THE EVOLUTION OF AN INFORMATION SYSTEM FOR MANAGERIAL USE: A LONGITUDINAL STUDY

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ABSTRACT

The failure of many Information Systems (IS) designed for use by managers may be due to the fact that traditional IS methodologies were used in their development. In this paper we describe an organisation's efforts, over a period of four years, to develop an IS for use by senior management and show how traditional methodologies have impeded the involvement of the intended users of the system from the development process resulting in poor specification of user requirements and inflexible systems. From this experience we verify the superiority of an evolutionary prototyping methodology for the development of these types of systems.

INTRODUCTION

In the 1990's the process of management has become information intensive (Broadbent et al 1992) and organisations are now having to make changes to their Information Systems (IS) in order to meet the information requirements of managers at all levels. Companies have not always been successful in managing the changing demands of Information Technology (IT) from the self-contained business support units of the sixties to the distributed strategic business functions of the nineties (Selig 1991, Hasan & Cheung 1993). Organisations continually face the trade-off between IT processing power, human effort and different investment decisions in order to best meet organisational objectives and opportunities (Galliers 1991).

It is reported that at least half of the Executive Information Systems (EIS) developed in the nineteen-eighties have not lived up to expectations (Crockett 1992) and that this failure is due in part to the methodology used for their development. Current literature in this area suggests that an EIS can only be successful if it is created using an evolutionary prototyping methodology (Guimares & Saraph 1991, Rainer & Watson 1992, Watson et al 1991, Wetherbe 1991). With this approach executive user involvement can be sustained, ensuring that their changing information requirements can continue to be met.

In order to study this process, we have instigated, in one organisation, a longitudinal investigation of the use of IT by senior management for their own information needs. The findings reported here support the use of evolutionary prototyping for development of this type of system.

BACKGROUND TO THE STUDY

The organisation participating in the study is a medium sized public organisation of around 1000 employees and 200,000 customers. The organisation has had a long history of IT use. The senior management had no formal IS training but all have a technical (Engineering) background.

Interviews were conducted over a period of four years, from 1991 to 1994, with a total of 16 subjects, 5 at executive level, 6 at middle management level and 5 members of the IS staff. These interviews focused on the following:

- the sources of the information used by senior management,
- the current and anticipated flows of information throughout the organisation
- the information systems used by managers at various levels.

The responses to four years of interviews have been recently collated and a picture of change has emerged as shown in Figure 1. The study began in 1991 when there was a recognition by second-tier managers (immediately below the Chief Executive Officer) of information as an organisational resource and an awareness of a need to overcome short-comings in their Managerial Information Systems. We have documented their reaction to this over the ensuing three years.

Figure 1 An overview of Changes to Managerial IS

Stage 1 1991	Stage 2 1992	Stage 3 1993	Stage 4 1994
Awareness of Management Information Deficiencies	Attempt at a Quick Fix Solution	Rationalisation of the existing Information Systems	Evolutionary development of an EIS prototype

RESULTS

Four main stages were identified in the longitudinal study, coinciding roughly with the four years 1991 to 1994 as shown in Figure 1. These were:

Stage 1 In 1991 the State Government, in an endeavour to stimulate a more competitive corporate environment, imposed a set of Performance Indicators (PI) on the organisation. This resulted in the launch by management of a Performance Improvement Program aligned with the corporate goals shown in Figure 2. An analysis of these goals shows that additional Management Information Systems would be required to monitor progress on achievements in each of the four areas. Consequently there was at that time an emphasis on better strategic use of IT throughout the organisation. This led to the development of new user-oriented operational computer

systems that could keep much more comprehensive information on customers and employees. The development of these systems was carried out by teams consisting of middle management users and IS Staff but which left out senior management. So just when there was an increased pressure for timely and accurate information by senior management, their needs were not considered during the development of the new Organisational Information Systems.

Figure 2 Corporate Goals

- Excellent customer service by discovering and responding to customers' expectations and providing a level of service and reliability that meets customer expectations.
- Sound business management that optimises market share, maintains financial viability and seeks new business opportunities.
- Good people management that sustains high level of employee commitment and a skilled and flexible workforce.
- Respect for the environment.

Stage 2 In 1992, as a reaction to the crisis in managerial information, there was an attempt at a cheap quick-fix solution to Executive Information needs. With a large amount of company IT resources being invested in upgrading the operational and middle management IS, the provision of a system to supply information to senior executives, was low on the priority list of the IS Department. No resources were available for this project despite pressure from one senior executive who was keen on sponsoring an Executive Information System (EIS).

At the same time the organisation was given a PC based EIS package that was about to be superseded and, coincidentally, a Research Fellow from the local University wanted to undertake a study with an organisation on current management uses of IT in real world situations.

The Executive Sponsor mentioned above instigated a project to use these free resources (the PC package and consultation time from the Research Fellow) to implement an EIS. His approach to systems development was to follow the traditional life cycle method of ascertaining requirements then designing and building the final system. The plan was that the Research Fellow should interview all executives to ascertain their information needs and determine the sources of this information. A member of the IS staff would then set this information up in the EIS package.

The result of these interviews was a vague and conflicting list of executive user requirements and a long list of problems with the existing sources of information as has already been reported (Hasan & Cheung 1993). It was clear that many of the problems on this second list needed to be addressed before anything further could be done. This

included the consolidation of duplicate sets of data, particularly on staff and customers, held in different Departments and a co-ordination of the timing and format of the various reporting systems. Following a traditional development path the options were either to wait until all these problems were fixed or to go ahead and build a system that would be of no use.

