8 Revisiting CSFs for decision-making support systems implementation in South Africa

8.1 Introduction

Organisation workplace dynamics are shifting with growing worker mobility and the need for quicker decision-making grows. In today's difficult economic times, organisations require the support of information systems (IS) to improve business performance and decision-making. In the discipline of IS, there are many decision-making support systems – popular ones under the broad category of Business Intelligence (BI) are Decision Support Systems (DSS) and Executive Information Systems (EIS). Organisations invest heavily in DSS and EIS to help users make better decisions. DSS are at the management level and EIS at the strategic level in organisations (Laudon and Laudon, 2007). Both such IS have been implemented in many organisations in developing countries. Implementation can be defined simplistically as getting a newly developed (or significantly changed) system to be used by those for whom it was intended – it is the 'software underbelly' of IS development. DSS and EIS implementation is usually brought about by a desire to improve business performance and decision-making.

Critical factors influencing IS implementation have been actively researched topics in the IS field (see, for example, Boon, Corbitt and Peszynski (2004); Salmeron and Herrero (2005)). The success of a well-designed IS can be seriously reduced by improper or inadequate attention to implementation issues. Organisational IS are often critical to the successful business performance and competitiveness of an organisation. The question arises whether the published critical success factors (CSFs) associated with the implementation of IS (such as DSS and EIS) in developing countries, are nowadays still *critical* (*i.e.* absolutely necessary) to improve business performance and decision-making in an organisation. An investigation of this question in the developing country of South Africa is the objective of this chapter.

This chapter is structured as follows: The CSF concept is introduced. Information Technology (IT) and IT in South Africa are then discussed. Thereafter BI is presented. Decision support for management is then briefly discussed. From the literature, CSFs for DSS and CSFs for EIS are then reviewed. From this review, some management implications and a future DSS and EIS implementation research agenda are suggested. Thereafter a conclusion is presented.

8.2 Critical Success Factors (CSFs)

The Critical Success Factors (CSFs) concept was developed to help identify the information needs of managers. CSFs for the whole field of IS have been systematically explored (see, for example, Boon *et al.*, 2004). Rockart (1979) defines CSFs as the few key areas of activity where 'things must go right' for the organisation to flourish and for a manager's goals to be attained *i.e.* favourable results are 'absolutely necessary' for a manager to reach his (or her) goals. CSFs are those areas of a project that are absolutely essential to its success (Vodapalli, 2009).

CSFs for an organisation are the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organisation. They are the key areas where 'things must go right'. Human factors often make up CSFs *e.g.* top management support and a project champion (Somers and Nelson, 2001). Furthermore with the increasing move by organisations towards the Internet, the World Wide Web (hereinafter referred to as 'the Web') and Web-based technologies (*e.g.* portal technologies) are becoming integral to IS implementation initiatives. CSFs are areas of activity that must receive constant and careful attention from management. This chapter discusses published CSFs for the successful implementation of DSS and EIS in organisations in South Africa.

8.3 Information Technology (IT)

IT is rapidly changing and developing, especially due to the Web, altering the way in which IS are built. IT has changed the way in which organisations are doing business and plays an increasing important role in business performance and decision-making support. For example, social software is a key component of Web 2.0 which extends the collaborative decision-making process by allowing decision makers to discuss an issue, 'brainstorm' options, evaluate their pros and cons and agree on a course of action.

There are increasing trends in cloud computing, enterprise systems, predictive analysis, mobility, personalisation, data visualisation, green computing, portals and Intranet. The advent of the Internet has, for example, allowed an EIS to not only gather information from an organisation's existing Intranet but also externally through the Web and as a result EIS have become even more useful (Basu, Poindexter, Drosen and Addo, 2000). With the Internet, data and information are no longer a scarce resource and have a significant effect on decision-making support in organisations. For example, nowadays some organisations are investing in developing and leveraging business intelligence (BI) technology for improved collaborative decision-making. This means that the loci of focus of DSS and EIS has been expanded.

Many scholarly research articles on DSS still exist (see, for example, *Decision Support Systems* Journal, Imprint: Elsevier, ISSN: 0167-9236, eight issues per annum). While few articles are being written about EIS, they still exist because organisations have a need for EIS as the need for executive information remains (Wang, Xing and Yao, 2008).

IT in South Africa

It is essential for managers in developing countries to be sure that investment in IT is economically justified. In some organisations in South Africa, IT represents a significant ongoing capital expenditure. DSS and EIS are found in many organisations in South Africa.

The existence of research literature on DSS and EIS in South African organisations is contained in Strydom (1994), Chilwane (1995), Steer (1995), and Addison and Hamersma (1996), Khan (1996), Baillache (1997) and Averweg (1998) – during the pre-Internet era. This chapter focuses specifically on studies of CSFs for DSS and EIS implementation in the South African environment during the 1994–1998 period. The rationale for selecting this period is the availability of published DSS and EIS research findings. Furthermore from a scan of the literature it appears that no further and recent research has been undertaken in South Africa focusing on CSFs for DSS and EIS implementation. The author's chapter will therefore be useful to organisations which intend embarking on DSS and EIS implementation in the age of the Internet, the Web and Web-based technologies.

