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THE INFLUENCE OF TOP MANAGEMENT TEAM CHARACTERISTICS ON THE CONTRIBUTION OF ENTERPRISE INFORMATION SYSTEMS TO LONG-TERM FIRM PERFORMANCE
(Dissertation proposal)

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Abstract

The proposal examines the long-term financial impact of Enterprise Systems (ES) on firm performance and the role of top management on this impact. A unique methodology based on recent accounting research is proposed to measure the contribution of ES to long-term financial performance. The proposal borrows from strategic management literature to examine the relationship between such contribution and TMT characteristics. Upper echelons theory argues that the organization is a reflection of its top management, so top management exerts an important influence on organizational outcomes. ES usually brings important changes not only in business processes, but also in organizational culture and distribution of power within the organization. Based on these arguments, the proposal makes the case that the power balance in the TMT and TMT demographic heterogeneity significantly contributes to ES outcomes that in turn influence long-term business performance.

Keywords
Contribution of Enterprise Systems to Financial Performance, Accounting Fundamentals, Top Management Team (TMT) characteristics, TMT Power Balance

Introduction

Enterprise system (ES) technology is considered to be the most important corporate information technology (IT) innovation (Davenport 1998). Adopting and implementing an ES implies high levels of investment and organizational commitment. Unlike many other information technologies, ES technology impacts the organization as a whole. It has the potential to enhance not only operations across business units, but also managerial decision making and organizational strategy. Therefore, the role of top management in an ES deployment is important (Davenport 2000; Nah et al. 2006).

Although ES deployment has many potential benefits, the organizational costs and risks associated with it are considerably high. ES deployment implies changes in business practices and organizational culture (Davenport 2000). The organizational assimilation of ES is idiosyncratic and complex. It is a dynamic process characterized by intense interactions among users from different business units, IT personnel, line managers, top management, and IT vendors. User resistance (Lapointe et al. 2005) and knowledge barriers (Fichman et al. 1999) are important factors that influence the level of IT assimilation. Sources of user resistance are the changes in business practices and the potential of the IT system to shift the balance of power across business units and employees (Markus 1983). Researchers and practitioners often stress that top management plays an important role in successful ES implementations (Nah et al. 2006). However, very little is known about how the top management team (TMT) can influence ES implementation and post-implementation outcomes, and what profile of TMT is more likely to have a positive impact on the final contribution of the ES to business performance. The TMT is an important stakeholder that might be able to lessen user resistance and lower knowledge barriers by making relevant decisions related to resource allocation, policies, incentives, and organizational structure.
Identification of gaps in the literature, research questions and research model

The great number of ES implementation failures and negative impacts of ES on business performance are not consistent with the rapid diffusion of ES across industries. Case studies and cross-sectional studies have produced mixed results about the impact of ES on business value. Researchers have documented both negative and positive impacts of ES on business performance and operations (Hitt et al. 2002; Poston et al. 2001). Results of cross-sectional studies in ES business value have recently shown some positive results overall (e.g. Hitt et al. 2002; Nicolaou 2004; Ranganathan et al. 2006), but results are not conclusive. In addition, the lack of robust methodologies to measure the ES impact on business value casts some doubts about these results.

Also, although it has been extensively documented that top management support is one of the most important critical success factors of ES implementations (Al-Mashari et al. 2003; Nah et al. 2006), there is no known research that has empirically examined whether top management has an influence on the contribution of ES to business performance. In addition, there is little theoretical development about the mechanisms through which the TMT can influence the ES contribution to business performance. Furthermore, there is no study that has investigated what types of top management team (TMT) are more likely to have a positive influence on the ES contribution to long-term financial performance.

Leading researchers in IS have pointed out the difficulty in measuring performance effects of IT innovations in organizations and have called for more sophisticated and creative methods beyond the self-reported perceptual measures and pure accounting measures of revenue or profits (Sambamurthy 2001). By having a robust method to measure the contribution of enterprise systems to firm performance, researchers will be able to examine relevant environmental, organizational and technological factors that might be systematically associated with such contribution.

