The Adoption of E-commerce in SMEs: the Colombian Case

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Abstract: The few studies in South American developing countries that refer to the adoption of e-commerce in SMEs require knowledge of how this context is presented. The objective of this study addresses this need and seeks to determine the variables that influence the adoption of e-commerce in SMEs in Colombia. The measurement tool (IMAES) was applied using a digital questionnaire; 263 surveys were collected in SMEs and the data were analysed using the partial least squares methodology, validating tool and model. The results found that Colombian SMEs adopt e-commerce because of pressure from senior management, performance expectations, the competitive advantage it offers, and pressure from their customers. This is one of the first studies in the region that empirically analyses the adoption of e-commerce, as well as describing the theoretical framework for this line of research.

Keywords: e-Commerce, Adoption, SMEs, Information and Communication Technologies

Introduction

Information and Communication Technologies (ICT) are a key element of the revolution in the way in which business is carried out, especially as a result of the Internet as a medium coupled with its applications (Stathis, 2015). In addition to facilitating communication with customers, these technologies work as a channel for delivering value proposals to the stakeholders of an enterprises (Belvedere & Grando, 2017). Thus, it is relevant to indicate that the term e-commerce has been coined to account for the digital channels or media that facilitate the marketing exercise, as well as the personalised (or direct) communication before, during and after the sale. In addition, it is a channel that is not only accepted but required by

http://doi.org/10.18080/jtde.v9n3.403

customers, given its immediacy and time savings, as well as the inherent advantages of virtuality (He & Bakht, 2018; Yadav & Mahara, 2018).

In this context, the literature on e-commerce demonstrates that its mediation role offers differential competitive advantages to the enterprises that adopt it (Cecere, 2016), and especially to small and medium-sized enterprises (SMEs) (Abou-Shouk, Megicks & Lim, 2013; Abou-Shouk & Eraqi, 2015; Alrousan & Jones, 2016; Chong *et al.*, 2011; Pickernell *et al.*, 2013) since it is a mechanism that extends borders. In addition, it allows personalisation of the service and attention to users and customers.

The literature that accounts for e-commerce in SMEs began with simple suggestions, such as minimising costs with the use of HTML language formats (Charlton *et al.*, 2000), and then moved on to thinking about more complex issues, such as the evolution of the diffusion and adoption of this technology for the field (Al-Bakri & Katsioloudes, 2015; Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; MacHaria, 2009; Sparling, Toleman & Cater-Steel, 2007; Wilson, Daniel & Davies, 2008). In addition, previous research also reports on the evaluation of the effectiveness and critical success factors of the strategies (Hamad, Elbeltagi & El-Gohary, 2018; He & Zhang, 2010; Li, Feng & Lin, 2008; Molapo, 2014; Sanayei & Rajabion, 2009; Shah Azam & Quaddus, 2009; Wu *et al.*, 2011). The strategic value and perceived barriers or obstacles have also been investigated (Abou-Shouk & Eraqi, 2015; Mbatha & Ngwenya, 2018; Saffu, Walker & Mazurek, 2012).

Scientific research on the adoption of e-commerce in Colombia, however, is scarce, and the models that have explained this context in other countries have not been tested. Likewise, there is a lack of studies related to South American realities: 80% of the productions found are distributed in Asian, European and African countries (Kwan-Chung & Ortiz-Jiménez, 2021).

In this scenario, it should be noted that, in Colombia, about 99% of companies are SMEs and they have been making efforts to present their websites in languages other than Spanish since 2011, perceiving the advantages of export technologies. They have also implemented e-commerce solutions in their export activities (Rojas-Berrio & Vega-Rodríguez, 2011).

Similarly, in the study by Osorio-Gallego, Londoño-Metaute & López-Zapata (2016), it was found that this type of enterprise showed an electronic commerce adoption of 60.6% by 2014 for uses such as supply purchases and financial and commercial transactions. However, while there are negative perceptions towards information security, implementation and management costs, there are also previous references indicating that entrepreneurs of this type of company are not unaware of the potential benefits (dos Reis & Machado, 2020; Hussein *et al.*, 2019; Lim, Lim & Trakulmaykee, 2018; Mbatha & Ngwenya, 2018; Rojas-Berrio & Vega-Rodríguez, 2011).

http://doi.org/10.18080/jtde.v9n3.403

Meanwhile, the Observatory of Digital Economy in Colombia (OECD, 2019) shows data on the relevance of SMEs to Latin America as comprising 60% of total companies, representing 70% of formal employment and contributing 50% of the Internal Gross Domestic Product (GDP). Similarly, for 2017, the Colombian ICT Ministry presents 98% Internet usage figures for these types of companies, of which 82% use the Internet as a channel to provide services and 30% to deliver them.

However, although it is true that the advance in Internet adoption and broadband use in Colombian companies is almost 99%, its use is mostly limited to basic actions such as intranet and the use of emails, denoting limited adoption of e-commerce (Parra *et al.*, 2019). This is reinforced by Suárez (2020) which, from a compilation of technical reports of unions and institutions, identified the following weaknesses that SME managers find in e-commerce: low presence of SMEs in the digital ecosystem; low organisational culture around technological development and digital innovation; slow adaptation and development of technological skills; management of e-commerce technology platforms; lack of investment in digital technology; deficiency in training in the management of technological and digital tools; distrust of e-commerce (electronic fraud); cost overruns in electronic transactions; and normative and legal knowledge of e-commerce. Finally, the study by Sánchez-Torres (2019) showed that the high digital divide in this country negatively moderates the adoption of e-commerce.

