Vidyodaya J. of Soc. Sc., (1997) Vol. 8 1 & 2, No. 1, pp. 185-199

INFORMATION SYSTEMS DEVELOPMENT AND IMPLICATIONS FOR MANAGEMENT: AN EMPIRICAL INVESTIGATION

R. S. GUNATUNGE
Department of Business Administration
University of Sri Jayewardenapura

1.0 Introduction to the study

Advances in Information Technology (IT) have played a prominent role in improving organsational effectiveness (Robey & Azeredo, 1994). Particularly, the idea of Infomation Systems (IS) in organisations have come to be seen as a strategic resource. It provides a potential competitive advantage (Porter, 1985) or a strategic weapon to defeat or frustrate competition (see, Applegate et al., 1998, Laudon & Laudon, 1991). It is also seen that such systems have profound effects on both processes and structures in organisations (Davis and Olsen,1985) and many business activities tend to seek Infomation Systerms Development (ISD) in "shaping their future" (Keen, 1991). Consequently, both organisations in developed and developing countries consider ISD as an agent of change in Organisation Development (OD) (Schein , 1985) as rapid changes within organisation environments have demanded organsational processes and structures which are more flexible and responsive than traditional bureaucratic structures.

Traditionally, recommendation for effective ISD research concerned with the rational notion of Management Information Systems (MIS) and in turn have provided sets of technical reasons such as precision, accuracy, timeliness, capability of the system and so on for the success of ISD. A relatively new field of study, MIS focused exclusively on Computer Based Information Systems (CBIS) (Davis & Olsen, 1985). Much of the MIS is technical combining theoritical work of Computer Science, Management Science and Operational Research with practical orientation toward building systems and applications (see, Laudon & Laudon,1991). They were heavily based on scientific methods that attempt to derive "law-like generalizations" (e.g. Hirschheim & Klein, 1992; Orlikowski & Baroundi, 1991).

The traditional approach to IS emphasizes mathematically sound normative systems to study IS as well as the physical technology and formal capabilities of the system. For example, discrete entity models focus on explicit economic, physical and information processing features of the technology (Kling,1987). This thrust of research on ISD in view of technical orientation

has neglected the social and organisational dynamics of systems development (see, Westrup,1994). They have not understood actual functioning of ISD within organisations. They originated MIS frameworks through "academic assumptions but not through "real" social controversies (see, Tinker & Yuthas, 1994). For example, information systems are often conceived as a way of routinizing and automating procedures. The term Office Automation (OA) is in common use for the process of introducing computers and computer based systems into offices. However, the current "success" of such automation is very limited and a detailed understanding of social and organisational context is now widely recognized as essential as an alternative to the technical view of office (see, for example, Hirschheim, 1985). In a summary of information systems problems and solutions, Lyytinen (1987) notes the recurrent nature of information systems problems and argues that in order to obtain better understanding of the context of information systems, a move away from the technical view of information systems and rational decision making view of organisation is essential.

The negligence of social and organisational context to ISD has resulted well-thought-out and technically sound systems so often thwarted in the implementation phase. For instance, research on user resistance to development and implementation of CBIS delineates the fact that much of the ISD works are social and organisational bound so that organisational performance are not only a consequence of technical validity of the systems but also an outcome of social and organisational interactions with the system (Markus & Robey, 1983). Such critical ideas have led a number of researchers to study ISD with social and organisational context (e.g. Bjorn et al., 1978; Alter, 1980; Keen, 1981; Pettigrew, 1973; Markus & Robey, 1983; Robey and Azevedo, 1994). They have not relied only on rational and technical notions of ISD. Instead they tried to study IS through studying organisational and social context within which they operate.

However, much of these critical studies have been confined only to developed countries. In developed countries, ISD and implementation of them is considered as a separate management activity (Goyal, 1994) and circumstances that affect ISD success are different from that of developing countries. There is no denying the fact that the concept of MIS or any other information system e.g. Decision Support Systems (DSS) in general and ISD in particular has not been well realized as in developed countries.

Consequently, some general questions such as what are the specific characteristics in developing countries that affect system development ? To what extent do they affect ? How? and Why? are all these different from a situation in a developed countries are remained unanswered. Indeed developing countries are characterized by lack of advanced technology, shortages

of managerial skills, existence of unstable political structures and development policies, persistence of market failures and so on (Hoselitz, 1964). So it would be of interest in pursuing empirical research in systems development in developing countries.

