



MEASUREMENT MODEL FOR ASSESSING THE DIFFUSION OF E-BUSINESS AT VOJVODINA

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Abstract

The conceptual model shows how the use of e-business impacts firm performance. Drawing on the value hierarchy we posit that e-business leverage the unique characteristics of the Internet to improve business performance. We investigate e-business functionalities that make use of these unique characteristics and consequently enable e-business value creation.

E-business is also influenced by organizational factors because these variables may constrain or facilitate the implementation and usage of e-business. Based on prior innovation studies, size scope, and financial commitment are identified as three critical organizational factors that would influence the extent of e-business use in an organization: (1) Firm size, (2) International scope, (3) Financial resources.

Grounded in the innovation diffusion literature and the resource-based theory, this study will theoretically develop and empirically evaluate an integrative research model incorporating technological, organizational, and environmental factors, for assessing e-business use and value at the firm level.

Key Words: e-economy, firm performance, structural equation modeling, e-business value, resource-based theory

Topic Groups: Organizational information and communication systems, Business strategy, Industry, are or region specific studies

INTRODUCTION

Skepticism about the value of e-business and information technology (IT) has been renewed recently, in part due to the gap between substantial firm spending on IT-particularly on Internet-related technologies-and the widespread perception about the lack of value of value from e-business.

Today more than ever, IS research face strong pressure to answer the question of whether and how e-business investments create business value. Although innovation diffusion represents a complex process, much of the existing research has focused on the adoption decision and on measures such as "intent to adopt" and "adopting versus nonadoption" (Fichman 2000). We need to view e-business diffusion as a multistage process that starts at adoption and extends to usage and value creation.

There is a lack of empirical evidence to gauge e-business usage and its impact on firm performance, partly because of the difficulty of developing measures and collecting data. A related issue is the lack of theory to guide empirical research. Although showing recent signs of advancement, the linkage between theory and measures is still weak in the e-business literature. Clearly, there is a need for a theoretically rigorous and empirically relevant framework for examining the use and value of e-business in organizations.

Prior research argued that theories developed in the context of mature markets and industrialized economics need to be reexamined in the context of developing countries, because these countries may have very different economic and regulatory environments challenges the presumption of conceptual equivalence across cultural and economic barriers in management science research. We believe it is important to investigate whether innovation theories can be generalized and empirical findings are applicable in different economic contexts. To achieve this, we study e-business experience of organizations in developed and developing countries that might represent different stages of e-business transformation, for results in Vojvodina.

The gaps in the literature limit our understanding of the process of e-business innovation and consequently of e-business value. Key research questions that motivated our work are: (1) What framework can be used as a theoretical basis for studying e-business use and value? (2) Within this theoretical framework, what factors can be identified as key antecedents of e-business use and value? (3) How would these factors vary across different economic environments like Vojvodina?

To better understand these issues, we developed a conceptual model for e-business use based on the technology-organization-environment (TOE) framework (Tornatzky and Fleischer 1990). We also analyzed e-business value creation, from a resource-based perspective, that stems from the unique characteristics of the Internet.

THEORETICAL FOUNDATIONS OF E-BUSINESS

Unlike the typical focus on adoption (or intent to adopt) as found in the literature, we focus on postadoption stages, that is, actual use of e-business and value creation from e-business; both are important stages in the process of conducting business over the Internet. These

issues are analyzed on the basis of two theoretical foundations: (1) the TOE framework and (2) the resource-based theory of the firm.

Different Kind of Framework for E-Business Use

A theoretical model for e-business use needs to take into account factors that affect the propensity to use e-business, which is rooted in the specific technological, organizational, and environmental circumstances of an organization. The TOE framework identifies three aspects of a firm's context that influence the process by which it adopts, implements, and uses technological innovations: (a) Technological context describes both the existing technologies in use and new technologies relevant to the firm. (b) Organizational context refers to descriptive measures about the organization such as scope, size, and the amount of slack resources available internally. (c) Environmental context is the arena in which a firm conduct its business-its industry, competitors, and dealings with government.

There are three types of innovations: Type I innovations are technical innovations restricted to the IS functional tasks (such as relational databases, CASE); Type II innovations apply IS to support administrative tasks of the business (such as financial, accounting, and payroll systems); and Type III innovations integrate IS with the core business where the whole business is potentially affected and the innovation may have strategic relevance to the firm. We consider e-business a Type III innovation, in the sense that e-business is often embedded in a firm's core business processes (e.g., making use of the open standard of the Internet protocol to streamline information sharing among various functional departments); e-business can extend basic business products and services (e.g., leveraging Internet-enabled two-way connectivity to offer real-time customer service); and e-business can streamline the integration with suppliers and customers.

