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ASSESSING DRIVERS OF E-BUSINESS VALUE: RESULTS OF A CROSS-COUNTRY STUDY

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Abstract

This study seeks to better understand the factors that contribute to value creation of e-business. Grounded in the technology-organization-environment (TOE) framework, we developed a research model for assessing the value of e-business at the firm level. Based on this framework, we formulated six hypotheses and identified six factors (technology integration, firm size, firm scope, financial resources, competition intensity, and regulatory environment) that may affect value creation of e-business. Survey data of 612 firms across 10 countries in the financial services industry were collected and used to test the theoretical model. To examine how e-business value is influenced by national environments, we compared two subsamples from developed and developing countries. Structural equation modeling demonstrated several key findings: (1) Within the TOE framework, technology integration emerges as the strongest factor for e-business value, while financial resources, firm scope, and regulatory environment also significantly contribute to e-business value. (2) Firm size is negatively related to e-business value, suggesting that structural inertia associated with large firms tends to retard e-business value. (3) Competitive pressure often drives firms to adopt e-business, but e-business value originates more from internal organizational resources (e.g., technological integration) than from external pressure. (4) Government regulation plays a much more important role in developing countries than in developed countries. These findings indicate the usefulness of the TOE framework and our research model for studying e-business value.

Keywords: Electronic business, IT investment, business value, firm performance, global diffusion, international perspective, IT in financial services industry

Introduction

Electronic business (e-business, defined as business activities conducted over the Internet) has been one of the most remarkable information technology (IT) innovations in the last decade. Firms such as Dell, Wal-Mart, Charles Schwab, and Capital One have achieved tangible improvements in operational efficiency and customer intimacy by integrating e-business into their business

models (Clemons and Hitt 2001). At the same time, many firms, concerned about falling behind on the technology curve, engage in e-commerce initiatives without deriving any business value (Barua and Mukhopadhyay 2000). Puzzled by the mixed evidence, researchers and practitioners are struggling to determine whether e-business delivers a value proposition reflected in firm performance, and, if so, what factors contribute to e-business value. However, such issues have not been well studied in the literature. In particular, what is missing in the existing literature is: (1) a solid theoretical framework for identifying factors that shape e-business value; (2) a research model for studying the relationships of these factors to e-business value; and (3) empirical assessments based on a broad dataset instead of a few isolated cases (Zhu 2003a).

Our study seeks to reduce these gaps. Key research questions that motivated our work are: (1) What theory can be used to study e-business value? (2) What factors can be identified within this theoretical framework? (3) How would the patterns of e-business value creation vary across different economic or organizational environments (e.g., developed vs. developing countries)? To better understand these issues, we developed a conceptual model incorporating six factors for assessing e-business value based on the technology-organization-environment framework (Tornatzky and Fleischer 1990). We then tested this model using survey data from 612 firms in the financial services industry from 10 countries (both developed and developing ones). The data analysis was performed by structural equation modeling. The results identified significant factors shaping e-business value in general, but demonstrated varying patterns across different economic environments.

The following section reviews the relevant literature from which the technology-organization-environment framework was developed. A conceptual model and a series of research hypotheses are then formulated, followed by research methodology, analysis, and results. The paper concludes with a discussion of research findings, limitations, and implications.

Theoretical Foundations

Although showing recent signs of advancement, the e-business literature is still fragmented. A major reason is the lack of an overarching framework to unify various factors affecting organizational usage of e-business. In response to this problem, we reviewed the e-business literature, as well as prior studies of IT implementation and general innovation adoption. After carefully reviewing the literature, we found that the *technology-organization-environment* (TOE) framework developed by Tornatzky and Fleischer (1990) is comprehensive and can serve as a theoretical guideline for studying factors shaping the value of e-business.

The TOE framework identifies three aspects of a firm's context that influence the process by which it adopts and implements a technological innovation: technological context, organizational context, and environmental context. *Technological context* describes both the internal and external technologies relevant to the firm. These include existing technologies inside the firm, as well as the pool of available technologies in the market. *Organizational context* is defined in terms of several descriptive measures: firm size and scope; the centralization, formalization, and complexity of its managerial structure; the quality of its human resources; and the amount of slack resources available internally. *Environmental context* is the arena in which a firm conducts its business—its industry, competitors, access to resources supplied by others, and dealings with government (Tornatzky and Fleischer 1990, pp. 152-154). These three groups of contextual factors influence a firm's intent to adopt an innovation, and affect its assimilation process and eventually its impacts on organizational performance. This is consistent with the technology diffusion theory of Rogers (1983).

