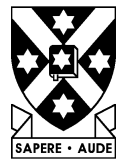

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Management Perceptions of IS Research and Development Issues

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Management Perceptions of IS Research and Development Issues

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Abstract

Whilst *change* is an inherent characteristic of the IT industry, the difficulty of frequent and timely change in tertiary curricula is a constraint on the ability of universities to adequately meet the requirements for knowledge and expertise expected of new graduates. In this paper, some recently published research concerning the top ten issues for managers of information technology in the USA, Europe and Australia is evaluated in terms of its impact on IS teaching and research. The paper concludes that the top ten issues perceived by IS managers was probably in large part due to change resulting not only from advances in technology but also in response to past failures or inadequacies in the process of delivering high quality information system products to corporate consumers. The need for business and education to be aware of the motivations for change and the constraints that are attendant on it in both environments is emphasised for harmonious progress to prevail in the production and utilisation of new IS graduates.

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1 Introduction

A cursory glance at Information Systems or Information Science (IS) courses around the globe indicates differences in approach and content, although there is a core of similar topics present in each. This is not surprising and in this respect does not distinguish IS courses from any other discipline. The reality however, is that approach and emphasis do differ widely in IS courses, ranging from what has become thought of as 'soft' versus 'hard' IS. The former is more concerned with organisational issues and the dynamics of IS interacting with people and the environment within which they operate. The latter concentrates more on the methods and techniques of systems development. The reality of course, is that neither approach in the extreme can provide an adequate preparation for graduates in IS, so knowledge and skills for both are taught; it is only the emphasis that distinguishes one school from another. In many cases it is the research profile of individual IS departments that is used to determine the 'thrust' of a particular school. Academics and practitioners alike continue to ponder the most suitable mix of topics to provide a comprehensive and adequate course of study for graduates.

Rather than setting out to promote one or another emphasis in IS teaching and research, this paper is intended to examine some contemporary reports of how IS management rate the most pressing issues in IS. This profile of need can then be considered in light of what is taught. Accordingly, this profile can be matched against a set of requirements for the knowledge and skills base of IS graduates if they are to meet the perceived needs of modern business.

A distillation of the published reports examined here is compared with a perception framework of why information systems fail. It is suggested that although IS educators may not 'have it completely right', no matter what emphasis is placed on 'soft' and 'hard' aspects of the discipline, courses in IS cannot be designed solely on the results of surveys of what business executives consider appropriate at any given point in time. Needs change, as do methods for meeting them. The IS discipline is about 'change'; a characteristic that must be recognised by both academics and practitioners.

2 Some contemporary management perspectives

Change is an integral part of our society, not least insofar as computing is concerned. So often we look at the popular computing press and read of smaller, faster, greater capacity,

even lower cost technology and wonder where it is all headed. Very few serious forecasts of future developments are attempted with horizons greater than two or three years. A useful observation on the rate of change in IS is presented by Benjamin and Blunt(1992). Table 1 is Robert Benjamin's 1982 predictions of developments for the last decade with an achievement rating given in 1992. Table 2 gives their predictions for the next decade.

	Achieved	Partly Achieved	Not Achieved
1.Workstations will be as common as telephones	X		
2.The distinction between office systems and end-user will disappear	X		
3.Databases and processing power will become more distributed		X	
4.IT spending as a percent of sales will increase by at least half, relative to sales	X		
5.The primary value of the centralized IT function will be to provide interconnectability		X	
6.The 1980s will be a decade of integrating applications across functions			X
7.All aspects of software will continue to improve steadily.		X	

Table 1 The predictions for the last decade

Technology

. The cost performance of everything related to IT(eg.memories, microprocessors, etc) will improve by two orders of magnitude

. The billion bit backbone network will be completed; it will be the international highway of business communication

Architecture and Standards

. Client/server will be the predominant technology architecture, and it will evolve into an important application architecture

Services

. Electronic mail will become ubiquitous, integrating graphics, voice, and text, and it will provide extensive collaborative support capabilities

