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What drives global B2C E-commerce? An analysis of the effect of ICT access, human resource development and regulatory environment

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ABSTRACT

This study explores the drivers of Business to Consumer (B2C) electronic commerce (e-commerce) adoption at a global level. The study used a Technology-Organisation-Environment (TOE) framework to investigate factors that influence B2C e-commerce adoption. The study relied on archival and cross-sectional data from 135 countries and employed Partial Least Squares Structural Equation Modelling (PLS-SEM). Our findings indicate that B2C E-commerce adoption at the national level is positively influenced by ICT access, political and regulatory environment and human resource development. Our findings show that technological, organisational, and environmental factors (ICT access, political, human resource development and political and regulatory environment) altogether explain 70% of the variance in B2C E-Commerce adoption. Our findings provide a fresh insight into the adoption of B2C e-commerce at the national level. Our study provides some implications for research and practice.

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B2C E-commerce; ICT access; regulatory environment; human resource development

1. Introduction

Electronic commerce (e-commerce) has become the number one priority for many businesses across the globe (Awiagah, Kang, and Lim 2016). Companies now rely on the Internet to market their products to individuals and to communicate with their shareholders (Rodríguez-Ardura and Meseguer-Artola 2010). The reliance on the internet by businesses has been triggered by the increasing number of individuals who patronise online shopping. In 2017, an estimated 11% of online shoppers made online shopping on a weekly basis through their smartphones (Statista 2019a). E-commerce is defined as 'the use of the global internet for purchase and sale of goods and services, including services and support after sale' (Treese and Stewart 1998, 5). E-commerce is changing the way trade is carried out worldwide. Nevertheless, this transition is rising at different rates in different parts of the world (Zheng 2016). Asia, the US, and Northern Europe are currently experiencing rapid growth in e-commerce compared to other parts of the world (Awiagah, Kang, and Lim 2016; Pappas et al. 2017). There are several e-commerce classifications. E-commerce can be classified based on communicating entities, i.e. customers, corporations, and governments, most of which are categorised as business-to-customer (B2C), business-to-business (B2B) and business-to-government (B2G) (Thatcher, Foster, and Zhu 2006).

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This study focuses on B2C e-commerce. This category of e-commerce enables firms to advertise, sell products to customers and receive payment for products electronically (Iddris 2012; Turban et al. 2010). B2C e-commerce is currently experiencing tremendous growth as more and more individuals favour purchasing goods online (Statista 2019a). In the year 2013, an estimated 1 billion people worldwide purchased goods online. This number increased to 1.8 billion people in the year 2018 which is nearly one-seventh of the world's population (Statista 2019a). Furthermore, in the year 2017, worldwide retail e-commerce sales amounted to \$2.3 trillion. It is, however, projected to increase to \$4.88 trillion in the year 2021 (Statista 2019b). Despite the overwhelming potential of B2C e-commerce, extant studies in this area have largely focused on B2C e-commerce adoption at the industry or firm-level within a specific country. This includes the study (Rodríguez-Ardura and Meseguer-Artola 2010) which adopted the framework for technology-organisation-environment to conduct a study among Spanish companies on the drivers of B2C e-commerce. Results from their study revealed that technological readiness, increasing scope of the firm's operation, environmental factors such as ICT and government regulations influence the adoption of B2C e-commerce by firms. Similarly, findings from the study of Awiagah, Kang, and Lim (2016) conducted on e-commerce adoption among Small and Medium Enterprises (SME's) in Ghana indicate that that government support greatly impacted SME's intentions to adopt and use e-commerce. Furthermore, managerial support and regulatory conditions played a key role in inspiring SME's adoption of e-commerce. While important, these studies largely examined the impact or effect of each TOE construct on the adoption of B2C e-commerce at the firm or industry level. Therefore, aiming to fill the gap inherent in literature, this study seeks to examine the effect of each TOE construct B2C e-commerce adoption at the global level. In addition, we examine the relationship between the constructs in the framework and how they subsequently influence e-commerce adoption at the global level. To carry out this study, we rely on data from 135 countries from sources including the World Bank World Development Report (World Bank 2006), and World Economic Forum (WEF) Global Information Technology Report (GITR) (Baller, Dutta, and Lanvin 2016).

The rest of the paper is structured as follows; first, in Section 2, we highlight the theoretical framework and the development of the hypothesis. In Section 3, we outline our methodology. Furthermore, we analyse data and present findings in Section 4. Finally, we discuss findings and conclude our research whilst outlining the limitations and implications of this study for future research in Sections 5 and 6 respectively.

2. Theory and hypothesis development

2.1. Technology-organisation-environment framework

To carry out this study, we lean on the foundations of the Technology-organisation-environment (TOE) framework as proposed by DePietro, Wiarda, and Fleischer (1990). The TOE framework seeks to explain the process through which an organisation or firm adopt and implement technological innovations. The framework argues that the process by which organisations adopt and implement technological innovations is determined or influenced by the technological, organisational and environmental contexts (DePietro, Wiarda, and Fleischer 1990). First, the technological context is made up of both internal and external technology technologies which are essential for the organisation. These technologies may include, but not limited to equipment, processes, etc. In addition, the organisational context relates to the features and resources of the organisation, for example, human resources, the size of the firm, managerial structure, the number of slack resources, linkage among employees and degree of centralisation. Lastly, the environmental context consists of the firm's competitors, the size and structure of the firm, the regulatory environment and the macroeconomic context (DePietro, Wiarda, and Fleischer 1990). Together, these constructs (i.e. Technology, Organisation and Environment) influence the manner in which organisations view the need for the adoption of new technology.