The TOE framework has been examined by a number of empirical studies in various IS domains. Iacovou et al. (1995) developed a model formulating three aspects of EDI usage—*technological* factors, *organizational* factors, and *environmental* factors—as the main factors affecting the adoption and impact of EDI, and examined the model using seven case studies. Ramamurthy et al. (1999) posited the impact of EDI on firm performance as the consequence of technological factors (compatibility of EDI with existing infrastructure), organizational factors (internal management support and EDI resources), and environmental factors (customer expertise and competitive pressure). Their empirical results, based on 83 firms in the U.S. trucking industry, indicated that these factors significantly influenced firms' operational performance (measuring EDI impact).

These studies provided consistent empirical support for the TOE framework, although specific factors identified within the three contexts may vary across different studies. Drawing upon the empirical evidence combined with the literature review and theoretical perspectives, we adopted this framework and extended it to the e-business area, since e-business is enabled by technology development (Kauffman and Walden 2001), requires organizational enablers and may entail necessary business and organization reconfiguration (Chatterjee et al. 2002), and may shape (and be shaped by) the strategic environment (Kowtha and Choon 2001; Kraemer et al. 2002).

Our literature review, on the other hand, reveals that the existing literature, particularly the e-business literature, is mainly focused on TOE contexts affecting adoption, the first stage in technology assimilation in organizations. Yet, subsequent processes—assimilating the technology into the organization and realizing its business value—have not been studied in depth. Seeking to fill this gap, we developed a research model built upon the TOE framework to examine the technological, organizational, and environmental factors that may affect e-business value at the firm level.

The Research Model and Hypotheses

Based on the TOE framework, a research model incorporating six TOE factors shaping e-business value has been developed. Three dimensions of e-business value (its impact on firm performance) are incorporated: impact on commerce, impact on internal efficiency, and impact on coordination. These three dimensions are consistent with the value chain analysis of Porter (1985), which has been broadly used in the IS literature to study the business value of information technology (e.g., Mahmood and Soon 1991; Tallon et al. 2000). Our study seeks to extend these notions to the e-business environment, as e-business may have certain impacts on value chain processes—downstream commerce with customers, internal operations, and upstream coordination with suppliers and business partners (Clemons and Hitt 2001; Mukhopadhyay et al. 1995; Zhu 2003a). These prior studies motivated us to theorize e-business value on these three dimensions along the value chain. Next, we hypothesize how six TOE factors may affect e-business value.