Given the above considerations, it is necessary to more precisely examine the factors that generate the adoption of e-commerce in Colombian SMEs in order to guide actions that promote its adoption by all public and private agents.

The objective of this study is to determine the relationships between the factors that affect the adoption of e-commerce in SMEs in the case of Colombia since, although these companies use these channels, the level of penetration is not sufficient for the marketing challenges and the advantages that this method implies, and because there are few studies in the area. This approach will allow us to review opportunities for improvement and possible solutions in this sector. Thus, this study, through the empirical test of a model proposed by Sánchez-Torres & Juarez-Acosta (2019), will identify the relevant variables that affect the adoption of e-commerce in Colombian SMEs.

This paper is first composed of a summarised theoretical approach to this line of research. Then, the methodology and field work of the empirical study are presented. Finally, the results and conclusions are presented.

http://doi.org/10.18080/jtde.v9n3.403

Theoretical Framework

Studies on the adoption of e-commerce in SMEs have used the theoretical models of several schools of organisational thinking that analyse technological adoption (Abou-Shouk, Megicks & Lim, 2013; Alrousan & Jones, 2016; Awa, Ojiabo & Emecheta, 2015; Feng *et al.*, 2018; Grandon & Pearson, 2004; Ibrahim & Moertini, 2015; Kumar & Kaur, 2021; Molla, Heeks &Tjia, 2006; Newby, Nguyen & Waring, 2014; Pickernell *et al.*, 2013; Solaymani, Sohaili & Yazdinejad, 2012; Sparling, Toleman & Cater-Steel, 2007; Wymer & Regan, 2005). These results show empirically that there are several variables that influence the adoption of electronic commerce in SMEs based on the theory "Technology – organisation – environment" (Tornatzky & Fleischer, 1990), which identifies and categorises the internal, environmental and technological factors that intervene in the adoption of this technology (Ghobakhloo & Ching, 2019; Nair, Chellasamy & Singh, 2019; Sánchez-Torres & Juarez-Acosta, 2019).

Internal factors

Based on the Strategic Resource Theory (Barney, 1991), many studies have shown that the adoption of e-commerce is supported by its resources, processes and knowledge. SMEs are oriented strategically around their own resources and take advantage of the surrounding conditions (Hadi Putra & Santoso, 2020). According to Rivard, Raymond & Verreault (2006), SMEs will work when driven by competitive forces and use their resources to formulate and implement strategies that allow them to generate an advantage in the market (Xuhua *et al.*, 2019).

Internally, several variables that influence the adoption of e-commerce in SMEs stand out (Anim-Yeboah *et al.*, 2020). One of these is the extent of the disposition of managers towards innovation and the use of technologies to improve the company's processes (Deng, Duan & Luo, 2019; Rogers, 1995; Wang, 2020). It has also been shown that some internal characteristics of SMEs, such as investing in research and development, having employees with favourable levels of training and decentralised decision-making and long-term planning, increase the likelihood of adopting new technologies (Deng, Duan & Luo, 2019; Giotopoulos *et al.*, 2017; Wang, 2020). In this sense, the investment capacity to adopt e-commerce or the costs incurred stands out as another internal variable of high influence (Harris, Marett & Harris, 2017; Wang, 2020). This is due to the investment in hardware and software that is necessary for the implementation of e-commerce and what it can represent for an SME compared to a large company (MacGregor & Vrazalic, 2005).

Another variable corresponds to the size of the company. Some studies have shown that the size of SMEs is positively related to the adoption of e-commerce (Van-Huy *et al.*, 2012; Wang,

http://doi.org/10.18080/jtde.v9n3.403

2020). However, in general, when the levels of technological adoption are low, the size of SMEs is not significant (Rahayu & Day, 2015).

Finally, some authors propose that the characteristics of the product/service, the type of customer and the characteristics of commercial channels affect the adoption of e-commerce in SMEs (Cassetta *et al.*, 2020; Darsono *et al.*, 2019; MacGregor & Kartiwi, 2010; MacGregor & Vrazalic, 2005; Wymer *et al.*, 2008; Wymer & Regan, 2005; Xuhua *et al.*, 2019).

Environmental factors

From the Contingency Theory External (Stewart & Luthans, 1977), environment agents can put pressure on SMEs to adopt e-commerce. One external agent is the government, which, through government policies that promote transparency and competitiveness, establishes policies to motivate companies to adopt technology (Ahluwalia & Merhi, 2020; Al-Bakri & Katsioloudes, 2015; Alrousan & Jones, 2016; Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; Grandon & Pearson, 2004; Scupola, 2009; Van-Huy *et al.*, 2012; Wymer & Regan, 2005). In accordance with the government variable, the degree of complexity of the adoption of e-commerce in a country is a factor that also generates effects on adoption. With a greater degree of e-commerce development in a country, there will be greater investment in information and communication technologies, and therefore its adoption by SMEs will be easier (Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; MacGregor & Vrazalic, 2005; Van-Huy *et al.*, 2012).

