



The Strategic Impact of Enterprise Systems: A Dynamic Capabilities Study

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RESEARCH BACKGROUND AND OBJECTIVE

The move to enterprise systems (ES) and its extended applications is a prominent issue in the field of information systems (IS) (Kumar and Van Hillegersberg, 2000; Markus and Tanis, 2000). Featuring a central database, open system architecture, and business reference models, ES is a process-based commercial system that aims to integrate transactional information and business processes in a distributed business environment. Its implementation has influenced business operations in two significant ways. First, the integrated central database and open system architecture comprise an application information technology (IT) infrastructure that affects scope, feasibility, and flexibility in long-term organizational information support and system deployment. Second, ES imposes standard business models regardless of the idiosyncratic practice of the firm. The increasing ubiquity of ES, then, indirectly homogenizes operational processes within an industry and opens new avenues for electronic inter-organizational interaction and cooperation (Davenport, 2000; Kumar and Van Hillegersberg, 2000).

The ES-imposed generic processes and the trend toward a single industrial IT application have caused great strategic concern to researchers and practitioners alike. Tom Davenport, one of the pioneers of ES and BPR research, speculates that homogeneous best practice in a single industry might lead to a lessening of the value of innovation in business process design (Davenport, 1998). Weill and Broadbent (2000) also question the strategic impact of standardized IS packages. While these questions imply that the pervasiveness of ES undermines any extraordinary advantage, empirical research has revealed various outcomes of ES adoption (Davenport, 2000; Kumar and Van Hillegersberg, 2000; Markus and Tanis, 2000; Bermudez, 2002). Yet despite increasing concerns about the business value associated with ES, systematic research on the strategic implications of ES is lacking. Most research on ES consists of anecdotal case studies that focus on system implementation processes and critical success factors, or deals with the multi-faceted impact of ES on business operation. Seldom, however, does the research examine the implications of ES transition.

The objective of this study is to address this research issue through formulating and validating a research construct to analyze ES-enabled organizational capabilities and their impact on firm performance. The position taken in this research is that ES does not provide a source of competitive advantage. The adoption of a single system within industry, however, does not mean that system outcomes will be homogeneous, as firms may not be equally capable of capturing the strategic benefits of ES. Based on this assumption, a key to understanding the strategic implications of ES is the identification and assessment of system-enabled capabilities.

LITERATURE REVIEW

The dynamic capabilities perspective, combining ideas from both resource-based theory and evolutionary theory, focuses on the source of competitive advantage in a rapidly changing environment (Teece, Pisano et al., 1997). Such an approach is particularly relevant to this research because it highlights the strategic implications of management processes and organizational structure through which firms develop and renew their competences.

The Conceptual Framework of Dynamic Capabilities

As ES-imposed best practice becomes an industrial standard, strategy is fast becoming a dynamic process of system utilization toward innovative competence deployment and exploitation (Eisenhardt and Martin, 2000). The strategic implication of this process can be understood from the perspective of dynamic capabilities—the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece et al., 1997, p. 516). This capability is dynamic because it constantly modifies the leverage of competence to achieve congruence with the harsh competitive environment.

The dynamic capabilities study supplements resource-based analysis in two ways. First, rather than focusing on the issues of resource appropriateness and sustainability, dynamic capability highlights the value of resource portfolio configuration and integration (Kogut and Kulatilaka, 2001; Makadok, 2001). In essence, dynamic capabilities posits that the perpetually changing environment will frequently alter the strategic value and the life span of core resources (Eisenhardt and Martin, 2000; Barney, 2001; Barney, Wright et al., 2001). Thus, the capability for plural competence deployment and exploitation of resources overshadows the characteristics of those resources (Lengnick-Hall and Wolff, 1999).

Second, the characteristics of dynamic capabilities are idiosyncratic in detail yet common in key features (e.g., best practice), a notion that departs markedly from the usual view of RBV regarding the idiosyncratic features of strategic resources and capabilities (Eisenhardt and Martin, 2000). Compared with RBV researchers, advocates of this theory hold a relatively conservative view as to the value of organizational best practice. However, the observation of organizational routines as dynamic capabilities offers an operational foundation for empirical study.

The dynamic capabilities perspective contributes to IT research in two distinct ways. First, it repositions IT capabilities as competitive necessities. Rather than being the source of competitive advantage, IT capabilities are stepping-stones to advanced competence creation and leverage. Second, the concept of dynamic capabilities provides an overarching framework within which the implications of IT-enabled flexible competence leverage, organizational learning, and business transformation can be recognized and analyzed (Porter and Millar, 1985; Clemons and Row, 1991; Venkatraman, 1994; Lee and Lee, 2000; Zello and Winter, 2002).

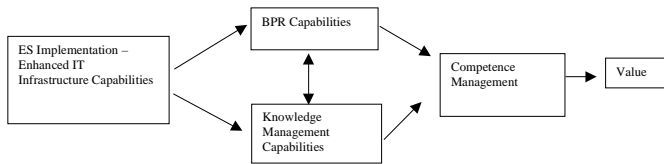
ES and Dynamic Capabilities

With respect to competitive advantage, the roles of ES as IT infrastructure, knowledge management mechanism, and BPR catalyst have been discussed favorably in the literature (Davenport, 2000; Lee and Lee, 2000; Markus and Tanis, 2000; Weill and Broadbent, 2000). The dynamic capabilities perspective provides unique insights into the strategic influence of these ES roles.

IT Infrastructure

As part of an IT infrastructure, ES is an organizational backbone and operational mechanism providing an integrated communication platform for functional applications. Its capabilities are often measured in terms of system-enabled reach and range (Keen, 1991). Modularity, compatibility, integrity,

Figure 1. Dynamic ES capabilities and business value



and IT personnel skills are assessment indicators of the flexibility of the IT infrastructure (Byrd and Turner, 2001). These capabilities are essential because they determine the firm's ability to add, modify, and remove application systems; the effectiveness of information sharing and control; and the functional competence of ES deployment and exploitation to support business strategies (Broadbent and Weill, 1997; Willcocks and Sykes, 2000; Byrd and Turner, 2001). IT flexibility, then, influences organizational performance in terms of market responsiveness and innovative action.

Business Process Reengineering

As a viable instrument of business processes reengineering, ES is positioned as processware (Davenport, 2000). Business process reengineering is a socially complex procedure that involves radical change in organizational culture, structure, and business processes (Hammer and Champy, 1993). While the concept of process is not new, ES is the major driving force bringing the concept into institutional practice (Davenport, 2000). Researchers have identified several key aspects of the impact of IT on process management: IT leadership, process integration and disintegration throughout value systems, information bundling and unbundling, culture fit, management competence, and strategic thinking (Feeny and Willcocks, 1998; Davenport, 2000; Scheer and Habermann, 2000; Soh, Kien et al., 2000; Willcocks and Sykes, 2000).

Knowledge Management

The proposition that organizational routines and processes represent firm-specific skills and capabilities has made knowledge management a focal point of concern in dynamic capabilities research (Pisano, 1994; Grant, 1996). The ES-embedded business model provides a formal vehicle for knowledge retention and distribution (Zello and Winter, 2002). Lee et al. (2000) investigated the processes of ES implementation and suggested that the ES-embedded reference model offers a viable learning mechanism for communicating tacit business process knowledge across functional areas. While the reference model provides codified tacit knowledge to adopting firms, the level of knowledge internalization and its further application to process innovation may be subject to the firm's absorptive ability, comprehensive understanding of internal resource characteristics, and commitment to the application of knowledge to resource reconfiguration (Cohen and Levinthal, 1990; McGrath, MacMillan et al., 1995).

Summary

The literature addressing IT infrastructure, BPR, and knowledge management sheds considerable light on ES capabilities analysis. Synthesizing the foregoing discussion, we propose the research construct shown in Figure 1.

RESEARCH METHODOLOGY

This research will combine both case study and survey methods for theory building and empirical validation. Traditionally, IS research is dominated by a single methodology paradigm and rarely explores the analytical benefits of a multi-method application. Yet despite the limited application, the value of utilizing a multi-method approach in a single research design is recognized (Lee, 1991; Gable, 1994; Henderson and Cockburn, 1994). The qualitative and quantitative methods, while drawing on different sources of evidence and ideas, serve a complementary purpose at different phases of IS research.

Secondary Cross-Case Analysis for Issue Identification

The qualitative research method, or case study, is a context-rich and empirically valid approach in IT research. This method collects descriptive phenomenological data from on-site observation, internal document assessment, and in-depth personal interviews. By means of extensive access to organizational information, the case study seeks to describe and explore the con-

text of the research object. Orlikowski (1993) suggests that such an interpretive and explorative approach provides an effective instrument for theory building and testing (Orlikowski, 1993). Gable (1994) also highlights the contribution made by observational information to the identification of problems and issues.

There are two ways of collecting qualitative data. One is the pilot case study based on a carefully designed research protocol. This method delivers specific information for a purposeful investigation. The other is the published case study that is ready for advanced hermeneutical interpretation. Such public data usually contains rich contextual information and can serve a broad range of research purposes. As an alternative lens enabling a different focus on the research question, secondary data offers a viable avenue to the discovery of business issues, patterns, and ongoing research trends. This rich source of data also simplifies the demand for cross-referencing of issues and problem verification.

Given the abundance of ES case reports, it is believed that the copious amount of empirical information will provide a rich source of insight for proposed ES capabilities analysis and testing. Although the validity of such an approach is questionable in terms of the research theme, it is reasonable to propose that a hermeneutic approach to secondary case analysis is not only valid but also provides insight equivalent in value to that derived from primary investigation (Lee, 1991; Lee, 1994). Furthermore, by cross-referencing multiple case studies, the concern over methodological legitimacy is resolved. Building on this vein of thought, the first stage of this research plan is to enhance the content of proposed ES capabilities on the basis of 15 published case studies focusing on ES implementation and utilization. Descriptive data has been collected from the *Journal of Information Technology*, *Harvard Business Cases*, and *CIO Magazine*. The outcome of this research stage will be an empirically verified measurement construct and a research questionnaire derived from assessments of case analyses.

Survey Methods for Hypotheses Testing

The survey method refers to quantitative analysis where the research data is collected by mail questionnaires, telephone interviews, or published statistics. Essentially, this method provides a snapshot of the research context and yields statistically descriptive information for research models. As well it offers a scientific technique for testing the reliability and validity of the research model and variables.

According to Gable (1994), the quantitative method supplements the qualitative approach by improving the generalizability of the research model. Therefore, the second stage of this research will test the proposed research model using a questionnaire survey. More specifically, the second phase of the research targets 1000 ES adopters recognized as major players in the business community to serve as research informants. In this way, this research will be able to capture the business consequences of ES adoption that are unavailable for qualitative assessment.

DISCUSSION AND FEEDBACK SOUGHT

This research is still in the preliminary stage. Building on dynamic capabilities, this study expects to provide theoretically rigorous and practically relevant guidelines for effective ES deployment and exploitation. The research outcome is expected to reveal the link between ES adoption and business value through identifying the ES-enabled dynamic capabilities. For the research purpose of enhancing operationalization of the RBV paradigm, the author seeks comments on the potential drawbacks of the multi-method approach in research design. Furthermore, identification of missing pieces in the proposed research questions and construct, and suggestions for enhancement, are equally important to further development and refinement of the research.

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