2.0 Statement of Research Problem

With respect to developing countries, one broad but important phenomenon that needs to be investigated would be the actual functioning of ISD in the industrial organisations as the practice of developed countries indicate the introduction of CBIS into organisations have profound effect on economic performance (Cotterell, 1998). Therefore, this provides a potential context for an ISD research as it has strong effect on improving the economic performance of such organisations. If it were focused on newly privatized enterprises in these countries, one fundamental question in this regard would be that how these newly transformed organisations could be strategically successful through ISD.

The proposed study focuses on newly privatized industrial organisations in Sri Lanka which is considered as a low income economy (World Bank, 1990). It is reported that many of these privatized companies are equipped with newly introduced ISD as a means of OD since the development and implementation of CBIS is considered as a major organisational change and trying to cope with competitive market (e.g. Veytex Ltd., 1993). Despite the heavy investment on IT and ISD efforts, these systems have failed in the implementation process as they were developed following the "Western prescriptions" and they are highly technical and rationalistic. It seems that these systems tend to be contradictory with the organisational and social "reality". The ISD has not considered as a complex and dynamic process by these organisations incorporating organisatioal contexts. As a result, a number of organisations have realized that technical aspects of ISD need to be considered with organisational and social aspects that reflect the specific characteristics of Sri Lankan context (Gray, 1991). One important implication of this practical problem is the fact that ISD work needs to be considered combining technical and social aspects. This provides us a potential area for an empirical study as there is a wide gap between the practice (i.e. ISD as a technical activity) and the ideal situation (i.e. ISD as a complex and dynamic activity). The proposed study therefore intends to address this theoritical lacuna in Sri Lankan context of information systems research. Therefore, the proposed study would be based on two fundamental research questions. They are:

1. What factors in the Sri Lankan privatized industrial organisations correlate with ISD success? How? and to what extent? and why? (an empirical question).

2. How do such findings contribute to a theory of ISD? (a theoritical question).

3.0 Significance of the study

The proposed study is useful to Sri Lanka as it was introduced market oriented economic policies since 1997. The post economic reforms have resulted in significant transition of State Owned Enterprises (SOEs) to private sector in the form of privatization, expansion of private sector and reshaping of hierarchical structures. The concept of privatization has been introduced due to inefficient performance of SOEs. One fundamental but important phenomenon in this transition would be the change of ownership and consequently the information systems as earlier information systems development was based on the state ownership under a controlled arrangement. Therefore, how information systems have been changed with the change of ownership provides us a potential context for an ISD research.

There has been enormous research on ISD in the literature and relationship between technical characteristics and ISD success and failures have been studied in developed countries but not in Sri Lanka. In addition, how, some of the factors such as the degree of top management support, the degree of user involvement and the perceptions and attitudes of various participants etc. independently and simultaneously affect ISD success was studied by using a factor model (e.g. Swanson,1988) in developed countries but not in Sri Lanka. Moreover, a research has not been persuaded in privatized industrial organisations in Sri Lanka or elsewhere in developing countries to see how various factors independently or simultaneously influence ISD success or failure. The proposed study focuses on this gap in the information systems development literature. Based on a review of research and literature associated with ISD, it is believed that the concept of technical, organisational and social characteristics to the ISD success must be linked into a conceptual model to provide a better understanding of how various factors in organisations affect systems development success. The adoption of such a model of ISD from a managerial point of view is timely and such studies would strengthen the ISD literature.