Another variable is the pressure exerted by suppliers, competitors and other market forces on SMEs in relation to the use of e-commerce (Dethine, Enjolras &Monticolo, 2020). This is a pressure that is created within the obligation to sustain long-term relationships, although it does not always influence technological adoption (Cassetta *et al.*, 2020; Rahayu & Day, 2015).

Technological factors

The variables associated with technological factors are the most important in studies on SMEs worldwide (Chen & Holsapple, 2013; Sombultawee, 2020) when assessing the technological disposition. Several authors rely on the theory of diffusion of innovations (Rogers, 1995), the theory of technological adoption (TAM) (Davis, 1989) and the unified theory of technological adoption (UTAUT; Venkatesh *et al.*, 2003; Venkatesh, Thong & Xu, 2012) to explain the technological factors that influence technological adoption. These studies have identified that the main variables are perceived risk, perceived utility (compatibility and observability) and perceived facility of use and intention to use (verifiability; Sombultawee, 2020).

The risk perception variable of the system negatively influences the adoption of e-commerce (Al-Tit, 2020; Van-Huy *et al.*, 2012). The risk of adopting e-commerce is associated with the

http://doi.org/10.18080/jtde.v9n3.403

risks of using the Internet. In particular, it is presumed that the levels of confidentiality of companies can be affected by the exposure of information in an open manner and by the levels of insecurity of the Internet (Alam, Ali & Jani, 2011; Wei *et al.*, 2019).

On the other hand, the perceived utility is related to internal factors and refers to the link that people make between the adoption of new technology and the scope for a strategic advantage. In this sense, the adoption of e-commerce and its degree of technological compatibility (e-commerce is in line with existing needs) and observability (the degree of visibility of new innovation outcomes) are factors validated to a large extent in many countries (Abou-Shouk, Megicks & Lim, 2013; Al-Tit, 2020; Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; Sombultawee, 2020; Van-Huy *et al.*, 2012).

Finally, the intention to use refers to the degree to which a person believes that using a system can be free of effortless since it is flexible and understandable (Alam, Ali & Jani, 2011; Al-Tit, 2020). This is a favourable condition for the adoption of e-commerce by companies (Abou-Shouk, Megicks & Lim, 2013; Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011).

Theoretical Model

To better understand the nature of Colombian SMEs, this study examined the e-commerce adoption model for SMEs (IMAES) proposed by Sánchez-Torres & Juarez-Acosta (2019), which integrates all the variables that have been empirically validated in previous studies in other countries (Figure 1) and has the following hypotheses:

H1: The ease of use regarding e-commerce influences its adoption in Colombian SMEs
H2: Government support regarding e-commerce influences its adoption in Colombian SMEs
H3: Management guidelines regarding e-commerce influence its adoption in Colombian SMEs
H4: The degree of observability regarding e-commerce influences its adoption in Colombian SMEs
H5: Organisational readiness regarding e-commerce influences its adoption in Colombian SMEs
H6: The relative advantage of e-commerce influences its adoption in Colombian SMEs
H7: Perceived risk regarding e-commerce influences its adoption in Colombian SMEs
H8: Customer pressure regarding e-commerce influences its adoption in Colombian SMEs
H9: Compatibility with respect to e-commerce influences its adoption in Colombian SMEs
H10: Direct competitors' attitudes to e-commerce influence its adoption in Colombian SMEs
H11: The complexity of the country with respect to e-commerce influences its adoption in Colombian SMEs
H12: The cost with respect to e-commerce influences its adoption in Colombian SMEs

http://doi.org/10.18080/jtde.v9n3.403

H13: Managers' innovative personality regarding e-commerce influences its adoption in Colombian SMEs

H14: Organisational factors ICT regarding e-commerce influence its adoption in Colombian SMEs