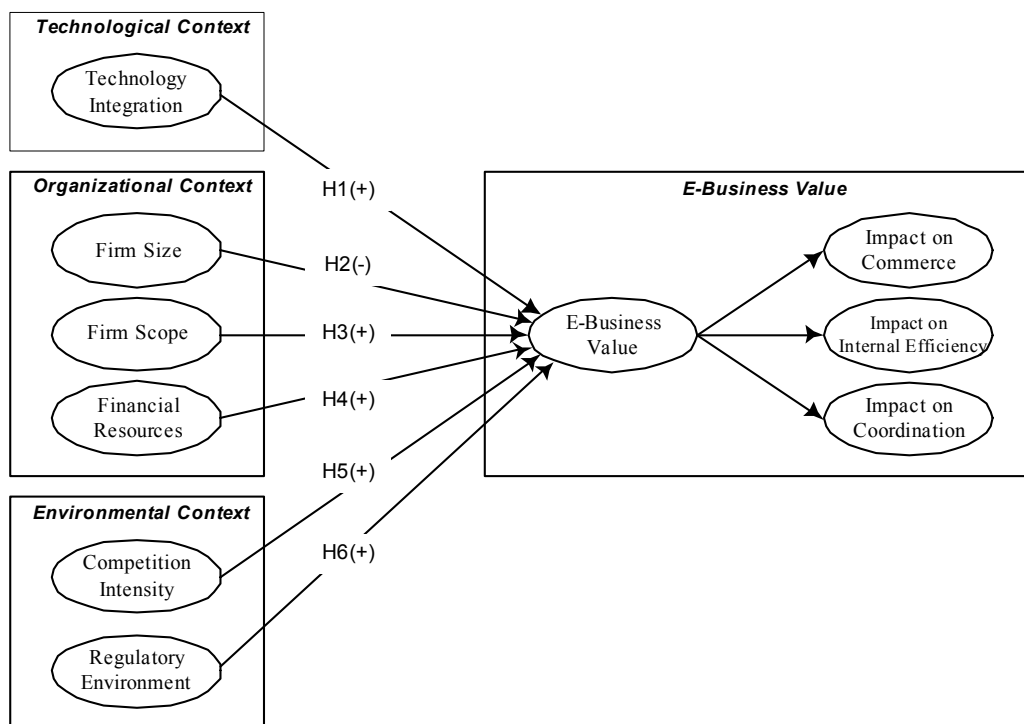


Figure 1. A Research Model for E-Business Value Based on the TOE Framework

Technological Context

Prior research has demonstrated that a complementary infrastructure is necessary to leverage and integrate the new technologies being adopted (Davern and Kauffman 2000; Weill and Broadbent 1998). The potential for value creation resides in firms' ability to effectively convert the Internet technologies into technological capabilities (Zhu et al. 2003). At the front end, customer-facing Website functionalities help firms provide real-time information to consumers, update product and pricing offerings, and facilitate self-service via online account management and research tools, thereby improving customer services and expanding revenue sources. At the back end, the connectivity and open-standard data exchange of the Internet potentially reduce incompatibility of

the legacy information systems and achieve data integration among various databases so as to provide integrated accounts for customers (Zhu 2003a). This is often called the *single customer view* in the financial services industry. Given the information-intensive nature of the financial services industry, it is particularly critical for firms to pursue information integration at the back end, thereby unleashing the hidden value of disparate information sources (Clemons and Hitt 2001; Sato et al. 2001).

Therefore, we conceptualize technology integration to consist of three dimensions: (1) technology infrastructure, (2) Website functionality, and (3) back-end integration. The first dimension offers the necessary infrastructure on which e-business, both front end and back end, can be built, and the second and third dimensions help to convert technologies into capabilities. By incorporating these three dimensions, our conceptualization extends the traditional notion of technology in the TOE framework, and leads to the following hypothesis:

H1: Technology integration is positively associated with e-business value.

Organizational Context

Firm size is one of the most commonly studied factors in the innovation literature (for a meta-analysis, see Damanpour 1992). Yet, different opinions exist as to the role that firm size plays in the process of innovation implementation. On one hand, large firms often possess more slack resources that can facilitate innovation implementation—so-called resource advantages (Schumpeter 1950). On the other hand, large firms tend to be less agile than small firms. The greater structural inertia associated with large firms may entail more effort and cost for innovation implementation (Duncan 1976). Also, as Tornatzky and Fleischer (1990, pp. 162) pointed out, size may be little more than a proxy for more meaningful underlying dimensions such as resources. Since our model has controlled for key organizational resources (technological and financial, see Figure 1), the notion of structural inertia leads us to hypothesize that large firm size may retard e-business value creation.

H2: Firm size is negatively associated with e-business value.

Firm scope is another commonly studied organizational factor in the IS literature (e.g., Dewan et al. 1998). Firm scope is defined as the horizontal extent of a firm's operations. The role of firm scope in shaping e-business value can be explained from a transaction cost perspective (Wigand 1997). In general, companies may face a steep rise in transaction costs when they expand into heterogeneous market segments (Gurbaxani and Whang 1991; Teece 1980). As documented in the literature, e-business may help reduce transaction costs, including direct costs such as search costs, communication costs, and contractual costs (Garicano and Kaplan 2001; Malone et al. 1987), and indirect costs such as the costs of adverse selection, moral hazard, and hold-up (Amit and Zott 2001). In sum, firms with greater scope would face higher transaction costs, and thereby may realize more value from e-business, because e-business helps to reduce transaction costs. Also, firms involved in a greater variety of activities are likely to find a given technology applicable to a range of operations (Tornatzky and Fleischer 1990), and thus will be likely to realize greater value from adoption. These theoretical assertions lead to the following hypothesis:

H3: Firm scope is positively associated with e-business value.

Prior research has shown that financial resources are an important factor for technology implementation (Ramamurthy et al. 1999). Adopting e-business requires investment in hardware, software, system integration, and employee training. It may also require hiring people with specialized skills such as Web design that few financial institutions would have in-house, and that were quite rare and costly until recently. Sufficient financial resources help firms to obtain these necessary resources and develop superior e-business functionalities, so as to realize the potential e-business value. Hence, we have the following hypothesis:

H4: Financial resources are positively associated with e-business value.