4.0 The research model

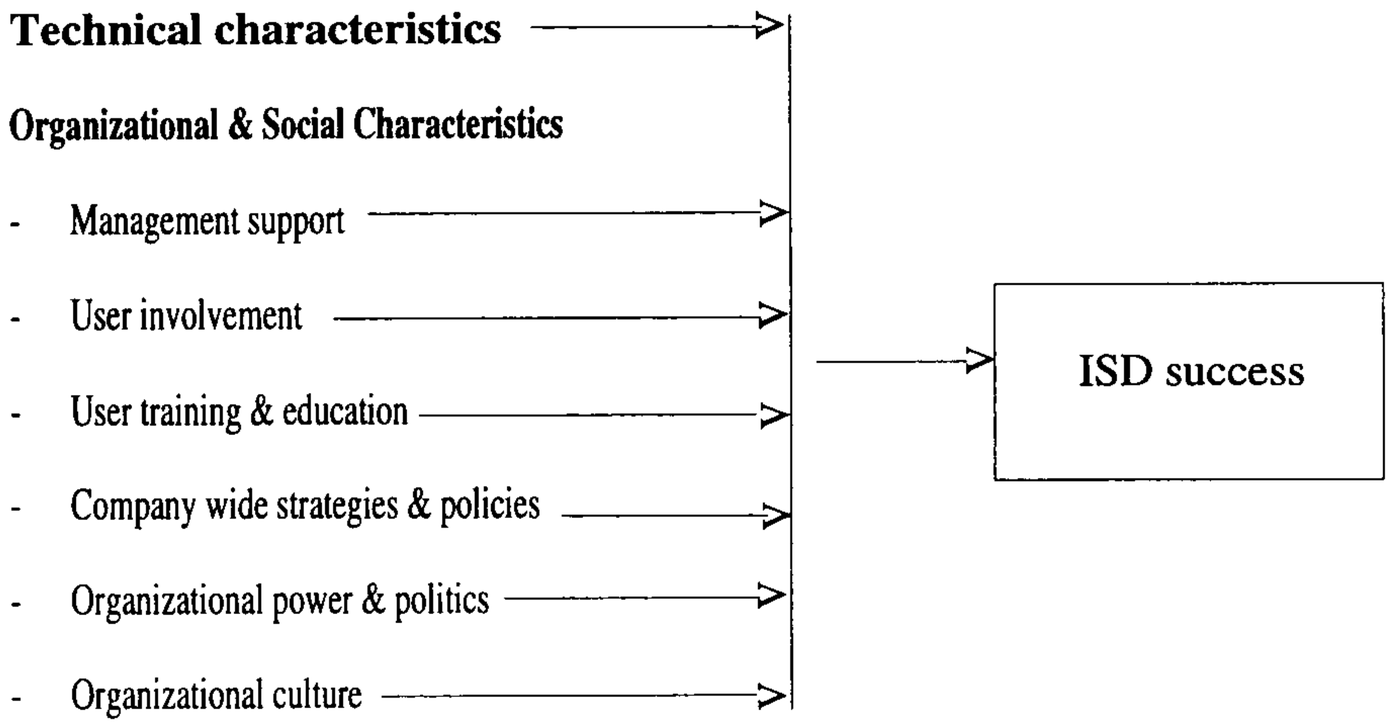
In this study, a research model is developed combining determinants of ISD with a particular emphasis on the technical, organisational and social contexts. This framework is based on an argument that management should constantly reassess the scope of ISD activities incorporating technical,

organisational and social characteristics simultaneously. The guiding consideration for such a view to ISD includes information systems success (e.g user satisfaction , utilization of systems, economic performance, better decision making etc.). To the extent the knowledge and understanding can be pooled across different concepts, the ISD can be successful which is otherwise failure.

The existing literature has been used to derive the specific constructs for the research. Thus, the technical characteristics are viewed as involving dimensions drawing upon computer science, management science and operational research (as in Davis & Olsen, 1985). The objective of this endeavor is to understand the technical functioning of ISD in privatized organisations in Sri Lanka. Further, organisational and social characteristics are viewed as involving dimensions drawing upon management support, user involvement, user training and education, company wide strategies and policies covering IT strategies and policies, organsational power and politics, and organisational culture. Figure 01 shows a schematic representation of the research model.

Figure 01

Schematic representation of dimensions (variables) of ISD success.



The above model suggests a useful conceptual scheme for relating technical, organisational, and social context variables and ISD success. This scheme adopted in the study categorizes independent and dependent variables. The classification permits a stepwise analysis of the independent varibles as they relate to the ISD success. The description of each of the variable and related hypothesis is explained.

4.1 ISD- The dependent variable

The dependent variable of the study is ISD success. Previous literture has suggested several measures for information systems success. These include user information satisfaction, systems utilization, organistional performance (e.g. Return on Investment (ROI), profitability and the application of CBIS to the major problems of the organisation (Ives & Olsen, 1984). Critical success factors if identifiable, have also been cited as a measure of information systems success (see, Rockart, 1979). In the present research it is assumed that the ISD will success only when the users utilize it. Research suggest that utilization is highly correlated with the other measures of the ISD success (Maish, 1979; Robey,1979; Swanson, 1978)