Extant studies in the field of Information Systems (IS) have adopted and applied the TOE framework across several research areas. This includes domains such as electronic data interchange (Musawa and Wahab 2012), adoption of inter-organisational systems (Al-Hujran et al. 2018; Bhattacharya and Wamba 2015; Gangwar, Date, and Ramaswamy 2015; Grover 1993), enterprise systems (Ramdani, Kawalek, and Lorenzo 2009), open systems (Chau and Tam 1997), e-business (Soto-Acosta, Popa, and Palacios-Marqués 2015; Srivastava and Teo 2010; Srivastava, Teo, and Teo 2006; Zhu and Kraemer 2005) and a broad range of IS applications (Thong 1999). TOE has similarly been adopted by IS researchers to study e-commerce adoption. However, considerable studies have largely focused on e-commerce adoption at the firm or industry level within a single country (Aljowaidi, Arbia, and Arabia 2015; Awiagah, Kang, and Lim 2016; Ibrahim and Stevens 2014; Mohtaramzadeh, Ramayah, and Jun-Hwa 2018a). A dearth of studies relying on the TOE framework to undertake studies on e-commerce adoption at the global level exist. This includes the study of (Jennifer and Kenneth 2004). They adopted the TOE framework to examine the drivers of e-commerce adoption of 2,139 establishments across ten countries. The findings from their study revealed that environmental factors, as well as technological readiness, plays a major role in the firms' adoption of e-commerce. Although the significance of this study cannot be excluded, a problem arises when findings from this study are generalised to the global context. Furthermore, previous studies failed to examine the relationships between constructs in the TOE framework and how they subsequently influence B2C e-commerce adoption. It is against this backdrop that we seek to carry out this study to examine the drivers of B2C e-commerce adoption at the global level. Furthermore, we examine the relationships between constructs in the TOE framework and how they influence B2C e-commerce adoption. Figure 1 depicts our model based on the TOE framework.

2.2. Technology context

Oliveira and Martins (2008) refer to technology readiness as a firm's technology infrastructure and Information Technology (IT) human resources. Thus, the range of technologies available to a firm (Scupola 2009). This consists of internal and external technologies that are considered essential to the firm or organisation. Results from the study of Krishnan, Teo, and Lim (2013) indicates that a nation's technology infrastructure promotes the adoption of different kinds of ICT systems. Furthermore, findings from the studies of (Aljowaidi, Arbia, and Arabia 2015; Ibrahim and Stevens 2014) on e-commerce adoption in Ghana and Saudi Arabia respectively, revealed that, a nation's technological infrastructure influences the firm's adoption of e-commerce. Similarly, results from the study of Ferguson and Yen (2006) on e-commerce adoption at the global level revealed that a nation's ICT infrastructure influences its adoption of e-commerce. We, therefore, extend this to postulate that, ICT access which represents the technology construct in our study will positively affect B2C e-commerce adoption and use at the global level. We measure ICT access in this study by fixed telephone subscription, household with internet access, households with personal computers, and Internet bandwidth per user (ITU 2017). We, therefore, hypothesise that;

H₁: The level of ICT access in a country is positively associated with its B2C e-commerce adoption

Furthermore, studies conducted on e-commerce adoption have largely examined the effect or influence of the technological context or construct on e-commerce adoption and use (Awiagah, Kang, and Lim 2016; Ho, Kauffman, and Liang 2007; Mohtaramzadeh, Ramayah, and Jun-Hwa 2018b; Rodríguez-Ardura and Meseguer-Artola 2010). In addition, the literature reviewed indicates that public policies and regulations are essential in advancing ICT diffusion (Billon, Marco, and Lera-Lopez 2009). Although results from these studies are valuable, we extend them to postulate that, ICT access within a country is positively associated with its political and regulatory environment (ICT Regulation). We, therefore, argue that once individuals or citizens in a country have ICT access,