E-business is a new Type III innovation and warrants investigation along with these innovations. In particular, the migration toward the Internet and the transformation of traditional processes require firms and their subunits to orchestrate the coevolutionary changes to their technologies in use, business processes, and value chain structures to successfully assimilate the Internet technologies into their e-business initiatives.

The TOE framework is appropriate for studying e-business usage. Based on the TOE framework, the use of e-business in organizations will be influenced by three types of antecedents: technological factors, organizational factors, and environmental factors.

The Internet is characterized by open standard (versus proprietary standard), public network (versus private network), and broad connectivity (back end and front end). These characteristics may have very different impacts on customer reach and richness of information. The global reach of the Internet enables cost-efficient means of reaching out to new markets, attracting new customers, and delivering products and services, as well as improving coordination with suppliers and business partners.

E-Business Value and the Resource-Based Theory

The resource based view (RBV) provides a theoretical basis for linking e-business use and value. Rooted in the strategic management literature, the RBV of the firm posits that firms create value by combining heterogeneous resources that are economically valuable, difficult to imitate, or imperfectly mobile across firms.

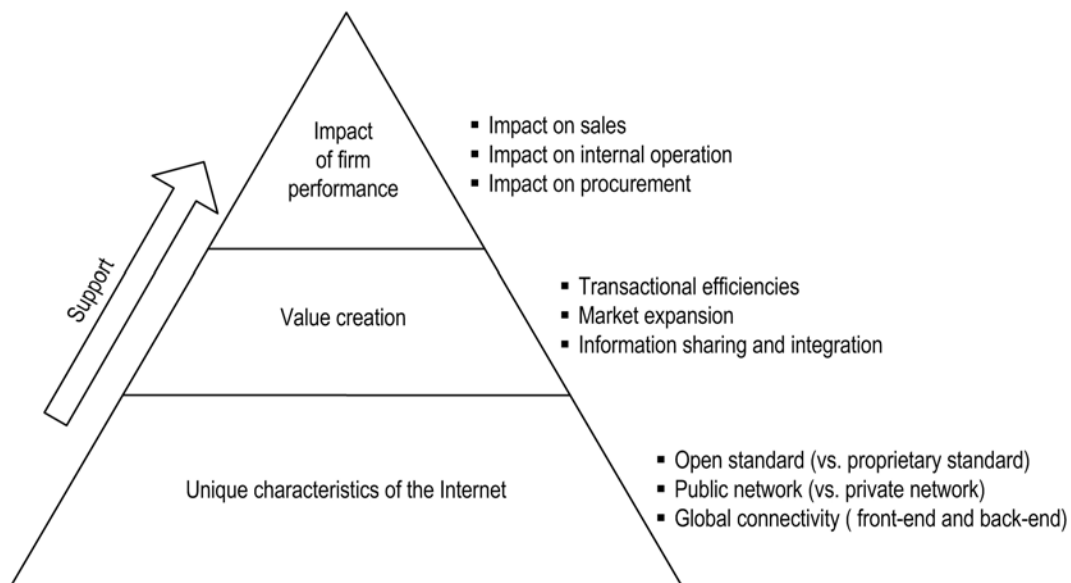
The value hierarchy depicts the unique characteristics of the Internet and how these characteristics enable value creation via e-business. In contrast to e-business, less

connectivity, and a private network configuration – creates business value mainly through improving transactional efficiencies and reducing costs in procurement (Figure 1).

We examined the unique characteristics of the Internet and linked them in three ways through which e-business may create value-transactional efficiencies, market expansion, and information sharing. Combining them with the RBV, we developed an e-business value hierarchy, as shown in Figure 1.

Open-standard information exchange can result in a more synchronized information flow will make materials move efficiently along the supply chain, thereby reducing the bullwhip effect.

Figure 1: E-Business Value Hierarchy: From Internet Characteristics to Value Creation



Such e-business value may lead to improved firm performance in sales, procurement, and internal operations, as shown in the top layer of the value hierarchy in Figure 1.

THE CONCEPTUAL MODEL AND BASIC ELEMENTS FOR DIFFUSION OF E-BUSINESS

The Conceptual Model

Integrating the TOE framework and the resource-based theory, we developed a conceptual model to assess the use and value of e-business by organizations. The key elements of the model and postulated relationships focuses on two postadoption stages: use and value. The Internet is being adopted quickly by firms in both developed and developing countries, but there are differences in Internet adoption between these countries. The extent of technology diffusion depends on a variety of economic, social, and political factors, including basic information infrastructure; regulatory environment; and access to technical, managerial, and financial resources. Therefore, we expect that there will be systematic differences between countries and also among firms in the actual use of e-business and related value creation. We will use our model to examine these differences.

The focus on postadoption is also motivated by the process-oriented view about the use and value creation of IT innovations. According to the process-oriented view, merely examining

the initial adoption or the dollars invested in IT cannot reveal the reach and richness of postadoption activities, because a multistage process exists before the business value of IT can be realized. Thus, we incorporate these two important stages in one unified model. We could have just used adoption and postadoption.

E-business use is defined as the extent to which e-business is being used to conduct value chain activities. This is measured by the breadth of use for different value chain activities and the depth of use (percentage) for each activity that has been migrated to the Internet platform.

E-business value refers to the impact of e-business use on firm performance, which is measured by three major activities along the value chain: downstream sales (i.e., increasing sales and improving customer services), upstream procurement (i.e., reducing inventory and procurement costs and improving coordination with suppliers), and internal operations (i.e., increasing employee productivity and making internal processes more efficient).

The right-hand side of the conceptual model shows how the use of e-business impacts firm performance. Drawing on the value hierarchy in Figure 1, we posit that e-business leverage the unique characteristics of the Internet to improve business performance. These characteristics (open standard, public network, and global connectivity) are examined from a functional perspective. That is, we investigate e-business functionalities that make use of these unique characteristics and consequently enable e-business value creation. We classify these e-business functionalities into two types: front-end functionalities that provide product information to consumers on the Internet, facilitate transaction processing, and enable customization and personalization; and back-end integration that links Web applications with back-office databases and facilitates information sharing along the value chain. Together with usage, these two IT-enhanced capabilities will contribute to e-business value.

The left-hand side of the conceptual model shows the antecedents of e-business use. As discussed earlier, the extent of e-business use by an organization would be influenced by its technological, organizational, and environmental contexts within the TOE framework.

On the basis of a thorough literature review, Kwon and Zmud (1987) asserted the importance of technology resources (e.g., infrastructure and technical skills) for successful IS diffusion. This theoretical assertion was strengthened by a number of empirical studies. Hence, we include technology competence in our model.

E-business is also influenced by organizational factors because these variables may constrain or facilitate the implementation and usage of e-business. Based on prior innovation studies, size scope, and financial commitment are identified as three critical organizational factors that would influence the extent of e-business use in an organization.

(1) Firm size is one of the most commonly cited factors in the innovation literature. As size represents several important aspects of the organization, including resource availability, decision agility, and prior technology experience, it should be included in the model.

(2) International scope is an antecedent new to this study, which refers to a firm's geographical spread or its extent of multicountry operations in the global market. Firms with activities dispersed geographically may benefit more from e-business use as a means of coordinating their value chains. The public, open nature of the Internet makes doing so easier than earlier technologies such as EDI. The global reach of the Internet makes it potentially more beneficial as well. As a consequence, firms with greater international scope are likely to use e-business to a greater extent than those with less international scope. Given the international dimension of our research design and our geographical, multicountry

emphasis on globalization of e-business, it is important to include international scope in the model.

(3) Financial resources have been a popular antecedent to IS diffusion. To capture financial resources specifically committed to e-business rather than the overall financial resources of the organization, we use the construct financial commitment and define it as the commitment of financial resources to e-business as a proportion of total firm resources. This is felt to be a more appropriate antecedent of e-business use because it reflects committed rather than merely available resources. It also reflects the strategic importance that the senior management puts on e-business. One would expect that greater resource commitments would lead to more e-business applications that are both more useable and used.

As the environment presents both constraints and opportunities for technological innovation, e-business is influenced by environmental factors related to competition and regulation. As explained above, we have selected these six antecedents based on prior research and particular linkages to the nature of Internet-based e-business. We incorporated these six factors within the technological, organizational, and environmental contexts of the TOE framework. Further justification for each of these factors is provided below, together with hypothesis development.

Basic Elements for Diffusion of E-Business

Based on the TOE framework, we developed the following basic elements, corresponding to the six factors in Figure 2 within the technological, organizational, and environmental contexts of the TOE framework.

Technology Context. The literature suggests that IS capabilities consist of infrastructure, human resources, and knowledge. Firms with a higher degree of technology competence tend to enjoy greater readiness to use e-business in their value chain processes. As a result, they would be more likely to achieve a greater extent of e-business usage. This leads to the following hypothesis.

H1. Firms with greater technology competence are more likely to achieve a greater extent of e-business use.

