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The Effects of Enterprises' E-Business Adoptions on Cross-Border Firm Internationalization

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Abstract: Nowadays, in the complex business network system, the interaction of firms across borders is facing several challenges. Many studies in the literature also suggest numerous approaches to overcome these challenges. However, a few of the obstacles for internationalizing firms were studied and the challenges are increasing against firms' growth opportunities cross-border. Taking this into account, the present research emphasized the roles of enterprises' e-business adoptions of countries on cross-border firms' internationalization by drawing from network theory and technology–organization–environment frames. By employing a fixed effect model to 365 enterprises, leaders' attitudes of preferring technology-intensive firms, network infrastructure, risk-averting attitudes, country's market size, multilingual services, e-government status, threats from competitors, reliable utility sources, human capital quality, costs of adoptions and telecom services enrichments, and costs of adopting different online services need to be taken into account before internationalization of born global companies.

Keywords: cross-border enterprises; complex system; risk aversion; born global companies; internationalization; e-business adoptions; network theory

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1. Introduction

Beyond the traditional exporting approach to connect to the host market, currently, firms are trying to ensure their physical presence in international business by collapsing boundaries through collaborative networks [1,2]. This is among the approaches to reaching international market demands. For instance, some firms have a born global nature from the beginning. Internationalization through born global was like "rings in the water", which meant contextualizing the geographic market and product policy to internationalize in a slow and stepwise manner [3]. In fact, internationalization is a complex procedure that contains neither forward nor monotonic moving [4,5]. So far, although the attempts have been started, the readiness of SMEs and institutions abroad are still at varying stages of status, particularly for the least developed areas, toward the internationalization of firms. For instance, the adoption of e-business in several countries is significant in enhancing the flow rate of high-tech firms from dense areas to unmet need areas.

Furthermore, even though the rate of e-business expansions is low, adopting several types of e-business approaches and the technical readiness of home country firms to integrate with cross-border high-tech firms is receiving significant consideration. However, still, the readiness of growing firms (SMEs) is facing numerous restraining forces to adopt e-business in order to be ready to harmonize with giant and high-tech firms at the international level and SMEs at the local. For instance, to accelerate the acceptance of new

technology to the area of demand, several factors act as inhibitors, including but not limited to the trust of new technology by receivers, protections (safety) against malicious actions, users' skills, and information technology infrastructures. Likewise, a country's E-government adoption status is another factor that needs consideration in the internationalization of high techs [6]. In several studies, beyond environmental forces [7], perceived usefulness and ease of use were widely recognized to affect the adoption of E-business, which suffers from the speed of internationalization of high-tech firms. Additionally, some studies appreciated the roles of national culture in electronic banking adoptions [8,9].

As a result, to realize the internationalization of high-tech firms' objectives and to enhance its spillover effect for least developed areas, most countries are emphasizing the digitalization of SMEs as a priority issue [10]. For instance, the Internet of Things brought dramatic improvements that radically changed the mechanisms of interaction in the market by creating a new digital ecosystem [11,12]. However, it is not an easy journey due to obstacles from multiple factors that the sender and receiver of technology face [13]. For instance, the effects of low telecom service on enterprise internationalization were overlocked in many scholars' studies. To accelerate the acceptance of firms' internationalization by enhancing the firm's readiness to interact with cross-border tech firms, factors like, but not limited to, network infrastructures, protections (safety), familiarity with technology of employees, users' skills level, threats from competitors' pressures, and reliable utility sources were identified as constraints by previous studies [8,14–16].

Since it is not methodologically feasible to undertake a study on all firms at once, in the present work, the authors adopted the conceptual frame on e-business adoption by implementing the technological, organizational, and environmental framework on 365 users, emphasizing readiness analysis toward interacting with the internationalization of high-tech firms. This is based on the comparative view that in underdeveloped countries, there is low internet connectivity, which results in a low rate of e-business adoptions [17]. The breakthrough of vicious circles in a developing country to improve connectivity by enhancing technology-intensive firms' attractions is essential [18]. Similarly, the findings of some of the literature have appreciated the role of national culture in firm digitalization [19].

