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THE EXTENT OF ENTERPRISE SYSTEM ADOPTION IN COMPANIES: A MULTIPLE THEORETICAL PERSPECTIVE

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Abstract

To date there has been little academic research exploring the theoretical reasons that motivate organizations to adopt Enterprise Systems (ES). By employing Transaction Costs Economics (TCE) and Institutional theory, this research project intends to provide a theoretical foundation to better explain the extent of ES adoption within companies. TCE, Institutional Theory, and combined models are developed and examined for explanatory power. We will examine the differences in the power of each theory to explain the extent of ES adoption as well as test the potential superiority of a dual theory approach in understanding the extent of ES adoption. Hypotheses derived from each theoretical perspective are offered. Finally, we will examine the explanatory power of each model at different stages in the diffusion of ES within industries. This research in progress submission includes our intended research methodology and expected contributions.

Keywords: Enterprise systems, transaction costs economics, institutional theory, adoption

Introduction

ES emerged in the early 1990s as an enterprise wide solution to organizational coordination problems due to the growing trend toward globalization, mergers, and acquisitions. ES spending is expected to reach \$78 billion in 2004 (Management and Distribution Report 2000) and it should continue to be one of the largest, fastest-growing, and most influential approaches in the application software industry for the next decade (Yen et al. 2002). Given the broad diffusion and the magnitude of investment associated with ES implementation, it is intriguing that no academic research has been published to explore the theoretical reason(s) that motivate organizations to adopt ES. To study the adoption of complex technologies, a multiple theoretic perspective can provide better understand on the overall diffusion process (Damsgaard and Lyytinen 1997). Thus, in the context of ES adoption, employing multiple theories to study ES should significantly enhance our understanding of the overall diffusion process. This paper applies Transaction Costs Economics (TCE) and Institutional theory to address the following questions regarding the extent of ES adoption in companies:

Is the extent of ES adoption best explained as a rational economic decision, or by the social influence imparted from the environment in which a corporation operates? In essence, does TCE, Institutional theory, or a hybrid model best explain the extent of ES adoption within companies?

Do these two theories have differing explanatory power concerning the extent of ES adoption of different companies at different stages in the overall ES diffusion process within industries?

The Extent of Enterprise Systems Adoption

This study describes the extent of ES adoption along two dimensions. Level of implementation characterizes the extent to which the ES covers different operational levels. Level of integration depicts how well are the adopted ES connected to other enterprise application systems and embedded in the business processes within and across organizations. The level of integration can be further grouped into two dimensions: enterprise application integration (EAI) and enterprise process integration (EPI). EAI refers to the mechanisms that link ES to other enterprise systems or legacy systems. EAI can take place at data, application, and presentation level (Linthicum 2000). EPI refers to the scope that the ES embed in business processes within and across organizations. EPI has three major levels: intra-functional, cross-functional, and inter-organizational integration (Morash and Clinton 1998). The extent of implementation is classified into three levels based on the information systems classification scheme developed by Gorry and Scott Morton (1971): operational control level, management control level, and strategic planning level.

Theoretical Foundation

Transaction Costs Theory

Transaction costs economics (TCE) examines the choice of economic organization through a transaction costs perspective. Transaction costs are the costs of developing and monitoring exchange relationships (Williamson 1985). TCE rests on two essential assumptions about economic actors. First, bounded rationality is the assumption that decision makers have constraints on their cognitive capabilities that prevent parties in a transaction from writing up complete contracts specifying all the possible outcomes. Second, opportunism is an assumption that parties in a transaction may seek to serve their individual gains.

TCE argues that transaction costs are largely influenced by asset specificity (AS) and uncertainty. AS is referred to as the extent to which the investments are generalizable (Williamson 1996). A firm with highly specific assets is more likely to organize the activities within its own boundaries, rather than making exchanges through the market. In this paper, AS refers to both physical asset specificity (PAS) and human asset specificity (HAS).

Uncertainty is generally defined as the inability to predict something accurately (Milliken 1987). TCE claims that high levels of uncertainty increase the costs of predicting the organization's future and evaluating the performance of exchange partners. TCE contends that firms try to minimize these costs through vertical integration. Environmental uncertainty and behavioral uncertainty are discussed in this paper.