This chapter focuses on some of the non-technical issues for organisations embarking on DSS and EIS implementation programs. The scope of the research is limited to existing DSS in KwaZulu-Natal and existing EIS in Gauteng.

8.4 Business Intelligence (BI)

Business Intelligence is a broad category of applications and techniques for gathering, storing, analysing and providing access to data to help managers and executives in organisations make better business and strategic decisions (Oguz, 2003). BI employs a large number of techniques and tools. According to Turban, Rainer and Potter (2005), BI can be divided into two major categories:

- Information and knowledge discovery (*e.g. ad hoc* query, online analytical processing (OLAP), data mining, Web mining); and
- Decision support and intelligent analysis (*e.g.* DSS, executive and enterprise support, applied artificial intelligence).

Vodapalli (2009) suggests a list of seven CSFs for BI implementation and these CSFs (in alphabetical order) are reflected in Table 1.

Business driven methodology and project management
Clear vision and planning
Committed management support and sponsorship
Data management and quality issues
Mapping solutions to user requirements
Performance considerations of the BI system
Robust and extensible framework

Table 1: CSFs for the Successful Implementation of BI
(Source: Adapted from Vodapalli, 2009)

8.5 Decision Support for management

Changes in IS technology have produced a significant revolution in opportunities for improved managerial performance. Information is one of the key inputs in the decision-making process. An important key to the success of IS is its ability to provide users with the *right information* at the *right time*. DSS and EIS are examples of two such IS to assist managers and executives for improved decision-making. These IS are the focus of this chapter.

DSS

Executives recognise that IS allow organisations to compete and sometimes even survive. A DSS is "an interactive computer-based system or subsystem intended to help decision makers use communications technologies, data, documents, knowledge and/or models to identify and solve problems, complete decision process tasks, and make decisions" (Power, 2007). Clearly there is a need for improved decision-making for business performance in organisations.

EIS

Definitions of EIS are varied but all identify the need for information to make decisions about the business as the most important reason for the existence of EIS. An EIS is used by executives to extract, filter, compress and track critical data. EIS applications support executive information needs and decision-making activities. EIS is defined as "a computerized system that provides executives with easy access to internal and external information that is relevant to their critical success factors" (Watson, Houdeshel and Rainer, 1997). Classified as high-risk projects, just like any other IS projects, organisations have been cautious and critical in ensuring EIS successful implementation (Ako-Nai, 2005). Traditional EIS has given way to Web-based resources (Basu *et al.*, 2000).

8.6 CSFs for DSS

The works of Guimaraes, Igbaria and Lu (1992) and Kivijärvi and Zmud (1993) suggest conditions which are critical to the successful implementation of DSS. Averweg and Erwin (1999) combined the conditions suggested by these researchers as being critical to the successful implementation of DSS and formed Table 2 reflecting nine CSFs. Averweg and Erwin (1999) targeted 27 sizeable and well-established organisations in KwaZulu-Natal that have DSS experience. Of the nine previously identified CSFs, only five were completely ('totally') supported by the highest total scoring group of surveyed organisations – see Table 3.

Top Management Support
User Involvement
User Training
Information Source
Level of Managerial Activity Being Supported
User Information Satisfaction
Relative Use
Perceived Utility
Goal Realisation

Table 2: CSFs for the successful implementation of DSS

CSF
Top Management Support
User Involvement
User Training
Relative Use
Perceived Utility

Table 3: CSFs 'totally' supported by all organisations from the highest total scoring group

The four CSFs 'totally' not supported by all organisations from the highest total scoring group of surveyed organisations are shown in Table 4. A summary of CSFs identified by the authors' survey as "absolutely necessary" (Rockart, 1979) for organisations embarking on a DSS implementation program is shown in Table 5. Only one of the CSFs in Table 5 (Top Management Support) partially 'matches' a CSF in Table 1 (Committed management support and sponsorship).

CSF
Information Source
Level of Managerial Activity Being Supported
User Information Satisfaction
Goal realisation

Table 4: CSFs 'totally' not supported by all organisations from the highest total scoring group

CSF
Top Management Support
User Involvement
User Training
Relative Use
Perceived Utility
Appropriate DSS Tools

Table 5: Summary of CSFs necessary by organisations embarking on a DSS implementation program

8.7 CSFs for EIS

The goal of EIS is to provide top management with immediate and easy access to data and information about an organisation's CSFs. For EIS, the CSF method is the most frequently mentioned approach of the methods that determine information requirements based on the characteristics of the object system (Sprague and Watson, 1996).

The basis of Steer's (1995) research "was to identify the critical success factors for the successful implementation of an Executive Information System…where an EIS had been implemented" in organisations in Gauteng. An analysis of Steer's findings revealed twenty-one major concepts that were raised by interviewed respondents in relation to the CSFs for implementing EIS. The top ten CSFs (in descending order) that were identified in the study for the successful implementation of EIS are reflected in Table 6. None of these CSFs in Table 6 'match' those CSFs in Table 1. Steer (1995) indicates that although "the remaining 11 concepts of the 21 discussed during the research are not the most important critical success factors of implementing an EIS, *they are still important*, and should therefore *be considered* when implementing an EIS" (italics added by author). The researcher labels these CSFs as 'secondary' CSFs for the successful implementation of EIS and are discussed in Averweg (2009).