Economics

. Major investments will be made to complete and maintain the infrastructure

. Because technology is increasingly cheaper for all, the advantage will go to those who (a) apply it well and (b) effectively purchase value-added services for implementing it

Applications

. Applications will be designed and built using high-level business models; emphasis will be on design of robust applications that adapt to both short-term operational difficulties and evolutionary change

. The implementation process within and between large businesses is generating larger and more complex applications; because the design issues are so complex, it is reasonable to expect one or two application Chernobyls

Change Management

. The executives in charge of IT organizations will have to learn change management skills and make sure that these skills are built into the IT organization

Table 2 The predictions for the next decade

In summary, they propose the following six trends can be expected by IT executives by the year 2000[2]:

. The size of computer will not dictate the use of different application programs for the same task (ie. there will be a high level of 'scalability'). Each major vendor will sell a single computer architecture that spans from the desktop to the largest mainframes. An application programmer will only have to learn and use a single set of tools and standards.

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2 These are verbatim extracts from p.11 of their paper cited here in the list of references.

. There will be similar scalability for small to moderately large-size applications across vendor architectures in the Unix open systems environment.

. The highest performance systems, such as online reservation systems, will continue to operate within the large vendor architecture. Partly this reflects expectations about technology, in particular software robustness and the practicality of distributing massive databases. It also reflects conservatism in systems design and the high risk of making substantial shifts in architectures for core applications.

. The choice of user interface will be independent of the choice of hardware. Next and Sun, for instance, are creating versions of their interfaces to run in IBM PCs.

. Some services will become standardized and available across architectures, such as file transfer, document mail services, and so forth.

. A more sophisticated and extensive market in outsourcing and leasing of resources will develop. Companies will be able not only to buy resources outright from corporations but also to pay on a usage basis for basic processing and telecommunications capacity and for software. A significant advantage of adopting and implementing an open or industry standard architecture will be the flexibility this provides for planning capacity and responding to changing demand, that is, the ability to outsource in demand-driven chunks.

What is not to be expected by IT executives by the year 2000 they say, is to distribute certain mission-critical applications: the very high-volume, real-time, inventory management systems, such as airline reservation systems. The larger databases will still require proprietary (ie. nonrelational) solutions to meet performance needs.

Together, these assumptions describe a vast increase in computer power and telecommunications resources, which are made easier to use by wide adoption of client-server architectures and much improved standards for interconnection, display, and data sharing.

It has been considered desirable to reproduce all of the above here because Benjamin and Blunt have made a serious attempt at synthesising a large amount of quantitatively observable and widely held qualitative data. Their conclusions reflect precisely the point made earlier in this paper concerning the rate of change in the field of IS and its place as a constant in both education and practice. With reference to their work they say, *"This paper started with the hypothesis that it was possible to make reasonable predictions of the future of IT based upon a few long-term trends. But prospective futurologists are advised to consider the track record of their profession. In many ways the future is bound to surprise us. Yet we can guess where some of the surprises will come from. They are those areas where there is no useful track record or analog from the past."*

The paper by Benjamin and Blunt is a useful starting point when looking at what IS executives actually say are the top management issues for the 1990s. The research of

Niederman, Brancheau and Wetherbe(1991) is an exemplary longitudinal study of these perceptions. Using the delphi method of rating and synthesising lists of issues, the study has sampled opinion from 1986, 1989 and 1990. The approach taken by Watson(1989) in a survey of Australian IS executives, is reported by Niederman et al to have influenced and changed their method of rating for the 1990 study. Watson's results will be discussed here following an overview of the Niederman et al study.

Niederman et al set out to gain a perspective of the relative importance of issues facing IS management. Their survey is limited to senior IS executives from large organisations, so all results must be seen in that light. In terms of the interface issue of management needs with educational provision being considered here, this limitation is not considered relevant. Certainly not all graduates will enter employment with large organisations but the areas of expertise and knowledge required for professional preparation should be seen as global.