Environmental Context

Competitive intensity refers to the degree that the company is affected by competitors within the market (Zhu 2003b). Porter and Millar (1985) analyzed the strategic rationale underlying the relationship between competition intensity and IS innovations. They suggested that by adopting IS, firms might be able to alter the relative positions in competition, affect the industry structure, and leverage new ways to outperform rivals. Therefore, firms facing a greater degree of competition tend to attribute more value to

IS innovations. We apply this argument to the Internet domain, and hypothesize a positive association between competition intensity and e-business value, as follows:

H5: Competition intensity is positively associated with e-business value.

Within the TOE framework, the *regulatory environment* has been recognized as a critical environmental factor affecting innovation diffusion (Kraemer et al. 2002). Governments could facilitate e-business usage by utilizing supportive business and tax laws and regulating the Internet to make it a trustworthy business platform, e.g., dealing with fraud and credit card misuse (UNCTAD 2002). Given that financial transactions often involve very sensitive information, an adequate regulatory and institutional framework is deemed more critical for the financial services industry than for others (Sato et al. 2001). Thus, we form the following hypothesis.

H6: A supportive regulatory environment is positively associated with e-business value.

Research Methodology

Data and Sample

To test the conceptual model in Figure 1 and the associated hypotheses proposed above, we designed a questionnaire and conducted a multicountry survey. The survey questionnaire was designed on the basis of a comprehensive literature review and interviews of managers, and was refined via several runs of pretests and revisions. The survey was conducted at the establishment level (physical location or site). To have a broad representation of both developed and developing economies, the survey was conducted in 10 countries (Brazil, China, Denmark, France, Germany, Japan, Mexico, Singapore, Taiwan, and the United States)¹ during the period of February through April 2002. The sampling was a stratified random sample by size, with sites selected randomly within each size cell. The sample frame was obtained from a list source representative of the entire local market. Thus, we believe that our sample reflects the status of e-business development across developed and developing economies.

Our final dataset contains 612 financial firms.² Distribution of firm size measured by employee number reflects a balance of large and small businesses. Most respondents are CIOs, CEOs, and IS managers or directors, which suggests a good quality data source. We examined nonresponse bias and no statistically significant differences were found in terms of revenue and firm size.

All of the firms in the sample belong to the financial services industry. This industry has long been recognized as an information-intensive sector that exists at the forefront of IT applications (Clemons and Weber 1990). Statistics published by the Bureau of Economic Analysis (BEA 1995) show that IT investment per employee was about \$5,000 in the financial services industry in 1994, much higher than in other major industries such as manufacturing, retail, and transportation.³ Firms in this industry on average spent 8 percent of their revenues on IT (including e-business), compared to 2 percent in retail and 3 percent in manufacturing (*Information Week* 2002). These facts make the financial services industry an appropriate testing field for our research model.

¹Strictly speaking, our sample contains nine countries, because China and Taiwan are one country (the Taiwan island is a part of China). We initially believed that there might be some differences in their IT infrastructure and economic environments, yet the differences turned out to be statistically insignificant.

²After we received the dataset, which contained 695 responses, we checked for consistency and excluded 83 outliers based on sales, employee number, and financial resources. This resulted in the final sample of 612 observations. All of them belong to SIC 60-65 (i.e., banking, securities, credit institutions, insurance, and real estate).

³In these industries, IT investment per employee ranged from \$500 to \$2,000 (BEA 1995).

Operationalization of Constructs

E-Business Value

Consistent with the theoretical arguments made earlier, we operationalize *e-business value* as a second-order construct manifested in three related dimensions: impact on *commerce* (e.g., increasing sales and improving customer services), impact on *internal efficiency* (e.g., increasing employee productivity and making internal processes more efficient), and impact on *coordination* (e.g., reducing transaction costs with business partners and improving coordination with business partners or suppliers). Figure 2 shows the second-order construct of e-business value, as well as its first-order constructs and indicators.

