Behind the Celtic Tiger: Key Issues in the Management of Information Technology in Ireland in the Late 1990's

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INTRODUCTION

Like most of its counterparts in the developed world, in the last ten years the Irish economy has become highly dependent on information technology (IT), both as a source of export earning and as a means for businesses enhance their competitive performance. Indeed, given its unusually high dependence on IT-based industries, Ireland is particularly exposed to the need to maximise the benefits accrued from information technology. The country is now, in absolute terms, the world's second largest supplier of software, with over 40% of all packaged software sold in Europe originating in Ireland (IDA Ireland, 1999). Nearly one third of all personal computers sold in Europe are manufactured in Ireland, with many major manufacturers having their European bases in Ireland. Ireland has also developed a thriving indigenous IT industry. Iona, Kindle and CBT are but the best known of the 600 small, medium and large Irish IT companies operating at the current time. The IDA presently estimate that, on average, Irish IT company start-ups occur at the rate of three per week (Brown, 1999).

Given Ireland's remarkable success in attracting, developing and retaining IT-specialised companies, it is surprising that no detailed analysis has ever been carried out of the IT management issues within the country. Such an analysis might be of immense use in identifying areas of concern; points where pressure may be growing in the rapidly expanding Irish IT sector. Identification of such factors may allow managers to make allowances for them, thereby lessening their effects.

In July 1998, the School of Business Studies, Trinity College, Dublin began a study of key issues in information technology (IT) management in Ireland. The work was to focus on all areas of practice in IT management in the Irish economy, and to attempt to identify trends in the field. Our study was the first large-scale examination of IT management issues in the Irish context, a smaller case based study having been carried out by Moynihan (1990). A number of studies have also been carried out in recent years in a number of different countries (Watson et al, 1997). Considerable work has been done in the UK (e.g. Price Waterhouse, 1998 (a) & (b); Galliers et al., 1994), the US (Brancheau, Janz & Wetherbe, 1996) and in Asia (e.g. Yang, 1996;), among others.

Watson et al (1997) in their comparison of a broad range of key issues surveys world - wide identified a number of issues that tended to continually be identified as key issues in IT management. In their paper they rank the top ten issues as described in Table 1.

An examination of any recent work on IS management issues form any journal in recent years will reveal a similar set of results. Typically, broad managerial issues such as IS strategy development, the alignment of information systems with the organisation, and leveraging information systems for competitive advantage are high in the rankings of the most important issues. Further down the rankings will be operational and technical issues such as information systems security and maintenance, ensuring IS reliability and managing software development.

INSTRUMENT & METHODOLOGY

The instrument chosen for the survey was a questionnaire, originally developed at Warwick Business School, which has been applied to large samples of companies, in the UK and elsewhere, a number of times already. (Parker & Idundun, 1988; Galliers, et al. 1994) The targets of the questionnaire were senior managers with responsibility for IT in larger organisations across a broad cross section of the Irish public and private sectors.

The instrument was made up of two parts. Part One of the questionnaire consisted of 21 multi-part, multiple-choice questions. Looking at personal details of the respondent, organisation-specific information, industry and sector data, and specifics each organisation's information systems / technology operations.

Part Two, the principal focus of this paper, consisted of 40 questions, covering a broad range of current issues, from Information Systems Strategy and using IS for competitive advantage to the impact on the organisation of technologies such as e-mail and intranets. Participants ware asked what the considered to be the most important and the most problematic information systems management issues facing their organisations over the previous five years, presently, and over the next five years. They were asked to indicate their views by rating each issue six times on a scale of 1 to 10, (3 times for importance, past, present and future, and 3 times for associated problems, past, present and future). High numbers represented more important or problematic issues, low numbers indicated less important / problematic issues and zeros represented "don't knows".

The questionnaire is specifically designed for companies with a significant IT infrastructure. Typically such firms tend to be quite large in terms of both numbers of employees and overall turnover.

The companies in the sample were drawn from the Irish

Table 1. Key Issues in IS Management: International Rankings.