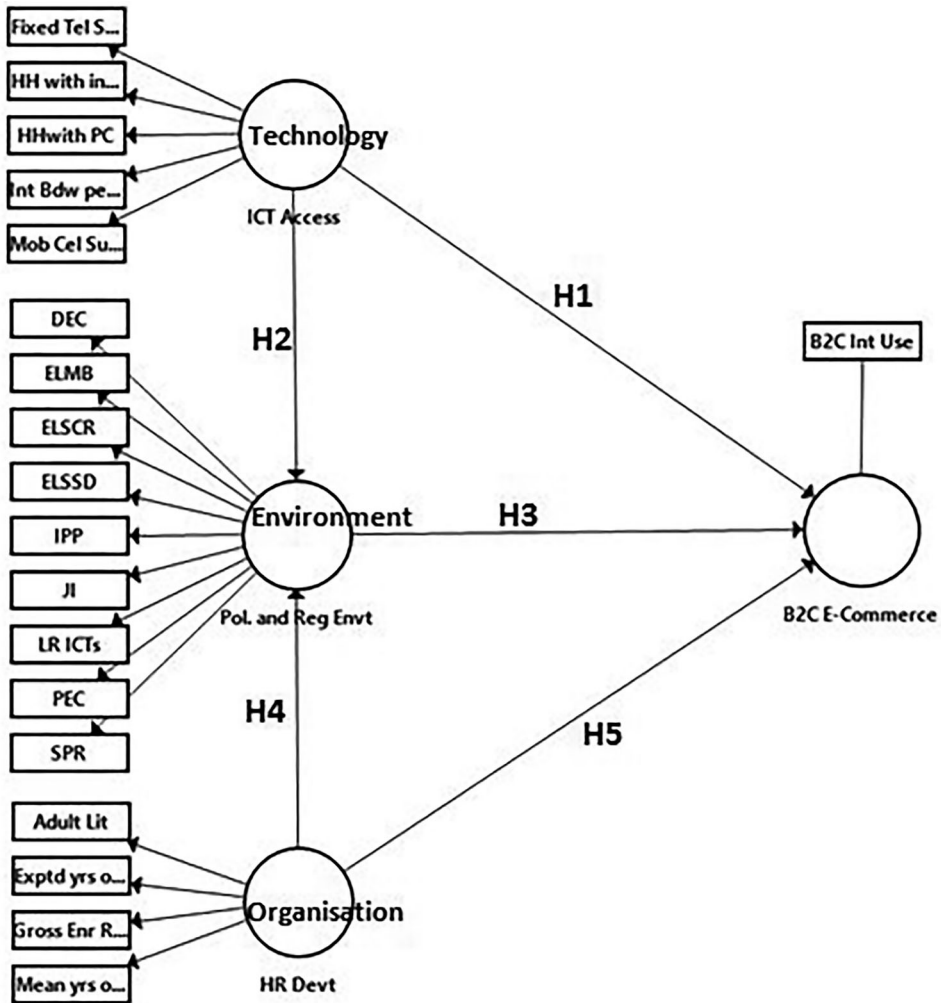


Figure 1. Research model.

the government rolls out certain mechanisms or policies to regulate the use and ensure security and privacy on e-commerce platforms. As a result, we hypothesise that;

H₂: The level of ICT access in a country is positively associated with its political and regulatory environment.

2.3. Organisational context

Organisational context refers to the features and resources of the organisation or firm. This may include, its human resources, size, managerial structure, degree of centralisation, degree of formalisation and linkages among employees (Tornatzky, Eveland, and Fleisher 1990). Findings from the study of Bogaert, Martens, and Cauwenbergh (1994), revealed that, that employees should be viewed as the most important resource for organisational development. Therefore, applying this to the global level, we argue that, education and training of individuals within a country will positively influence B2C e-commerce adoption. From the study of (Srivastava and Teo 2010), it was found that education and training was the main driver for e-business

and e-government use. Similarly, findings from the study of (Ho, Kauffman, and Liang 2007) also indicate that education and the quality of human resources influence B2C e-commerce adoption and use. We, therefore, extend these results to postulate that, organisation, which is represented in this study as human resource (HR) development positively influences B2C e-commerce adoption. We further measure HR development by Adult literacy, Gross enrolment Ratio, Expected Years of Schooling and Mean Years of Schooling (World Bank Group 2016). We, therefore, hypothesise that;

H₃: The level of HR development in a country is positively associated with its B2C e-commerce adoption

In addition, there exists a lack of studies examining the effect or influence of HR development and political and regulatory environment. The lack of professional and educated human resources, institutional structures and processes, would make it difficult for regulatory agencies to act in a credible manner (Quarthey 2005). This lack of credibility poses a negative effect on the total effectiveness by reducing the relationship between the regulators and the various stakeholders concerned in the regulated sector. We, therefore, postulate that HR development in a country will positively influence its political and regulatory environment. That is, we argue that a trained and educated HR will consciously use ICTs and as such, regulations relating to the use of ICTs would be lenient. This, therefore, leads to our next hypothesis that states that;

H₄: The level of HR development in a country positively influences its political and regulatory environment.

2.4. Environmental context

According to Tornatzky, Eveland, and Fleisher (1990) and Zhu and Kraemer (2005), the environment construct comprises of the firm's regulatory environment, its size and structure, as well as its macro-economic environment. Findings from the study of (Khan and Krishnan 2019) on ICT laws and its impact on ICT diffusion within countries revealed that ICT laws within a country positively influence ICT diffusion among individuals, businesses, and governments within a country. Similarly, findings from the studies of Awiagah, Kang, and Lim (2016), Mohtaramzadeh, Ramayah, and Jun-Hwa (2018b), Rodríguez-Ardura and Meseguer-Artola (2010) showed that the environmental construct plays a key role in e-commerce adoption. Relying on this evidence stated above, we postulate that the environmental construct which is represented by the political and regulatory environment in this study positively influences B2C e-commerce adoption. We measure this construct by the effectiveness of law-making bodies, laws relating to ICTs, judicial independence, efficiency of the legal system in settling disputes, intellectual property protection, software piracy rate, the percentage of installed software, number procedures to enforce a contract and number days to enforce a contract (in the 2016 Network Readiness Index) drawn from the World Economic Forum (WEF) Global Information Technology Report (GITR) (Baller, Dutta, and Lanvin 2016). We, therefore, hypothesise that;

H₅: The level of political and regulatory environment within a country positively influences its B2C e-commerce adoption.

3. Research methodology

3.1. Data sources

The data for the study was drawn from several archival sources for the period 2016. Specifically, data were drawn from the ITU (for ICT access data), the World Bank (World Development Indicators-Human capital index) and World Economic Forum (for the political and regulatory environment of the Network Readiness Index). The data were collected from 135 countries globally from these sources because; first, the researchers were constrained resources and time to be able to collect primary data on this scale and so the need to depend on these reliable data sources which have

been used in past research of this nature. Secondly, data was not readily available in a single source and so collecting and compiling the data from these databases for this research was needful. The ITU database contained data for 176 countries whilst the data from the WDI contained 193 countries. The GCI report, on the other hand, contained data for 151 countries. These different secondary data sources were merged for all the countries which had complete data in relation to the constructs under study. We took cognisance of the fact that the variables used were taken from these different sources, we only considered data for the countries that were available in all reports. The data points which were common across all the reports were then analysed and these led to a list of 135 countries. The data points for indicators that had missing data of less than 5% were mean-replaced (Hair et al. 2016).

