees) and the remaining 115 respondents were from large organizations.

The literature is divided on how to define *small*. Some studies use annual sales figures of less than $10 million [9], however, private companies are often reluctant to disclose their annual revenues [10]. Those who discriminate based on numbers of employees have chosen different thresholds, ranging from “less than 50” employees [11] to “500 or less” [12]. For the purposes of the current study, we define “small” as “200 or less” employees, consistent with Rivard, et al. [2] to allow us to compare findings across studies.

4. Findings

Table 2 compares the ten most critical issues that Canadian firms expect to face in the 1995-2000 era with those previously reported by Rivard, et al. [2] and Niederman, et al. [1].

Table 2 Comparison of Top Ten Current Canadian Issues with Previous Findings

			Rank		
Mean Rating	**Std. Dev.**	**Issue**	**Current Study**	**R, B & T* (1988)**	**N, B & W** (1991)**
8.15	1.45	Building a Responsive IT Infrastructure	1	NEW	6
7.78	1.68	Improving IS project management practices	2	NEW	NEW
7.63	1.54	Planning and Managing Communication Networks	3	15	10
7.51	1.77	Improving Effectiveness of Software Development	4	2	9
7.32	1.95	Aligning the IS organization within the Enterprise	5a	NEW	7
7.32	1.83	Coping with Degree and Rate of Technology Change	5b	13	NEW
7.28	1.76	Developing and Implementing Information Architecture	7	NEW	1
7.26	1.99	Using IS for competitive advantage	8	4	8
7.18	1.67	Facilitating and Managing Business Process Redesign	9	NEW	NEW
7.07	1.70	Developing and Managing Distributed Systems	10	NEW	16

*Rivard, Boisvert and Talbot (1988) - Canadian IS managers

** Niederman, Brancheau and Wetherbe (1991) - U.S. IS executives

In the following section, each of the issues listed in Table 1 is discussed briefly in the context of the current findings and those previously reported.

1. Building a Responsive IT Infrastructure - Top of the list is an important task that is frustrated by the continuing rapid changes in IT and the increasing breadth and depth of applications that need to be supported. Building a technology infrastructure to support existing applications, while remaining responsive to change, is key to long-term enterprise productivity. This is an issue that has not previously been reported by Canadian IS personnel, and indicates an increased importance in comparison to the sixth place that it was awarded by U.S. IS executives in 1989.

2. Improving IS Project Management Practices - The second most important issue is a newcomer to any of the issues lists. Along with the recognition that IT can improve their status in the marketplace, comes the need to make sure that this increasingly important resource is managed well. Respondents agreed that project management of software development is more critical than the software effectiveness itself. Although business has been dealing with this issue for a number of years, the growing scale and complexity of IT projects is still a major concern. To improve IS project management, well-trained, highly specialized, multi-disciplinary teams must be developed to deliver on time and within budget.

3. Planning and Managing Communications Networks - The increased importance of networks is reflected in the high placement of this issues compared with previous studies, where it was awarded 15th place by Canadian IS personnel and 10th place in the U.S. study. Recognition that stand-alone workstations are no longer feasible in today's team-oriented workplace placed Planning and Managing Communications Networks third in importance. Using IT for competitive advantage depends heavily on access to appropriate internal and external communication networks. This task is complicated by rapid advances in underlying technology and major structural changes in the communications industry.

4. Improving the Effectiveness of Software Development - In fourth place in the list of most important issues, improving the effectiveness of software development has slowly been gaining in importance. Just as the project itself must be managed well, so must the quality of the end product. Companies have long wrestled with the application development backlog. In comparing current findings with Rivard, et al. [2], it would appear that Canadian IS personnel are "winning the battle" in that respect, since it has dropped from second place in importance over the past several years. However, Canadians are still awarding this issue greater importance than did the U.S. respondents in 1989.

5a. Aligning the IS Organization within the Enterprise - The IS organization's effectiveness in supporting the business needs is dependent on its location within the business. Too often IS is not located and structured appropriately. This issue has not been raised previously in Canadian studies, but was awarded a similar level of importance in Niederman, Brancheau and Wetherbe's 1989 study. The continued importance of this issue, indicates a recognition that IS personnel recognize the need to view IT as an integral part of their business strategy, but that its alignment is still not being adequately addressed.

5b. Coping with the Degree and Rate of Technology Change - tied for fifth place, coping with degree and rate of technology change is a new issue when compared with the U.S. study, and has grown significantly in importance over the years in Canada (previously 13th). Given the high degree of technology change in the next few years (e.g., new CPUs and Operating Systems) major purchases of the wrong hardware and operating system combination could be particularly disastrous to firms that are heavily constrained by limited resources. Many of the barriers to IT-enabled productivity enhancements involve the management of people's responses to technological change rather than the IT itself and this concern is reflected in the importance awarded to this particular issue.

