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The Impact of Firm and Business Environment Contexts on E-Business Value

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ABSTRACT

The structure and institutions of economies and the increasingly interconnected global business landscape influence firms' information system (IS) choices and performance. Our knowledge of IS business value has resulted from mainly a firm-centric perspective based on internal business processes, which is consistent with computing paradigms that dominated the pre-W3 eras. Although emerging works are now examining pieces of the Internet-era e-business value conundrum, our knowledge remains underdeveloped, and cross-country research on e-business capabilities are few. As a response, this research empirically examines the impact of environmental and firm contexts on e-business capability for improving performance. The TOE perspective underpins the conceptual development of this research. Results from the survey of 218 financial firms in Singapore and Nigeria reveal significant impact of environmental factors on the firm's ability to derive value from e-business. The data also reveals significant differences between Singapore and Nigerian contextual factors, indicating location dynamics in advancing e-business capabilities for business performance.

Keywords: E-business Value, Business Environment, Information Systems, Financial Firms

INTRODUCTION

The continued increase in environmental turbulence, shorter product life cycle, and growing customers' needs extend the relevance of innovations to firms, which motivate firms to invest heavily in information system (IS) via either deploying new technologies or upgrading existing ones. A representative trend include the huge investment in e-business technologies (from proprietary networks such as electronic data interchange [EDI] to open networks such as the World Wide Web [W3]), among firms in all industries in the past decade (Iacovou, Benbasat and Dexter, 1995).

Prior research indicates that IS may contribute to the improvement of firm performance (Kohli and Devaraj, 2003). In addition, the dimensions and extent of IS business value depend on a variety of factors including the type of IS, management practices, firm structure, as well as competitive and macro environment (Melville et al., 2004). Literature indicates that our knowledge of IS business value has resulted from mainly a firm-centric perspective based on internal business processes, firm structure, and workplace practices (Jayaraj, Balser, Chowa and Griggs, 2004; Melville, Kraemer and Gurbaxani, 2004) with relatively few efforts to integrate macro environment. To continue advancing knowledge, however, it is pertinent to expand the conceptualization of IS business value.

In the Internet era, non-proprietary electronic linkages such as e-business among firms are increasing, altering the ways in which firms acquire assets, convert them into products and services, and market the outcome to their customers (Melville et al., 2004). This raises new questions about how e-business enables firm performance. For instance, how do electronically linked trading partners affect a firm's ability to execute e-business strategies for improved efficiency and competitive advantage? How does the evolving competitive environment shape e-business value? Although emerging researches are beginning to examine pieces of these questions (Mukhopadhyay and Kekre, 2002), our knowledge, as Jayaraj et al. (2004) noted, remains underdeveloped, and cross-country research on e-business capabilities are few (Zhu, Kraemer, Xu and Dedrick, 2004; Eze and Gilbert, 2004; Teo, Tan and Buk, 1998). In response, this research empirically examines firm and environmental impacts on firms' ability to improve performance via e-business (see Figure 1).

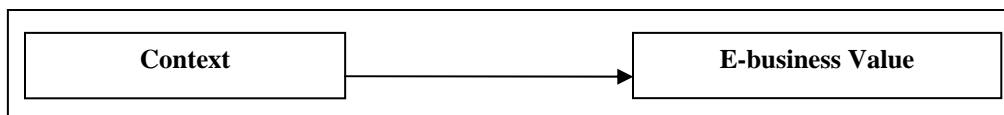


Figure 1: Overview of the Conceptual Model for this research

The discussions in this paper draw from financial services firms' field experiences with e-business applications in two divergent locations: the equatorial city-state of Singapore and the Nigerian city of Lagos. The results reveal a contextual approach that could extend e-business deployment and management in firms from macro environment perspective and relevant to improving research and practice as the subsequent discussions indicate.