Overall Ranking	International Issue
1	Strategic Planning
2	IS Organisational Alignment
3	Information Architecture
4	IS for Competitive Advantage
5	Data as a Resource
6	Human Resources
7	Security and Control
8	Integrating Technology
9	Software Development
10	The Role and Contribution of IS

Business and Finance databases. Subjects were selected subject to criteria including turnover, number of employees and sophistication of IT infrastructure. Upon completion of the selection process, questionnaires were posted to 902 public & private companies and organisations. Given the small size of the Irish economy, the companies selected made up the vast majority, if not the entire population of non-SME firms operating in Ireland. Such a sample group allowed us to minimise the possibility of sampling errors inherent in the postal survey technique.

A total of 144 usable responses were received, a 16.0% response rate. This is comparable to rates of 8 to 10% in equivalent UK studies. An identifiable bias was apparent in the responses, with larger organisations responding at a much higher rate than smaller ones. Among the largest 300 trading companies sampled, the response rate was 19.6%, among the smallest 200, less than 5%.

RESULTS AND DISCUSSION
Past Issues.

The top 10 most important and most problematic issues over the past 5 years are summarised in Table 2 (below) and Table 3 (overleaf).

Immediately we note a difference between the Irish responses and those collected internationally (See Table 1 above). While some broader strategic questions, such as IS strategy formation, are mentioned, the issues of most interest to Irish managers, both in terms of perceived importance and difficulty, are operational in nature.

The principal issue of importance for Irish IT managers over the last five years has been the reliability of the systems they manage. This issue encompasses both the evaluation of risks associated with systems failure and the provision of suitable contingency arrangements in the event of failure, as well as other matters. The top ranking of this issue is, no doubt, to some extent due to concerns surrounding the Year 2000 date-field problem and related issues. Yet as we shall see below, the same managers predict information systems reliability will retain much of its importance beyond 2000. In terms of the difficulty of dealing with this issue, overall respondents ranked it 11th of the 40 issues studied. This suggests that while IS reliability causes some problems, it is by no means the most intractable problem facing IT managers. Closely related to the reliability question are the second ranked issue in terms of importance; IS/IT Maintenance, the third; Software Development and the fourth, Information Systems Security. Fortunately, of these only IS/IT maintenance was viewed as having been especially problematic.

All four top ranked issues are closely related to the day-to-day running of an Information System. It is clear that in the past, at least, Irish IT managers have seen their duties as more to do with the day to day functioning of the information system, including its upgrading from time to time. The only broader "strategic" issue is ranked only fifth (IS Strategy), while no other related issue appears in the top ten. The remaining issues are either technical (managing Legacy Systems), or are concerned with improving the relationship between the IT function and the organisation as a whole.

Table 2: The top 10 information technology management issues identified as being important 3 to 5 years ago.

Issue	Important		Problematic	
	Rating	Rank	Rating	Rank
Reliability of IS	6.25	1	5.39	11
Maintenance of Information Systems	5.72	2	5.46	10
Management of Software Development	5.47	3	5.22	15
Security of IS	5.40	4	4.83	23
Information Systems Strategic Planning	5.39	5	4.85	22
IT Staff Awareness of Business Imperatives	5.29	6	5.04	19
Limited Perception of the Role and Contribution of the IS Function	5.28	7	5.72	3
Communication Gap between IS and non-IS staff	5.20	8	5.67	5
Impact of IT on Jobs and Roles	5.08	9	5.23	12
Managing Legacy Systems	4.96	10	4.97	21

Table 3: The top 10 information technology management issues identified as being problematic 3 to 5 years ago.