3.2. Constructs measures

They were four latent variables under consideration. These were ICT access, political and regulatory environment, human resource development and B2C e-commerce. ICT access concerns communication technologies that provide access to information. This includes access to the Internet, wireless networks, cell phones, and other communication technologies. ICT access is measured by indicators such as fixed telephone subscriptions, households with personal computers, households with internet access, internet bandwidth per user and mobile cellular subscriptions. ICT access is a subcomponent of the ICT development index, which is drawn from the 2016 International Communications Union (ITU) report (ITU 2017). The political and regulatory environment is a pillar of the World Economic Forum (WEF) Global Information Technology Report (GITR) (Baller, Dutta, and Lanvin 2016). It consists of nine variables and these variables assess the extent to which a national legal framework facilitates ICT penetration and the safe development and engagement in business activities. Generally, features such as the protection afforded to property rights, the independence of the judiciary, and the efficiency of the law-making process as well as more ICT-specific dimensions such as the passing of laws relating ICTs and software piracy rates. The human resource development constructs in the model are measured by four indicators. This consists of adult literacy, gross enrolment ratio, expected years of schooling and the mean years of schooling for each country. The source of this is the Human Capital Index from the 2016 World Development Report. The B2C e-commerce adoption construct is measured by the use of B2C consumer internet use, which was drawn from the 2016 GITR. It assesses the overall use of the internet by businesses to interact with consumers. The WEF's Global IT Report (Baller, Dutta, and Lanvin 2016) reports the measure that captures the extent of B2C internet use in different countries. Table 1 provides a summary of the constructs, the indicators and the sources of the data. The acronyms for each indicator are also provided.

4. Results and analysis

We used Smart PLS to conduct our data analysis in exploring the drivers of B2C e-commerce by assessing the effects of IT access, human resource development and the political and regulatory environment of a country. The results of the analysis is depicted in Figure 2. The study used partial least squares structural equation modelling (PLS-SEM) over covariance-based SEM techniques because we found the use of PLS-SEM in dealing with small sample sizes appropriate, especially when models used comprise of many constructs (Fornell and Bookstein 1982; Hair et al. 2017; Willaby et al. 2015). Secondly, the use of distributional assumptions in PLS-SEM (do Valle and Assaker 2016; Hair et al. 2012; Nitzl 2016) was the reason because of the reliance on non-normal data. Lastly, PLS-SEM was found to be suitable for exploratory research with secondary data, since it provides some flexibility for the interplay between theory and data (Nitzl 2016).

Table 1. Constructs and sources of data.

SN	Latent Variable	Proxy	Source	Indicator	Acronym
1	Business-to-Consumer E-commerce	Business-to-consumer Internet use	Network Readiness Index (NRI)	Business-to-consumer Internet use	B2C Int Use
2a	ICT Access	ICT Access	ITU	Fixed Telephone Subscriptions	Fixed Tel Subs
b				Households with internet access	HH with internet acc
c				Households with computers	HHwith PC
d				Internet bandwidth per user	Int Bdw per User
e				Mobile cellular subscriptions	Mob Cel Subs
3a	Political and Regulatory Environment	1st pillar: Political and regulatory environment	Network Readiness Index (NRI)	Effectiveness of law-making bodies	ELMB
b				Laws relating to ICTs	LR ICTs
c				Judicial independence	Jl
d				Efficiency of legal system in settling disputes	ELSSD
e				Efficiency of legal system in challenging regs	ELSCR
f				Intellectual property protection	IPP
g				Software piracy rate, % software installed	SPR
h				No. of procedures to enforce a contract	PEC
i				No. of days to enforce a contract	DEC
4a	Skilled Labour	HCI	World Development Report	Adult Literacy	Adult Lit
b				Gross Enrolment Ratio	Gross Enr Ratio
c				Expected years of schooling	Exptd yrs of sch
d				Mean years of schooling	Mean yrs of sch

4.1. Assessment of the measurement model

The model under study was a reflective one and so we tested for reliability and validity of the measurement model before an assessment of the structural model was conducted. To do this we assessed for internal consistency for reliability, convergent validity, and discriminant validity (Hair et al. 2019). As a reflective model, our first was the indicator loadings. Loadings above 0.7 are recommended (Hair et al. 2019) since they indicate that acceptable item reliability is achieved because at least the construct explains more than 50% of the indicator's variance. Not all the indicators loaded significantly on their corresponding constructs (Gefen and Straub 2005). When the analysis was first run some of the indicators were less than the threshold of 0.7 and so were dropped. Specifically, and in terms of ICT Access, HH with internet acc was 0.411 and int bdwth pp 0.573. In terms of the Pol. and Reg Envnt, SPR, PEC, and DEC were -0.033 , 0.521 , and -0.396 respectively and were also deleted. The model was re-run after that. The results were then extracted for an assessment and evaluation of the measurement and structural model. This meant that not all the indicators were a good measurement of the latent constructs. Construct reliability and validity were assessed in different ways. The internal consistency, Cronbach's alpha and Fornell-Larker's composite reliability (Fornell and Larcker 1981; Jöreskog 1971) were used. This is summarised in Table 2. The threshold for Cronbach's Alpha is 0.7 (Nunnally 1978) and all were from 0.749 to 1.000 in excess of the minimum. The Cronbach's alpha is said to produce lower values than composite reliability and is a less precise measure of reliability because the items are unweighted. Therefore, rho A is usually used as an alternatively approximate measure of construct reliability (Dijkstra and Henseler 2015). Rho A also exceeded a minimum of 0.7. The composite reliabilities also exceeded the minimum threshold of 0.7 and this was considered adequate (Fornell and Larcker 1981). Whilst this was considered adequate and proof of internal consistency, a third step assessed was employed to test for the