Moreover, the proliferation of new technology results in expansions by SMEs has several contributions to users and firm efficiency itself [20]. For example, in most of the least developed areas, paper money usage is a medium of daily transactions. Thus, firm digitalization status needs to be accelerated in order to transform paper money transactions and to further interact with high-tech firms. These arguments reflect that the roles of digitalized firms were great in responding to the internationalization of high-tech firms [14,21,22]. Moreover, e-business adoption has been widely discussed in developed countries and is rapidly expanding in developing countries. Multiple factors inhibit the adoption of e-business and implementations for companies. Even though e-business adoptions were studied by several researchers, it does not mean that all aspects of it were covered. In this research, intensive evaluating inhibitors of e-business adoptions by enterprises were emphasized with scenarios in low telecom service penetration areas toward internationalization of high-tech born global firms.

Moreover, to integrate e-business services with enterprises' activities readiness for the internationalization of high-tech enterprise, several inhibitors like skills of receivers, network infrastructures, language barriers, firms' organization's structure fit, costs of adoptions, and perceived risks need special needs [23]. These determinants of e-business imposed potential threats on the speeds of new technology expansion, human interactions, and business structure [22,24]. In addition to this, there were very limited published works that investigated the factors that influence the adoption of e-business by using the

TOE framework in the focus enterprises in the least developed areas. Therefore, the question is "How do factors embedded in enterprises' e-business adoptions affect cross-border enterprises' internationalization in the least developed countries?"

To respond to this fundamental question, the present research was classified into the following sections: Introduction (1), Literature Review and Hypothesis Development (2), Methodology (3), Results and Discussions (4), Practical Implications (5), and Conclusions and Suggestions (6).

2. Literature Review and Hypothesis Development

In enterprise internationalization attempts of companies, among the essential internalization theories, the two forefront theories were the Uppsala model and the Innovation-related Internationalization Models [25]. However, these two theories are presently almost dominated by the introductions of knowledge-intensive network theory [26]. Network theory is highly encouraged in firms' internationalization in most companies. Additionally, born global firms are also nurtured by creating a global nature from the birth of firms that are insured by the business network across the globe (i.e., internationalization route) [27]. However, born global firms need rapid internationalization at early startups. At this point, the receiver countries' readiness governs the early internationalization of these firms. As a result, in this section, the authors have emphasized the above-mentioned theories, in general, and developed hypotheses.

2.1. Internationalization Theory 1: Uppsala Model (U-M)

Using the concept of the Uppsala firms internationalization model (U-M), it was found that the business first establishes in the internal (home) market, which reflects internationalization is the result of several incremental progress [28,29]. Likewise, another researcher also shared arguments in support of the firm internationalization process (i.e., no export, subsidizing through sales, use of an independent agent for export, or direct production in the host market) [30]. Ignoring completions and only focusing on the learning dimensions of firms were among the criticisms of the Uppsala model in internalization theory. Furthermore, this theory suggests, through organizational learning, the establishment of a chain and the gradual internalization of firms [31]. The model further encourages firms to easily enter geographically nearest and culturally similar socio-economic dimensions [32]. In contrast, this model is criticized by the approaches and period of internationalization commencement of companies. In another view, firms need to look back into the quality of products and services that promote early internationalization, particularly giants and high techs that are run by huge investment costs [33,34]. Additionally, the learning market drives other learning capabilities in the enterprises to contribute collectively to innovation stocks, and in turn, international market outcomes of born global firms [35].

2.2. Internationalization Theory 2: Innovation-Related Internationalization Model

Internationalization through innovation-related models is an approach in which companies enter the market by bringing new ways of doing things [3]. There is not much variety between the Uppsala model and the innovation-related model of firm internationalization by gradually learning about overseas market natures. However, in the context of the innovation-related model, the role of export leadership varies [36] due to market and entrepreneurship orientations [34]. The internationalization of high-tech firms across borders enhances the innovations of growing firms [32]. However, some of the literature argues that there is a U-shaped relationship between technological innovation and the internationalization of SMEs [37]. This implies that there is still room between the innovations of firms and their internationalization success.

2.3. Internationalization Theory 3: Network Theory

As mentioned earlier, network theory is currently the most active and faster internationalization model, particularly for technology-intensive global firms [26]. In network theory, all the actors in the system, such as traders, clients, subcontractors, and other market players, are interlinked and in collective approaches. Some earlier research distinguished the network model as a natural development of firms through collective agreement [38]. Here, restraining forces against internalizations are low due to the development being a natural process and a collective decision from market actors. Additionally, the approach is not easy to imitate by competitors' forces because of closed communication in the line of networked market actors only.