THE CONTEXT FOR E-BUSINESS

Singapore and Lagos play similar regional roles, but vary widely in terms of their levels of development, and their positioning in the global context. Supporting a population of about 4.2 million in an entirely urban equatorial island of about 650 square kilometers, Singapore is a former British colony that became a self-governing state in 1959, and fully independent in 1963. In addition, a former British colony, Nigeria became independent in 1960. Nigeria, with a population of about 130 million, lies on the south-western coast of West Africa, and covers about 923,768 sq km. Lagos, the largest city, is divided into an island containing the central business district and housing 4.9 million people, and an adjacent mainland with a population of 8.7 million. Lagos serves Nigeria and the West African region as its industrial, business services, commercial and financial centre. The financial services industry (FSI) is a significant source of development and growth in the two cities. Singapore's economic policy has evolved over the past 4 decades to confront new economic challenges and to sustain its competitive position in South East Asia. While local firms drive most innovative uses of technology in Lagos, the presence and activities of Multinational Corporations and government programs shape and determine the direction of innovation and technology policy in Singapore. An aggressive IT industry liberalization initiative and strong infrastructure investments by Singapore's Infocomm Development Authority (IDA) complement e-business policies, development agendas, and mechanisms that are generally better coordinated and more effective than those in Lagos.

The nature of IS in FSI is diverse. On the front end, firms use IS to execute and record customer transactions, whether they are handled in person, by phone, by electronic funds transfer, or on the Internet. On the back end, funds are transferred among firms via electronic transfer system, such as Fedwire and Swift, which handles hundred of trillions of dollars in transactions yearly. Financial firms use EDI to support internal operations and managerial functions. There is little standardization within and among firm's internal systems and limited use of enterprise systems (ES) that are rather common in manufacturing and retailing industries. Some financial firms use ES in narrow functional areas such as human resources and financial ledgers. E-business technologies have the potential to add significant value to all of these areas, especially the potential for integrated Web-based applications to improve customer services. Loan applications and insurance forms can be filed out, stock trades initiated, bills, and fund transferred on-line. Customers can now access research tools such as mortgage calculators or retirement planning applications, credit status, and account information online. Applications based on open Internet standard can enable data sharing across firms in an industry. Internally, e-business applications can also improve integration of various proprietary and legacy systems such as EDI.

CONCEPTUAL FRAMEWORK

Literature indicates that researches on Technology-Organization-Environment (TOE) framework focus mainly on technology adoption, and only a few works have directly examined TOE factor's impact on technology innovation value (Zhu et al., 2004; Teo, et al., 1998; Iacovou et al., 1995). In addition, while previous researches adopted the three constructs in the framework, this research focuses on two constructs: the firm and environment constructs. Based on the foregoing, this research uses the TOE framework in examining factors that may influence the values firms may derive from deploying e-business.

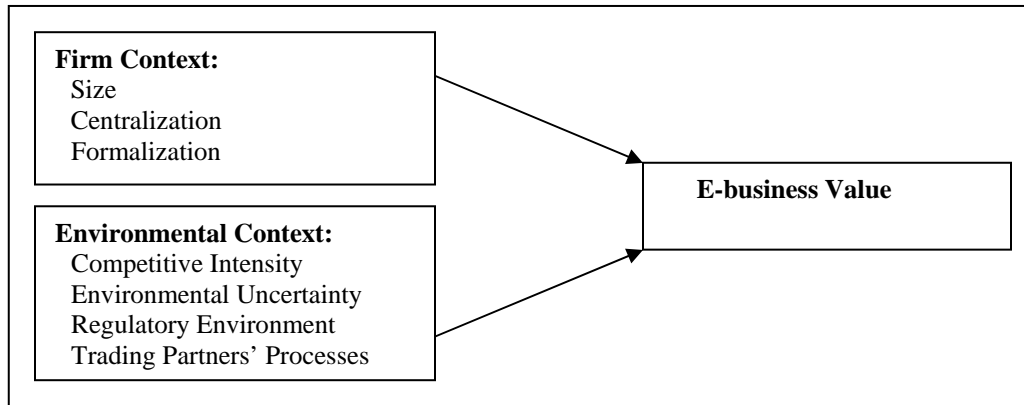


Figure 2: Conceptual Framework for Firm and Environment Impacts on E-business Value