7. Developing and Implementing an Information Architecture - In 1989 this issue was rated number one by IS executives in the US, and has not been previously mentioned by Canadian IS professionals. It would appear that Canadian IS personnel are beginning to address the need for a corporate-global information architecture to guide applications development and facilitate the integration and sharing of data both locally and through remote access.

8. Using Information Systems for Competitive Advantage - The rating of competitive advantage as the eighth most critical issue may indicate that Canadian businesses are currently dealing with the use of IT as a competitive weapon, to the extent that IS executives in the U.S. were in 1989. It also reflects an increasing Canadian competency, which may indicate the realization that simply applying IT is no guarantee of success. A corporate strategy that leverages the IT must also exist.

9. Facilitating and Managing Business Process Reengineering - The ninth issue is another newcomer to the issues list. To remain competitive, many organizations are radically changing the way they do

business, and this is particularly true of small business. IT plays an increasingly important role in this change process by enabling the innovative redesign of core business processes [13].

10. Developing and Managing Distributed Systems - was rated as the tenth most important issue facing IS personnel. Its importance as a critical issue has increased over the years, and is a new addition to the Canadian list of top ten issues. This would appear to indicate that the challenges associated with the promise of client-server applications as cost-effective alternatives to centralized applications, are still a cause for concern and have not been adequately addressed.

4.1 Analysis by Size

Table 3 reveals that small firms share a number of the same top ten issue with large business, but differ in their prioritization. This is consistent with results reported in previous studies [2, 14]. It is also evident that a number of new IS issues not previously reported are expected to plague small Canadian firms in the next three to five years.

The high rating by small firms of Using IS for Competitive Advantage, indicating that it is the most important issue being faced by small firms, is particularly startling given that it was rated 10th by large firms in the current study ($p < .01$) and 18th by small firms in the Rivard, et al. Canadian study [2]. The large difference in the current ratings suggests that small firms are lagging larger firms to a greater extent on this critical issue. This may be explained by the fact that hardware and software costs have been radically and steadily declining over the last ten years. Given its rise in importance in the rating of small firm issues, it is possible that small firms now have more resources to adopt significant information technology and are therefore facing the same issues that larger firms faced when they were making their initial investment in IT.

Table 3: Top Ten Issues by Size

Issue	Small (<=200) (n=43)		Large (>200) (n=115)	
	Rank	Mean Rating	Rank	Mean Rating
Using IS for Competitive Advantage**	1	8.00	10	6.98
Improving IS Project Mgmt. Practice	2	7.67	2	7.82
Improving Effectiveness of Software Development *	3	7.60	5	7.47
Building Responsive Infrastructure	4	7.58	1	8.36
Aligning IS Organization within the Enterprise	5	7.28	7	7.34
Coping with Degree and Rate of Technology Change	6	7.21	6	7.36
Planning and Managing Communications Networks	7	7.19	3	7.80
Facilitating and Managing Business Process Redesign	8	7.19	9	7.19
Educating the User *	9	7.09	N/R	
Recruiting and Developing IS Human Resources	10	7.00	N/R	
Developing and Implementing Information Architecture	N/R		4	7.52
Developing and Managing Distributed Systems	N/R		8	7.31

N/R = Rating does not rank issue in top ten
* Significant at $p = < 0.05$
** Significant at $p = < 0.01$

Significant differences between the ratings of small and large firms were also reported with respect to improving effectiveness of software development ($p < .05$). Small firms rated this issue as being more important than did larger firms. This is surprising, given the tendency of small firms to purchase off-the-shelf software and spend less time and effort modifying or customizing the software to their specific needs.

Firms with 200 or fewer employees also varied somewhat on two other issues: 1) planning and managing communications networks and 2) building a responsive IT infrastructure.

Currently, the "price per seat" of networking is actually less for small implementations, thus small firms may have been implementing basic networks recently and are feeling the effects. It isn't surprising that both

sizes of firms agree that it is an important yet manageable issue.

In the case of aligning the IS organization within the enterprise, this would appear to be of less importance to small firms, many of whom do not have a formal IS organization. Owner/operators can usually communicate and implement their vision more easily than can senior managers, who have to contend with large political structures.

Two new issues rated in the top ten by small organizations did not appear in the top ten list of larger organizations. Although they have been previously reported by small Canadian firms in Rivard, et al. [2], their importance appears to have diminished over the years. In order of current importance, they are 1) educating the user ($p < .05$) and 2) recruiting and developing IS human resources.

The inclusion of these two issues indicates that small firms are continuing to recognize the need to consider "people" issues along with technology issues. It has long been shown that IT investment does not bear fruit unless it is accompanied by organizational changes, and this may be more important in small firms where appropriate in-house skills are often lacking and the use of an outside consultant may be perceived as an admission of personal failure and incompetence. Likewise, as a percentage of revenue, the cost to the small firm of training personnel in IS skills is very high. Small firms cannot afford to train personnel only to have them leave, thus forcing the firm to start the process all over again.