From each model's drawbacks, network theory is the most appreciated theory in the internationalization of technology-intensive firms. In this network theory, bonding between stakeholders such as customers, suppliers, and facilitators in host countries is created based on market forces and collaborative decisions. This argument makes the theory more powerful than others. Thus, it is reflective that technology-intensive firms that are stuck on borders need to follow the natural development process, as network theory argues. Additionally, to break through the shadow effect of antecedents in e-business adoption by enterprises in the least developed countries in an internationalization move by high-tech born global firms, this study has regressed some variables.

Moreover, network theory takes a diverse view of the internationalization approaches by arguing that a growing firm can instantly start operating internationally supported by partners that have international experience and operations [26]. In the network mechanisms, a firm internationalizes when it initially starts to develop a linkage with business actors belonging to another network in a foreign country. This extra-communication acts as a bridge to foreign markets, and the firm depends on resources controlled by the other actors in the system of dealing [39]. To understand the approaches in network theory, see Figure 1 below.

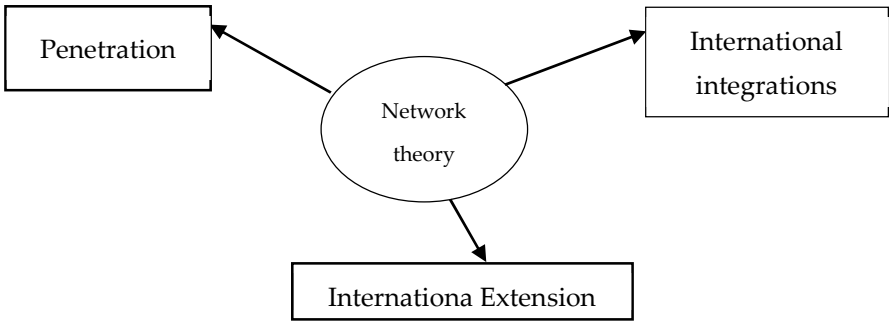

Figure 1. Approaches in network theory to internationalization.

An investment network relationship with foreign individuals and firms has great value as a source of market information and knowledge and the firm's internationalization naturally develops from these network relationships. Therefore, as illustrated in Figure 1, foreign market positions are established using foreign networks [38] in the following three manners: (1) international extension that includes joining new host markets by making use of new ties with host network partners, (2) penetration that implies that in the markets where the firm has a presence, it further expands resource commitments, and (3) through international integration that contains spreading around several countries through coordination.

2.4. Constraints in E-Business Adoptions During Internationalization

Looking into antecedents of e-business adoptions in the least developed countries as bottlenecks to the cross-border expansions of technology-intensive SMEs is one aspect of this research. Among several inhibitors of e-business adoption status for the improvement of countries, the TOE framework has several good indicators that should be examined before the internationalization process. The concept of the technology–organization–environment framework was argued by Tornatzky and Fleisher [40]. In the TOE context, factors that inhibit technology adoption and its likelihood are at the business level. TOE further describes the steps by which a firm adopts and implements technological innovations that are influenced by technological scenarios, the organizational context, and environmental issues [41]. To start with the initials of the TOE framework, the *technological aspect* includes the endogenous and exogenous issues that focus on the firms' technological readiness and contribute to the firms' e-business adoptions. In this aspect, the availability of firms' technology-assisting materials such as hardware (computers) and software (processes) are endogenous. In another aspect, the technological context further contains techniques (e-business know-how level) and operates advanced equipment/tools, as well as processors [42]. Likewise, the organizational context refers to the nature and resources of the organizations, including the enterprise's size, the extent of control, the degree of formalization, the managerial hierarchy, human skills level, the number of slack resources, and imitating technology to halt such issues, and networking among employees. Additionally, an environment is an arena and forces in the field, such as potential competitors, the macroeconomic context, and the ease of regulations [43].