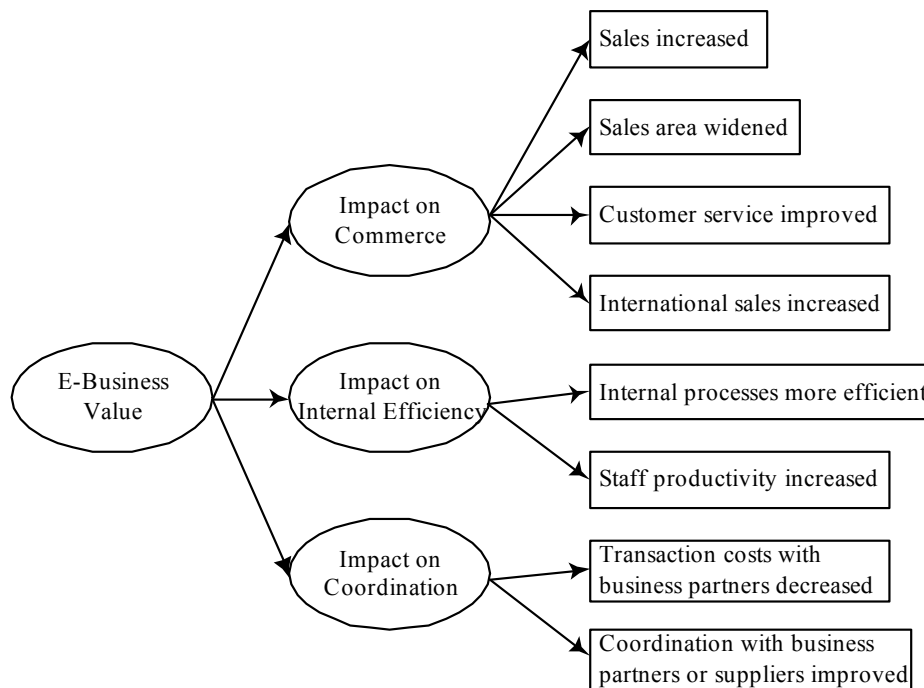


Figure 2. A Specification of E-Business Value Along the Value Chain

The TOE Factors

Based on the conceptualization in the theoretical section, we examined *technology integration* along three dimensions: (1) basic e-business-related technology infrastructure such as intranet, extranet, EDI, and EFT; (2) Website functionality at the front end, including online services and account management; and (3) the extent to which various information sources and databases in the back office are connected, within and beyond a firm's boundary. These items were designed on the basis of the e-commerce metrics proposed and tested by Zhu and Kraemer (2002). *Firm size* is measured by the number of employees in the entire organization, log-transformed to reduce data variance (Raymond 1990). *Firm scope* in our study mainly measures geographic scope (e.g., multiple establishments and business activities in other countries), which prior research has shown to be a significant factor for studying e-business usage (Zhu et al. 2003). *Financial resources* are measured by the budget for IT and Web applications as percentages of total revenue (Mahmood and Mann 1993). *Competition intensity* is measured by the degree to which firms' businesses were affected by local, nationwide, and worldwide competitors, reflecting the rivalry in the market (Thong 1999). For the *regulatory environment*, we investigated whether the government has established supportive regulations, for instance, legal protection for consumers' Internet purchases and business and tax laws supporting e-business. Items for this construct were designed based on a previous e-business study examining national environment and policies (Kraemer et al. 2002).

Instrument Validation

To empirically assess the constructs theorized above, we conducted a confirmatory factor analysis by fitting our measurement model using AMOS 4.0. The results are shown in Table 1. All standardized factor loadings are significant ($p < 0.01$), thus suggesting convergent validity (Bagozzi et al. 1991). To evaluate construct reliability, we calculated composite reliability for each construct. Most constructs have a composite reliability over the cutoff of 0.70 as suggested by Hair et al. (1998), while three constructs have a composite reliability close to this cutoff as shown in Table 1. To assess the discriminant validity—the extent to which different constructs diverge from one another—we used the empirical criteria suggested by Bagozzi et al. (1991): testing whether the correlations between any two constructs are significantly different from unity. This test can be performed by comparing an unconstrained measurement model that “freely” estimates the correlation between two constructs of interest with a constrained model with that correlation fixed as unity. To satisfy discriminant validity, the χ^2 between these two models should be significantly different (Stewart and Segars 2002). In all paired comparisons, we found that the χ^2 difference was highly significant ($p < 0.001$), suggesting that constructs in our measurement model are distinct in nature.

Table 1. Measurement Model: Factor Loadings and Reliability

Constructs	Number of Indicators	Range of Standardized Factor Loadings [†]	Composite Reliability
Technology Integration	3	0.51 – 0.73	0.67
Firm Scope	3	0.38 – 0.77	0.65
Financial Resources	2	0.81 – 0.87	0.82
Competition Intensity	3	0.62 – 0.91	0.75
Regulatory Environment	4	0.33 – 0.80	0.65
Impact on Commerce	2	0.58 – 0.79	0.79
Impact on Internal Efficiency	4	0.79 – 0.83	0.80
Impact on Coordination	3	0.73 – 0.78	0.73

[†]All factor loadings are significant at $p < 0.01$ level.