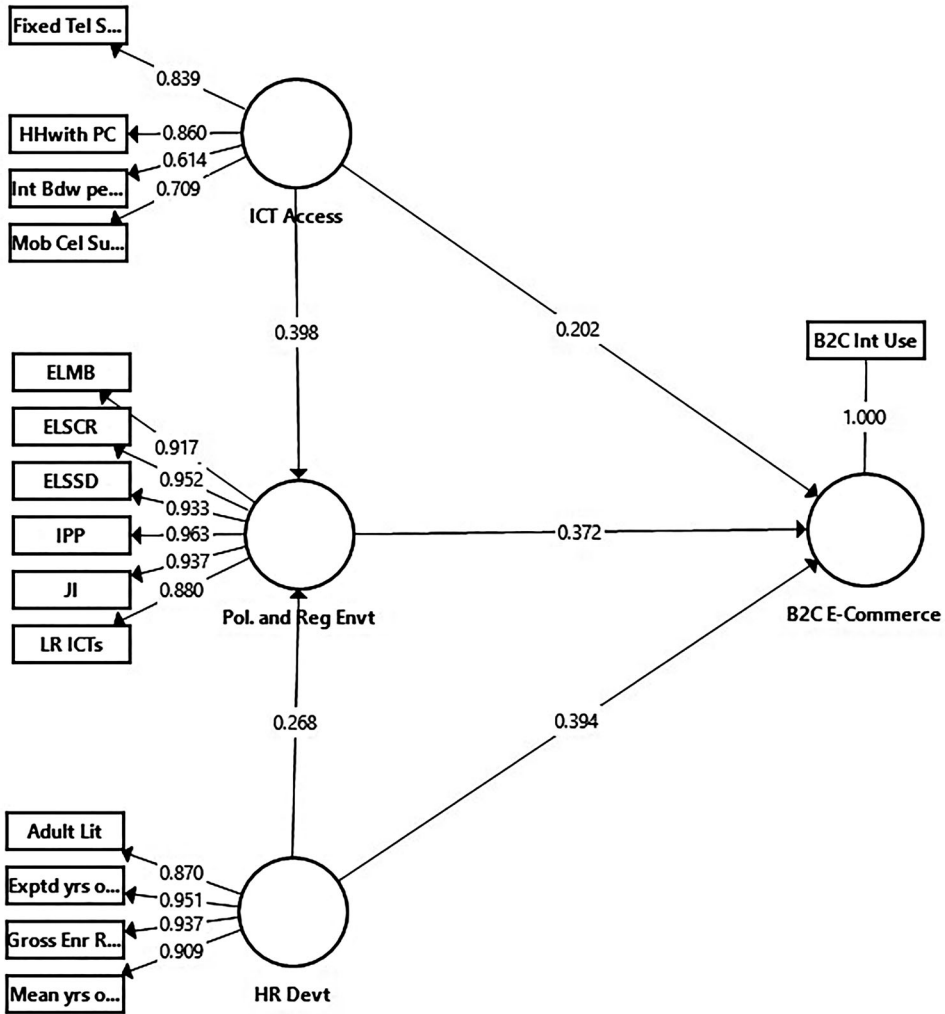


Figure 2. Results of PLS analysis.

convergent validity of each construct measure. Convergent validity is used to measure the extent to which the construct meets to explain the variance of its items. The measure of a construct’s convergent validity is the average variance extracted (AVE). This is used to measure all items on each construct and the threshold is ≥ 0.50 or higher to indicate that the construct explains at least 50% of the variance of its items. In our study, all the Average Variances Extracted (AVEs) were higher than the 0.5 threshold (Fornell and Larcker 1981; Hair et al. 2019).

Furthermore, we assessed for discriminant validity. Discriminant validity refers to the degree to which a construct is empirically different and distinct from other constructs in the structural model. The cross-loadings were used to assess this. As depicted in Table 3, the loadings for each

Table 2. Construct reliability and validity.

	Cronbach’s alpha	rho_A	Composite reliability	Average variance extracted (AVE)
B2C E-Commerce	1.000	1.000	1.000	1.000
HR Devt	0.937	0.945	0.955	0.841
ICT Access	0.749	0.749	0.845	0.581
Pol. and Reg Envt	0.970	0.992	0.975	0.866

construct exceed its corresponding cross-loadings. For example, Fixed Tel Subs loads high on its corresponding construct ICT Access (0.839) but lower on constructs HR Devt (0.715) Pol. and Reg Envt (0.511) and B2C E-Commerce Adoption (0.659). This means that from the cross-loadings discriminant validity has been established.

In addition, we assessed for discriminant validity by using the Fornell-Larcker criterion (Fornell and Larcker 1981). This criterion holds that the AVE of each construct needs to be compared to the squared inter-construct correlation (to determine a measure of shared variance) of that same construct as well as other constructs which are reflective in the structural model. For all of the model's constructs, the shared variance is not supposed to be larger than their AVEs (Fornell and Larcker 1981; Hair et al. 2019). From Table 4 below, the diagonals are the square root of the AVE of the latent variables. These are highest in any column or row and this shows adequate discriminant validity.