Nowadays, the relevance of digital solutions such as production at lower costs/efforts and interacting without delays are becoming vital to daily tasks in global competitions [44]. Among digitalization's processes, the activity of transforming business phenomena from physical to online and further interlinking tech firms with SMEs from the least developed countries is at an early stage [45]. Digitalization aspects such as smart homes, e-procurement, smart cities, and e-health check technologies enhance many things from personal relationships linked by social media and its services to other associations, such as how society interacts with support services in e-government [46]. Thus, e-business concentrates on realizing the service offered by enterprises and the actual needs of customers in a reasonable time frame and at the designated place [Table 1].

Table 1. TOE framework and its application references.

Research	***Models***
e-business [24]	Network facility, technical cost of ICT tools, maintenance and upgrade (technological aspect), perceived cost of adoption (organizational aspects), legal issue, skills, supply (environmental aspect)
e-Marketing [47]	Technological potential (Tech), organization capabilities (Org.); environmental influence (Env.)
open system [48]	Perceived barriers, perceived relevance of compliance (nature of innovations), satisfaction with existing system (organizations), external environment (Env't)
e-banking diffusion [49,50]	Technology readiness or competence, IT/business strategy alignment, adequacy of IT professionals (Techno); firm size, financial resources commitment, IT/business strategy alignment (organizations); competition intensity or pressure, and regulatory support environment (environmental)
information technology adoptions [51]	Technological: relative advantage, compatibility, complexity; organization: top management, finance resources, IT knowledge, size; environment: government support, competitive pressure, external support

As already stated previously, this study has encouraged TOE theory, which serves as an important theoretical foundation of this study. To distinguish clearly, the TOE framework overlaps with the Diffusion of Innovation theory [52]. For instance, similarities can be identified between innovation characteristics and technological context as well as between organizational characteristics. However, the TOE framework does not assign the involvement of individual characteristics, such as top management initiation to new technology, in contrast to the DOI theory [53]. The two theories are similar in the TOE framework and the DOI theory has often been used in various e-business adoption domains and information system (IS) adoption. The e-business includes the adoption of various e-constructs e-banking, e-procurement, e-government, and e-commerce industry [52]. Based on the above theories and arguments TOE framework is suitable for exploring e-business adoption as antecedents of technology-intensive high-tech firms [7,28]. To enhance our analysis, the following hypotheses were developed:

Hypothesis 1 (H1). *Technological elements are significant and contribute to the adoption of e-business and are further linked to enhancing the internationalization of high-tech firms.*

Hypothesis 2 (H2). *Organizational factors are significant and contribute to adopting e-business and are further linked to enhancing the internationalization of high-tech firms.*

Hypothesis 3 (H3). *Environmental variables have contributed to the adoption of e-business and are further linked to enhancing the internationalization of high-tech firms.*

Hypothesis 4 (H4). *Considering the interactions of e-government with network infrastructures while evaluating the impacts of TOE variables on e-business adoption has an association with encouraging the adoption process.*

Hypothesis 5 (H5). *Measuring the interactions of market size and risk aversion attitude toward e-business adoption have an association with the internationalization of technology-intensive firms.*

3. Methodology: Materials and Methods

3.1. Research Design, Variables, Data Source, and Sampling

Similarly to the local growth of firms, enterprise expansion across borders is based on different variable response levels [54,55]. Among these variables, the constraints embedded in the e-business adoption of countries are directly or indirectly linked to high-tech firms' internationalization attempts. For instance, the size of firms (large and small) [55,56], organization structure (organic and flat), managers' attitude toward new technologies [57,58], network facilities, internet quality access, power supply, and skills to operate new services have significant impact on e-business adoptions. Although several variables inhibit e-business adoptions of enterprises, the findings of the study at hand emphasized 365 SMSs e-business adoption antecedents and their effects on the internationalization of born global firms. Additionally, the present study follows a *descriptive* approach and emphasizes identifying the effects of TOE variables on e-business adoptions, which have further material impacts on enterprises' internationalization. To reach out to a specific sample for this study, the authors took a *sample of* 365 enterprise users. Then, after selecting distinguished firms the designed Linkert scale with five categories of questionnaires was administered to respondents. Additionally, e-government (e-government is simply electronic governance that is carried out through online service delivery in a transparent and accountable manner efficiently and effectively. In short, it is an online government service that enhances information delivery between business groups, government bodies, and nations (the UN).), human capital, and country market size were chosen as moderator variables and the remaining variables are indicated in Table 2.

Table 2. Variables and descriptions.