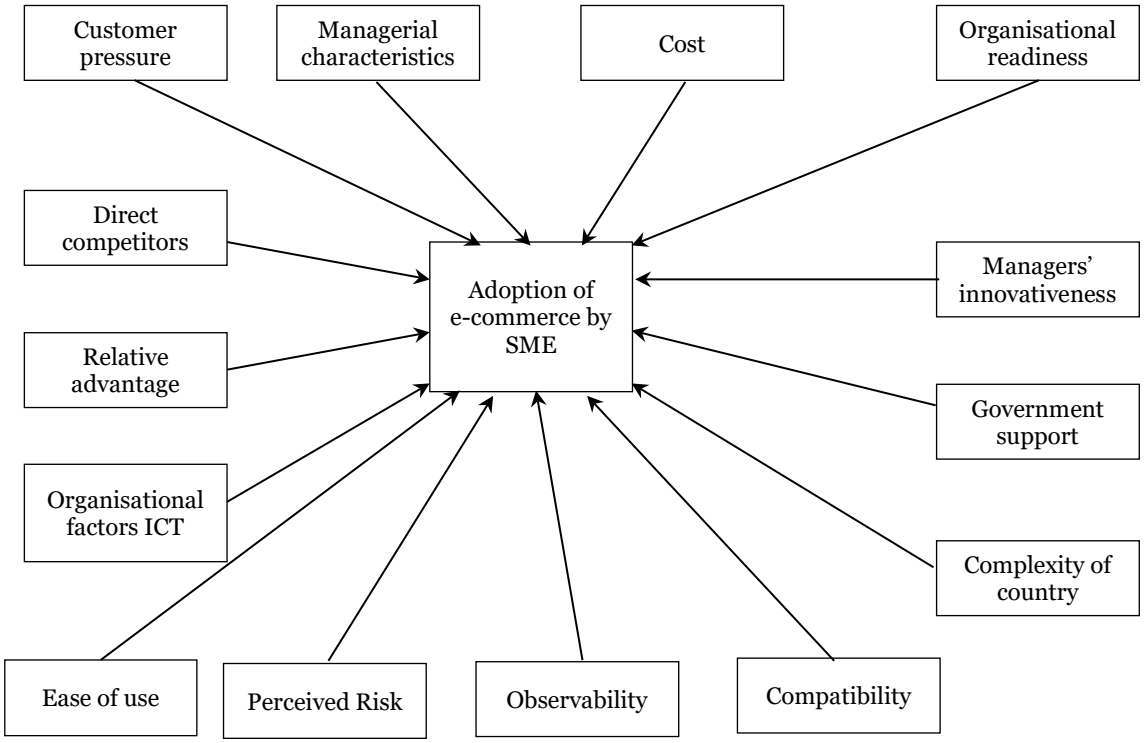

Figure 1. Integrated model for the adoption of electronic commerce SMEs (IMAES). (Source: Authors' elaboration)

Methodology

Measurement tool

The questionnaire was adapted from the one proposed by Sánchez Torres & Juarez-Acosta (2019) since it had already been validated for the country of application. At least three items per variable were chosen so that the measurement met the minimum validity standards. A pilot test was carried out with 15 managers to check the understanding of the questions without finding any discrepancies or doubts (Annex 1).

Sample and field work

The sample was collected using a non-probabilistic random method (Churchill & Iacobucci, 2005) with a minimum quota of 100 SMEs. The survey was developed digitally using an online platform. The contact data were obtained through Chambers of Commerce and other means, whereas databases of SMEs were obtained nationwide. The data collection was developed in the period from January 1, 2019 to December 30, 2019, and a total sample of 263 SMEs was obtained.

http://doi.org/10.18080/jtde.v9n3.403

Of the total, 193 SMEs belonged to the service sector and 70 to manufacturing. In terms of operating time, 100 SMEs have been operating for between 1 and 2 years and 163 for more than 2 years. As for their geographical location, 171 SMEs are located in the Colombian capital (Bogotá), 37 SMEs in the department of Antioquia (Medellín) and the rest are distributed between "Cauca" valley, the Eastern sector and the Caribbean coast.

Analysis of data

The model was analysed using the partial least squares (PLS) technique via the Smart PLS 3.0 program. This technique was chosen due to the fact that the model has many variables and has not been tested empirically and is thus suitable for obtaining exploratory results (Ketchen, 2013). Taking into account the PLS analysis methodology, first, the measurement tool was validated, and, second, the structural model was validated.

Results

It should be noted that the characteristics of the sample did not show any moderating or control effects on the relationships and are therefore completely ignored in the analysis and are not considered in the results.

The individual reliability of each item was measured by the correlation loads of each item compared to each variable, and the loads for each indicator were found to be significant in their entirety (Ketchen, 2013) (Table 1). (For the meaning of variables, see Annex 1).

Table 1. Indicator loads

Variable	Original Sample (O)	T Statistics (|O/STDEV|)	P Values*
BS1 - Customer pressure	0.916	49.055	0.000
BS2 - Customer pressure	0.924	69.109	0.000
BS3 - Customer pressure	0.855	27.722	0.000
CEC1 - Complexity country	0.972	4.830	0.000
CEC2 - Complexity country	0.978	4.933	0.000
CEC3 - Complexity country	0.891	5.002	0.000
CEC4 - Complexity country	0.777	3.364	0.001
CP1 – Direct competitors	0.943	10.383	0.000
CP2 - Direct competitors	0.894	8.372	0.000
CP3 - Direct competitors	0.825	7.457	0.000
CT1 - Cost	0.872	3.959	0.000
CT2 - Cost	0.909	3.472	0.001
CT3 - Cost	0.676	2.471	0.014
CU1 - Compatibility	0.739	2.697	0.007
CU2 - Compatibility	0.808	3.187	0.001
CU3 - Compatibility	0.846	3.325	0.001

http://doi.org/10.18080/jtde.v9n3.403

Variable	Original Sample (O)	T Statistics (|O/STDEV|)	P Values*
CU4 - Compatibility	0.906	3.715	0.000
EU1 - Ease of use	0.914	4.327	0.000
EU2 - Ease of use	0.872	4.541	0.000
EU3 - Ease of use	0.923	4.722	0.000
EU4 - Ease of use	0.814	4.031	0.000
GS1 - Government support	0.938	4.439	0.000
GS2 - Government support	0.909	4.436	0.000
GS3 - Government support	0.915	4.410	0.000
INN1 - Managers' innovativeness	0.854	21.907	0.000
INN2 - Managers' innovativeness	0.907	41.773	0.000
INN3 - Managers' innovativeness	0.892	33.393	0.000
OR1 - Organisational Readiness	0.924	56.239	0.000
OR2 - Organisational Readiness	0.950	99.772	0.000
OR3 - Organisational Readiness	0.838	15.751	0.000
MC1 - Managerial characteristics	0.937	4.981	0.000
MC2 - Managerial characteristics	0.924	5.364	0.000
MC3 - Managerial characteristics	0.834	4.230	0.000
PU1 - Observability	0.943	85.915	0.000
PU2 - Observability	0.927	44.057	0.000
PU3 - Observability	0.952	97.278	0.000
PU4 - Observability	0.933	88.511	0.000
RA1- Relative Advantage	0.917	62.098	0.000
RA2 - Relative Advantage	0.945	99.962	0.000
RA3 - Relative Advantage	0.980	37.763	0.000
SEC1 - Perceived Risk	0.991	3.681	0.000
SEC2 - Perceived Risk	0.665	2.350	0.019
SEC3 - Perceived Risk	0.857	17.521	0.000