Organization Context. Firm size is commonly cited in innovation diffusion literature, yet different opinions exist as to the role that firm size plays in the process of innovation diffusion, due to the tension between resource availability and organizational inertia. On one hand, large firms generally possess slack resources that can facilitate implementation and usage. On the other hand, firm size is often associated with inertia; that is, large firms tend to be less agile and flexible than small firms. The possible structural inertia associated with large firms may slow down organizational usage and may therefore retard e-business value creation. Because our model has controlled for technological and financial resources that large firms may possess, the notion of structural inertia leads us to expect that large firm size may deter e-business usage and value creation. This leads to the following hypothesis.

H2. Controlling for resource availability effects, larger firms tend to achieve a lesser extent of e-business use.

Firms conducting business in multiple markets have to manage demand uncertainty in all segments simultaneously, which requires a high degree of integration, flexibility and responsiveness in their information systems, as well as the broader information infrastructure linking the firm with its customers, trading partners, and distributors. As documented in the literature and consistent with our value hierarchy in Figure 1, e-business

may help to create these capabilities within the firm and with its trading partners as a result of common standards, lower cost, and greater ease of implementation of Internet-based applications. In sum, retail companies that expand globally would have a greater incentive to use e-business to leverage their existing IT capabilities for a competitive advantage. This leads to the following hypothesis.

H3. Firms with greater international scope are more likely to achieve a greater extent of e-business use.

Financial resources constitute another important factor recognized in the innovation literature. In this study, we tailor this factor to financial resources specially committed to e-business. Implementing e-business requires investment in hardware, software, system integration, and employee training. Sufficient financial resources dedicated to e-business helps companies to obtain these necessary resources and develop them into superior e-business functionalities. Thus, firms with greater financial commitment are more likely to achieve successful e-business implementation and thus tend to achieve a greater extent of usage. Hence, we have the following hypothesis.

H4. Firms with greater financial commitment are more likely to achieve a greater extent of e-business use.

Environment Context. Competitive pressure refers to the degree of pressure that the company feels from competitors within the industry. The use of e-business may induce changes of industry structure through disintermediation and reintermediation, offer new means of competing and altering competition rules through lock-in, electronic integration, and brick-and-click synergy. Thus, competitive pressure plays a significant role in pushing firms toward using e-business.

H5. Firms facing higher competitive pressure are more likely to achieve a greater extent of e-business use.

Regulatory support is another critical environmental factor that tends to affect innovation diffusion. This concept is similar to government policy theorized to affect IT diffusion in Umanath and Campbell (1994) and empirically tested in Dasgupta et al. (1999). The latter found that companies operating in an environment where government policies are restrictive have low IT adoption.

H6. Firms facing higher regulatory support are more likely to achieve a greater extent of e-business use.

Linkage from E-Business Use to E-Business Value. We draw on the RBV to explain the connection between usage and value. RBV suggests that the greater the extent of IT use, the greater the likelihood that organizations will create IT capabilities that are rare, inimitable, valuable, and sustainable, thereby contributing to value creation (along with organizational compliments). Through deeper usage in organizations, IT creates asset specificity, which provides a competitive advantage. A classic model for general IS success developed by DeLone and McLean (1992) suggested that there tends to be a strong link between system use and system impact.

H7. Firms with greater e-business use are more likely to generate higher e-business value.

E-Business Value. The ultimate goal of using e-business is to improve the business performance of the organization. As shown in the value hierarchy of Figure 1, e-business helps companies develop appropriate functionalities to leverage the Internet's characteristics. E-business functionalities are categorized into two groups: front-end functionality and back-end integration. Back-end integration helps firms achieve technology integration and enables information sharing within the firm and along the value chain. Thus, one would expect that

superior front-end functionality and back-end integration help firms improve business performance. This leads to the following hypothesis.

H8. Greater e-business capabilities, including both front-end functionality and back-end integration, are positively associated with higher e-business value.

Although both have the potential to create e-business value, front-end functionality and back-end integration may vary in importance, as suggested by the resource-based theory. Front-end functionality is public and open on the Internet, and thus could be easily observed and imitated by competitors. As a result, front-end functionality could become commodity-like as more competitors adopt e-business. In comparison, the process of back-end integration is far more difficult to imitate, because its success requires quality complementary resources. In addition, the integration process is often tailored to a firm's strategic context and woven into the organization's fabric, which is not transparent to competitors. Therefore, we propose the following hypothesis.

H9. Back-end integration will have a stronger impact on e-business value than front-end functionality.

International Effects: Differences between Developed and Developing Countries. Given that the Internet is an open platform with global connectivity, we believe it is important to incorporate an international dimension in this study.

H10. The strength of the antecedents of e-business use and value will differ for developed and developing countries.

MEASUREMENT MODEL

The development of the measurement model included successive stages of theoretical modeling, statistical testing, and refinement (Straub 1989). Measurement items were developed on the basis of a comprehensive review of the literature as well as expert opinion. We then tested multi-indicator constructs using confirmatory factor analysis (CFA)¹. Based on the assessment of CFA, the measurement model was further refined and then fitted again.

Several constructs deserve further explanation. First, technology competence is instrumented not only by physical technologies, but also by IT human resources that possess the knowledge and skills to implement e-business. Such a design is consistent with the theoretical rationale discussed. Our study used the major items in the first three dimensions to instrument front-end functionality, and the fourth dimension corresponded to our back-end integration.

¹ For the purpose of testing the robustness of our measurement model, we also ran exploratory factor analysis on all indicators. Principal component analysis with equamax rotation yielded a consistent grouping with CFA.

Table 1: Measurement Model: Factor Loadings, Reliability, and Convergent Validity

| Measurement Model: Factor Loadings, Reliability, and Convergent Validity | | | |
|--|------------|----------|-------------------------------|
| Constructs (reliability) | Indicators | Loadings | Convergent validity (t-start) |
| Technology competence (0.81) | TC1 | 0.79*** | 46.76 |
| | TC2 | 0.79*** | 37.10 |
| | TC3 | 0.71*** | 24.90 |
| International scope (0.81) | FS1 | 0.64*** | 36.65 |
| | FS2 | 0.86*** | 160.80 |
| | FS3 | 0.78*** | 52.66 |
| Financial commitment to e-business (0.83) | FR1 | 0.86*** | 29.07 |
| | FR2 | 0.82*** | 15.84 |
| Competitive pressure (0.86) | CP1 | 0.87*** | 74.04 |
| | CP2 | 0.87*** | 73.89 |
| Regulatory support (0,80) | RE1 | 0.68*** | 21.30 |
| | RE2 | 0.69*** | 24.87 |
| | RE3 | 0.71*** | 22.91 |
| | RE4 | 0.74*** | 30.76 |
| Back-end integration (0.86) | BI1 | 0.87*** | 80.53 |
| | BI2 | 0.86*** | 79.54 |
| E-business use (0.78) | EU1 | 0.64*** | 18.44 |
| | EU2 | 0.50*** | 6.67 |
| | EU3 | 0.46*** | 4.85 |
| | EU4 | 0.83*** | 35.95 |
| | EU5 | 0.75*** | 13.55 |
| Front-end functionality (0.80) | FF1 | 0.63*** | 15.92 |
| | FF2 | 0.65*** | 25.76 |
| | FF3 | 0.67*** | 26.00 |
| | FF4 | 0.72*** | 24.31 |
| | FF5 | 0.68*** | 20.46 |
| Impact on sales (0.88) | IS1 | 0.86*** | 76.46 |
| | IS2 | 0.84*** | 51.62 |
| | IS3 | 0.81*** | 41.92 |
| Impact on internal operations (0.90) | II01 | 0.89*** | 81.85 |
| | II02 | 0.91*** | 123.42 |
| Impact on procurement (0.87) | IP1 | 0.85*** | 50.11 |
| | IP2 | 0.85*** | 74.50 |
| | IP3 | 0.79*** | 37.90 |

* p < 0.10; ** p < 0.05; *** p < 0.01. Insignificant factors are dropped (FS4 and FS5).

To empirically assess the constructs theorized above, we conducted CFA using structural equation modeling. We assessed construct reliability, convergent validity, discriminant validity, and validity of the second-order construct. The measurement properties are reported in Table 1.

(1) Construct Reliability: Construct reliability measures the degree to which items are free from random error and therefore yield consistent results. In our measurement model (Table

1), all constructs have a composite reliability over the cutoff of 0.70, as suggested by Straub (1989).

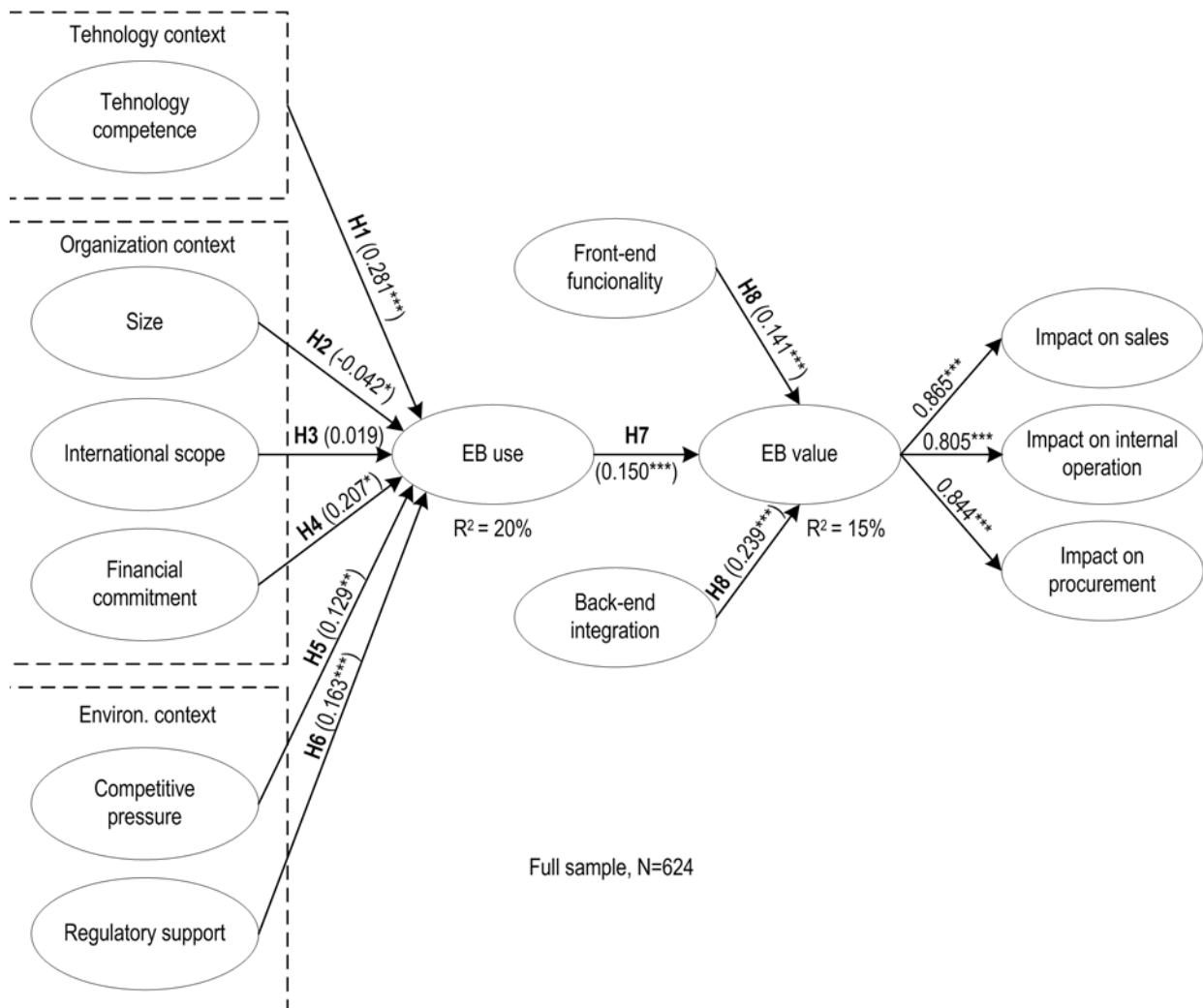
(2) Convergent Validity and Discriminant Validity: Convergent validity assesses the consistency across multiple operation. As shown in Table 1, all estimated standard loading are significant ($p < 0.01$), suggesting good convergent validity. To assess the discriminant validity-the extent to which different constructs diverge from one another-we used Fornell and Larcker's (1981) criteria: average variance extracted for each construct should be greater than the squared correlation between constructs.

Table 2: Measurement Model: Second-Order Construct

| Table 2 Measurement Model: Second-Order Construct | | | | |
|---|------------------------------|----------|--------|-----------------------|
| Second-order construct | First-order construct | Loading | t-stat | Composite reliability |
| E-business value | Impact on sales | 0.865*** | 77.68 | 0.88 |
| | Impact on internal operation | 0.805*** | 44.08 | |
| | Impact on procurement | 0.844*** | 55.52 | |
| * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ | | | | |

(3) Validity of the Second-Order Construct: Table 2 shows the estimation of the second-order construct, e-business value. 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. Our model has a very high T ratio of 0.99, implying that the relationship among first-order constructs is sufficiently captured by the second-order construct. Therefore, on both theoretical and empirical grounds, the conceptualization of e-business value as a higher-order, multidimensional construct seems justified. In summary, our measurement model satisfies various reliability and validity criteria. Thus, constructs developed by this measurement model could be used to test the conceptual model and the associated hypotheses proposed earlier. Empirical tests are on the Integrated Model of E-Business Use and Value (Figure 2).

Figure 2. An Integrated Model of E-Business Use and Value



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ANALYSIS AND INTERPRETATIONS

1. We tested the conceptual model in Figure 2 by structural equation modeling using both the full sample and the sample split between developed and developing countries. Although theory and prior research led us to expect differences, we did not know a priori that there would be differences between the full and split samples; therefore, we needed to do the analysis for both. It also enabled us to relate our finding to the broader IT literature.

The strong statistical power enhanced our confidence in the result of hypotheses testing, which is based on the examination of the standardized paths shown in Figure 2. For e-business use, five of six TOE factors-technology competence, size, financial commitment, competitive pressure, and regulatory support- have significant paths leading to the dependent construct. Size has a negative path, while the other factors have positive paths. The path associated with international scope is positive but statistically insignificant ($p > 0.10$).

E-business value is also shown to have significantly positive associations with front-end functionality and back-end integration. Hence, Hypothesis 8 is supported. To test hypothesis 9, we compared the standardized path from front-end functionality to e-business value with standardized path from back-end integration to e-business value. Back-end integration is found to have much higher magnitude than front-end functionality (0.239*** versus 0.141***). Thus, Hypothesis 9 is supported.

Within the TOE framework, technology competence, financial commitment, competitive pressure, and regulatory support are found to have significant influence on the extent of e-business use. Among these, technology competence appears to be strongest factor.

As indicated by their significant and positive paths in Figure 2, firms with higher levels of technology competence tend to achieve greater extent of e-business use, as do firms facing competitive pressure and regulatory support. Among all the TOE factors, technology competence is the most significant factor, as indicated by its path loadings and significance levels ($p < 0.01$), followed by regulatory support. Within the organizational context, our study reveals a negative effect of firm size on e-business use. While it has been commonly believed that large firms have more slack resources for committing required investments, our results show that large firms are also burdened by structural inertia, possibly due to fragmented legacy systems and entrenched organizational structures. Our model has controlled for technological and financial resources, and thus the net effect of firm size in our model might be dominated by structure inertia. These results suggest that the proposed research model in Figure 2 is a useful theoretical framework for explaining factors that affect the use of e-business by companies.

2. The linkage from e-business use to e-business value is found to be significant, suggesting that use would be a "missing link" if not included.

As theorized earlier, firms with higher e-business use-tend to achieve greater value from e-business use. Our results from both the full sample and the split sample consistently show a significant and positive linkage from e-business use to e-business value. This means that higher degrees of e-business use are associated with improved business performance. This also confirms the earlier postulation that actual use may be the "missing link" to IT payoff. This significant linkage also supports our research design, in which use and value are evaluated together in one model.

3. Both front-end functionality and back-end integration contribute to value creation of e-business.

Using a large dataset, our analysis has identified two ways in which e-business creates value-front-end functionality and back-end integration. This finding is supported by the significant and positive linkages from front-end functionality and back-end integration to e-business value. Front-end functionalities help firms provide timely information to customers, facilitate personalization and account management, expand existing channels, and improve transactional efficiencies; back-end integration enables technology integration within the organization and facilitates information sharing with suppliers and business partners. As a result, these two types of e-business capabilities help firms improve performance by

affecting intermediate achievements such as customer intimacy in the front end and operational excellence in the back end; both are critical for firms to achieve performance improvement.

4. Back-end integration is found to have a much stronger impact on firm performance than front-end functionality, highlighting its importance to e-business value, which seems consistent with the resource-based theory.

While e-business value can be created from the front end and the back end, our study has further evaluated their relative importance, theoretically motivated by the RBV. Back-end integration would have a greater contribution to firm performance than front-end functionality, because back-end integration is firm specific, difficult to imitate, and less mobile across firms. More importantly, back-end integration helps e-businesses develop the capability to link fragmented resources together, hence increasing integration and complementarities among disparate systems, which is strengthened by the Internet-enabled connectivity and open-standard network integration. In the full sample (see Figure 2), both paths associated with back-end integration and front-end functionality are significantly positive, but the one with back-end integration is much stronger. The difference is more pronounced in the developed-country subsample. The underlying rationale would be the following: Firms in developed countries have been using e-business longer, thus front-end functionalities have become more and more common; e-businesses are more differentiated by back-end integration because it is often tailored to a firm's strategic context and is woven into the organization's fabric, which is not transparent to competitors. The resource-based theory suggests this as an important source of e-business value.

5. The importance of two factors-competitive pressure and regulatory support-differs across developed versus developing countries. This finding confirms that economic environment shape e-business use.

This result might be explained as follows. First, competitive pressure is statistically significant for developed but not for developing part of the country. Such a difference could be explained by the distinct market environments of developed and developing part of the country. Prior research has shown that information asymmetry exists in less-developed markets, and market imperfections and inefficiencies may weaken the pressure from competitors. In developed area of the country, however, markets have evolved into mature stages over time, characterized by more transparent information flow and more stable legal frameworks and government policies. Therefore, firms in developed countries can obtain more information about competitors, e-business development, which may force them to adopt e-business to avoid competitive decline. Second, although the path loadings of regulatory support appear to be significant in both subsamples, more sophisticated analysis (group analysis) reveals that it is relatively more important in developing countries. This finding is related to the above discussion, that markets in most developing part of country are characterized by information asymmetry and immature institutional structure. As a result, government regulation (e.g., legal protection of online transactions), or the lack thereof, tends to be a greater force in developing countries. In light of these varying behaviors across the two subsamples, we have learned the significant role that economic environments play in shaping the extent of e-business use. This finding further confirms the usefulness of the proposed conceptual model for studying e-business, as economic environment is an important factor within the TOE framework.

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. It is important to build up technology competence

includes tangible technologies, intangible managerial skills, and human resources. Further, IT managers have struggled for ways to create value from Internet technologies. Our study sheds light on ways to realize value from e-business-greater breadth and depth of use, customer-facing Web functionalities on the front end, and tight integration on the back end.

In particular, our empirical results highlight the importance of back-end integration among various back-office databases and enterprise systems, and information sharing with business partners. Our analysis has identified this as a major source of e-business value. It will become even more important as e-business develops into deeper stages, as suggested by the results that the significant of back-end integration is more pronounced in developed countries that seem to be at deeper stages of e-business development. These findings could serve as useful guidelines for firms to develop their e-business capabilities. This is especially important in the retail industry, where firms have been building various legacy systems and using multiple IT platform over the years.

Furthermore, managers need to assess the appropriateness of e-business to certain organizational characteristics (e.g., size scope), as suggested by our empirical findings. This implies that potential value of e-business investment could be affected by structural differences. Effective e-business programs rely on necessary organizational reconfiguration and business processes reengineering. As Internet technologies diffuse and become necessities, these organizational capabilities and structural differences will be even more critical. In particular, managers in retail firms with a wider scope should pursue e-business usage more proactively, given the greater potential to achieve benefits from e-business. This implication should be of special interest for retailers seeking global expansion into different regions and market segments. Such expansion means that retailers would face greater coordination tasks and could leverage e-business initiatives to facilitate coordination and achieve resource integration.

Finally, our study also offers implications for policy makers. Regulatory support has emerged as an important factor for e-business use and value. This is even more important for developing countries. During our study, companies frequently cited significant obstacles to doing e-business, including inadequate legal protection for online transactions, unclear business laws, and security and privacy concerns. While this was important for all countries, it was a much more significant factor for developing countries. It also pointed to the need for establishing a broad legal and institutional framework that supports e-business. Governments, therefore, could accelerate the diffusion of e-business by establishing supportive business laws to make the Internet a trustworthy business platform (e.g., dealing with transaction fraud, promoting credit card use). This is particularly important at early stages of e-business development in an economy. Technological innovations are considered the primary driver of improvements in industrial productivity. Yet if promising innovations cannot be widely deployed, then the benefits resulting from their invention will be curtailed.

CONCLUSIONS

Grounded in the innovation diffusion literature and the resource-based theory, this study has theoretically developed and empirically evaluated an integrative research model incorporating technological, organizational, and environmental factors, for assessing e-business use and value at the firm level. While these issues were typically studied separately in the literature, our results suggest that usage and value are closely link, indicating that this unified perspective helps us gain a more holistic picture of the postadoption diffusion and consequence of e-business. To realize e-business value, firms need to facilitate the usage of e-business in various value chain activities.

For e-business use, our study has examined six factors, within the TOE framework, as drivers of e-business use. Some of these factors play different roles across different economic environments. This finding shows that, while e-business is a global phenomenon, its use is moderated by local environments. For e-business value, our study has demonstrated that the extent of e-business use and e-business capabilities, both front-end functionalities and back-end integration, contribute to value creation of e-business, but back-end integration has a much stronger impact.

In summary, this study has developed an integrative theoretical framework for assessing e-business use and value, beyond initial adoption.

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