4.2 Technical Characteristics and ISD Success (TECCHA)

The well accepted concept in the literature of ISD is that technical characteristics are directly associated with the ISD success. Thus, much of the earlier research on ISD concentrated on designing technically sound systems as poor technical quality systems were found cumbersome to use, unfriendly, unreliable, lack of functionality and so on. If users find the technical quality of the system to be low, they are unlikely to welcome it, with the result they would be disinclined to use it (Kling & Scacchi, 1982; Shneiderman, 1981; Steinumuller,1984). As a result technical approach to ISD dominated the field in its early years. Source disciplines of technical approach such as Computer Science concerned with the establishing theories of computability, methods of computations and methods of efficient data storage and access. Management Science emphasizes the develpment of normative models of decision making and management practice. Operational Research focuses on mathematical techniques for optimizing selected parameters of organisations such as transportation costs, inventory control and transactions costs (Laudon & Laudon, 1991). Therefore it is believed that technical characteristics are crucial determinants of ISD success.

Hypothesls 1 (H_1)

The technical characteristics of the system are positively related to the ISD success

4. 3 Management Support and ISD Success (MANSUP)

Several authors (Adams, 1975; Gallagher, 1974; Gingras & McLean, 1982; Lucas, 1975) have found a positive relationship between the perceived value of information systems and managerial position. Gingras and McLean (1982) noted that managerial level is positvely related to the amount and

quality of systems use. In addition, Dickson and Simmons (1970) found that the higher the management level the less resistance to change is encountered. Schonberger (1980) states that the grater user involvement is needed at higher managerial level due to the decision making oriented nature of the computer applications at the strategic planning level. Because top management recognizes the importance and value of information systems and their involvement is necessary if decision support applications are to be successful. As leaders, they must extend their support during the development, implementation and operation of an information system. If management is not seen to support and encourage the change, organisational workers are unlikely to be willing advocates of the system [Mick Newman, 1985?]

Hypothesis 2 (H_2)

The higher the level of management support more likely the success of ISD activities.

4.4 End User Training and ISD Success (ENUSTR)

Educational training program development has received attention in the MIS literature for over two decades (Brady,1967). This study suggests that lack of education is a major reason for the lack of MIS utilization. Several other studies have recognized the education as one of important factors in ISD success (Dickson,1980). A number of researchers have considered the education of end users as an item in their research frameworks (Ives & Olsen,1984; Lucas, 1973; Nolan & Wetherbe,1980). Lucas (1975) found that older and less educated employees of the organisation is most likely to resist Computer Based Systems. Sprague and Carlson (1982) noted several educational techniques such as tutorials, professional develpment seminars, programmed instructions, computer assisted instructions, residents experts and "help" component in software packagers. Therefore education and training is considered as a major activity of the MIS systems development.

Hypothesis 3 (H_3)

The availability of end-user training programs is positively associated to the success of ISD

4.5 Corporate Strategies and Policies and ISD Success (COSTPO)

Information Systems Developments must be consistent with the overall organisational strategies & policies and meet the objectives of the organisation. And also it must sustain a level of quality and completeness that is appropriate to the organisational units and decision making activity (Davis & Olsen, 1985). Traditionally ISD activities were dominated by the systems analysts. As a result, the analyst recognised the information requirements of

the organisation and the decision makers. Accordingly systems were designed. The analyst also provided an organisational mechanism for enforcing appropriate standards and practice in testing, documentation, programming controls, operating controls, audit trials and interface with other systems (Davis & Olsen, 1985; Rockart & Flannery, 1983). These same controls are needed when end users develop, maintain and use of their own systems. What happened in the field of systems development during the last few decades was the fact that there have been a tremendous improvement of systems development activities and use of them within the organisations for many activities ranging from higher level to bottom line of the organisation. Therefore a broad company wide strategy and policy covering ISD activities at corporate level is an essential aspect to ISD success.

Hypothesls 4 (H_4)

The establishment of corporate strategies and policies covering the creation and operations of the ISD is positively associated with the ISD success.