Issue	Important		Problematic	
	Rating	Rank	Rating	Rank
IT for Process Integration	5.88	1	4.71	16
Management of Distributed Systems	5.77	2	4.64	19
Limited Perception of the Role and Contribution of the IS Function	5.72	3	5.28	7
Managing Data as a Corporate Resource	5.71	4	4.80	14
Communication Gap between IS and non-IS staff	5.67	5	5.20	8
Electronic Communications Infrastructure	5.67	6	4.53	22
Managing Access and Use of External Data	5.64	7	4.18	27
IT-enabled Business Process Redesign	5.47	8	4.15	28
Information Handling Capabilities	5.47	9	4.31	25
Maintenance of Information Systems	5.46	10	5.72	2

A serious dislocation between organisations' IT functions and the rest of the employee body appears to underlie issues ranked 6th, 7th, 8th and, to some extent, 9th. Over the last five years, IT managers have placed a great deal of importance on lessening the "culture" gap between these two groups. Notably, IT managers appear to believe that it was a great deal easier to induce IT staff to understand the problems of their non-IT colleagues, than vice versa. While creating IT staff awareness of business imperatives ranked only 19th in terms of difficulty, and managing the impact of IT on employees' jobs and roles 12th, lessening non-IT staff's misunderstanding of the role of the IT function was perceived as being a lot more difficult.

From the perspective of those issues that are most problematic (Table 3), the issues that IT managers rate as having been the most difficult over the last five years (1st, IT for process integration and 2nd, management of distributed systems) are not seen as having been particularly important overall.

The 3rd and 5th ranked issues, we have discussed above. Altering the limited perception of the role and contribution of the IS function (#3) and closing the communication gap between IS and non-IS staff (#5) are seen as having been both important and problematic IS management issues over the last five years.

Current Issues

Table 4: The top 10 information technology management issues identified as being important at the present time.

Issue	Important		Change - 5 Years		Problematic	
	Rating	Rank	Rating	Rank	Rating	Rank
Reliability of IS	7.99	1	1.74	0	6.11	5
Information Systems Strategic Planning	7.87	2	2.48	3	5.74	16
Electronic Communications Infrastructure	7.74	3	3.21	19	5.57	21
Security of IS	7.54	4	2.14	0	6.47	2
Recruitment and Currency of in-house IS Skills	7.35	5	2.53	8	7.08	1
Managing Data as a Corporate Resource	7.20	6	2.40	8	6.05	7
IT for Process Integration	7.16	7	2.45	9	6.04	8
Staff Education about IT Capabilities	7.11	8	2.32	7	6.30	3
Exploitation of E-mail	7.07	9	3.53	25	5.16	32
IT and IS for Competitive Advantage	7.06	10	2.37	7	5.69	19

Table 5: The top 10 information technology management issues identified as being problematic at the present time.

Issue	Problematic		Change - 5 Years		Important	
	Rating	Rank	Rating	Rank	Rating	Rank
Recruitment and Currency of in-house IS Skills	7.08	1	2.62	29	7.35	5
Security of IS	6.47	2	1.64	21	7.54	4
Staff Education about IT Capabilities	6.30	3	1.15	14	7.11	8
Maintenance of Information Systems	6.24	4	0.78	6	7.05	11
Reliability of IS	6.11	5	0.72	6	7.99	1
Change Management Skills	6.08	6	0.90	10	6.77	16
Managing Data as a Corporate Resource	6.05	7	0.34	-3	7.20	6
IT for Process Integration	6.04	8	0.16	-7	7.16	7
Information Handling Capabilities	6.02	9	0.56	0	6.50	19
Management of Distributed Systems	5.90	10	0.13	-8	6.93	13

Tables 4 & 5 show the current most important and problematic issues in information management, as IS managers perceive them. It also shows the change in both average score and ranking for each issue. Notably, average ratings for both importance and associated problems increased by approximately 1.5 in comparison with the earlier period. It is observed, however, that this increase appears to be constant over all questions. In practice, it may simply reflect that the problems managers have solved already may simply seem less intractable than those they have to cope with in the present.

We see first that IS reliability has retained its status as the most important issue for IS managers, the principal change over the last five years being that it is seen to be a good deal more difficult to achieve. One might have assumed given the greater usability of modern systems, and the move over the last few years to more open systems would have made it easier to ensure the reliability of systems, yet it appears that the opposite is in fact the case. It is observable too that the maintenance of IT systems has become relatively more problematic. It would appear that the complexity of modern systems has been increasing faster that IT managers ability to cope.