This study aims to respond to the following research questions: a) Does ES have a positive overall impact on business value? b) Does the TMT have a role in the ES contribution to long-term firm performance? What TMT characteristics are associated with the ES contribution to performance?

Based on these research questions, the purpose of this study is three fold. First, this study examines the contribution of ES on long-term financial performance. Second, a theoretical model is developed to understand how the TMT influences intermediate processes that in turn affect organizational performance. Third, the relationship between TMT characteristics and the ES contribution to financial performance is examined.

The research model is based on three theoretical perspectives: the Upper Echelons (Hambrick et al. 1984), power research from the strategic management literature (Finkelstein 1992), and the meta-structuration perspective of information technology (Orlikowski et al. 1995; Sharma et al. 2003). This study argues that certain TMT/CEO characteristics are proxies of cognitive base characteristics of TMT/CEO that influence the decision making related to important ES outcomes, which ultimately influence the final contribution of ES to firm performance. The research model is the following:

![Theoretical Model](image-url)
Hypothesis development

The magnitude and duration of ES influence on business value differs from that of other types of IT. According to options perspective of IT, innovative information technologies are considered as digital options that enable effective organizational agility needed to implement competitive actions that in turn improve firm performance in the long run (Fichman 2004; Sambamurthy et al. 2003). Organizational agility refers to the ability to identify and seize opportunities for innovation in order to improve operational performance, customer service and supplier relationships (Sambamurthy et al. 2003).

Enterprise systems can be considered as digital options since they provide the technological infrastructure that allows the incorporation and constant adaptation of both new technological changes and business process changes (Fichman 2004). ES can enhance organizational agility by streamlining the supply chain and support activities, and providing technological flexibility. First generation types of enterprise systems such as ERP facilitate the adoption of second generation types of enterprise systems such as supply chain management (SCM), customer relationship management (CRM), e-commerce, and knowledge management systems (KMS).

Recent empirical studies suggest that the benefits of an ES can be seen only after two to three years post implementation. Therefore, it is expected that on average, firms that implement enterprise systems significantly improve their operational firm performance in the long run. The digital option lens and the recent findings of ES business value research suggest the following hypothesis:

**H1: The contribution of ES implementation on long-term financial performance is positive**

Adopting the IT strategic role conceptualization from Schein (1992), Chatterjee (2001) classified industries according to three IT strategic roles: 1) automate, 2) informate-up-and-down, and 3) transformative. Industries with dominant automate IT role usually replace expensive human labor with information technology; informate-up-and-down industries usually provide information to empower employees and give more control to management; transformative industries radically change traditional ways of doing business by redesigning business processes, structures and relationships. IT business value research has found that firms that belong to industries with a transformative IT strategic role experience higher IT business value (Dehning et al. 2003).

The contribution of ES to financial performance might also vary according to the type of strategic IT role in the industry. Firms that belong to industries where IT plays a more transformative role might experience higher levels of ES business value than those firms that belong to industries where IT does not play a transformative role. Since ES has the potential to transform business processes, those firms that emphasize this technological capability as a source of competitive advantage might experience higher ES payoffs. Therefore, the following hypothesis is stated:

**H2: Firms that belong to industries with dominant transformative IT role experience a significantly higher contribution of ES on long-term financial performance than firms that belong to industries with dominant automate or informate IT role.**

Based on the structuration of technology proposed by Orlikowsky et al. (1991), employees shape the way they use and appropriate an IT system based on the institutional context. The institutional context is defined by the organization structure, organization reward system, and control and coordination mechanisms. This perspective argues that senior management shapes the institutional context through metastructuration actions such as instituting new structures, new performance systems, and new coordination mechanisms (Sharma et al. 2003). Looking at the ES implementation process in more detail, the following figure illustrates how the TMT might influence both ES outcomes and long-term financial performance:

![Figure 2. Illustration of the mechanism through which TMT influences ES contribution to firm performance](image_url)
In an ES context, the TMT can directly or indirectly influence employee behavior related to the assimilation process. The TMT can directly influence the ES assimilation by extending the ES to different locations and business units. The TMT can also influence the ES assimilation indirectly by changing the institutional context, such as establishing new performance incentives/sanctions, allocating resources (e.g. training and technical support), and establishing new coordination mechanisms to improve the link between business units and the IT department. The TMT can also influence the redesign of business processes by identifying innovative ways to use the ES along with other technologies or firm resources.