4.6 Organisational Power, Politics and ISD Success (ORPOPO)

The importance of power and politics has received attention in organisations and in the information systems literature including Keen (1981), on the politics of organisational change related to information systems (Marks & Pfeiffer, 1983). On power in the decision and implementation of accounting and control systems, Marks(1993) describes power and political actions over extended period of several years in relation to the introduction of financial information systems and observed that there had significant effects on both divisional and centralized accounting functions and it was the source of major conflict between them. Kling & Iaccno (1984) observed the post implementation politics related to a material requirement planning systems. (Marks & Bjorn-Anderson,1987) studied the type of power that information systems professionals exercise over users. A recent study conducted by Waema and Walsham (1990) describes political activities and the use of power in the formulation and implementation of an information system strategy in an U.K. building society. The kinds of politics and power conflicts exist in organisations because organisations are divided into specialized subgroups (e.g. marketing, accounting, production etc), different values represented by different groups in organisation . These groups compete for resources which lead to create competition among the various specialists and ultimately politics in organisations. Politics means the competition between organisational subgroups for influence over the policies, procedures and resources of the organisations (Laudon & Laudon ,

1991). ISD inevitably become bound up in the politics of organisations because they influence access to a key resource namely, information. For example, within organisations, even, seemingly innocuous systems such as a new accounting system can have powerful political ramifications. If these new systems take functions and authority from one group and distribute to others, they can inspire considerable resentment and counter implementation resistance in an organisation (Keen, 1981). These findings delineate the fact that organisational politics and power play an important role in the ISD activities.

Hypothesls 5 (H_5)

Less the resistance to ISD as a result of loosing power in the exercise of political activities the more likelihood of ISD success.

4.7 Organisational Culture and ISD Success (ORGCUL)

The concept of culture has received a considerable attention in the management literature. For example, Peter & Waterman (1982) describe eight desirable attributes of organisational cultures possessed by many successful companies. In the context of information systems, Schein (1988) describes how to use IT to produce innovative cultures within organisations. Coombs et al. (1992) describes the relationship between IT and change. These authors treat IT as change to which members of the culture must adjust. Similarly, the literature on information systems supports "the use of culturally appropriate" implementation strategies to restore a sense of control of users of information technologies (Baronas & Louis, 1998; Robey & Rodrigues- Diaz, 1989). Moreover, the systematic importance of IT within organisation culture was studied by Meyer (1982) showing that organisational values like efficiency and progress are nicely supported by heavy investment in computer hardware and software. These studies outline the fact that the importance of representation of the organisational values and culture in ISD as a determinant of the ISD success.

Hypothesls 6 (H_6)

The more the values of both organisation and its members represent in ISD the grater the likelihood of ISD success.

4.8 User Involvement /Participation and ISD Success (USEINV)

Information systems are often failed due to the exclusion of users from the decision making process associated with the ISD. This relates to two aspects of involvement.

1. Initiate the development of an information system and,
2. Participation in the development of the information system.

As a result, much of the ISD activities are failed in the implementation and operation stage. In order to reduce this difficulty user involvement in the ISD activities is considered as an important aspect as participation is thought to produce commitment, knowledge about the change, enhanced systems quality and safe-guarding of individual interests. This concept of user participation is against the traditional concept of systems design in that systems professionals were dominated in the development activities. These systems were recognized as "analyst led" systems. The assumption behind such development efforts (analyst led design) would be that analyst could understand information requirements of the users and accordingly the required system could be developed. But later studies recognized that the analyst led systems have strong resistance of users (Bjorn-Anderson and Hedberg,1978; Land & Hirschheim, 1983; Mumford, 1983; Ives & Olsen, 1984; and Baronas & Louis,1988).

Hypothesis 7 (H_7)

User participation in the decision making process associated with the ISD is positively related to the ISD success.

4.9 Econometric Representation of the Model

The economic specification for the analysis of variables is as follows

$$ISDSUC = b_0+b_1TECCHA+b_2MANSUP+b_3ENUSTR+b_4COSTPO+b_5ORPOPO+b_6ORGCUL+b_7USEINV+ e$$

Where,
ISDSUC represents ISD success
$b_0, b_1, b_2, \ldots\ldots\ldots\ldots b_7$ provide population parameters
TECCHA, MANSUP, ENUSTR, COSTPO, ORGCUL, USEINV represent independent variables or predictors of the ISD success and e represents the random error of the measurement.

5.0 Summary

This article is the first article of a series of articles of an extensive research project on ISD. The main theme of this paper has been the need to incorporate a broader diversity of views of organisation into research in ISD. Therefore it attempts to identify organisational variables affecting the success or failure of ISD within an organisation. The hypotheses relating to

the ISD success presented in this paper are derived from previous research findings and are based on logical arguments. The study of research questions raised by this article as well as empirical evidence of hypotheses developed would be promulgated in coming issues of the same journal.

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