Security, already important in the past, has become an even more crucial issue. More worryingly, managers now perceive that the security problem has become far more difficult to solve. As more and more vital data is stored on organisations' information systems the problem of providing adequate back up and disaster recovery has become far more complex. The advent and proliferation of e-mail and internet applications has also greatly increased the number and scale of threats facing the typical information system.

"Business-level" issues have begun to appear at the top of the importance ranking. Broad issues such as Information Systems Strategic Planning (#2), Managing Data as a Corporate Resource (#6), IT for Process Integration (#7) and IT and IS for Competitive Advantage (#10) are ranked much higher in terms of importance in comparison with five years ago. This may reflect a growing sophistication among IT managers, and a more global view of IT in the context of the entire business. Also notable is the fact that respondents believe that, relatively speaking, the management of some of these issues is still relatively straightforward. IS strategy development and information handling are perceived as being relatively more problematic than they were, but are still by no means the most difficult problems facing managers.

Managing data as a corporate resource, considered difficult in the past, has not become any easier. It has, however, become a great deal more important. It would appear from this fact that information management techniques still have not been able to catch up with the continuing development of information gathering resources. More positively, it is notable that the management of distributed systems is perceived to have become considerably easier over the last few years. Improved connectivity products and the move to "open systems" in recent years have no doubt contributed to this improvement.

Even before this study was carried out it was clear that Irish organisations were have difficulty recruiting and retaining trained IT staff. In our study, respondents ranked this issue fifth in terms of importance, but first in terms of difficulty, and by a considerable margin. The last two years has seen a considerable increase in staff recruitment from abroad, both of expatriate Irish and non-Irish IT specialists. Over 60% of graduates entering Irish third level institutions this year will be commencing courses in either business or some form of IT and the emphasis placed by respondents

on staff IT education is evidence of companies turning to internal training to provide themselves with extra IT-literate personnel. (McGarvey, 1999)

Future Issues.

Tables 6 & 7 show those issues in information management predicted by Irish IS managers to be the most important and problematic in the next five years.

With a single exception, Irish IT managers believe that the issues that will be important in five years time, are the same that are important today. The most important issue is foreseen to be managing organisations' electronic communications infrastructure. This issue is closely related to the only new item in the ranking; understanding and exploiting internet opportunities. It is also reflected in the importance assigned to the management of e-mail, the relative importance of which is predicted to increase.

The survey respondents clearly see the boundaries of their organisations, and in particular their organisations' information systems, begin to blur. The responsibilities of information technology managers have shifted considerably. Over the ten years covered by the study, we see a shift of emphasis from and operations-based transaction processing focus, towards a much greater focus on information provision and management.

The shift from the situation where IT simply supported the business process, to one where it is an inherent part of product delivery is reflected in a number of the predicted rankings. Managing IT to provide competitive advantage to the organisation, and delivering information systems that will be flexible enough for the new operating environment are predicted to become relatively problematic over the next few years.

Not all has changed however. Even after the Year 2000 problem has passed, IS reliability and security are predicted to remain important issues in IS management. Nor is the difficulty of dealing with such matters predicted to ease to any great extent.

Likewise, IS strategy development, and managing IS for process integration are predicted to remain important issues. Managers predict that strategy development will marginally increase in difficulty over the next five years. Conversely, process integration through information technology is predicted to become a great deal easier, as new products and techniques become available. Similarly the management of distributed systems is expected to lose nothing in importance over the next five years, but is predicted to become a great deal easier from the perspective of management.

Surprisingly, the recruitment of IS staff is predicted to drop from the list of most important issues facing IS managers (to 16th in the ranking), although the problems associated with recruiting new IS staff are not expected to ease at all. Meanwhile, the training of IS staff internally retains much of Its importance as an issue, while retaining many of its associated problems. These results are difficult to interpret. They may suggest that organisations intend to place much more emphasis on internal training, making external recruiting less of an issue.