More recently, Henseler, Ringle, and Sarstedt (2015) propose that the Fornell-Larcker criterion can be complemented with the Heterotrait-Monotrait (HTMT) ratio of the correlations (Voorhees et al. 2016). The HTMT shown in Table 5 explains the mean value of the item correlations across constructs

Table 3. Indicator item cross loadings.

	HR Devt	Pol. and Reg Envt	ICT Access	B2C E-Commerce
Adult Lit	0.870	0.365	0.628	0.627
Exptd yrs of sch	0.951	0.565	0.673	0.685
Gross Enr Ratio	0.937	0.538	0.629	0.661
Mean yrs of sch	0.909	0.545	0.711	0.753
ELMB	0.368	0.917	0.442	0.515
ELSCR	0.402	0.952	0.465	0.577
ELSSD	0.347	0.933	0.412	0.521
IPP	0.612	0.963	0.618	0.735
JI	0.516	0.937	0.548	0.616
LR ICTs	0.695	0.880	0.692	0.847
Fixed Tel Subs	0.715	0.511	0.839	0.659
HHwith PC	0.845	0.639	0.860	0.765
Int Bdw per User	0.130	0.260	0.614	0.233
Mob Cel Subs	0.490	0.378	0.709	0.477
B2C Int Use	0.746	0.710	0.706	1.000

Table 4. Discriminant validity: fornell-larcker criterion.

	B2C E-Commerce	HR Devt	ICT Access	Pol. and Reg Envt
B2C E-Commerce	1.000			
HR Devt	0.746	0.917		
ICT Access	0.706	0.722	0.762	
Pol. and Reg Envt	0.710	0.556	0.592	0.931

Table 5. Heterotrait-monotrait ratio (HTMT).

	B2C E-Commerce	HR Devt	ICT Access	Pol. and Reg Envt	
B2C E-Commerce					
HR Devt	0.768				
ICT Access	0.816	0.859			
Pol. and Reg Envt	0.692	0.545	0.667		
	Original sample (O)	Sample mean (M)	Bias	2.50%	97.50%
HR Devt -> B2C E-Commerce	0.768	0.767	-0.001	0.697	0.824
ICT Access -> B2C E-Commerce	0.816	0.813	-0.003	0.732	0.898
ICT Access -> HR Devt	0.859	0.861	0.002	0.738	0.975
Pol. and Reg Envt -> B2C E-Commerce	0.692	0.69	-0.002	0.593	0.767
Pol. and Reg Envt -> HR Devt	0.545	0.543	-0.002	0.402	0.662
Pol. and Reg Envt -> ICT Access	0.667	0.663	-0.004	0.494	0.811

relative to the (geometric) mean of the average correlations for the items measuring the same construct. The HTMT has a proposed threshold of 0.90. What this portrays is that with an HTMT value of 0.90, it means that that discriminant validity is not present. Further testing using the HTMT can be done using bootstrapping to test whether the HTMT value is significantly different from 1.00 (Henseler, Ringle, and Sarstedt 2015). A bootstrapping procedure was run in order to examine if the upper bound of the 95% confidence interval of HTMT is lower than 0.90.

4.2. Assessment of the structural model

Finally, we assessed for multicollinearity as shown in Table 6. This is done by examining the variance inflation factor (VIF) taking into cognisance a minimum threshold of 5 or lower. This is to avoid a collinearity problem (Hair, Ringle, and Sarstedt 2011). If the VIF value is lower than 5 it indicates that the variable under consideration is almost a perfect linear combination of independent variables in the equation (Hair, Ringle, and Sarstedt 2011; Hair et al. 2016; Mansfield and Helms 1982). In our study, all of the VIF values were less than 5 and this confirms that multicollinearity was not a problem in the study.

In order to test the hypothesis for significance, we performed a bootstrapping procedure using a two-tailed *t*-distribution. The bootstrapping was run using 5000 iterations. The results are presented in Tables 7 and 8 and supported by Figure 3.

Table 6. Multicollinearity statistics: inner VIF values.

	B2C E-Commerce	HR Devt	ICT Access	Pol. and Reg Envt
B2C E-Commerce				
HR Devt	2.203			2.086
ICT Access	2.344			2.086
Pol. and Reg Envt	1.625			

Table 7. Structural model hypothesis testing for direct effects.

Hypothesis	Relationship	Std Beta	Std Error	[<i>t</i> -values]	Decision	95% CI LL	95% CI UP
H ₁	ICT Access -> B2C E-Commerce	0.201	0.068	2.979	Supported	0.084	0.304
H ₂	ICT Access -> Pol. and Reg Envt	0.419	0.134	2.976	Supported	0.214	0.643
H ₃	Pol. and Reg Envt -> B2C E-Commerce	0.373	0.052	7.145	Supported	0.285	0.457
H ₅	HR Devt -> B2C E-Commerce	0.393	0.059	6.646	Supported	0.296	0.489
H ₄	HR Devt -> Pol. and Reg Envt	0.246	0.136	1.971	Supported	0.009	0.449

Table 8. *T*-statistics of outer loadings.