Source: Authors. (Significant at: *p<0.05 - t-value 1.960)

To measure the internal measurement coherence of all indicators in relation to their corresponding variables, Dillon-Goldstein's ρ, also known as the composite reliability index, was determined; all resulting values were higher than the minimum acceptable value of 0.70 (Gefen, Straub & Boudreau, 2000). Cronbach's alpha value was also determined (Table 2), obtaining values greater than 0.7 (Churchill & Iacobucci, 2005). Finally, the convergent validity was analysed again in consideration of the variance; in other words, it was determined whether the variance that exists between the indicators and their construct is similar, which means that it must be greater than 0.50 of the variability explained by the indicators (Fornell & Larcker, 1981).

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Table 2. Construct Reliability and Validity

Variable	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Ease of use	0.911	1.047	0.933	0.777
Government support	0.917	1.015	0.943	0.847
Managerial characteristics	0.923	0.925	0.951	0.867
Observability	0.956	0.978	0.967	0.882
Organisational readiness	0.891	0.943	0.931	0.819
Relative advantage	0.909	0.913	0.943	0.847
Perceived Risk	0.715	2.609	0.826	0.712
Customer pressure	0.883	0.915	0.927	0.808
Compatibility	0.864	0.885	0.896	0.684
Direct competitors	0.820	0.873	0.916	0.845
Complexity country	0.943	0.946	0.949	0.825
Cost	0.820	0.735	0.863	0.681
Managers' innovativeness	0.861	0.873	0.915	0.783
Organisational factors ICT	0.920	1.017	0.938	0.792

Source: Authors.

Discriminant validity of the measuring instrument was defined correctly (Fornell & Larcker 1981). Similarly, a test used by Henseler, Ringle & Sarstedt (2014) was conducted, finding that all values are below 0.90, therefore confirming that the variables exhibit an acceptable level of discriminant validity (Henseler, Ringle & Sarstedt, 2014). (Tables 3 and 4).

Table 3. Convergent validity of the indicators (Fornell-Larcker Criterion)

Part 1:

Ease of use	0.882						
Government support	0.000	0.920					
Managerial characteristics	0.074	0.138	0.931				
Observability	0.070	0.172	0.510	0.939			
Organisational readiness	0.141	0.156	0.406	0.343	0.905		
Relative advantage	0.007	0.118	0.489	0.756	0.259	0.920	
Perceived Risk	0.034	0.108	0.282	0.226	0.326	0.240	0.844
Customer pressure	-0.010	0.100	0.443	0.349	0.210	0.279	0.194
Compatibility	0.508	0.059	0.112	0.114	0.164	0.034	0.049
Direct competitors	-0.100	-0.077	0.250	0.226	0.110	0.219	0.215
Complexity country	0.071	0.354	0.212	0.138	0.135	0.176	0.186
Cost	0.044	-0.045	0.260	0.232	0.076	0.236	0.218
Managers' Innovativeness	-0.039	0.067	0.442	0.360	0.245	0.361	0.259
Organisational factors ICT	0.218	0.254	0.254	0.283	0.432	0.189	0.202

Part 2:

Ease of use
Government support
Managerial characteristics
Observability

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Organisational readiness							
Relative advantage							
Perceived Risk							
Customer pressure	0.899						
Compatibility	0.017	0.827					
Direct competitors	0.360	-0.073	0.919				
Complexity country	0.079	0.006	0.020	0.908			
Cost	0.334	0.040	0.299	0.101	0.825		
Managers' Innovativeness	0.385	0.026	0.376	0.122	0.300	0.885	
Organisational factors ICT	0.308	0.114	0.111	0.189	0.009	0.279	0.890

Source: Authors.

Table 4. Convergent validity of the indicators (Heterotrait-Monotrait Ratio - HTMT)

Part 1:

Ease of use						
Government support	0.057					
Managerial characteristics	0.087	0.147				
Observability	0.069	0.186	0.537			
Organisational readiness	0.174	0.178	0.444	0.372		
Relative advantage	0.037	0.126	0.533	0.806	0.286	
Perceived Risk	0.081	0.132	0.324	0.233	0.399	0.240
Customer pressure	0.035	0.115	0.479	0.367	0.230	0.300
Compatibility	0.581	0.098	0.113	0.119	0.191	0.040
Direct competitors	0.129	0.085	0.285	0.259	0.138	0.256
Complexity country	0.088	0.406	0.210	0.120	0.174	0.175
Cost	0.064	0.077	0.224	0.195	0.081	0.213
Managers' Innovativeness	0.082	0.078	0.497	0.392	0.278	0.408
Organisational factors ICT	0.240	0.290	0.262	0.317	0.505	0.213

Part 2:

Ease of use							
Government support							
Managerial characteristics							
Observability							
Organisational readiness							
Relative advantage							
Perceived Risk							
Customer pressure	0.059						
Compatibility	0.050	0.026					
Direct competitors	0.128	0.428	0.095				
Complexity country	0.021	0.081	0.037	0.032			
Cost	0.051	0.382	0.089	0.369	0.065		
Managers' Innovativeness	0.030	0.444	0.041	0.460	0.110	0.348	
Organisational factors ICT	0.034	0.357	0.163	0.153	0.236	0.027	0.082

Source: Authors.