The top ten ranking issues from the 1990 study by Niederman et al are:

1. Information architecture
2. Data resource
3. Strategic planning
4. Human resources
5. Organizational learning
6. Technology infrastructure
7. IS organization
8. Competitive advantage
9. Software development
10. Telecommunications systems planning

Across a list of twenty-five issues where the rankings were compared for change, it is interesting to observe the dynamics of individual items such as software development, which was ranked thirteenth in 1986 and ninth in 1989; up four places in the list of relative importance. Issues such as distributed systems and CASE were not listed in 1986 and are ranked twelfth equal in 1989. Competitive advantage has dropped six places to eighth position from being second in 1986 and eighth in 1989.

The 'top ten' from the latest study can be compared with Table 3 below, which is an extract from the comparison of key issues by the authors having conducted their three-year delphi study.

1989 rank	1986 rank	3-year change	Issue Name
1	8	+7	Information Architecture
2	7	+5	Data Resource
3	1	-2	Strategic Planning
4	12	+8	IS Human Resources
5	3	-2	Organizational Learning
6	NR	new	Technology Infrastructure
7	5	-2	IS Organization Alignment
8	2	-6	Competitive Advantage
9	13	+4	Software Development
10	11	+1	Telecommunication Systems
11	4	-7	IS Role and Contribution
12	14	+2	Electronic Data Interchange
12	NR	new	Distributed Systems
12	NR	new	CASE Technology
15	16	+1	Applications Portfolio
16	9	-7	IS Effectiveness Measurement
17	NR	new	Executive/Decision Support
18	6	-12	End-User Computing
19	18	-1	Security and Control
20	NR	new	Disaster Recovery
21	NR	new	Organizational Structure
22	10	-12	Technology Islands
22	NR	new	Global Systems
24	NR	new	Image Technology
25	NR	new	IS Asset Accounting

"NR" indicates that an issue was not ranked.

Table 3 Comparison of Key Issues in 1989 and 1986

Of primary interest is the emphasis on information architecture and other organisational issues. This is a different categorisation from that of Benjamin and Blunt, who concentrated more on systems-specific issues such as client-server architectures, but they are mutually supportive in many respects, particularly the obvious impact of telecommunications on IS throughout the next decade.

In his study of Australian and New Zealand organisations, Watson(1988) found a different ranking was evident (see Table 4 below) but the emphasis on information architecture, strategic planning and human resource management is given not dissimilar weight.

Interestingly, the improvement in effectiveness of software development is placed sixth, whereas it is only placed as a general category as ninth in the Niederman et al results.

Rank	Issue	Mean rating
1	Improving IS strategic planning	8.09
2	Specifying, recruiting and developing human resources	7.61
3	Developing an information architecture	7.42
4	Improving the effectiveness of software development	7.20
5	Aligning the IS organization with that of the enterprise	7.18
6	Increasing understanding of the role and contribution of IS	6.98
7	Using information systems for competitive advantage	6.83
8	Facilitating and managing end-user computing	6.74
9	Promoting effective use of data as a resource	6.61
10	Facilitating organizational learning and the use of IS technologies	6.38

Table 4 The Top Ten Issues in Australia

A very useful set of comparative data is given in Table 5. Here, Watson has compared his results with those of the 1986 USA study by Brancheau and Wetherbe and a European study carried out by Davenport and Buday(1988). The sequence numbers in Table 5 refer to the sequence of issues in Table 4.

Issue	Australia 1988 (n=48)	Europe 1988 (n=75)	US 1986 (n=68)
1	1	1	1
2	2	7	12
3	3	5	8
4	4	14	13
5	5	2	5
6	6	3	4
7	7	4	2
8	8	14	6
9	9	12	7
10	10	8	3

Table 5 Comparison of key issues study

These combined results leave little doubt that IS executives consider strategic planning, human resource management, the development of an information architecture and improving the effectiveness of software development as the key issues for the 1990s.