The model (see Figure 2) depicts seven factors within two contexts of the TOE framework: firm size, centralization, formalization, regulatory environment, competitive intensity, trading partners' resources and environmental uncertainty). These factors are proposed to influence the impact of business on firm performance - commerce, internal efficiency, and coordination efficiency - (Zhu et al. 2004). These three dimensions of performance are grounded in the value chain analysis of Porter (1985, 2001), which has been used widely in the IS research to study the business value of IS. This study extends the notions in this analysis to the e-business environment, as e-business may influence every value chain processes. With richer information about down stream markets, e-business can improve firms' responsiveness to market dynamics and help firms to expand sales channels and improve customer relationships. Inside the firm, e-business has the potential to improve staff productivity and operational efficiency (Clemons and Hitt, 2001). Upstream, the broad interactivity and connectivity of the Internet can facilitate firms' coordination with business partners and reduce transaction costs (Porter, 2001). This analysis indicates areas where e-business would have massive positive impact in the FSI.

Propositions

Here are the research propositions:

- P1: Firm size positively influences a firm's capacity to derive value from e-business.
- P2: Formalization will positively influence the capacity of a firm to derive value from e-business.
- P3: A centralized IS structure will negatively influence the capacity of a firm to derive e-business value.
- P4: Competitive intensity will positively influence the capacity of a firm to derive value from e-business.
- P5: Environmental uncertainty will positively influence the capacity of firm to derive e-business value.
- P6: An enabling regulatory environment will positively influence the capacity of a firm to derive value from e-business.
- P7: Trading partners' with high levels of e-business resources and processes will positively influence the capacity of a firm to derive value from e-business.

METHODOLOGY

Initially, the instrument was pre-tested with two academics and two business executives selected from the FSI, and the instrument was later revised for any potentially confusing items. Before the administration of the final survey, 10 respondents were randomly selected for pilot testing to determine further areas in the instrument that needs improvement. Six instruments were returned, and their recommendations for improving the instrument and thus the content validity were incorporated into the instrument. In the instrument itself, the author used previously validated measurements items (Grover and Lederer 2004; Zhu et al., 2004; Teo, and Pian, 2003; Sundell, 1999; Teo, et al., 1998; Iacovou et al., 1995) wherever possible to help ensure the validity of the measures; multiple-item measures were used for most constructs to enhance content coverage. Cronbach's alpha test for the overall internal reliability and consistency was computed on the Likert scale statements and questions in the instrument pertaining constructs, resulting in alpha scores of 0.71 or higher, which indicates strong internal consistency. Generally, Cronbach's alpha represents the amount of error in the measurement, where scores at or above the 0.70 levels are considered acceptable (Anderson and Gerbing 1988).

A sample of 530 participants (257 from Singapore and 273 from Lagos) was selected for this study. The participants were mainly large financial services firms, and were randomly selected from the population frame. The population frame for the

financial firms in Lagos include the List of Registered Businesses provided by the Lagos Stock Exchange and the Industry Classification provided by Nigeria Statistics Office. The Directory of Financial Institutions in Singapore provided by Monetary Authority of Singapore (MAS) served as the population frame for the firms in Singapore. For purposes of reliability the CIO was considered the best person to respond to the survey questions (Gatian et al. 1995). The instruments were then mailed to CIOs of the 257 and 273 firms in Singapore and Nigeria FSI, respectively. The cover letter provided confidentiality assurance and an offer for an executive summary of the findings as an incentive for participation. Responses to the survey questions were entered on a five-point Likert-type scale as follows: Strongly Disagree [1], Disagree [2], Neutral [3], Agree [4], and Strongly Agree [5]. Of the 530 firms surveyed, 218 useable responses were collected, i.e., a total response rate of 41.13%. There were 102 valid responses from Singapore, (i.e., a response rate of 39.69%), while there were 116 useable responses from Nigeria (i.e., a response rate of 42.49%). The combined response rate of 41.13% compares very favorably with similar mail surveys of firms: e.g., McDougall et al. (1994) had 11% response rate in a study of new technology-based firms.