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Regarding the predictability of the model of the adoption of electronic commerce in SMEs, a re-sampling was carried out using the bootstrapping technique with 5,000 sub-samples (Henseler & Chin, 2010). This study obtained an R^2 of 0.318, which is an acceptable value that allows us to conclude that the model may enable a high level of prediction with a great degree of statistical validation of the variables (Table 5).

Regarding validation of the hypotheses, hypothesis H1 (β: -0.074) did not support ease of use as a factor for the adoption of e-commerce in SMEs. This result showed what other studies in the sector noted about the lack of experience in the use of these technologies (Parra *et al.*, 2019; Suarez, 2020).

Hypothesis H2 (β: -0.063) was also not supported. The government was not a positive factor in the adoption of e-commerce in SMEs, verifying that, although this country has improved in connectivity policies, support for SMEs to adopt this technology is poor (Sánchez-Torres, 2019).

Hypothesis H3 (β: 0.264*) was supported, confirming that the characteristics of management are influential in the adoption of e-commerce in Colombian SMEs. This illustrates a core characteristic of Colombian SMEs, since decision-making is generally centralised to the manager or owner of the company (Marin-Idárraga & González, 2021).

Hypothesis H4 (β: 0.120*) was also supported, demonstrating that the degree of observability regarding e-commerce influences its adoption in Colombian SMEs. This is in line with previous studies in other countries, where it is highlighted that perceiving subsequent benefits from the use of e-commerce leads to its adoption (Sombultawee, 2020).

Hypothesis H5 on the organisational readiness of SMEs in Colombia was not supported (β: 0.081). As in other countries (Deng, Duan & Luo, 2019), this result denotes the lack of preparation and training in Colombian SMEs for the implementation of e-commerce (Suarez, 2020).

Hypothesis H6 (β: 0.186*), which states that the relative advantage that e-commerce generates is another determining factor in its adoption, was supported. For example, e-commerce in SMEs generates reduced marketing costs and added value such as personalised customer service (Xuhua *et al.*, 2019).

Hypothesis H7 (β: -0.048) regarding perceived risk was not supported. This is perhaps due to the fact that the Colombian culture does not have a high perception of risk in relation to e-commerce, as concluded in a recent study on e-commerce marketplaces (Sánchez-Torres *et al.*, 2021).

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Hypothesis H8 (β: 0.210*) was supported, showing that pressure from customers has a positive effect on SMEs' adoption of e-commerce, consistent with other studies worldwide, due to the social and economic trend of e-commerce.

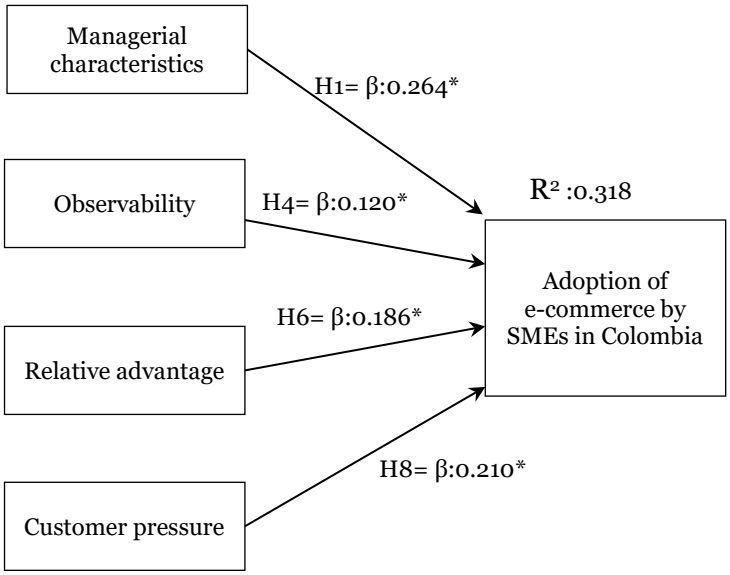
Hypothesis H9 (β: 0.051) on compatibility was not supported. This result can be associated with the high cost of investing in implementing this technology in Colombian SMEs (Suarez, 2020). Hypothesis H10 (β: -0.058) on direct competitors was also not supported. Possibly, characteristics of the market, especially internal to Colombian SMEs, do not present an implementation in process in direct competitors. Hypothesis H11 (β: 0.010) regarding complexity of country was not supported: a country with a wide digital gap and other types of economic gap still lacks support in infrastructure and communications. Hypothesis H12 (β: -0.070) in relation to cost was not supported either. This is another factor closely linked to the problems that this country has, for example in the high cost of Internet connection (Sánchez-Torres, 2019). Hypothesis H13 (β: 0.009) regarding managers´ innovativeness was also not supported, perhaps due to the character of directors of Colombian SMEs, who, also being investors, prefer to be more conservative than innovative (Marin-Idárraga & González, 2021). Finally, Hypothesis H14 (β: 0.013) in relation to organisational factors affecting ICT was not supported, reinforcing the great problems and deficiencies that SMEs present in terms of the adoption of information and communication technologies (see Table 5 and Figure 2).