Table 2 shows the estimation of the second-order construct, e-business value. Its structure is illustrated in Figure 2. The paths from the second-order construct to the three first-order factors are significant and of high magnitude, greater than the suggested cutoff of 0.7 (Chin 1998). Marsh and Hocevar (1985) suggested that the efficacy of the second-order model be assessed by the target coefficient (T ratio) with an upper bound of 1. Our model has a very high T ratio of 0.98, implying that the relationship among first-order constructs is sufficiently captured by the second-order construct (Stewart and Segars 2002). Therefore, on both theoretical and empirical grounds, the conceptualization of e-business value as a higher-order, multidimensional construct seems justified. Thus, constructs in our measurement satisfies various reliability and validity criteria, and could be used to test the conceptual model and the associated hypotheses proposed earlier.

Table 2. Measurement Model: Second-Order Construct of E-Business Value

Second-Order Construct	First-Order Constructs	Factor Loadings	t-stat	Composite Reliability	Target Coefficient (T ratio)
E-Business Value	Impact on Commerce	0.89 ^a	--	0.87	0.98
	Impact on Internal Efficiency	0.76***	11.73		
	Impact on Coordination	0.85***	12.94		

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$; ^a loadings are specified as fixed to make the model identified.

Empirical Analysis

Analysis of the Full Sample

We tested the research model shown in Figure 1 by structural equation modeling (SEM). Standardized paths and various model-fit indices are shown in Table 3. We used the following criteria to assess model fit: normed χ^2 less than 5 (Anderson 1987), incremental fit indices (NFI, RFI, IFI, TLI, and CFI) greater than 0.9 (Hair et al. 1998), and RMSEA less than 0.08 (Browne and Cudeck 1993). By these criteria, we have verified that our model has a good fit with the empirical data. In addition, the dependent variable, e-business value, has a significant R^2 of 58 percent, meaning that 58 percent of the variance can be explained by the six factors. Thus, we believe that the six TOE factors have significantly explained data variations for e-business value and its underlying dimensions.

Technology integration, firm scope, financial resources, and regulatory environment have positive and significant paths ($p < 0.01$ for technology integration and regulatory environment; $p < 0.05$ for firm scope and financial resources) leading to e-business value. Firm size has a significant but negative path (-0.27 , $p < 0.01$) leading to e-business value. The path from competition intensity to e-business value is insignificant. Thus, all hypotheses, except H5, are supported. Implications of these results will be discussed soon.

Table 3. SEM: Standardized Paths and Model Fit Indices

	Full Sample (N = 612)	Developed Countries (N = 329)	Developing Countries & NICs (N = 283)
Standardized Paths			
Technology Integration	0.55***	0.72***	0.38***
Firm Size	-0.27***	-0.30**	<i>ns</i>
Firm Scope	0.22**	<i>ns</i>	<i>ns</i>
Financial Resource	0.18**	0.21**	0.33*
Competition Intensity	<i>ns</i>	<i>ns</i>	<i>ns</i>
Regulatory Environment	0.32***	<i>ns</i>	0.22***
R ²	58%	64%	48%
Model Fit Indices			
Normed χ^2	3.38	2.29	2.34
NFI, RFI, IFI, TLI, CFI	0.96–0.98	0.94–0.98	0.95–0.98
RMSEA	0.058	0.056	0.069

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$; $ns = p \geq 0.10$.

Sample Split: Developed vs. Developing Countries

Given that the Internet is a global technology and e-business is an international phenomenon, we believe it is important to add an international dimension to the study of e-business value. Within the environmental context of the TOE framework, we wanted to understand the differences of e-business value across countries, as each country has its own unique national environment for e-business. A national environment embeds many environmental factors (e.g., economic, legal, cultural, business, and consumer markets). Several environmentally imposed obstacles that managers face in implementing IT in less-developed countries were identified, including a scarcity of managerial, technical, and financial resources at the firm level (Dasgupta et al. 1999); the inadequacy of basic infrastructure at the national level (Dewan and Kraemer 2000; UNCTAD 2002); and other institutional factors such as culture and politics (Jarvenpaa and Leidner 1998). Such theoretical and empirical evidence motivated us to investigate how different economic environments shape e-business value.

