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Empirically testing ES success factors in business process reengineering

Tor Guimaraes[a,*], Youngohc Yoon[b], Aaron Clevenson[c]

[a] *Tennessee Technological University, Cookeville, TN 38505, USA*
[b] *Department of Information Systems, Virginia Commonwealth University, Richmond, VA 23284-4000, USA*
[c] *E.I. DuPont de Nemours & Company, Inc., One Kingwood Place, Suite 215, Kingwood, TX 77339, USA*

Abstract

Previously proposed success factors for Expert Systems implementation are field tested in the context of business process reengineering (BPR) projects. Due to its nature mimicking human expert behavior, ES technology applications in BPR provide a unique opportunity to study major organization changes within a relatively short time. Using Pearson correlations and multivariate regression analysis, eight ES implementation success factors proposed in the literature were empirically tested in this study in terms of their importance to the BPR benefits derived from the application. Sixty-two ES applications within E.I. Dupont de Nemours and Company dealing with business process changes significant enough to be called BPR were used. Despite the relatively small sample size, six of the eight success factors were corroborated: user satisfaction with the ES, the importance and difficulty of the business problem addressed, user attitudes toward ES technology and the particular ES project, the degree of user involvement in the ES implementation process, and the ES developer(s) skills.

Keywords: Expert systems; Knowledge-based systems; KBS; Business process reengineering; Benefits; ES success factors

1. Introduction

Expert systems (ES) have demonstrated their potential and are being widely used to solve a variety of business problems in industry and government (Hayes-Roth and Jacobstein, 1994). Due to their capability to effectively improve the way an organization does business, many ES applications have been used to dramatically change a variety of business processes (Hamscher, 1994a; Lazarus et al., 1993; Pierson and Gallant, 1993). In one case, SMART at Compaq has enhanced the effectiveness of its customer support staff by distributing problem-solving knowledge to the entire support staff at the point it is needed (Acorn and Walden, 1993). Another ES, QuickSource, has enabled Compaq to empower its customers with expert knowledge which allows them to solve advanced network printer problems entirely on their own (Nguyen and Czerwinsksi, 1993). With the use of ES technology Compaq has completely reengineered its customer support strategy and implementation. In another organization, MPSA and COLES are two interrelated systems which offers automated expert support to AT&T's scheduling and customer service staffs by improving and expanding the utility of existing legacy mainframe systems (McManus and Garland, 1993). At Bell Atlantic, SNNS was developed to provide automated support for sales-service negotiation process (Carr et al.,

* Corresponding author. J.E. Owen Chair of Excellence. Tel.: (615)372-3385; fax: (615)372-6249; e-mail: tg5596@tntech.edu.

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1994). This system has significantly improved sales efficiency and optimized customer contact time.

While ES have been recognized as important implementation vehicles for Business Process Reengineering (BPR) (Friedenberg and Rice, 1994; Hamscher, 1994b), in some cases ES development has been extremely difficult or failed. There are many ES which have been rejected by their target user community (Coats, 1988; Keyes, 1989b; Sloane, 1991). Many of the failures may be due to the urgency and massive changes associated with BPR projects. Thus, a burning issue deals with whether or not the factors affecting ES success or failure under BPR conditions are the same as the ones found important under less "dramatic change conditions". While some may believe that there should be no difference, this needs to be tested empirically. The purpose of this study is to empirically test, under conditions of "dramatic changes to the business process" involved, the set of factors proposed earlier (Yoon, Guimaraes and O'Neal, 1995) as determinants of ES success when the system is used for automating existing business processes or making relatively small changes in the process model.

2. Conceptual framework

An ES is a computer-based system employing expert knowledge to attain high levels of performance in solving the problems within a specific domain area. By encapsulating expert knowledge and experience, ES enables organizations to support important decision making and improve organization productivity. Much of the computer-based system implementation research has been focused on identifying the factors which appear to be conducive to either success or failure of system types other than ES (Guimaraes et al., 1991; Liang, 1986). In the context of ES, many success factors have been proposed (Ignizio, 1991; Keyes, 1989b; Prerau, 1990; O'Neal, 1990; Turban, 1992b; Yoon et al., 1995). Although most of the findings have been on the basis of personal opinion, some recent studies have empirically tested ES success factors (Yoon et al., 1995). The independent variables considered in this study, the factors determining ES success proposed in the literature, are: user satisfaction with the ES; the importance of the business problem to end-users; problem difficulty; developer(s) skill; end-user(s) characteristics; shell characteristics; user involvement; and management support.

Prior research has employed various measures for ES success as a dependent variable, including user satisfaction (Yoon et al., 1995), and impact on end-users jobs (Yoon and Guimaraes, 1995). The benefits from using ES in BPR is the measure of ES success used in this study. It is discussed next, followed by a discussion of each of the major independent variables. Except for the dependent variable, all variables have been discussed in greater detail in Yoon et al. (1995).

2.1. ES success: Benefits from ES use in BPR

As business competitiveness increases, many business organizations have reacted to expand the value of their products and services to customers by redesigning their business processes to increase efficiency, deliver new products and services, and improve quality of their offerings. There are several motivating reasons for the introduction of BPR: incremental process improvements not meeting expectation, large gaps between current and target level of company productivity/performance, loss of market share due to customer dissatisfaction and products/services becoming commodities (Tsang, 1993). Based on such motivators, BPR projects have become widespread in industry today.

Information systems technology has played a critical supporting role in BPR. Concurrently, the dramatic changes to the organization and the pressing nature of BPR projects (Guimaraes, 1995), provide a unique opportunity for studying the impact of information systems on business organizations. Among various computer-based information systems, ES have been recognized as important implementation vehicles for BPR. The increasing use of ES techniques in BPR has raised the importance of understanding various factors affecting the success of ES for such purpose. By encapsulating expert knowledge and experience, ES technology provides the means to deliver expertise in the field, and change the way an organization performs its business processes. Friedenberg and Rice (1994) have also proposed ES as viable implementation vehicles for BPR because they are effective in capturing and distributing knowledge and knowledge processing capability across an organization.