3 Systems failures and the key IS issues

The papers summarised above contain their own discussion and rationales for why IS executives have chosen the key issues mentioned. At least in part, their motivation may reasonably be expected to spring from experiences of IS failure. The foundations for this assumption can be debated, but few IS professionals, be they practitioners or academics, would argue its contribution to either subjective or objective weightings when determining key IT issues for the next decade.

Some of the factors generally thought to contribute to 'failure' are:

. unfilled user requirements

. poorly defined requirements

. unsatisfactory staff expertise or knowledge

. overruns on time and cost for software projects

. poorly presented and untimely information

. information systems that are not aligned with the strategic requirements of the organisation.

If these factors are compared with the issues rated by participants in each of the previously discussed studies, it becomes clear that there is some correlation; particularly at the level of human communication, integration of IS with organisational objectives and the need for quality improvement in the process of systems development. The question of what can be incorporated in courses to better prepare graduates to deal with the key issues and thereby avoid the factors that contribute to system failure, remains open for both academics and

practitioners. Nonetheless, it is clear that any IS course that prepares graduates for professional life must contain elements of the key issues listed.

This brings the discussion full circle. Observably, at least in general terms, most IS courses contain elements of the key issues and are mindful of the need to improve quality across the spectrum of tasks undertaken by IS professionals. Just how much individual courses can be changed and how often, to meet the perceived needs of business and management, is a matter for judgement on the part of academics. A useful insight to how that change should be managed by academics can be found in Elliot(1993), where he provides a timely reminder that whilst what we teach in computing courses promotes efficiency and effectiveness, we do not always reflect these characteristics in our course organisation and delivery. He particularly relates this observation to the use of educational technology and hints at how educational institutions could be in many more meaningful partnerships with industry in this regard. This is an adaptation (change) to the academic-industry interface that is not as obvious as the 'need to keep up-to-date' panic which often besets concerned academics.

Change may be integral to the IS discipline but it is not always achieved in a timely manner within the organisational structures of academia. Furthermore, in order to retain integrity and some consistency in courses of study that are typically between three and five years in duration, it is necessary that major change is not undertaken lightly or too often. This is a dynamic that cannot be ignored.

4 Conclusions

This paper sets out to describe some recent research relating to key IT issues as they are perceived by information systems managers. The studies illustrated have spanned the years since 1986 and reflect considerable change in emphasis across a wide range of issues. This in itself supports the intuitive perception of the IT industry's characteristic of 'change being a constant'; perhaps the only constant.

Given that academic programmes of three and four years duration cannot, for reasons of continuity and integrity at least, change as dynamically as reality in the computing industry, a tension exists between what can be provided in terms of knowledgeable graduates and what the immediacy of industry needs. Courses of study need therefore, to identify the 'unchanging' aspects of a desirable knowledge and skills base (verbal and written

communication skills, analytical skills, etc) whilst providing a contemporary as possible range of topics that reflects the needs of industry.

Studies such as those cited in this paper provide an insight for academics into the needs of industry. Industry can support the quest by academics to keep their courses and research current by being actively involved in their development through co-operative ventures. In many cases the only change required is attitudinal...both in academia and industry.

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Department of Information Science

The Department of Information Science is one of six departments that make up the Division of Commerce at the University of Otago. The department offers courses of study leading to a major in Information Science within the BCom, BA and BSc degrees. In addition to undergraduate teaching, the department is also strongly involved in postgraduate programmes leading to the MBA, MCom and PhD degrees. Research projects in software engineering and software development, information engineering and database, artificial intelligence/expert systems, geographic information systems, advanced information systems management and data communications are particularly well supported at present.

Correspondence

This paper represents work to date and may not necessarily form the basis for the authors' final conclusions relating to this topic. It is likely, however, that the paper will appear in some form in a journal or in conference proceedings in the near future. The authors would be pleased to receive correspondence in connection with any of the issues raised in this paper. Please write to the authors at the address provided at the foot of the first page.

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