SUMMARY AND CONCLUSIONS

The issues identified in the study can be classified into four main areas of concern:

• *Technical and Operational Issues.* These are concerned with the effective running of information systems, and would be closest to the general perception of the "traditional" role of the

Table 6: The top 10 information technology management issues identified as being important in 3 to 5 years time.

Issue	Important		Change/5 Years		Chng./10 Years		Problematic	
	Rating	Rank	Rating	Rank	Rating	Rank	Rating	Rank
Electronic Communications Infrastructure	8.78	1	1.04	2	4.25	21	4.62	37
Reliability of IS	8.61	2	0.62	-1	2.36	-1	6.25	4
Security of IS	8.54	3	1.00	1	3.14	1	6.85	2
Information Systems Strategic Planning	8.35	4	0.48	-2	2.96	1	5.56	13
Managing Data as a Corporate Resource	8.31	5	1.11	1	3.51	9	5.65	11
Understanding and Exploiting Internet Opportunities	8.25	6	2.19	24	6.08	33	5.05	27
IT for Process Integration	8.20	7	1.04	0	3.49	9	5.25	22
Exploitation of E-mail	8.12	8	1.05	1	4.58	26	4.87	34
Staff Education about IT Capabilities	8.06	9	0.95	-1	3.27	6	6.20	5
Management of Distributed Systems	7.95	10	1.01	3	3.31	9	5.09	26

Table 7: The top 10 information technology management issues identified as being problematic in 3 to 5 years time.

Issue	Problematic		Change/5 Years		Chng./10 Years		Important	
	Rating	Rank	Rating	Rank	Rating	Rank	Rating	Rank
Recruitment and Currency of in-house IS Skills	6.95	1	-0.13	0	2.49	29	7.71	16
Security of IS	6.85	2	0.39	0	2.03	21	8.54	3
Maintenance of Information Systems	6.26	3	0.02	1	0.80	7	7.49	21
Reliability of IS	6.25	4	0.14	1	0.86	7	8.61	2
Staff Education about IT Capabilities	6.20	5	-0.10	-2	1.05	12	8.06	9
Change Management Skills	6.15	6	0.07	0	0.97	10	7.65	18
Impact of IT on Jobs and Roles	5.97	7	0.25	11	0.73	5	7.15	25
IT and IS for Competitive Advantage	5.85	8	0.16	11	1.22	20	7.92	11
Flexibility of IS	5.79	9	-0.06	4	0.74	9	7.68	17
Measuring the effectiveness and productivity of the IS Function	5.72	10	-0.14	2	0.68	10	6.86	30

IT manager. Typical among this group would be questions of information system security, reliability and maintenance. In the past managing legacy systems was a problem in this area. In the present and future, questions of distributed system management, electronic communications infrastructure and internet use are considered important.

IS reliability is seen as a critical issue which is difficult to manage, despite all the efforts of system developers over the last decade. Nor is it seen as an issue that is likely to go away. Information Systems security is another key issue, which is likely to cause serious problems for managers into the distant future

- *Strategic and Planning Issues.* These are by no means as important to Irish managers as they are to their counterparts in other countries. IS strategy formation is considered a key issue, and there is a belief that it is likely to become more difficult in the future, but for the moment it is not seen as especially problematical. Irish managers have learned to see data as important corporate resources, and have begun to appreciate the difficulties in managing that data.

There is evidence that Irish information technology managers are increasingly inclined to see the softer non-technical side of their discipline, but there appears to still be a strong orientation to the more mundane technical aspects of the job.

- *Relationship with the Organisation.* There is a perception that, in the past, a communications gap existed between organisations' IS functions and the organisations themselves. The results suggest that most managers believe that this problem has been, to a significant extent, overcome.
- *Recruitment of IS Staff.* This issue has become, by a considerable margin, the most difficult for Irish organisations. At present

it is seen as key issue in information technology management, but is predicted by many managers to decrease in significance as other sources of IS personnel are identified.

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