ANALYSIS

Among the respondents, over 50% reported annual gross revenue exceeding S\$500 million. More than 60% of respondents from Singapore and Nigeria reported more than 1000 persons in their employ. Over 50% of the respondents reported investing annual average of 6% or over in e-business systems, which is considered high. More than 70% and 60% of the respondents from Singapore and Nigeria respectively, reported using e-business in their operations for over 8 years. Respondents were well educated with average of 6 years college education. They had above 15 years experience in the industry, about 10 years of experience within their firms and about 15 years within the IS field. Hence, the respondents are well informed (see Table 2).

Item	Value	Singapore	Nigeria
		Percent of Respondents	Percent of Respondents
Number of Employees	Over 1000	65%	60.88%
Annual Revenue	Over S\$500m	56%	52.82%
Duration of EC Use	Over 8 years	71.76%	63.4%
Annual Expenditure on EC	6% & Over	50%	58.45%

Table 1: Profile of Respondents

RESULTS

Table 3 illustrates the means, standard deviations, and correlation matrix for the factors. As the table indicates, trading partners' processes and formalization relatively correlated. A probable explanation is that it is likely that trading partners' e-business resources and processes would respond positively to a firm with formalized business protocols and procedures. The result recorded relatively higher mean values for Singapore variables compared to those for Nigeria participants. In addition, Singapore firms appear to have less centralized business and IS structure compared to the firms in Nigeria, which may suggest differences in the stages of IS infrastructure development in the industry in both countries.

Factors	Mean-S	SD	Mean-N	SD	1	2	3	4	5	6
1. Competitive Intensity	4.08	0.73	3.48	0.69	1.00					
2. Environmental Uncertainty	3.86	0.57	4.16	0.67	0.76**	1.00				
3. Regulatory Environment	4.01	0.71	3.59	0.81	0.52**	0.21	1.00			
4. Trading Partners' Processes	3.95	0.63	3.49	0.67	0.65**	0.56**	0.03	1.00		
5. Centralization	3.21	0.59	3.91	0.57	0.37	0.41	0.04	0.02	1.00	
6. Formalization	4.13	0.73	3.87	0.71	0.19*	0.27	0.09	0.61**	0.11	1.00
7. Firm Size					0.12	0.08	0.05	0.12*	0.03	0.09

Table 2: Mean, Standard Deviation and Correlation Matrix

$P < 0.05$ ** $p < 0.01$, S=Singapore, N= Nigeria

In testing the propositions, multiple regression analysis was conducted using hierarchical regression procedure. The first regression performed was on firm and e-business value variables, and the second regression was on environment and e-business variables. The level of significance to enter the framework was set at 0.20 and the level of significance to stay in the framework was set at 0.10. Being a directional proposition, these values are equal to the one-tailed test with values of 0.10 and 0.05, respectively. The analysis supported five of the seven propositions (see Table 3). The research indicates that centralized IS structure would adversely influence the capacity of a firm to derive value from e-business. The idea of centralized IS business structure would significantly inhibit firm efficiency in the contemporary knowledge-based economy and as firms continue to face advanced technology proliferation. Firms will derive high benefits from e-business innovation including greater information sharing among stakeholders because e-business uses open standard platform. P1 was not supported by the analysis and suggests that the size of a firm may not be critical in the capacity of a firm to derive value from e-business systems, which confirms Zhu et al. (2004) findings. The data also supported P3, indicating that formalized business procedures and standards tend to encourage greater value generation from e-business deployment, which is consistent with Ranganathan and Sethi (2000) findings.