Stage 3 Towards the end of 1992 and into the beginning of 1993 there was a rationalisation of the situation. It was seen that many, but not all, of the problems identified in the previous stage could be solved without much difficulty and outlay of resources (which was still a concern). In particular a good deal of mis-information was identified as due to the number of small end-user developed systems kept mainly on PC's by individuals through out the organisation. Most of these had been set up as a reaction to problems with the old operational systems that were now being replaced. However many employees still produced reports for managers based on the data kept on these small systems in preference to the new centralised systems. So it was often a question of whose figures did you believe. The IS Department was asked to locate and rationalise all organisational systems.

Also in 1992 the implementation of some of the new operational systems was completed and a decision was made on the purchase of suitable hardware for the executives (networked PC's). At the same time one member of the IS staff was allocated to work with the Executive Sponsor on the problem of a suitable IS software for the executives. A small prototype executive query system was set up on top of the most critical of the existing operational systems (the customer billing system) using Q&A. This was done to stimulate discussion among the executives and enable a more concise list of their information requirement to be gathered.

Stage 4 Late in 1993 the organisation decided to allocate some resources to continuing this project and a new PC based EIS package was purchased. This followed pressure from the Executive Sponsor who was convinced that the "easy to use" Graphical User Interface (GUI) of these systems was required by busy executives. There was also a long term objective that this type of interface would be the ultimate goals of all systems for managerial use such as email, wordprocessors, spreadsheets and also for queries on organisational databases.

An evolutionary approach has been used in the implementation of the EIS package so as not to repeat some of the errors made in attempting the quick fix solution of 1992. The most critical area for management information is based on the organisation's customer database so this is being set up first, with summarised information broken down into various categories. Other data, both internal and external, will be added as the system grows. The EIS package allows a "drill-down" facility to enable mangers to investigate problem areas. It is recognised that the system needs to be flexible to meet changing needs of the organisation and the different executives.

The IS Department, in conjunction with senior management, has come up with an organisational policy for data responsibility. User Departments are responsible for the

accuracy and timeliness of the data contained in their systems whereas the IS Department is responsible for their technical support, and for data security. All Departments are aware that the data is an overall company resource and should be used to supply information wherever needed as determined by management.

DISCUSSION

The literature shows that there is no clear definition of IS for managerial use with the terms Management Information Systems (MIS), Decision Support Systems (DSS), Executive Support Systems (ESS), EIS and many others being used (see for example Millet & Mawhinney 1992, Whymark 1990). In the course of this study we identified conflicting pressures on the use of information by different levels of management within the organisation. As a result there is no an easy solution to the problem of developing managerial Information Systems. These pressures result from continually changing technology, organisational structures, personality differences and the external environment. The organisation in the study in common with most others of the nineties is adopting a more distributed strategic business function structure with delegation of authority, accountability and greater autonomy of decision making to managers throughout the organisation.

With the process of management itself becoming so dispersed and information intensive, there is pressure for quick fix solutions to problems of management information. This used a traditional approach to IS development and a minimum of resources. In this study we have seen that this can lead to a lack of specification of real executive information needs and the supply of misinformation if there are problems with the underlying data systems. It would appear that a cautious approach using an evolutionary prototyping methodology will help to identify and remedy such problems and give the flexibility to built a more suitable IS for management (Guimares & Saraph 1991). The prototyping approach has the advantage of encouraging greater involvement of senior management in the setting up of organisational information systems. Their involvement results in better quality of management information and its alignment with the organisation's strategic objectives.

CONCLUSION

Despite the progress of four years the organisation of this study is far from claiming to have an ideal IS for use by managers. Their experience has however greatly improved their knowledge of the issues involved and has given them a way forward that is well accepted. It is yet to ascertain whether all senior managers will use the system that is being developed, in fact it is unlikely that the CEO will ever make any use of IT. The advantage of this system is that it is considered as a continually evolving prototype so that it is able to adapt where necessary.

More importantly, it is still not clear whether such a system actually aids managerial work and decision making. This will be an important issue as this study continues, although the criteria on which this should be measured have not been decided. The prevailing executive view is that, in the nineties, a competitive organisation must make every possible use of IT at all levels, including that of senior management, for strategic advantage.

REFERENCES

Broadbent M. Hansell A. LLoyd P. & Dampney C.N.G. (1992) "Managing Information Systems in Australia and New Zealand: Requirements for the 1990's" **The Australian Computer Journal.** Vol 24 No 1 pp 1-11

Crocket F (1992) "Revitalizing Executive Information Systems" **Sloan Management Review** Summer 1992 pp 39-47

Galliers R.D. (1991) "Information technology - management's boon or bane?" **Journal of Strategic Information Systems** Vol 1 No 2 pp 50-56.

Guimares T & Saraph J. (1991) "The role of prototyping in executive decision systems", **Information & Management** Vol 21pp 257-267.

Hasan H & Cheung L.(1993) "Executives, Users and IS in the 1990's " **Proceedings of the Fourth Australian Information System's Conference**. Brisbane pp 553-565.

Millet I & Mawhinney C (1992)"Executive Information Systems A critical perspective" **Information and Management** Vol 23 pp 83-92

Rainer R. Kelly Jr & Watson Hugh (1992) "The evolution of executive information systems software" **Decision Support Systems** Vol 8 pp 333-341.

Selig F (1991) "Managing information technology in the nineties" Editorial, **Information & Management** Vol 21 pp 251-255

Watson H, Rainer R Jr & Chang E.Koh (1991) "Executive Information Systems: A framework for development and a survey of current practices" **MIS Quarterly** March 1991 pp 13-30

Wetherbe J (1991) "Executive Information Requirements: Getting it Right" **MIS Quarterly** March 1991 pp 51-65.

Whymark G (1991) "Development of the EIS concept and its implementation in the RAN" **The Australian Computer Journal** Vol 23/3 pp 110-118