Institutional Theory

Institutional theory seeks to explain the organization-environment relationship from a social view. From institutional perspectives, organizations operate in a normative environment that constrains the choice of organizational actions and thus leads to organizational homogeneity within, and to some extent across, industries (DiMaggio and Powell 1983). To describe the process of homogenization, DiMaggio and Powell (1983) identified three isomorphic mechanisms: coercive, mimetic, and normative. Coercive isomorphism is driven by pressures from other organizations on which the focal organization is dependent. Mimetic isomorphism is viewed as a response to uncertainty. With high uncertainty, organizational leaders may decide that the best response is to mimic a peer that they perceive to be an appropriate model. Normative isomorphism is a process of professionalization, involving social learning in the network context.

Research Models and Hypotheses

TCE Model and Hypotheses

Asset Specificity (AS)

Asset specificity is an investment that has little or no value in uses other than the specific function for which it was undertaken (Williamson 1985). PAS refers to the tools, equipment, operating procedures, and systems tailored to specific transaction relationships, either in the market or a hierarchical organization (Williamson 1987). HAS refers to investments in specific skills

and knowledge through a learning-by-doing process (Williamson 1987). HAS may be accumulated as specific working relationships, learn important insider information, or become knowledgeable about a firm's or partners' products and applications (Anderson 1988).

As physical investments, knowledge and working relationship developed over time become highly specific, the transaction costs associated with guarding against opportunistic behaviors increase. We argue that firms with highly specialized assets would implement ES solutions that incorporate a wider range of corporate activities and increase the integration to standardize and integrate internal and external process to reduce the transaction costs. Thus, we hypothesize:

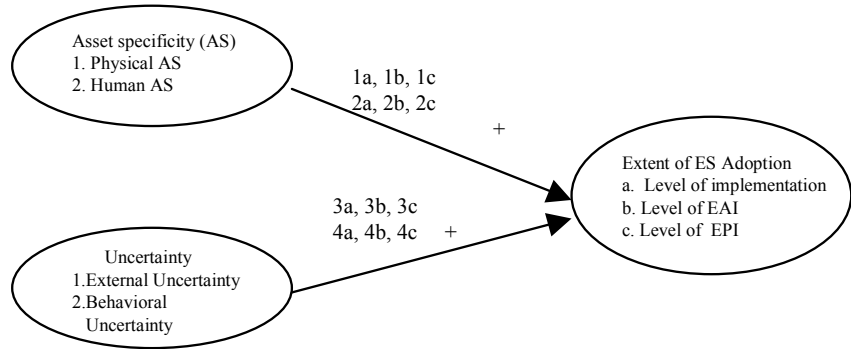


Figure 1. TCE Model

- H1: Physical asset specificity is positively related to the level of*
- a. implementation.*
 - b. enterprise application integration.*
 - c. enterprise process integration.*

- H2: Human asset specificity is positively related to the level of*
- a. implementation.*
 - b. enterprise application integration.*
 - c. enterprise process integration.*

Environmental Uncertainty

Environmental uncertainty is defined as “unanticipated changes in circumstances surrounding an exchange” (Noordewier et al. 1990). When organizations operate in a highly unpredictable environment, it is insufficient to implement information systems that only collect and integrate internal information. An organization needs to include external resources from which the corporate objectives and strategy could be formed. Furthermore, an organization also needs to embed this system in the organization and integrate processes that carry out the corporate strategies. Hence, we hypothesize:

- H3. Perceived environmental uncertainty is positively associated with the level of*
- a. implementation.*
 - b. enterprise application integration.*
 - c. enterprise process integration.*

Behavioral Uncertainty

TCE views behavioral uncertainty as arising from the difficulties associated with monitoring the contractual performance of transaction partners (Williamson 1985). We expect that when behavioral uncertainty is increased, organizations will tend to implement ES applications that are better designed to monitor and evaluate the performance of business partners. Also, when there is greater behavioral uncertainty, the greater the need to integrate ES to the other application systems and blend the implemented ES applications into the organization's processes to monitor and evaluate employees and business partners. Thus, we hypothesize:

- H4. Perceived behavioral uncertainty is positively associated with the level of*
- a. implementation.*
 - b. enterprise application integration.*
 - c. enterprise process integration.*

Institutional Theory Model and Hypotheses

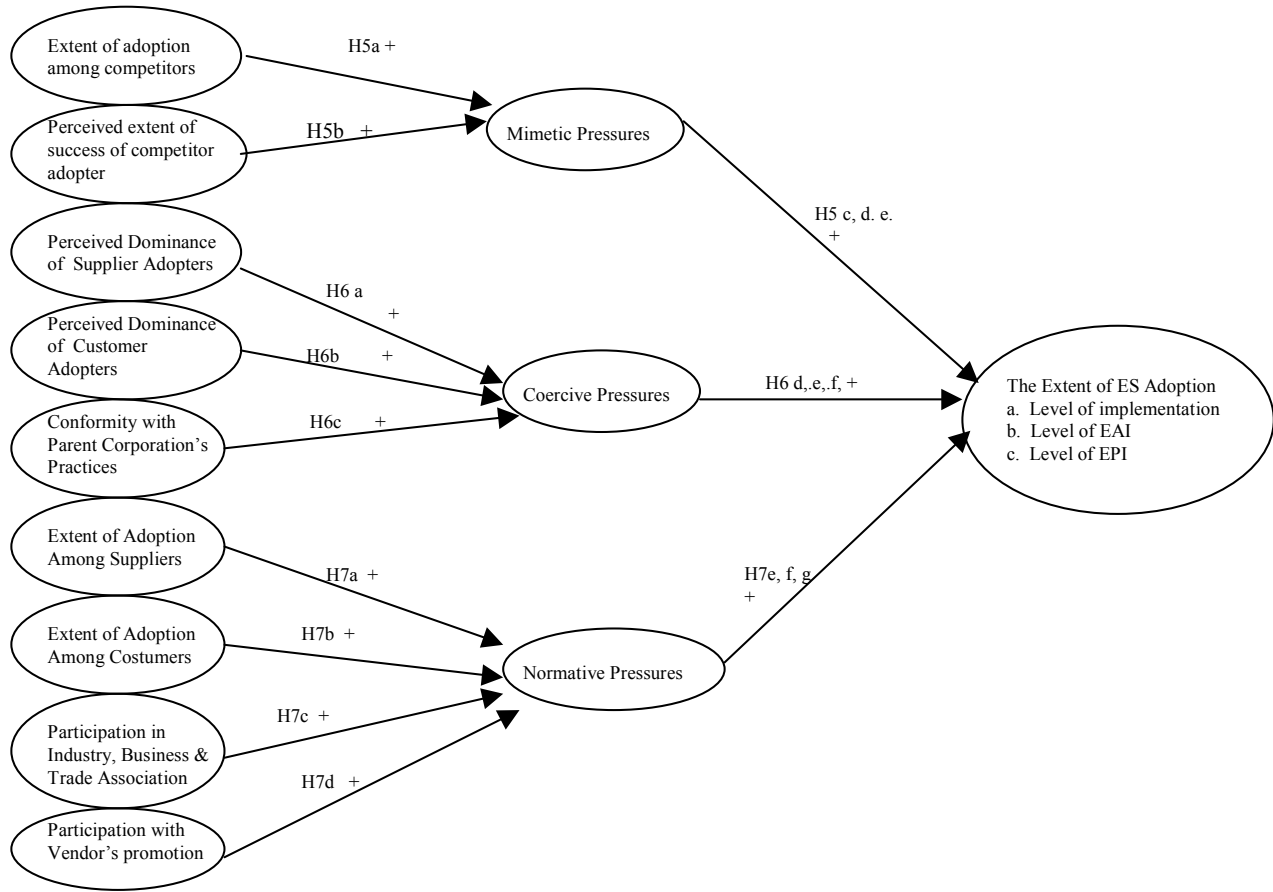


Figure 2. Institutional Theory Model

Mimetic Pressures

Organizations tend to copy actions of other organizations, especially competitors (Burns and Wholey 1993). Organizations may also seek to acquire status by imitating higher-status organizations (Fombrun and Shanley 1990). Therefore, when competitors and successful players in the industry adopt ES, an organization may experience increasing mimetic pressures. Hence,

H5a: The extent of adoption of ES among the focal firm’s competitors is positively related to mimetic pressures.

H5b: The size and extent of success of competitors that have adopted ES is positively related to mimetic pressures.

Mimetic pressures arise in response to uncertainty. Organizations may decide that the best response is to mimic a peer or competitor to avoid first-mover risks (Lieberman and Montgomery 1988). With large and complex information systems like ES, potential adopters may monitor their environment closely and model themselves after similar organizations that have adopted ES. Hence, we hypothesize:

- H5: The mimetic pressures that the focal company perceives are positively related to the extent*
- c. implementation.*
 - d. enterprise application integration.*
 - e. enterprise process integration.*

Coercive Pressures

Coercive pressures are defined as formal or informal pressures from other organization on which the focal organization is dependent (DiMaggio and Powell 1983). Coercive pressures stem mainly from dominant suppliers, dominant customers and the parent corporation (Teo et al. 2003). When an organization's dominant business partners (supplier, customer, or parent) adopt ES, it would receive higher pressure from the dominant adopter.

H6a: The perceived dominance of the focal company's suppliers that have adopted ES is positively related to coercive pressures.

H6b: The perceived dominance of the focal company's customers that have adopted ES is positively related to coercive pressures.

H6c: The adoption of ES by the parent is positively related to coercive pressures.

When the dominant organizations adopt certain ES solutions, the dependent organizations may be required to implement ES to maintain the exchange relationship. The dependent organization may also be required to use ES to integrate internal and external business processes parallel to the level its dominant partner. The greater the coercive pressures exerted by the dominant actors, the more likely the focal company will implement and integrate ES. Hence, we hypothesize:

H6: The coercive pressures that the focal company perceives are positively related to the level of
d. implementation.
e. enterprise application integration.
f. enterprise process integration.

Normative Pressures

DiMaggio and Powell (1983) argued that normative isomorphism arises from professionalization that provides shared definitions of problems and common repertoires for managing problems to which decision-makers often turn to in business and professional circles. These standards of behavior are disseminated by key institutions such as trade associations and professional associations that offer forums for norm formulation (King et al 1994). Hence, the more an organization engages in these normative institutes, the higher the normative pressure it will feel. Thus, we hypothesize:

H7a: The extent of adoption of ES among the focal company's suppliers is positively related to normative pressures.

H7b: The extent of adoption of ES among the focal company's customers is positively related to normative pressures.

H7c: The extent of participation in associations that promotes and disseminates information on ES is positively related to normative pressures.

H7d: The extent of participation with vendors that promotes and disseminates information on ES is positively related to normative pressures.

Normative pressures arise as a result of social learning within an inter-organizational network (Kraatz 1998). When a focal company's suppliers and customers implement certain combinations of ES solutions, the organization faces increasing normative pressures that lead to the isomorphic ES implementation. The focal organization may also experience normative pressures when it participates in normative institutions and adopt the level of ES implementation suggested by the institutions. We expect that the same isomorphic adoption would take place for the level of ES impact on integration. Thus,

H7: The normative pressures that the focal company perceives are positively related to the level of
e. implementation.
f. enterprise application integration.
g. enterprise process integration.

Hybrid Model and Hypotheses

While both TCE and institutional approaches make important explanatory contributions in their own right, they focus on different domains of organizational action. However, the pursuit of each individual theory alone may not provide a complete accounting of the motivation or context underlying these organizational decisions. It is suggested that an integrative model that includes TCE and institutional theory would greatly enhance the explanatory power for the phenomena in question (Robert and Greenwood 1997). Since ES are large and complicated information systems, we anticipate that applying a multiple theoretic approach would yield a better understanding of ES adoption. Hence, we argue

H8: An integrative model including TCE and institutional perspectives would have more explanatory power than either one of them alone.

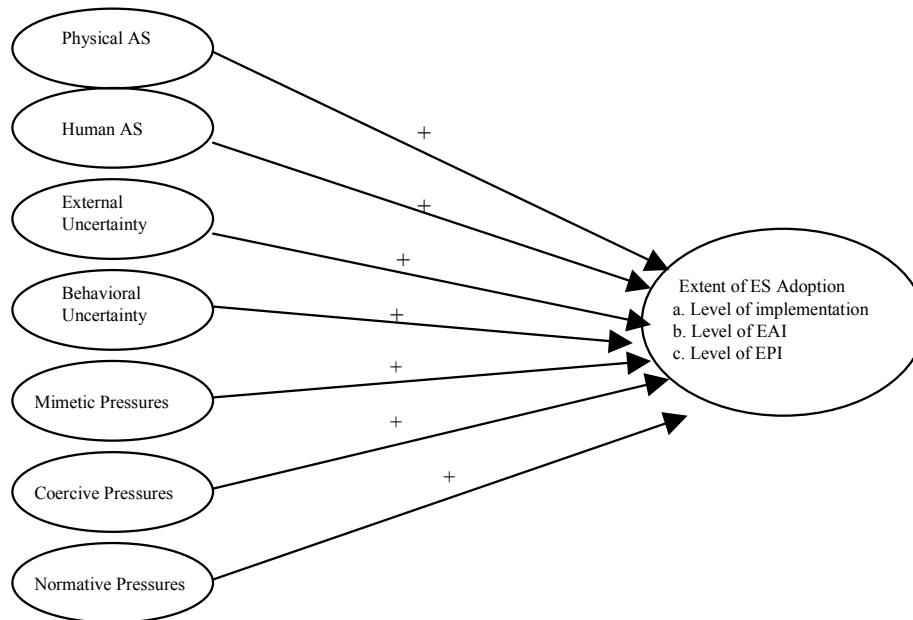


Figure 3. Hybrid Model

The Impact of TCE and Institutional Theory at Stages of Diffusion Process

This study will also examine if early and late adopters have different reasons for ES adoption. Research has suggested that organizations adopting innovation in the early stage do so to satisfy unique needs while late adopters tend to be influenced more by institutional forces (Tolbert and Zucker 1983). Thus, we argue that

H9a: In the early stage of ES diffusion process, TCE theory will have greater explanatory power than institutional theory.

H9b: In later stages of the ES diffusion process, institutional theory will have greater explanatory power than TCE theory.

Research Methodology

A survey instrument will be used to assess the constructs and test the proposed hypotheses. The items for measuring TCE variables, institutional variables, and level of EPI are adapted from existing scales. Data will be collected through surveys from firms that have adopted ES. The Compact Disclosure database will be used to collect organizations that have adopted ES using ES related key word, such as ERP, CRM, and vendors names, such as SAP, Baan, etc. Then the survey will be sent to the adopting

organizations. Given the investment magnitude and strategic significance of ES, senior executives such as CEO, CIO, or ES project managers who are most knowledgeable of the extent of ES implementation and integration will be targeted.

Regression models will be employed to estimate the relationship of the TCE variables and ES adoption variables. Structure equation modeling technique will be applied to estimate overall model fit and to compare the different models. To estimate if the two theories have different impacts during the overall diffusion process, firms in the sample will be asked to identify the time of their ES implementation and integration relative to the other organizations in their industry based on a classification scheme that categorizes innovation adopters into five groups: innovators, early adopters, early majority, late majority, and laggards (Roger 1985). Logistic regression models will be used to test this hypothesis (Neter et al. 1996).

Conclusion

This paper will have several academic implications. First, this study will contribute to the nascent empirical literature examining organizational decisions on ES adoption. Second, by reconciling two seemingly conflicting theories, this study will enhance our understanding on how social-based pressures and rational-based reasoning shape organizational decisions toward the extent of adopting complex IT such as ES. Decisions to adopt ES are business process benchmarking to seek and model the best-in-class practices. Thus, this paper offers practical implication for senior managers who are looking for ways for business process benchmarking by identifying external influential sources in and/or outside the industry. This paper will also help ES vendors targeting organizations that could influence potential adopters and facilitate ES diffusion.

Future research will also extend this study by examining the extent to which our research approach can predict the adoption of large and complicated information systems in other contexts. Furthermore, the models in this study will also open an avenue exploring the reason for the rise and fall of fads (IT trends) occurring in the IS field.

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