	<i>T</i> Statistics (O/STDEV)		
	ICT Access	Pol. and Reg Envt	HR Devt
Fixed Tel Subs <- ICT Access	44.085		
HHwith PC <- ICT Access	33.503		
Int Bdw per User <- ICT Access	10.051		
Mob Cel Subs <- ICT Access	14.879		
ELMB <- Pol. and Reg Envt		53.267	
ELSCR <- Pol. and Reg Envt		93.725	
ELSSD <- Pol. and Reg Envt		58.636	
IPP <- Pol. and Reg Envt		173.234	
JI <- Pol. and Reg Envt		82.125	
LR ICTs <- Pol. and Reg Envt		62.536	
Adult Lit <- HR Devt			43.488
Exptd yrs of sch <- HR Devt			134.468
Gross Enr Ratio <- HR Devt			101.898
Mean yrs of sch <- HR Devt			56.706
B2C Int Use <- B2C E-Commerce			Single item Construct

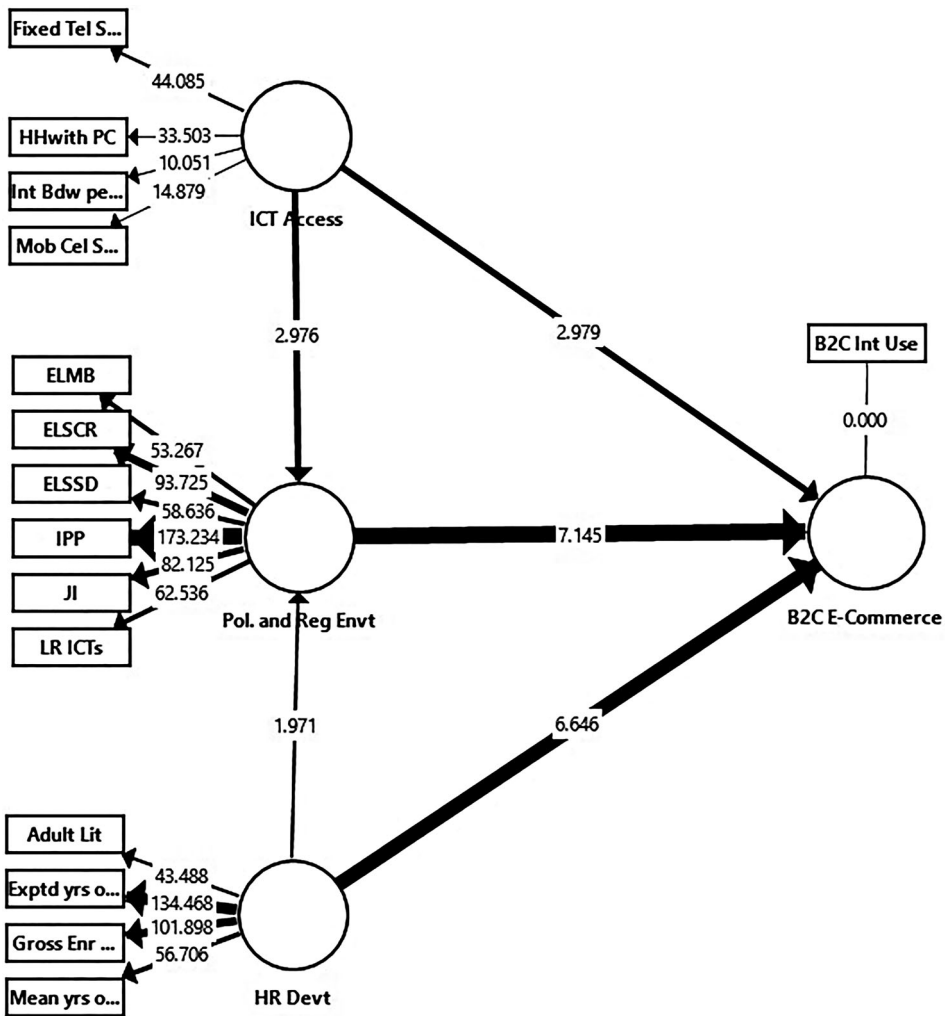


Figure 3. Model hypothesis testing for direct effects.

Table 7 presents a breakdown of the hypothesis results. All five hypotheses proposed in this study were supported. The analysis was done through bootstrapping with bias-corrected 95% confidence intervals. The findings related to the individual hypotheses are discussed in the following section below.

Furthermore, we used the coefficient of determination (R^2) to evaluate the structural model. This was to determine the model's predictive power. The R^2 represents the exogenous latent variables' combined effects on the endogenous latent variable (Hair et al. 2014). From Table 9 above, the R^2 is 0.700 for B2C E-Commerce. This means that the three latent variables (ICT Access, Pol. and Reg Envt and HR Devt) explain 70% of the variance in B2C E-Commerce. Also, ICT Access and HR Devt explain 38.5% of the variance of Pol and Reg Envt. The R^2 values are between 0 and 1 with higher values indicating higher levels of predictive accuracy.

Table 9. R Square.

	R Square	R Square Adjusted
B2C E-Commerce	0.700	0.693
Pol. and Reg Envt	0.385	0.375

5. Discussion of findings

From our analysis of the results, several findings were revealed. This further indicates the acceptance of the stated hypotheses in relation to the findings of the research. First, H_1 which sought to draw a positive association between the level of ICT access in a country and its B2C E-commerce adoption was supported. Although the Internet is a prerequisite for e-commerce, access to the internet does not indicate that people will actually exploit it for trade purposes. However, whilst the number of Internet users across the globe has been on the ascendancy, this has provided some opportunities for global e-commerce (Lawrence and Tar 2010). These opportunities provide an impetus for people to engage in e-commerce. For instance, considering the proliferation of mobile devices, mobile commerce (m-commerce) which is an aspect of e-commerce has seen substantial growth (Khalifa and Shen 2008; Liang and Wei 2004). M-commerce involves the use of wireless and mobile B2B and B2C exchanges of operational and financial data at different levels of a business cycle (Elliott and Phillips 2004). Examples of B2C m-commerce include mobile financial services and mobile shopping. This notwithstanding, globally, a country's technological infrastructure supports the adoption of different varieties of systems and this may also aid the growth of e-commerce (Krishnan, Teo, and Lim 2013). Specifically, our finding is consistent with the findings of Aljowaidi, Arbia, and Arabia (2015), Ibrahim and Stevens (2014) on e-commerce adoption in Ghana and Saudi Arabia who respectively reveal a direct association of a country's technological infrastructure and firm's adoption of e-commerce. However, these studies were conducted in a single country context and findings, therefore, cannot be generalised to the global context. Our findings extend to the global level and therefore fill the gap in the existing literature. Our findings indicate that when access to ICTs is provided, it can enable and boost B2C e-commerce at the global level.