Table 5. Model results

Hypothesis	Test	β	T-statistics	P-values
H1: Ease of use -> Adoption e-commerce	Not supported	-0.074	1.022	0.307
H2: Govern -> Adoption e-commerce	Not supported	-0.063	0.828	0.408
H3: Managerial Characteristics -> Adoption e-commerce	Supported	0.264*	3.742	0.000
H4: Observability -> Adoption e-commerce	Supported	0.120*	1.999	0.030
H5: Organisational Readiness -> Adoption e-commerce	Not supported	0.081	1.022	0.307
H6: Relative Advantage -> Adoption e-commerce	Supported	0.186*	2.270	0.023
H7: Perceived Risk -> Adoption e-commerce	Not supported	-0.048	1.201	0.230
H8: Customer pressure-> Adoption e-commerce	Supported	0.210*	3.427	0.001
H9: Compatibility -> Adoption e-commerce	Not supported	0.051	0.755	0.450
H10: Direct competitors -> Adoption e-commerce	Not supported	-0.058	0.917	0.359
H11: Complexity country-> Adoption e-commerce	Not supported	0.010	0.206	0.837
H12: Cost -> Adoption e-commerce	Not supported	-0.070	0.950	0.342
H13: Managers´ innovativeness -> Adoption e-commerce	Not supported	0.009	0.135	0.892
H14: Organisational factors ICT -> Adoption e-commerce	Not supported	0.013	0.206	0.835

Source: Authors. (Significant at: *p<0.05 - t-value 1.960)

http://doi.org/10.18080/jtde.v9n3.403



(Significant at: *p<0.05 - t-value 1.960)

Figure 2. Adoption of electronic commerce SMEs In Colombia (Source: Authors).

Discussion

The objective of this study was to determine the factors that generate the adoption of electronic commerce in SMEs in Colombia. For this, the IMAES model (Sánchez-Torres & Juarez-Acosta, 2019) was used in order to examine this phenomenon given the characteristics of this analysis tool. However, the results were not significant for almost all the variables. This behaviour of the model can be explained by the fact that this phenomenon is complex and depends on the context of each country.

The results did not support all the proposed effects, which was expected given that the results vary between countries and also within each country, and because some SMEs may value some factors over others (Dahbi & Benmoussa, 2019). Likewise, the few studies carried out on Colombian SMEs showed great deficiencies in many of the variables (Parra *et al.*, 2019; Suárez, 2020); therefore, one of the first conclusions of this study is the finding that the theoretical models omit the heterogeneous nature of SMEs in developing countries (Abdulhakeem, Edwards & McDonald, 2017).

This is in line with the only similar study carried out on the adoption of information and communication technologies in SMEs in Colombia, in which variables, such as the age of the SME, perceived costs, security, and government incentives, among others, were not supported. This may be due to the fact that, for Colombian SMEs, these factors are not motivating or influential for the adoption of this commercial channel given the characteristics of the Colombian economy and politics. Digital divide levels in this country are high and can even exert a negative moderating effect on e-commerce (Sánchez-Torres, 2019; Sánchez-Torres, Arroyo-Cañada & Gil-lafuente, 2016). In addition, e-commerce is not a strategic issue

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for SMEs due to their short-term vision in decision making. Furthermore, the sales that are generated through e-commerce can be less than traditional channels in this country (Corrales-Liévano, 2019).

The observability variable has been statistically supported as a variable that Colombian SMEs take into account to adopt e-commerce. In this case, as in previous studies, it is of great importance that the technologies that an SME adopts in its operations can generate economic value in the future. In this regard, it can be considered that e-commerce offers great benefits as a distribution channel that allows companies to increase levels of efficiency in distribution channels, in market internationalisation processes, and in customer marketing relationships, among others.

The next statistically validated variable is the relative advantage. This variable was also recently validated in a study on the adoption of information and communication technologies in SMEs in Colombia (Osorio-Gallego, Londoño-Metaute & López-Zapata, 2016). However, that study did not separate e-commerce from the use of the Internet and computer equipment. This variable is important because, if the SMEs consider digital marketing as a mechanism that supports its strategic advantage, it can then carry out actions toward the internationalisation of markets, given the low costs of implementation with respect to other methods of internationalisation. Likewise, it has been proven in other developing countries that SMEs adopt e-commerce when similar ones have been successful in their market, therefore valuing the relative advantage of e-commerce (Reardon *et al.*, 2021).

Finally, with a supported statistical significance, the customer pressure factor is a determining factor for Colombian SMEs in adopting e-commerce. The data reflect the fact that the SMEs that adopt this commercial channel in Colombia have a clear focus on meeting the needs of their customers regarding the use of Internet technologies and are aware of the benefits e-commerce presents for online purchasing and customer service. However, some studies on the use of this commercial channel by buyers have found that Colombian electronic buyers make up only 7% of the population that uses the Internet (Sánchez-Torres *et al.*, 2017). On the other hand, there is a wide digital divide where only those who have a high socioeconomic status have access to e-commerce (Sánchez-Torres, 2019; Sánchez-Torres, Arroyo-Cañada & Gil-lafuente, 2016). This context should be evaluated by companies, given that e-commerce will only be effective for certain products and services and for special segments of the population.