Variables	Descriptions
e-business adoption	Electronic Business, the status of availability of online services
Risk aversions	The tendency of enterprises to prefer outcomes with low uncertainty to those values with high uncertainty
Competitor's threat	The challenges from potential competitors with alternative technologies
Language barriers	Multilingual service of new technology to serve multiple clients
Market size	The percentage real GDP growth of one country
Human capital (know-how)	In-depth experiences of bankers in online service delivery
Reliable utility sources	e.g., uninterrupted internet and electricity sources in least developed areas
Network facilities	Essential equipment required for online banking services
The firm's structure fit	The nature of organizations (organic vs. mechanistic) toward e-banking
e-government	A digital government that transfers services within and beyond the border
The cost of adoption	The feasibility of attracting new technologies about their costs
Governor's attitude	Allowing for adoption and follow-up on e-business safety
Firm's size	Whether SMEs have large or small product lines with innovative features

Source: the literature.

3.2. Data Analysis Methods and Data Quality Test Tool

Several kinds of the literature reveal that the TOE framework selected as the independent variable and determinant of e-business adoptions contains multiple observations. As multiple variables exist, there is a possibility of potential confounding influence of unobserved heterogeneity [59–62]. To handle the effect of multiple observation effect, the fixed effects regression model was employed to alleviate heterogeneity concerns. Comparatively, the fixed effects method is preferable to the random effect method when a dataset is generic and based on the Hausman test result ($p < 0.01$, $p < 0.05$) [63]. Moreover, in the present analysis, the study did consider the first difference regression method because the first difference (FD) regression is appropriate when independent variables are varied through the study period. Similarly, to avoid the model suffering from serially correlation error, which may include a result of serially correlated unobserved factors, the study has managed it by following the arguments by O'Brien [64]. Additionally, the correlation errors have been managed by *xtregar* Stata command.

3.3. Model Specification

Based on the review of literature in this study, such as but not limited to [16,26,55], e-business adoption (dependent) by enterprises to enhance the internationalization attempts in the present research was evaluated by the TOE components with some adapted variables (e-government, market size, and human capital), as illustrated in the next Equation (1).

$$\text{EBA to enhance internationalization} = \text{f}\left(\begin{array}{c}\text{Costs of technologies, Leader's attitude,}\\ \text{Network facilities, Language barriers,}\\ \text{Service interruptions, Risk aversions,}\\ \text{Competitor pressures, Human capital,}\\ \text{Organization structures, Firm size,}\\ \text{e} - \text{governanmnet, Market size}\end{array}\right) \quad (1)$$

To simplify the result analysis, this article categorizes the main model into three equations. As shown in Equation (2) below, this study measured the effect of different costs incurred to adopt e-business. Additionally, the associations of corporate leaders' attitudes, network infrastructures, and firm size (large/small) were evaluated in Equation (2). Likewise, Equation (2) adds the interactions of a firm's size and country market size (growing, stagnant, or falling size) toward e-business adoptions to enhance

internationalization technology-intensive firms. Moreover, the moderating roles of e-government and market size regarding the association of each variable toward influencing e-business adoption status that further influences the internationalization of high-tech born global firms were evaluated in Equation (2).

$$\text{BA to enhance internationalization} = \text{f}\begin{pmatrix}\text{Costs of technologies adoption, Leader's attitude,}\\ \text{Network facilities, Firm size}\\ \text{market size, e} - \text{governanment}\\ \text{Firm size} * \text{Market size}\end{pmatrix} \quad (2)$$

In another aspect, Equation (3) contains the effect of variation in languages, a lack of reliable sources of utilities (electricity and internet), risk aversion, market size (moderator), and e-government (moderator) on the e-business progress of countries. Likewise, Equation (3) adds the interactions of human capital (skill levels of technology receivers) with network infrastructure toward e-business adoptions to enhance the internationalization of technology-intensive firms. Moreover, Equation (3) linked the interactions of firm size (large/small) with technology adoption costs while ensuring the firm's readiness to coordinate with the internationalization of high-tech born global enterprises.

$$\text{EBA to enhance internationalization} = \text{f}\begin{pmatrix}\text{Language barriers,} \quad \text{Reliable utility source}\\ \text{Risk aversions, Market size, e} - \text{governanment}\\ \text{Human capital} * \text{network infrastructure}\\ \text{Firm size} * \text{tech. adoption costs}\end{pmatrix} \quad (3)$$