Upper echelons research, power research and the small amount of IS research pertaining to the impact of TMT characteristics on IT implementation outcomes suggest basically three types of TMT factors that might be related to the ES contribution to performance: CEO/TMT power, TMT demographics, and TMT IT expertise. More specifically, it is argued that young TMTs with a powerful CEO, considerable IT expertise, diverse functional backgrounds, and a homogeneous distribution of power are likely to make effective decisions related to ES outcomes that in turn positively influence the ES contribution to firm performance. Based on this logic, theory and previous literature, the following hypotheses are stated:

**H3:** Firms with younger TMT members experience a significantly higher ES contribution to long-term financial performance than firms with older TMT members

**H4:** TMT power heterogeneity is negatively associated with the ES contribution to long-term financial performance

**H5:** For firms in industries with dominant IT strategic role, CEO power is positively associated with the ES contribution to long-term financial performance

**H6:** The ES contribution to long-term financial performance is significantly higher for firms with a CIO compared with firms without a CIO included in the TMT

**H7:** CIO Power is positively associated with the ES contribution to long-term financial performance

Consistent with the previous theoretical perspectives and the research model, the following are stated in the form of propositions:

**P1:** TMT functional background heterogeneity is positively associated with the ES contribution to long-term financial performance

**P2:** The association between TMT functional background heterogeneity and the ES contribution to long-term financial performance is higher in firms with low TMT power heterogeneity than in firms with high TMT power heterogeneity

**P3:** The level of TMT IT expertise is positively associated with the ES contribution to long-term financial performance

**P4:** The relationship between TMT IT expertise and the ES contribution to long-term financial performance will be higher for those firms with low TMT power heterogeneity than in firms with high TMT power heterogeneity

**P5:** The relationship between TMT IT expertise and the ES contribution to long-term financial performance will be higher for those firms that belong to industries with a transformative IT role compared with firms that belong to informate or automate IT role.

**Research design**

Public firms that have implemented an ES between 1994 and 2001 (treatment firms) will be identified through media announcements. Financial data of treatment and matching firms will be used in a prediction model to measure the ES contribution to financial performance. Publicly available data about the top five executives of each ES implementation will be used to measure the TMT constructs. Statistical t-tests will be used to examine whether the overall ES contribution to financial performance is significantly greater than zero and whether this contribution is higher for firms that belong to industries where IT is considered to be more strategic. Then, a multiple regression model using lagged cross-sectional data with repeated measures will be used to test the relationships between TMT characteristics and the ES contribution to financial performance.

The prediction model uses accounting fundamentals adopted from Piotroski (2000) as predictors of future performance. Piotroski’s (2000) F-score integrates accounting fundamentals that track annual changes in profitability, financial leverage and inventory turnover. The F-score conveys information about the firm potential to experience abnormal positive returns in the future. For each ES implementer, a sub-sample of control firms from the same industry and similar size will be used in the prediction model to estimate the abnormal future performance attributed to the ES.

**Testing the hypotheses related to TMT characteristics**

A lagged cross-sectional design with repeated measures will be used. This research design is consistent with previous Upper Echelons research. Each treatment firm will have two lagged-type observations, one related to the early effects of TMT, and other related to a late effect. For each firm, the early observation will have the independent variables (IVs) at $t$, and an average of the dependent variable (DV) at $t+2$ and $t+3$. The late effect observation will have the IVs at $t+2$, and an average of the DV at $t+4$ and $t+5$. Previous Upper Echelon research (e.g. Carpenter et al. 2001; Finkelstein 1992) has
used a time lag around two or three years between the measures of independent and dependent variables. In the context of ES, the effect of TMT decisions might not be immediate and might be reflected in performance in two to three years. For example, if a TMT decides to expand the functionality of the ES by acquiring an extra ES module, this might take between one to two years to integrate the module into the existing ES, and another year to start observing firm performance effects. There are several types of TMT decisions with different time lags, but for this study it is assumed that, on average, the effect of TMT decisions will become apparent in a two years period.