The high degree of change associated with IT is frequently overwhelming to any business, particularly to small business operators who are constantly contending with the need to play multiple roles, and often have little IT knowledge. Consequently, it is no surprise that they expect to face continued difficulty in coping with IS-related human resources over the next three to five years.

4.2 Analysis by sector

The largest number of significant differences occurred between public and private firms. Table 4 indicates some interesting similarities and differences between the critical IS issues faced by public and private firms. While the two sectors agree on eight of their top ten issues, their prioritization differs to some degree.

Table 4: Top Ten Issues by Sector

Issue	Public (n=69)		Private (n=89)	
	Rank	Mean Rating	Rank	Mean Rating
Building Responsive IT Infrastructure *	1	8.26	2	8.06
Planning and Managing Communications Networks	2	7.96	5	7.38
Developing and Implementing an Information Architecture **	3	7.49	9	7.12
Aligning IS organization within enterprise **	4	7.47	7	7.12
Coping with Degree and Rate of Technology Change	5	7.41	6	7.25
Improving effectiveness of software development	6	7.39	3	7.37
Improving IS project management practices	7	7.31	1	8.14
Improving IS strategic planning **	8	7.26	N/R	
Facilitating and Managing Business Process Redesign	9	7.20	8	7.17
Developing and Managing Distributed Systems **	10	7.13	10	7.02
Using IS for competitive advantage	N/R		4	7.57

N/R = Rating does not rank issue in top ten
* Significant at $p = < 0.05$
** Significant at $p = < 0.01$

IS personnel in public firms were more concerned **with building a responsive IT infrastructure** than were their private firm counterparts ($p < .05$). Similarly, their views indicated higher ratings for **developing and implementing an information architecture**, **aligning the IS organization within the enterprise, improving IS strategic planning** and **developing and managing distributed systems** (all significant at $p < .01$). Issues such as **using IS for competitive advantage**, that was rated highly by private firms, did not appear in the public firms' top ten issues., nor did **improving IS project management**

practice, the number one issue of private firms. This may reflect a difference in organizational culture since competition and market forces are less influential for public firms. This underscores their emphasis on effective and efficient use of IS, as suggested by Niederman, Brancheau and Wetherbe [1] who reported similar findings.

Taken as a whole, the two sectors placed a similar emphasis on the number of management (6) vs. technology (4) issues in their top ten. Respondents from both sectors rated the technology issues more important than management issues.

4.3 Analysis by position

Table 5 shows a comparison of the top ten critical issues faced by Canadian IS personnel by level. Four levels of IS personnel are represented: IS executives, IS Department managers, Systems Analysts/Programmers and Consultants. Of these, the first three levels are considered to have an internal orientation, while the Consultants would have an external orientation.

Table 5 Top Ten Issues by Position

Issue	IS Executives (n=33)		IS Dept. Managers (n=55)		Systems Analyst/ Programmer (n=36)		Consultant (n=34)	
	Rank	Mean Rating	Rank	Mean Rating	Rank	Mean Rating	Rank	Mean Rating
Building Responsive IS Infrastructure *	1	8.33	1	8.42	1	7.83	3	7.85
Improving IS project Mgmt. Practice	2	7.91	3	7.56	2	7.69	2	8.01
Aligning IS organization within the Enterprise	3	7.70	8	7.02	6	7.39	8b	7.38
Coping with Degree and Rate of Change	4a	7.61	7	7.06	N/R		7	7.41
Using IS for Competitive Advantage	4b	7.61	10	6.91	3	7.58	1	8.12
Improving Effectiveness of Software Development ***	4c	7.61	4	7.39	5	7.50	6	7.53
Planning and Managing Communications Networks	7	7.55	2	7.82	N/R		5	7.56
Facilitating and Managing Business Process Redesign	8	7.36	9	7.00	N/R		4	7.59
Measuring IS Effectiveness and Productivity	9	7.21	N/R		N/R		N/R	
Recruiting and Developing IS Human Resources	10	7.15	N/R		4	7.53	10	7.03
Developing and Implementing Information Architecture	N/R		5	7.27	4	7.53	8a	7.38
Developing and Managing Distributed Systems	N/R		6	7.22	9	7.22	N/R	
Improving IS Strategic Planning	N/R		N/R		8	7.33	N/R	
Facilitating Organizational Learning	N/R		N/R		10	7.06	N/R	

N/R = Rating does not rank issue in top ten

* Significant at p = < 0.05

** Significant at p = < 0.01

*** Significant at p = < .001

There appears to be agreement among internal IS personnel that **building a responsive IS infrastructure** is the most important issue. In contrast, the external consultants still view **using IS for competitive advantage** as the single-most critical issue. This may be due to the fact that the consultants are working with small firms, since it is consistent with the views of small firms (reported in the previous section).