Lastly, in Equation (4), the researcher has measured the effect of threats from competitors, firms' structural fit, human capital, and e-government status (moderator) on e-business adoption. Additionally, Equation (4) illustrated the associations between firm size and risk aversion attitude toward e-business adoptions that encourage acceptance of internationalization of born global firms. In another view, this equation also adds the influence of interactions of moderator e-government and network facilities against e-business adoptions.

$$\text{EBA to enhance internationalization} = \text{f}\begin{pmatrix}\text{Threat from Competitors, firm's structural fit}\\ \text{Human capital, e} - \text{governance}\\ \text{Firm size} * \text{risk aversion}\\ \text{e} - \text{governanmnet} * \text{network facilities}\end{pmatrix} \quad (4)$$

where EBA represents the e-business adoptions of firms, β_0 represents the constant term, β_1, β_2, $_{3\ldots10}$ represents slope coefficients of variables influencing electronic business adoptions.

4. Results and Discussion

4.1. Descriptive Results

Before determining the effect of independent variables on dependent variables, examining the relationship is critical. As a result, the figures in Table 3 imply that the correlations between variables were almost slight and positive across variables. This further indicates that the relationship between selected variables and e-business adoptions of enterprises is not only positive, but also the most significant relationship among costs of technology adoptions, multilingual issues, and organization structure. Additionally, concerning human capital, the availability of qualified and enough human capital in one country with regards to the enhancement of technology-intensive service and productions certainly built from the system's technical competence, the status of performance perceived by the system, the user's in-depth knowledge about the scenarios that administer the actions of the system [8,65,66]. Likewise, firms' know-how of operating an e-business and fragmented network infrastructure and the costs of adopting new technology and e-government were related to enterprises' e-business adoption status.

Table 3. Mean and correlation results.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
e-business status	1.00												
Leader's attitude	0.63	1.00											
Costs of technologies	0.82	0.41	1.00										
Network facilities	0.66	0.15	0.53	1.00									
Language barriers	0.71	0.58	0.46	0.32	1.00								
Reliable utility sources	0.84	0.90	0.89	0.17	0.67	1.00							
Risk aversions	0.72	0.84	0.51	0.21	0.59	0.87	1.00						
Competitor threats	0.42	0.29	0.41	0.57	0.19	0.27	0.44	1.00					
Human capital	0.78	0.59	0.19	0.33	0.42	0.09	0.16	0.93	1.00				
Organization structures	0.84	0.66	0.45	0.76	0.55	0.36	0.72	0.79	0.69	1.00			
Firm size	0.63	0.78	0.47	0.69	0.81	0.55	0.68	0.58	0.43	0.74	1.00		
e-government	0.71	0.66	0.59	0.74	0.55	0.49	0.61	0.70	0.72	0.46	0.68	1.00	
Country market size	0.43	0.28	0.62	0.51	0.69	0.71	0.45	0.83	0.24	0.62	0.36	0.57	1.00

4.2. Regression Coefficients Results and Analysis

Beyond the relationship between variables, measuring the extent of the relationship is important. Based on this fact, the next multiple linear regressions are developed to indicate the extent of effect between variables. As indicated in Table 4, the model contains three foundations (based on Equations (2)–(4) in the model specification section). Thus, the next computations belong to each result and analysis of regressions.

Table 4. Regression coefficient.

Models	1	2	3
Leaders' attitude on technology adoption	0.141 ** 0.021	0.0814 ** 0.0142	0.0913 *** 0.0017
Adoption costs	0.109 ** 0.019	0.0762 ** 0.0213	0.0102 *** 0.0025
Status of e-governance	3.051 *** 0.0028	0.091 *** 0.0016	0.271 ** 0.0162
Network facilities	0.487 *** 0.00311	0.2359 ** 0.0237	0.1204 * 0.088
Firms size	0.193 *** 0.005	1.018 ** 0.031	3.612 ** 0.0124
Language barriers		0.318 *** 0.008	0.315 *** 0.0015
Country market size	3.571 0.018	0.931 *** 0.006	
Reliability of utility sources		0.921 ** 0.0441	3.209 ** 0.0454
Firm size * market size	0.795 *** 0.004		
Risk aversions		3.054 *** 0.009	0.0813 ** 0.0311
Firm size * risk aversion			0.081 *** 0.002
Threats from competitors	0.198 *** 0.0017	−1.027 ** 0.0228	−2.481 ** 0.041
Human capital access (skills)	1.972 ***	0.0547 **	0.527 **