CONCEPT
An EIS needs a project champion
An EIS must support the cross-functional integration of information
An EIS has to link to the organisation's business strategy
An EIS should be implemented using a phased approach
An EIS project champion should be a steering committee
Resistance from the information users must be managed
An EIS must have the capability to access external information
Resistance from the information providers must be managed
The project champion should change during the project
An EIS must support drill-down facilities

Table 6: The top ten CSFs for the successful implementation of EIS
(Source: Adapted from Steer,1995)

8.8 Management implications

Table 5 shows that organisations embarking on DSS implementation must ensure that six CSFs, *viz.* Top Management Support, User Involvement, User Training, Relative Use, Perceived Utility and Appropriate DSS Tools are properly addressed during the implementation process as these CSFs were found to be present in **all** successful organisations. The findings by Averweg and Erwin (1999) suggest that the remaining four CSFs may not be critical, in the sense that they are "absolutely necessary" to ensure success (Rockart, 1979). This does not imply that the remaining four CSFs (see Table 4) need not be addressed but the author contends that it may be inappropriate to regard the remaining four CSFs as 'critical'. Consequently, a contingency approach is suggested by labelling them as "important but not essential for success" (Averweg and Erwin, 2000).

In the EIS research undertaken by Steer (1995), he suggests that "South African executives require a set of guidelines that can help the identified the full implication of implementing an EIS, which will allow them to build a solid foundation from which to implement a successful system". The aim of the research was to provide local executives with a benchmark against which they can develop a sound EIS foundation from which a successful EIS implementation can be built. The ten CSFs for the successful implementation of EIS (in South Africa) are reflected in Table 6 and are seen as 'absolutely necessary'.

The author contends that in South Africa **not** all previously identified CSFs for the successful implementation of DSS and EIS are 'critical'. The existence of the other success factors is, however, recognised. The author suggests a contingency approach by labelling some of the identified CSFs for DSS and EIS implementation as 'of secondary importance but not essential for success'. Furthermore with the increasing move towards the Internet, the Web and Web-based technologies are having a "major impact on systems that support decision making" (Laudon and Laudon, 2007), there is a need to revisit the CSFs for the successful implementation of DSS and EIS in South Africa. Ten pointers are suggested towards a future CSFs for DSS and EIS implementation research agenda:

- **Cloud computing**. Cloud computing intersects with decision-making support systems as employees become more mobile and have multiple Internet-enables devices;
- **Enterprise systems**. Enterprise systems supply managers and executives with powerful analytical tools for analysing and visualising data *e.g.* an executive dashboard on a desktop may allow faster decision-making, identification of negative trends and a better allocation of business resources in an organisation;
- **Predictive analysis**. Predictive analysis combines known information with critical insight helping solve problems and uncover hidden patterns not easily solved through reports or dashboards;
- **Mobile**. The intersection of wireless devices and decision-making support systems allows mobile business executives and users to more easily view and interact with the same analytics as found on their desktop;

- **Personalisation**. Web portal technologies provide greater flexibility in determining the data and information a manager or executive 'sees' on his desktop. Personalisation of data can facilitate decision-making by enabling users to filter out irrelevant data or information (Laudon and Laudon, 2007);
- **Data visualisation**. This refers to the *best* representation of data to aid in the exploration of the information being visualised;
- **Green computing**. Virtualised paper reports on business performance can be distributed over the Web. Furthermore organisations have the ability to transform their ageing data centres with low environmental impact;
- **Intranet and portals**. Intranet and portal technologies create organisation-wide networks that facilitate the flow of information across organisational divisions and business units;
- **Emergence of collaborative decision-making**. This combines social software with BI. It is envisaged that this combination may significantly improve the quality of decision-making by directly linking data and information contained in BI systems with collaborative input gleaned by the use of social software (*e.g.* adding annotations or notes with comments on business reports); and
- **Loci of focus**. DSS and EIS were previously 'inwardly centric' IS in organisations. They did not rely on external data and information which is nowadays available via the Internet and on the Web. Future DSS and EIS implementation will have to ensure that such IS gain the benefit of external data and information and become 'externally centric' and thereby widen their loci of focus.

8.9 Conclusion

With the increasing amount of IT investment and substantial evidence of failures, IS implementation evaluation has become a key management issue. The author contends that wise judgement is needed when deciding on the selective use of IS and feels that this is particularly relevant to DSS and EIS implementation in the current difficult economic times.

Special care is needed when implementing DSS and EIS because of their major potential importance to an organisation's business performance and decision-making. It is suggested that instead of trying to 'catch up' with the industrialised world, South Africa follows the route that extreme care must be exercised by all parties involved in the transfer of technology from one country to another. CSFs for DSS and EIS should serve South Africa's own needs rather than echoing those of developed countries. The Internet, the Web, Web-based technologies and social networking have accelerated developments in decision-making support and provide a new research focus area for CSFs for DSS and EIS implementation.

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