Internally, significant differences were reported between IS executives and lower level IS personnel (department managers, systems analysts, programmers) on two issues: 1) Although the ratings for **building a responsive IS infrastructure** placed it at the top of the list, its level of importance was significantly different between the two groups ($p < .05$). This may indicate that lower level IS personnel do not generally view the issues in the same way that the IS executives do. Hopefully, qualitative interview will provide some insight into this discrepancy between these and other ratings.

Highly significant differences were reported on the issue of **improving effectiveness of software development** ($p < .001$). Interestingly, those involved in the actual software development process (systems analysts and programmers) rated this slightly lower than the IS Executives who mandate it.

Table 5 highlights other differences. **Measuring IS effectiveness and productivity** is ranked 9th in importance by IS executives, but does not appear in the top ten issues of any of the other levels. This issue was previously ranked 16th by U.S. respondents [1] some seven years ago and 9th in an earlier study [6]. Since previous studies reported no qualitative data, it is impossible to discern whether the drop between 1986 and 1989 in the U.S. studies indicated that IS executives had effectively dealt with this issue or whether they had determined that it was not easily addressed and were concentrating on issues that were easier to implement. Given this, it is impossible to determine whether Canadian IS executives are lagging on this particular issue, or conversely they have found effective ways to address this elusive problem.

Similarly, **aligning the IS organization within the enterprise** appears to be of much greater importance to IS Executives than it is to managers, systems analysts/programmers and consultants. This is indicative of the emphasis placed on management issues (7) vs. technology issues (3) in the top ten list of IS Executives. This compares with an even split between management (5) and technology (5) issues by IS department managers and a six-four split on management vs. technology issues by Systems Analysts/programmers and Consultants.

When comparing the results to previous studies, it is interesting to note that **developing and implementing information architecture** was awarded highest importance by U.S. IS executives [1] but was rated 12th in importance in the current study. This issue has not previously been mentioned by Canadian IS personnel [2].

Overall, it would appear that Canadian IS Executives prioritize critical IS issues differently from IS Department Managers, Systems Analysts/Programmers and Consultants. We suggest that this difference in ratings could be in part due to poor communication up and down the line, between executives and staff.

5. Discussion

The results of this study suggest that the concerns currently expressed by Canadian IS personnel are different from those reported some eight years ago. Six new issues emerged: **building a responsive IT infrastructure, improving IS project management practices, aligning the IS organization within the enterprise, developing and implementing information architecture, facilitating and managing business process redesign and developing and managing distributed systems**. In addition, the prioritization of issues that were previously reported by the Canadian study [2] is significantly different. This is consistent with the changing focus reported in a series of U.S. studies spanning the past 15 years.

Interesting differences were revealed between IS executives and lower level IS management, which may indicate a need to improve and increase communication between the levels. Likewise, it is clear that public and private firms face different challenges in the IS arena. And, small firms view their pressing issues differently from larger firms. When assessing the overall differences between large and small firms, we suggest that a combination of two phenomenon are occurring: 1) owner/operators of small business have begun to see the power of IT and are finding the resources to adopt it; 2) small business still has a low level of IT expertise.

Over the next few years, if small firms truly **are** lagging large firms, we expect them to continue to be concerned with managing networks and software development. In a related issue to educating users (and as their IT expertise increases), small firms may find it difficult to locate and retain staff with the proper mix of business and information systems knowledge.

We believe that small firms will continue to desire more internal control over operations and consequently adopt more technology. Hardware and software quality

and reliability will stay at the forefront of their worries. Furthermore, as communications become more mission critical, i.e. Electronic Data Interchange, small firms will embrace network technology. Managing networks may become a **very** critical problem for small firms.

Seven of the top Canadian IS issues were consistent with those reported by the most recently reported U.S. study [1]. Agreement on their prioritization, however, is dramatically different.. While Canadian IS personnel are currently reporting a blend of management and technology issues, it is the technology issues that are being rated highest by Canadian respondents at all levels of the organization. This is contrary to reports of an increased management focus by U.S. respondents between 1986 and 1989. This may be a function of time given the emergence of networking and client-server technologies during the time period between studies. It should also be remembered that there are differences in sample composition between the current study, the most recently reported US study [1] and the previous Canadian study [2]. These differences suggest the need for caution in comparing results between the studies.

The absence of qualitative data makes it difficult to determine the reasons for the difference in the findings of the current study compared to those of earlier studies. The authors are presently scheduling follow-up interviews to enable questions about these differences to be answered more definitively. The results of the analysis of interview data will be reported at the conference.

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