	0.005	0.0176	0.007
Adoption costs * firm size	0.186 ***	0.681 ***	0.217 *
	0.008	0.005	0.0531
The firm's organizational structure fit	3.091 **	1.008 **	0.139 **
	0.041	0.021	0.024
Human capital * network facility	0.257 *	1.068 **	4.007 ***
	0.061	0.014	0.002
e-governance * network facilities			0.413 *
			0.071
Constant	15.291 ***	29.527 ***	22.572 **
	0.001	0.009	0.040
No. of SMEs	365	365	365
Adj. R^2	0.813	0.891	0.7351

No. of observation= 365, ***. $p \leq 0.010$, **. $p \leq 0.05$, * $p < 0.10$.

According to the result from Table 3, this article has measured the predictive power of independent and moderating variables towards e-business adoptions and enhancers of the internationalization of firms first in the model. Accordingly, in model 1, the results revealed a positive and significant effect regarding the effects of different costs incurred in adopting e-business. Thus, the result implies that a single unit improvement in the management of costs associated with e-business adoption will enhance the status of technology adoptions by 0.109 at not more than a 5% degree of error. Similarly, the former literature also revealed that the areas with the highest readiness to interact with high technology regarding costs of adopting technology will accept greater opportunities, and vice versa [3,24,30]. In another view, the associations of corporate leaders' attitudes, network infrastructures, and firm size (large/small) were evaluated in model 1. The results also similarly revealed that the enterprises' leaders' attitudes toward attracting and administering technologies contributed $\beta = 0.141$ at not more than a 5% degree of error to the e-business adoption status of enterprises, whereas the availability of network infrastructure fosters e-business adoption of enterprises by $\beta = 0.487$ at not more than a 1% degree of error. The findings from some of the literature also confirm that technology adoption is highly associated with the need to satisfy both stakeholders in the core business units [57,67,68]. Likewise, model 1 added the interactions of firm size and country market size (growing, stagnant, or falling size of enterprises) toward e-business adoptions, which contributed $\beta = 0.795$ at not more than a 5% degree of error, to enhance internationalization technology-intensive firms. However, the contributions of firm size on e-business adoption alone are only about $\beta = 0.193$ at a 1% degree of error.

In the context of the economic demand side, the standing together of growing market size and increments of product or service lines inspires the need for e-business by 0.795 at not more than a 1% degree of error. Moreover, the model 1 result shows that considering the moderating roles of e-government and market size enhances e-business adoptions by $\beta = 3.051$ at less than 1% and $\beta = 3.571$ at less than 5%, respectively. The result indicates that the association of each variable toward influencing e-business adoption status further influences the internationalization of high-tech born global firms. Likewise, the result reveals that as the government highly supports online service delivery activities and the market size is growing parallelly, the attraction of technology-intensive firms is also essentially enhanced [69].

In addition, model 2 illustrates the effect of multilinguistic service, the lack of reliable sources of utilities (electricity and internet), risk aversion attitude, market size, and e-government on the e-business adoption progress of firms. Accordingly, the result revealed that the difficulties associated with imitating various languages while e-business

adoptions impact adoptions progress by β = 0.318 at a 1% degree of error, whereas a lack of reliable sources of utilities, such as but not limited to electricity and internet access, contributes β = 0.921 at a 5% degree of error to e-business adoptions. Indeed, a substantial power source (electricity) is necessary to ensure readiness for internationalization. In areas where electricity and internet access are not reliable and there are frequent power failures, hardware burn and maintenance are serious problems for firms. Likewise, the risk aversion attitude of technology receivers impacts e-business adoption by β = 3.054 at a 1% degree of confidence. Similarly, considering the moderators, such as country market size and e-government, associated with e-business adoptions of β = 0.931 at a 1% degree of error and β = 0.091 at a 1% degree of error, respectively. Model 2 also shows that the analysis of the interactions of human capital (skill levels of technology receivers) with network infrastructure toward e-business adoptions resulted in β = 1.068 at a 5% degree of error. In another context, the interactions of firm size (large/small) with technology adoption costs ensure the firm's readiness to coordinate with the internationalization of high-tech born global enterprises. As a result, the interactions of firm size with costs of adopting e-business to the intended firm size are associated at β = 0.681 with a degree of error of 1%. The result implies that the growing firm size is contributing to sales units, and this enhances firms' confidence to imitate updated technology even though the costs are the highest [70].