Factors	Singapore	Nigeria
	E-business Value	E-business Value
P1. Firm Size	0.05 ^a (0.11) ^b	0.05 (0.15)
P2. Centralization	0.27 (0.17)	0.24 (0.27)
P3. Formalization	0.43* (0.09)	0.32 (0.13)
P4. Competitive Intensity	0.32* (0.11)	0.23 (0.19)
P5. Environmental Uncertainty	0.38* (0.13)	0.31* (0.10)
P6. Regulatory Environment	0.34* (0.16)	0.27 (0.11)
P7. Trading Partners' Resources	0.41* (0.13)	0.32* (0.16)

Table 3: Results of Regression Analysis

*Note: a. - Regression coefficient, b. - Standard error; $p < 0.05$, * $p < 0.01$*

In addition, the data supported P4 indicating that industry features characterized by competitive intensity tend to enable firms to generate value from e-business, which confirms Grover and Lederer (2004) findings. The findings also supported P5, suggesting that environmental uncertainty tend to enable greater value generation from e-business. Also, the data supported P6, which indicates that efficient regulatory environment would enable firms to generate greater value from e-business systems. Lastly, the research supports P7 indicating that efficient trading partner's processes and e-business capability would enable the focal firm to derive greater value from e-business systems, consistent with Ranganathan and Sethi (2000) findings. The analysis indicates a stronger perception on the relationships between the factors and e-business value among Singapore participants compared to participants in Nigeria evident from the strength of the regression coefficients in Table 6. The structural differences between the two countries demonstrate the distinct dynamics and trajectories in which the firms operate, and which tend to influence business performances.

Factors	Mean-S [1]	SD	Mean-N [2]	SD	F-Ratio	Turkey Test
1. Competitive Intensity	4.08	0.73	3.48	0.69	11.67***	[1]>>[2]
2. Environmental Uncertainty	3.86	0.57	4.16	0.67	8.94***	[1]<<[2]
3. Regulatory Environment	4.01	0.71	3.59	0.81	9.76***	[1]>>[2]
4. Trading Partners' Processes	3.95	0.63	3.49	0.67	7.87**	[1]>>[2]
5. Centralization	3.21	0.59	3.91	0.57	12.65***	[1]<<[2]
6. Formalization	4.13	0.73	3.87	0.71	6.8**	[1]>>[2]

Table 4: Mean, Standard Deviation and ANOVA Results

Table 4 presents results of one-way analysis of variance (ANOVA) conducted on the firm and environmental contextual factors for Singapore and Nigeria. Singapore and Nigeria groups of participants were compared based on the contextual firm and environmental factors to determine any significant difference between the two groups. The analysis reveal differences between Singapore and Nigeria based on the contextual factors showing that the competitive intensity is stronger, regulatory

environment is more efficient, trading partners' processes are more e-business enabled, and business processed and work procedures are more formalized in Singapore compared to Nigeria. In addition, difference on environmental uncertainty is significant indicating a better economic, political and social structure in Singapore compared to Nigeria. Also, the result indicates that the IS structure in Nigeria is more centralized than is the case in Singapore.

DISCUSSION

Competitive intensity emerged significant. A possible reason is that firms operating in the contemporary network environment characterized by global competition would increasingly use greater information networks. In essence, the pressure to reduce costs, improve internal business operations and processes and provide quick services to customers tend to translate into increased deployment of e-business systems. Hence, competitive intensity as a determining factor for the use of e-business to improve business performance remains critical as globalization increases the need for firms to leverage new technologies to improve operational efficiency and develop new business models.