Evidence from the literature indicates that public policies and regulations are critical in advancing or curbing ICT diffusion (Billon, Marco, and Lera-Lopez 2009). Through telecommunication policy, ICT diffusion can be enhanced through infrastructure development and this can influence the market structure and local competition and ultimately lead to reduced ICT costs. This can be achieved by varying the number of ICT providers and thereby affecting access and service costs positively. For instance, African and Latin American countries that ushered in free competition in the telecommunication sector enjoyed a sharper decrease in costs and sectorial growth than countries that postponed market competition (World Bank 2006). The literature also provides evidence that the rule of law and cultural variables can explain the differences in Internet diffusion (Zhao et al. 2007) supporting Chinn and Fairlie (2007) position that the quality of regulatory influence affects the divide in Internet use between developed and developing countries. In middle-income countries, however, an independent ICT regulation authority could be helpful in supporting ICT diffusion (Billon, Marco, and Lera-Lopez 2009). On one hand, whilst regulation can support ICT access and diffusion among individuals and firms, a positive regulatory environment can also lead to advancement in B2C e-commerce through ICT diffusion. This finding, therefore adds to the body of knowledge as extant literature has largely ignored the influence of ICT access on political and regulatory environment. Our finding indicates that, once individuals or citizens in a country have access to ICTs, the government can roll out certain policies to regulate the use and ensure security and privacy on e-commerce platforms.

Furthermore, from the analysis of the results, it was revealed that the hypothesis that the level of HR development is positively associated with B2C e-commerce was supported. This finding indicates that the education and training of individuals within a country will positively influence B2C e-commerce adoption. Similarly, a skilled labour force within an entity will greatly influence how its technological resources are used to facilitate B2C e-commerce. This is consistent with the findings of Srivastava and Teo (2010) and Ho, Kauffman, and Liang (2007) who found that education and training are critical to e-business adoption and use.

In addition, the hypothesis on HR development being positively associated with political and regulatory environment was supported. HR development in terms of the literacy and the ICT skills can

affect how a population would respond to regulations on ICT use. For instance, people who have digital skills and can adapt technology to address their needs will be more persistent in their use of technology for their individual tasks (Yu, Lin, and Liao 2017). As a result, such individuals will be ready to comply with regulatory policies that will enhance their use of technology. Similarly, a more educated population will understand regulatory issues more and hence the difficulty in compliance may be low. Therefore, a more a professional and educated HR will enable regulatory agencies to experience ease in implementing policies because they are more likely to use ICTs in a law-abiding manner.

Lastly, the hypothesis on political and regulatory environment being positively associated with e-commerce adoption was supported. This finding is consistent with the results of other studies such as Khan and Krishnan (2019) who found that ICT laws within a country positively influence ICT diffusion among individuals, businesses, and governments. Similarly, results from the studies of Awiagah, Kang, and Lim (2016), Mohtaramzadeh, Ramayah, and Jun-Hwa (2018b), Rodríguez-Ardura and Mese-guer-Artola (2010) revealed that the environmental construct (i.e. government support, enabling conditions, etc.) plays a key role in e-commerce adoption within a country.

6. Conclusion, limitations and future research

Our study set out to understand the drivers of global B2C e-commerce. We considered the role of ICT access, political and regulatory environment and human resource development at the country level. Relying on secondary data for 135 countries globally, our study makes some important contributions. Firstly, existing studies indicate that the lack of adequate technological infrastructure, socio-economic development as well as lack of national ICT strategies can impede the adoption and growth of e-commerce especially, in developing countries (Lawrence and Tar 2010). Our study adds to the body of knowledge by arguing that the role of ICT access and human resource development in the country, as well as the political and regulatory environment, is critical in driving B2C e-commerce adoption at the global level. Secondly, this study is one of the very few studies that examine how human resource development and ICT access of countries affect the global adoption of B2C e-commerce.

For practice and policy, the implication of our study is that it makes it possible for practitioners and policymakers to realise the impact of the human resource development through skilled labour force achieved through education and training one hand. On the other hand, policymakers need to consider infrastructural development that can bridge the digital divide among citizens to enable more access to ICTs since these can translate into broader e-commerce adoption and economic development.

Despite this, our study is limited by our dependence on secondary data drawn from varying sources. As a result of this, we had to rely on metrics and indices as formulated by the reporting agencies. We could not rely on primary data to ensure better control over the definition of the variables because this was not feasible. However, these indices were found to be reliable because they have been formulated by reputable and authorised organisations through the use of robust statistical procedures. Second, we could not include all countries in the world because the data was not commonly available in all the sources. Future studies may consider extending this study by introducing more variables into the model and including more countries.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix 1. List of countries

Albania, Algeria, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belgium, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Chad, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gabon, Gambia, The Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guyana, Haiti, Honduras, Hong Kong SAR, Hungary, Iceland, India, Indonesia, Iran, Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea, Rep. Kuwait, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Luxembourg, Macedonia, FYR Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United State, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe.