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# A Study of Information Requirement Determination Process of an Executive Information System

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## INTRODUCTION

An executive information system (EIS) provides senior management with easy access to information relevant to their needs. It can spread horizontally across and vertically down to other organizational managers and provide three major types of benefits: information, management support, and organizational support (Salmeron, 2002). According to Salmeron, one key EIS success factor is the fulfillment of users' information needs. However, the user information requirements determination (IRD) process during the implementation of an EIS remains a problematic exercise for most organizations (Walter, Jiang, & Klein, 2003). This is because IRD is the least understood and least formalized yet most critical phase of the information systems development (ISD) process. This phase is so crucial that many information systems researchers argue that IRD is the single most important stage during an EIS project development process, and if the IRD is inaccurate and incomplete, the resultant system will also be inaccurate and incomplete.

Hence, understanding the issues that influence the IRD process of EIS is of critical importance to organizations (Poon & Wagner, 2001). However, little is known about the issues that influence IRD processes during the implementation of an EIS project (Khalil, 2005). Therefore, this article aims to examine key issues surrounding the IRD process during the implementation of an EIS project in a large Australian public-sector organization. The article first reviews relevant literature with respect to IRD and EIS. Key findings and issues identified from the case study are also presented. The article examines these findings and issues in light of these organizations' IRD practices, and concludes by providing some lessons for EIS project implementation.

## BACKGROUND

IRD is a critical phase of ISD. IRD is primarily concerned with specific applications such as EIS. IRD has generated a lot of interest and debate among researchers and practitioners as a potential means for improving the success rates of ISD projects such as EIS (Havelka, 2002; Wu & Shen, 2006). The IRD process, which Browne and Ramesh (2002, p. 625) defined as "a set of activities used by a systems analyst when assessing the functionality required in a proposed system," has become increasingly important in obtaining the correct and complete set of user requirements.

A number of tools and techniques have been proposed to support the IRD process during the EIS project: prototyping, joint application development (JAD), rapid application development (RAD), data flow diagrams (DFDs), and entity relationship diagrams (ERDs; Duggan & Thachenkary, 2004; Spina & Rolando, 2002). However, despite the existence of all these techniques and tools, the history of ISD has been littered with numerous reports of the complete failure of EIS projects (Khalil, 2005). The common causes of these failures stem largely from difficulties in dealing with the information requirements (Browne & Ramesh, 2002; Davis, 1987). In many cases, budget blowouts and missed deadlines occur. Too often, initial design and programming is followed by a reassessment of needs, redesign, and then more programming (Urquhart, 2001). Many EIS project failures have little to do with technical or programming issues. The source of many of these problems lies with one or a combination of the following major factors: incomplete and/or inaccurate requirement specifications, lack of user involvement, lack of flexibility of computer-based information systems, poor communication, different worldviews of the systems analysts, and other factors

(Guinan, Cooprider, & Faraj, 1998; Kirsch & Haney, 2006). Each of these will be discussed briefly in the subsections that follow.

## Incomplete and/or Inaccurate Requirements Specifications

This can often lead an organization to address the wrong problem or identify incorrect information needs. Dissatisfaction of the stakeholders with their IS derives from the problem of specifications not being stated accurately and/or completely (Davidson, 2002; Khalil, 2005). This can also arise from users having totally unrealistic expectations of the final EIS. Therefore, incomplete and inaccurate requirements specifications can often result in identifying the wrong information needs or addressing the incorrect IRD problem. This may ultimately lead to EIS project failures.

According to Browne and Ramesh (2002), the following challenges should be recognized by both analysts and users when they are dealing among themselves:

- There can never be a complete, correct set of user information requirements.
- Requirements are not stable over time, but are in a constant process of evolution.
- The facilitation skills of systems analysts are crucial to the effective management of the IRD process.
- Systems analysts work in highly political contexts.

## Lack of User Involvement

One of the major factors contributing to the failures of EIS projects is the lack of user involvement. By failing to be involved during the system development stages, users might feel frustrated and disillusioned when they perceive new technologies such as EIS as the threatening creations of outsiders (Robertson & Robertson, 1999). This usually results in resistance and conflicts between the project sponsors, the systems analysts, and the users (Davidson, 2002).

Lack of user involvement often results in distrust between the users, the systems analysts, and the project sponsors. Users feel unable to specify what they want because they do not know what is possible while the systems analysts try to explain what is possible but describe it in ways not understood by the users

(Browne & Rogich, 2001; I. Wu & Shen, 2006). This usually not only reduces job satisfaction on both sides but also leads to less-than-adequate systems design (Alvarez, 2002).

## Lack of Flexibility of Computer-Based Information Systems

Computer-based information systems (e.g., EIS) often lack the flexibility to meet changing user information requirements and have little interaction with the manual systems (Salmeron, 2002; I. Wu & Shen, 2006). These are often due to the way computers have to be programmed, in which any change that involves a change to the program requires a detailed sequence of steps to be taken, which can be time consuming and disruptive. Some changes, even changes that appear trivial to the nonexpert user, cannot be incorporated in the system without a substantial redesign of the computerized parts of the system (Lauesen & Vinter, 2001; Sutcliffe, 2000). Moreover, since the organizations and the people within them are dynamic and constantly changing all the time, a computer-based information system that takes too long to finish will not be able to meet users' needs and hence will become a major stumbling block to the success of the EIS.

## Poor Communication

Poor communication between users and analysts is also a major factor contributing to the failure of EIS (Urquhart, 2001). Communication skills of systems analysts have a significant impact on successful and complete information requirements of EIS. Some of the most important reasons for communication difficulties are as follows (Douglas, 2003; Guinan et al., 1998; Urquhart):

- The different perspectives of the different stakeholders involved in a system study
- Uncertainty on the part of the users of the impact the final system will have on their individual roles in the organization
- The observation that the user operates with informal systems and that the formal procedure of the existing systems has been overtaken by less formal, unauthorized procedures
- The problem facing both users and systems analysts that new systems almost certainly include technological innovations

## Worldview of the Systems Analysts

The education and practice of systems analysts can also be the source of the problems when dealing with IRD processes since few systems analysts are equipped to deal with the essentially social nature of IS. The systems analysts tend to think that they are the experts who analyze the problem, define it, and provide the solution (Berry, 2002). Many of the problems of ISD projects such as EIS can be attributed to organizational behavioral problems. These behavioral problems are the result of bad designs. These bad designs are attributed to the way systems analysts view organizations, their users, and the function of ISD.

## Other Factors

There are also some other significant factors that might affect the success of ISD projects. These include an inaccurate assessment of the scope of the problem and broader organizational issues, poor budget control, a delay in the development of applications, difficulty in making changes, hidden backlog, program and software bugs, systems that cost much more to develop and maintain than expected, and development processes that are not dynamic (Alvarez, 2002; Browne & Ramesh, 2002; Havelka, Sutton, & Arnold, 2001).

## RESEARCH METHODOLOGY

The objective of this research is to examine key issues of the user-requirement determination process during the EIS project development process. An in-depth case study was carried out in one large Australian public-sector organization involved in the implementation of an EIS project. The organization was responsible for providing an important education service within Australia. It had an annual turnover of A\$500 million and about 3,000 employees. In order to meet the necessary educational quality requirements and guidelines set out by the Australian government, the organization had decided to implement an EIS to assist it in making proper decisions. The objectives of the EIS were to (a) support organizational reporting in the areas of program and planning review, annual reporting, and benchmarking and best practices, (b) support the organization in

its undertaking of quality-related activities, and (c) identify deficiencies in data sources.

Initially, the researchers had attended six sessions of the IRD process between the external systems analyst and the key users. On completion of all these sessions, the researchers refined and modified the interview questions, which were drafted before these sessions. Then, 16 interviews were conducted with nine key participants, and these included two main sponsors of the EIS project, an external systems analyst, and six key users of the EIS.

The interviews focused on the EIS project development process, different stakeholders' views of the EIS, the IRD process, and the evaluation process of the EIS. Each interview lasted between 1 to 2 hours. All interviews were taped and the transcripts were sent to the interviewees for validation. In cases where there were differences in opinion between participants, either follow-up interviews were conducted or e-mails were sent to clarify their positions.

Other data collected included some of the actual project proposals and detailed requirements specifications for the EIS project, planning documents, and some meeting minutes. More than 300 pages of transcripts were coded and analyzed. The data collection at this organization continued until a point of theoretical saturation, which is when the value of an additional interview was considered to be negligible (Eisenhardt, 1989). Qualitative content analysis was then used to analyze the data gathered (Miles & Huberman, 1994). The analysis of the materials was also conducted in a cyclical manner and the issues identified were double-checked by the researchers and other experts. The guidelines (i.e., multiple interpretations) set out by Klein and Myers (1999) for conducting and evaluating interpretive field studies in information systems were followed to improve the quality of the research.

## RESEARCH FINDINGS

A number of issues emerged from the analysis of the data and some of the key issues surrounding the IRD process of the EIS project are presented below in some detail. Related information from the observation and document review has been integrated into the discussion to further support the findings.

## Theme 1: Problems in the Using IRD Methodology

The interview data suggest that there was a general agreement among the users that no ISD/IRD methodology, tool, or problem-solving methodology had been used by the external systems analyst during the IRD process with users for the EIS project. Instead, only an interview was carried out by the external systems analyst to gather the required information from the users. For example, one user said, "It felt very much like questions to which I was responding because it's an interview like that....I didn't feel that I was settling into something that I was participating in. So it's very much like a question and answer." The user had expected some sort of methodology to be used by the systems analyst during the IRD sessions. The researchers' observation had supported their claims. Some of the users suggested that the use of a proven methodology and diagram would be valuable for the IRD process.

However, the sponsors and systems analyst claimed that some sort of methodologies had been used during the IRD sessions, although this had not been observed by the researchers. For example, the systems analyst said, "I worked loosely to various methodologies, sort of used in the past, in particular, Arthur Andersen's Method One and APT. But they tended to direct more on experience and referencing the documents." Furthermore, the systems analyst went as far as saying that the use of diagrams such as DFDs and ERDs would confuse the users. Most of the users interviewed by the researchers had rejected this claim.

## Theme 2: Lack of User Involvement

All users indicated that their contributions to the IRD sessions had been hampered by the lack of information. In addition, rather than having several IRD sessions with the systems analyst, most users suggested that a group session would be far more effective as it tended to create synergy among the users. The users felt that their ability to participate in the IRD process could be enhanced by having such a group session.

Instead, the IRD process for this EIS project was, as perceived by the users, merely a question-and-answer exercise. Although the users were given the opportunity to raise any questions and concerns about the existing systems as well as the forthcoming EIS, the problem was that there was no prior information given to the users before the IRD sessions. The users felt that they were not given any time and information to prepare for the meetings with the systems analyst. The problem was compounded by the lack of follow-up by the systems analyst. The users did not take part in the rest of the EIS project and were critical of the project sponsors and the systems analyst for not consulting them about the project. The researchers were told privately by one of the project sponsors that the systems analyst was instructed not to involve the users further in other phases of the project. The project sponsors were getting impatient with some of their users regarding their information requirements.

## Theme 3: Lack of User Satisfaction

Most users were unhappy with the IRD process of this EIS project and were not impressed by the performance of the project sponsors and, in particular, the systems analyst. For example, one user was very critical of the project sponsors and the systems analyst and said, "I think what they need to do is to give the user an understanding of what they have envisaged the EIS system should be able to do and where it fits….Also, they should articulate in a way that someone who is not a systems person can understand." None of the users were given enough information and time to prepare for the IRD process. For example, one user complained and said, "If people are going to be involved [in the IRD process], they need to know why..." The problem had been compounded by the instruction by the project sponsors not to spend too much time listening to the requirements of the users, and also the fact that the scope of the project was unclear.

## Theme 4: Lack of Project Scope

Both users and the systems analyst complained about the lack of scope and information for this EIS project. Some of the ideas put forward by the users included the following: (a) A group session should be deployed to elicit users' requirements and needs, (b) more research should be conducted by the systems analyst before the IRD process, and (c) more information about the purpose of the visits by the systems analyst should be given beforehand.

As mentioned previously, the reason for not giving the proper information to the users before the meetings could be due to the fact that the instruction given by the

project sponsors to the systems analyst was to finish the IRD phase as soon as possible. For example, the systems analyst said, "Problems that I had with this particular case is not being so much with gathering of information requirements from users....The problem I had with IRD is perhaps, not being able to maintain a limited scope." The systems analyst was having difficulty in maintaining a limited scope of the EIS project and hence was not able to tell the users exactly what the project was going to be like.

## Theme 5: Culture and Politics

Several users pointed out that the culture and politics within the organization forced many employees to be disillusioned about the whole process as they felt that they could not make any difference. For example, one user complained about the culture and politics that existed within the organization that were the cause for users not being consulted about the implementation of new projects such EIS. This had often led to project failures. For example, he said, "Now I hope we don't end up with yet another project failure. On past records, chances are we will. And when that happens, everyone will pass the buck. The MIS type of people will say, 'but I've fulfilled what you have told us.'" All users felt that this had been repeated to some extent in this EIS project. A good example of this was the lack of information given to the users by the systems analyst before the IRD session.

The EIS project had also appeared to be plagued with politics. Many users interviewed were unhappy with the way that the project sponsor had been given a significant role in this EIS project. On the other hand, the project sponsors also revealed that they were getting impatient with some of the users within the organization. The project sponsors had admitted to the researchers that they did not get along with some of the users. To make the matter worse, the systems analyst also agreed with the view expressed by some of the users that this EIS project was likely to fail as a result of the prevailing culture and politics existing within the organization. Both the systems analyst and the users had seen many ISD project failures before, both within and outside the organization.

Overall, most of the key issues identified from this study are largely consistent with the literature. However, the research has further identified that lack of user satisfaction and the organizational culture and

politics also have a major impact on the success of the implementation of EIS projects.

## FUTURE TRENDS

During the last decade, the names of information systems have changed from executive information systems to business intelligence (BI) systems (J. Wu, 2000). BI is a significant trend of EIS as the technology has significantly evolved from internally developed graphical user interfaces to packaged applications that provide users with easy access to data for analysis. BI is defined as the process of monitoring and analyzing business transactions by using business intelligence to align business operations with the tactical and strategic goals of the organization. In addition, BI encompasses software for extraction, transformation, and loading (ETL); data warehousing; multidimensional or online analytical processing (OLAP); data analysis; and data mining. However, there are still some challenges to overcome before BI can be used and implemented more widely. These include recognizing BI projects as cross-organizational business initiatives, engaging business sponsors, and developing an automated Web intelligence system to extract actionable organizational knowledge by leveraging Web content.

## CONCLUSION

This case study illustrates the dynamic relationships between project sponsors, users, and the systems analyst during the IRD process of an EIS project. Most of the users' complaints were centered on the difficulties in giving accurate and complete requirements to the systems analyst during the IRD process. Their difficulties not only stemmed from the inability of the users to specify what they wanted, but were also affected by the attitude of the systems analyst and project sponsors of the EIS project toward the opinions of the users. The results also indicated that there were discrepancies between what the systems analyst said about what he did (espoused theory) and what he actually did (theory in use) during the IRD process. For example, the systems analyst had insisted that some sort of formal methodology was used to elicit user requirements when in fact there was none.

Moreover, this research has found that there were significant differences in opinion between the users and the systems analyst. For example, although there was a high degree of agreement about the lack of project scope and the existence of issues in culture and politics, there were significant disagreements about the deployment of the IRD methodology for gathering information requirements for the EIS, the lack of user involvement, and user dissatisfaction. It was also surprising to hear from the systems analyst himself and most users that they were not very optimistic that this EIS project would succeed due to a long history of ISD project failures within the organization. A contribution of this short article is that it has further identified that a lack of user satisfaction and issues regarding the organizational culture and politics have a major impact on the success of the implementation of EIS projects.

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## KEY TERMS

**Business Intelligence (BI):** It is the process of monitoring and analyzing business transaction processes to ensure that they are optimized to meet the business goals of the organization.

**Data Mining:** It is an information extraction activity whose goal is to search large volumes of data for patterns and discover hidden facts contained in databases.

**Data Warehouse:** It is a relational database that is designed for query and analysis, and usually contains historical data that are derived from transaction data.

**Executive Information System (EIS):** It provides organizations with a powerful yet simple tool to view and analyze key factors and performance trends in the areas of sales, purchasing, production, finance, and so forth.

**Information Requirements Determination (IRD):** It is a set of activities used by a systems analyst when assessing the functionality required in a proposed system.

**Joint Application Development (JAD):** It is a process originally developed for designing a computer-based system. It brings together business users and IT professionals in a highly focused workshop.

**Rapid Application Development (RAD):** It is a methodology for compressing the analysis, design, build, and test phases into a series of short, iterative development cycles.

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