This research reveals strong influence of the location in which the firms operate as the strength of relationships between the constructs for Singapore and Nigeria indicate. In theory, location should no longer be a source of competitive advantage as, open global markets, rapid transportation, and high-speed communications systems extend across regions and are expected to level any differences. In practice, however, location and largely, regional imperatives appear to remain central to globalization and economic growth potentials. While firm capabilities are important determinants for operational activities, technological opportunities and related local imperatives are equally significant. By inference, the research findings demonstrate the strategic importance of sophisticated factor conditions in a location, which enable accelerated development processes in industrial activities, consistent with Porter's (1990) view. In essence, availability and access to quality expertise, efficient regulatory policies and enabling infrastructure such as supporting industries are necessary factors for advancing innovative technology and e-business initiatives in firms for subsequent economic growth.

The growth in investment in Singapore is a result of continued effective government regulatory business and technology policies, which have spurred e-business activities among firms in Singapore. Similarly, the rejuvenation of the IT industry in Nigeria, which has encouraged more businesses to conduct operations more efficiently, is a testimony to the government's aggressive regulatory policies (Eze, and Gilbert, 2004). This research underscores significant opportunities for co-operation between Singapore and Nigeria on ICT management issues, best business practices on emerging technologies and possible technology and knowledge transfer. This will enable Nigeria to tap into Singapore's expertise and experience while allowing Singapore access to the enormous knowledge stock and investment opportunities in Nigeria.

IMPLICATIONS FOR RESEARCH

The proposed paths between the constructs received some support, and the findings are generally consistent with prior research findings in new substantive areas – Singapore and Nigeria. In this regard, it extends the field of e-business, TOE theory application, and the overall IT- and knowledge-oriented strategies focused on new business models and overall business performance. As e-business phenomenon evolves into a stronger academic discipline, further studies based on the procedures in this paper would receive greater empirical support. Accordingly, the research methodology and findings represent modest but critical contribution to future e-business researches, particularly those studies seeking to advance the capabilities of a firm from innovation and economic development standpoint. In addition, taking into account the effects of business tradition, and extents of e-business deployment, this study is replicable to FSI in Hong Kong/Johannesburg and Kuala Lumpur in Malaysia. Firms should factor in into their corporate goals the growing relevance of knowledge-based economy and the restructuring capability of innovations such as e-business in light of changes in national, regional and global dynamics of production, marketing, distribution and business processes.

IMPLICATIONS FOR PRACTICE

This research provides an expanded understanding of TOE by extending the perspective to e-business as a critical complementary tool for streamlining and advancing business processes and corporate goals. Key findings of this paper include that competitive local dynamics and trajectories are imperatives for an effective and successful application of e-business, which ultimately affects the performance of firms. E-business systems enhance business processes and consequently the firm's growth in an enabling business environment. This understanding would be useful to managers who may need to adapt TOE and Porters (1990) analysis in making similar conjecture for instance, in identifying the core strategic

roles of e-business in enhancing business performance in challenging business conditions. It is evident that correlation is not causation, yet managers may still consider the quality of e-business systems in their firms. Perhaps, by investigating the sub-dimension of the constructs in this paper and the contextual issues, managers may be encouraged to improve their e-business strategies relative to the specific context, which might translate into better overall business performance.

AGENDA FOR FUTURE RESEARCH

There were some study limitations. First, the conclusions drawn from the data, while theoretically sound, are based upon perceptions of single informant. While CIOs are expected to be knowledgeable, study results would have been more reliable if paired with a second informant outside the IS area. Although all responses were anonymous, it is still possible that the CIO responses are biased in favor IS benefits. Second, this research relied primarily on perceptual data. Future research should consider personal interviews as they might provide additional information on the constructs. However, Dess and Robinson (1984) argue that subjective data tend to correlate strongly with objective data. Further studies could collect data on a multiple-item e-business value construct to enable practitioners and researchers appreciate the subject in a more constructive form. Third, it would be useful to gain greater understanding of e-business deployment in small firms. Comparison between small and large firms in terms of e-business technologies deployment patterns, would be critical for the firms to properly chart the direction of their innovation implementation strategies.

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