Our survey covered developing countries, newly industrialized countries (NICs), and developed countries, which enabled us to examine the role of national environment in e-business value. We split the full sample into two subsamples: (1) developing countries and NICs (Brazil, China, Mexico, Singapore, and Taiwan), $N = 283$; and (2) developed countries (Denmark, France, Germany, Japan, and the United States), $N = 329$. We then ran structural equation modeling on each subsample separately (the results are reported in Table 3). Again, our model on each subsample has good model fit as evaluated by normed χ^2 , incremental

fit indices, and RMSEA, and the R^2 is deemed significant (R^2 for e-business value is 64 percent in the developed-country subsample and 48 percent in the developing-country subsample).

In the developed-country subsample, three of the six TOE factors were found to be significant (technology integration, firm size, and financial resources). Thus, only H1, H2, and H4 are supported. Firm scope and regulatory environment, which were significant in the full sample, turned out to be insignificant ($p > 0.10$). Competition intensity remains insignificant.

In the developing-country subsample, three of the six TOE factors were found to be significant (technology integration, financial resources, and regulatory environment), while firm size, firm scope, and competition intensity are insignificant ($p > 0.10$). It is surprising that firm scope, which is a significant factor in the full sample, becomes insignificant in each subsample, and that competition intensity is statistically insignificant in all samples.

Discussion

Major Findings and Interpretations

Finding 1: *Within the TOE framework, technology integration emerges as the strongest factor for e-business value, while financial resources, firm scope, and regulatory environment also significantly contribute to e-business value.*

As shown by the full-sample results in Table 3, four factors within the TOE framework—technology integration, firm scope, financial resources, and regulatory environment—are significant facilitators for e-business value. These empirical results, combined with good model fit and sufficient data variance explained, indicate that the TOE research model in Figure 1 is appropriate and useful for explaining factors shaping e-business value.

Finding 2: *Large firms are less likely to realize the impact of e-business on their performance than small firms, which seems to suggest that structural inertia associated with large firms retard e-business value creation.*

Prior studies show that firm size is positively linked to technology adoption (Kowtha and Choon 2001; Thong 1999). However, the significant but negative path suggests that firm size has a negative effect on e-business value. This seems to suggest that firm size influences adoption and impact differently. Value creation of e-business demands tighter integration of a firm's IT infrastructure and requires transformation in a firm's business processes and organizational structure. Large firms tend to have fragmented IT legacy systems built over a long period of time, which is often further complicated by complex business processes, entrenched organizational structure, and slow, hierarchical decision making. These factors translate into structural inertia, which tends to slow down the transformation of large firms and in turn retards value realization by e-business.

Finding 3: *Competitive pressure often drives firms to adopt e-business, but e-business value originates more from internal capabilities (technological integration and organizational resources) than from external pressure.*

Previous literature has shown that competitive pressure is an important factor driving firms to adopt a new technology in order to avoid competitive decline (Iacovou et al. 1995). It is even more so in the e-business domain as many firms jump onto the Internet bandwagon driven by competitive pressure (Kowtha and Choon 2001). Yet, it is somewhat surprising to see that competition intensity turns out to be an insignificant factor in all of our samples (the full sample and the two subsamples). The extent to which e-business actually improves firm performance tends to be less tied to competition intensity. This seems to suggest that, as firms move into deeper stages of e-business transformation, the key factors shift from monetary spending to organizational capabilities (especially technology integration, which helps to leverage existing information systems and databases). This finding demonstrates the changing role of competitive pressure in the two stages of e-business transformation: adoption and value realization. In addition, it may be that competitive pressure forces firms to adopt e-business just to keep up, but limits their ability to capture the benefits of adoption. This has been the case in the financial sector in the past; for instance, the deployment of ATMs was a boon to customers, but banks were not necessarily able to create any competitive advantage from their adoption.

Finding 4: *The importance of firm size and regulatory environment differs across developed vs. developing countries. In developing countries, resource advantages associated with large firms tend to be offset by their structural inertia, and government regulation plays a more significant role than in developed countries.*

This result might be explained as follows. First, in developed countries, firm size has been shown to retard e-business value, reflecting the negative effect of structural inertia associated with large firms. This negative effect of structural inertia, in contrast, seems to be neutralized by the resource advantages associated with large firms in developing countries. Large firms tend to enjoy a more pronounced advantage than small firms in developing countries where the playing field seems to be less even than in developed countries (UNCTAD 2002). Thus, in developing countries, the two effects of firm size—structural inertial and resource advantages—seem to cancel out, thus making an insignificant path from firm size to e-business value.

Second, regulatory environment is a significant factor in developing countries, but not in developed countries. Such differences could be explained by the distinct market environments of developed and developing countries. Markets in most developing countries are characterized by information asymmetry and immature institutional structure (Dewan and Kraemer 2000). Thus, government regulation (e.g., providing a reliable legal environment with enforceable contracts and consumer protection) tends to play a greater role in developing countries. Together, these findings demonstrate the significant role that economic environments play in shaping e-business value. They further confirm the usefulness of the TOE framework for assessing e-business value.

Limitations and Future Research

We believe that the key limitations of this study are as follows. First, because our dataset is cross-sectional in nature, we can only show associations, not causality, and we cannot analyze longitudinal processes, such as the evolution of e-business functionalities and their business value in a dynamic context. Second, this study focuses on one industry, the financial services industry. While concentrating on one industry allows us to control for extraneous industry factors that could confound the analysis, we do not know whether these results would carry over to other industries, although the systematic nature of our investigation adds to our belief that the framework can be extended to other industry settings. Accordingly, one future research direction is to expand our study into other industry sectors (e.g., retail and manufacturing). More importantly, e-business is a dynamic capability (Zhu et al. 2003) that requires firms to build and then dynamically reconfigure in order to align with changing technology and business environments. To investigate the dynamic nature of e-business adoption and impact, we plan to enhance the database over time to pave the way for a longitudinal study.

We hope this study offers implications for other researchers as well. First, our study advanced the theoretical basis of the TOE framework and demonstrated the usefulness of this framework for identifying factors affecting e-business value. This framework could be used by other researchers for studying IS impact in the Internet domain (such as Web services and wireless mobile commerce). Second, we have developed several multi-item constructs, including technology integration and e-business value. These instruments have passed various reliability and validity tests, and they could be used in future studies. Third, grounded in theory and empirical data, we demonstrated varying relationships between the TOE factors and e-business value in different economic environments. These associations, found in our large-scale survey, might be useful for other researchers to develop their own models and hypotheses.

Managerial Implications

These results have several important implications for management. First, they offer a useful framework for managers to assess the *technological* conditions under which e-business is launched to better pursue business value. Our study sheds light on ways to achieve such conversions (customer-facing Web functionalities at the front end and tight integration at the back end). Second, managers need to assess the appropriateness of e-business to certain *organizational* characteristics (e.g., firm size and firm scope) as suggested by our empirical findings. This implies that the potential value of e-business investment could be affected by structural differences. This implication should be of special interest for firms seeking geographic expansion and product diversification (e.g., banking, trading, loan, mortgage, and credit cards). Such diversification means that firms would face greater coordination tasks, and could leverage e-business initiatives to facilitate coordination and achieve resource integration. Third, many firms jump onto the Internet bandwagon driven by *environmental* factors such as competitive pressure. Yet, our results show that e-business value originates more from internal organizational resources and technological capability than from external pressure. Thus, firms need to put more priority on building organizational capabilities to realize e-business value. On the other hand, government regulations still play an important role for e-business value creation, especially in developing countries.

Concluding Remarks

Based on data collected from a multicountry survey, this study has developed and empirically tested a theoretical model for assessing the impacts of technological, organizational, and environmental factors on e-business value at the firm level. Through structural equation modeling, our study has identified factors shaping e-business value in general, and shown that economic environment may shape the pattern of e-business value realization. In addition, the empirical results highlight the importance of technological integration. Linking this to the ongoing debate over sources of value-creation of e-business, our results provide empirical evidence that points to innovative front-end functionality and tight back-end integration as such sources. This seems to be a promising area for future research.

Unlike most of the studies in the literature, our data were not limited to a single country. The broad dataset of 612 firms from 10 countries allowed us to examine how economic environments influence the impact of e-business on firm performance. Because the sample included developed, developing, and newly industrialized countries, the generalizability of our model and findings is strengthened. As far as we are aware, this is the first time that such a rich database has been assembled for assessing factors affecting e-business value. We see this research as but a first step toward understanding the complex relationships among information technology, business environments, and organizational performance. We hope that these initial results will stimulate others to engage in more research in this important area.

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