To test the hypotheses, multiple OLS regression with fixed effects will be used to control for unobserved firm differences. Compared to the Generalized Least Squares (GLS) random-effects regression, OLS fixed-effects is considered a more conservative test and has been used in Upper Echelon research (Carpenter et al. 2001). OLS fixed-effects model is equivalent to adding a dummy variable for each firm in the sample, and controls for unobserved time-invariant effects of each firm. In the context of ES, each firm might have different but consistent characteristics over time related to IT infrastructure and IT human capital. The regression models used to test the hypotheses are the following:

\[ \text{ESContribution}_{(i,t+3)} = \beta_0 + \beta_1 \times \text{Age}_{(i,t)} + \beta_2 \times \text{TMTPower}_{(i,t)} + \beta_3 \times \text{CEOPower}_{(i,t)} + \beta_4 \times \text{CIOpower}_{(i,t)} + \beta_5 \times \text{TRoleDummy}_{(i,t)} + \sum_{j=1..5} \beta_j \times \text{ContrlVar}_{(i,t,j)} + \varepsilon_{(i,t)} \]  

\[ \text{ESContribution}_{(i,t+5)} = \beta_{10} + \beta_{11} \times \text{Age}_{(i,t)} + \beta_{12} \times \text{TMTPower}_{(i,t)} + \beta_{13} \times \text{CEOPower}_{(i,t)} + \beta_{14} \times \text{CIOpower}_{(i,t)} + \beta_{15} \times \text{TRoleDummy}_{(i,t)} + \sum_{j=16..20} \beta_j \times \text{ContrlVar}_{(i,t,j)} + \varepsilon_{(i,t)} \]  

Where:

- \( t = \{ \text{went-live year, went-live year+2} \} \). For each firm \( i \), two observations are used: one at the event year (early effects), and another at event year+2 (late effects).

- \( \text{ESContribution}_{(i,t+3)} \) = Average of ES contribution to long-term financial performance of firm \( i \) at \( t+2 \) and \( t+3 \).
- \( \text{Age}_{(i,t)} \) = TMT average age of firm at year \( t \)
- \( \text{TMT Power}_{(i,t)} \) = TMT Power of firm \( i \) at year \( t \)
- \( \text{CEOPower}_{(i,t)} \) = CEO power of firm \( i \) at year \( t \)
- \( \text{TRoleDummy}_{(i,t)} \) = Dummy for the dominant IT strategic role (1=transformative; 0 otherwise) of firm \( i \) at year \( t \)
- \( \text{ContrlVar}_{(i,t,j)} \) = Control variables of firm \( i \) at year \( t \): natural log of firm size \( j=1 \), CEO turnover \( j=2 \), vendor \( j=3 \), ES type \( j=4 \), and number of ES modules \( j=5 \)

It is very likely that the number of firms with CIO is very small. Out of the 22,200 firms in the ExecuComp database, only 798, 3.6%, have a CIO reported in the list of top five executives. Because of the low expected occurrence of CIOs, the hypothesis related to CIO power will be tested separately using only the sub-sample of firms with CIO. Then, CIOpower will be added as another independent variable to Equation (2) to test this hypothesis.

\[ \text{ESContribution}_{(i,t+3)} = \beta_{10} + \beta_{11} \times \text{Age}_{(i,t)} + \beta_{12} \times \text{TMTPower}_{(i,t)} + \beta_{13} \times \text{CEOPower}_{(i,t)} + \beta_{14} \times \text{CIOpower}_{(i,t)} + \beta_{15} \times \text{TRoleDummy}_{(i,t)} + \sum_{j=16..20} \beta_j \times \text{ContrlVar}_{(i,t,j)} + \varepsilon_{(i,t)} \]  

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