Lastly, in model 3, this study measured the effect of threats from competitors, firms' structural fit, human capital, and e-government status (moderator) toward e-business adoption. Based on the result, the effect of threats from potential competitors was negatively associated with e-business adoptions by β = −2.481 at a 5% error. In contrast, the firm's organizational structural fit fostered e-business adoption by β = 0.139 at a 5% degree of error. Similarly, the moderating effect of e-government was β = 0.271 at 5% of the degree of error; the moderating effect of human capital enhanced adoption by β = 0.527 at 1% of the degree of error. In this model context, enhancement of human capital (technical skills improvement) certainly moderates e-business adoptions of firms at greater contributions of β = 0.527 at 1% degree of error. The results are consistent with the former findings that found the technical skill level of users toward influencing e-business adoptions also simplifies the internationalization of firms [71,72]. Additionally, model 3 examined the associations of firm size and risk aversion attitude toward e-business adoptions that contribute to the acceptance of the internationalization of firms. From the result, taking into account the effect of associations of firm size and risk aversion attitudes positively and significantly enhanced e-business adoptions at β = 0.081 at 1% degree of error. Similarly, considering the interaction of e-government status, network facilities foster e-business adoptions by β= 0.413 at a 10% degree of error. Importantly, these results are supported by the former finding that focused on the enhancement of e-governance with high network facilities certainly enhances growth and interactions beyond a single border [73–77].

5. Practical Aspects of the Findings

For underdeveloped countries, the wide proliferation of technology is essential compared to developed nations. This is because doing business is nothing without a necessary network across borders. This business network works fast based on the technology utilizations of nations. Therefore, underdeveloped nations need to enhance e-business adoptions to attract giant businesses to their countries. According to several pieces of the literature, including from the authors above and their empirical results, this research finding also does not contradict former findings. According to the regression results, focusing on these antecedents in e-business adoptions of countries is quite essential to easily imitate high-tech firms from abroad. Specifically, in each of these variables, several constraints were measured such as leaders' attitudes toward e-business, network infrastructure,

threats from competitors, reliable utility sources, human capital quality, costs of adoptions, and others. Therefore, the results indicate that each variable needs to be positively maintained to ensure easy imitations of internationalization of born global firms.

6. Conclusions and Suggestions

According to the findings of the research at hand, the factors embedded in the TOE framework have material effects on e-business adoptions of enterprises in underdeveloped countries. Consequently, the low rate of technology expansion in underdeveloped countries has a significant effect on enterprises' internationalization attempts. For instance, as the size of a firm increases across borders, the need for technology is enhanced. Therefore, the positive standing together of growing market size and increments of product or service lines inspires the need for e-business. Likewise, e-government or government online services and growing market size are attributes for the attraction of technology-intensive firms' attractions. However, the interaction of risk aversion probability and firm size is significant and needs the attention of owners irrespective of firm size. Similarly, the threat from potential competitors needs due attention, too.

Moreover, following the arguments in firms' internationalization theories, particularly emphasizing the network theory of internationalization of enterprises, the present research also uses a network theory approach by considering antecedents in e-business perspectives of various countries. As the results indicate, antecedents such as leaders' attitude of preferring technology-intensive firms, network infrastructure, risk-averting attitudes, country market size, multilingual services, e-government status, threats from competitors, reliable utility sources, human capital quality, costs of adoptions, and telecom services enrichments, the costs of adopting different online services need be taken into account before starting networking enterprises across the border.

7. Limitations and Future Research

Lastly, in this research, the authors have emphasized the effects of antecedents from technological, organizational, and environmental perspectives on 365 enterprises. It was mainly focused on networking enterprises across borders. Since this study focuses on a limited enterprise, any interested researchers expand and examine the effect of the TOE framework on enterprise networking in underdeveloped nations. Moreover, the conclusion of this study was based on regression coefficients. However, multiple tools may be implanted to determine the replicability of the result.

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