Conclusions

The theoretical contributions of this work are that it empirically tested the IMAES model (Sánchez-Torres & Juarez-Acosta, 2019) for the first time, validating its diagnostic nature and therefore yielding unique results for each social and economic context of a region or country

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by integrating multiple factors that can explain the adoption of e-commerce in SMEs. The empirical results may occur because the context of SMEs in each country is different: it cannot be expected that the same characteristics will be verified worldwide, since results in previous studies from other developing countries do not support the expected hypotheses in the adoption of information technologies in SMEs (Nair, Chellasamy & Singh,2019).

However, this study has managed to validate some factors that are considered important by Colombian SMEs. It was found that the variables that influence the adoption of e-commerce for Colombian SMEs are the managerial characteristics and the degree of interest of senior management in which digital commercial channel is adopted. The latter is one of the factors that managers consider when implementing e-commerce.

Regarding the contributions to companies, this study has made it possible to diagnose why SMEs in Colombia adopt electronic commerce from an empirical perspective, which offers a precise diagnosis of the real perceptions of SME managers regarding current reasons behind e-commerce use. In this regard, it is especially true that e-commerce is considered a necessary tool for Colombian SMEs for their commercial relationships and for their differential strategy. Likewise, it is evident that SMEs that adopt this technology are aware of its importance from the beginning and the positive results that it can generate in its objectives. Also, the non-validation of many internal, external and technological factors shows that there are still many weaknesses and negative perceptions regarding e-commerce in Colombian SMEs. There is a great need to further support SMEs in the adoption of e-commerce from associations, clusters and public and private agencies to take measures related to programs and policies to promote the use of this technology, not only as a marketing channel between companies and consumers (B2C) but also between companies (B2B). For public policies, the results should motivate the government to act, providing SMEs with programs, policies and support for the development of this commercial channel.

The main limitation of this study is that the sample is low and may not reflect the aggregate of e-commerce adoption behaviour in SMEs. However, the R^2 value shows that the prediction level of the model is acceptable (R^2: 0.318) and achieves a level of prediction of reality. Another aspect is that the model did not validate many of the initial variables that were expected to be statistically accepted because they had only been previously tested in other SMEs and in other countries. However, our study can show that the heterogeneity in the characteristics of the SMEs in this country may be the ones that generate these results.

This allows us to propose, as a future line of research, the application of this e-commerce adoption model in other countries of the region to compare the results in a cross-referenced manner and verify the other relationships of the variables.

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Finally, the effects on companies derived from the COVID-19 pandemic have led to various commercial decisions in SMEs. Among them, the implementation of e-commerce stands out as a fundamental alternative to achieve sales results and become more familiar with the consumer. This contingency will promote the use of the Internet in different contexts and will boost e-commerce, which will lead to new research. Nevertheless, the damage to the economies as a result of this pandemic could also have delayed and weakened this technological adoption in these types of countries.

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Annex 1. Questionnaire

Construct	**Items**	
Relative advantage (Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; MacGregor & Vrazalic, 2005; Saffu, Walker, & Hinson, 2008; Sánchez-Torres & Juarez-Acosta, 2019)	RA1	Will increase the competitive advantage for our company
	RA2	Support effective reintermediation
	RA3	Customizing services to customer needs

Construct	Items	
Observability (Abou-Shouk, Megicks & Lim, 2013; Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; Sánchez-Torres & Juarez-Acosta, 2019; Wilson, Daniel & Davies, 2008; Wymer *et al.*, 2008)	PU1	Using e-commerce would enable my company to accomplish specific tasks more quickly
	PU2	Using e-commerce would improve my job performance
	PU3	Using e-commerce in my job would increase my productivity
	PU4	Using e-commerce would enhance my effectiveness on the job
Compatibility (Alam, Ali & Jani, 2011; Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; Grandon & Pearson, 2004; Van-Huy *et al.*, 2012; Saffu, Walker & Hinson, 2008; Sánchez-Torres & Juarez-Acosta, 2019)	CU1	Company's traditional operating procedures
	CU2	Company's current operations/procedures
	CU3	Existing values
	CU4	Suppliers' and customers' ways of doing business
Ease of Use (Alam, Ali & Jani, 2011; MacGregor & Vrazalic, 2005; Sánchez-Torres & Juarez-Acosta, 2019)	EU1	e-Commerce to be flexible to interact with
	EU2	e-Commerce would be clear and understandable
	EU3	Ease for me to become skilful at using e-commerce
	EU4	e-Commerce easy to use
Organisational readiness (Alam, Ali & Jani, 2011; Grandon & Pearson, 2004; Sánchez-Torres & Juarez-Acosta, 2019)	OR1	Financial resources to adopt e-commerce
	OR2	Technological resources to adopt e-commerce
	OR3	Skill and knowledge
	OR4	External support
Perceived Risk (Alam, Ali & Jani, 2011; Van-Huy *et al.*, 2012; MacGregor & Vrazalic, 2005; Sánchez-Torres & Juarez-Acosta, 2019)	SEC1	Current laws and regulations are sufficient to protect e-commerce user's interest
	SEC2	My company does not have confidence in the payment system of e-commerce
	SEC3	My company is concerned that information involved in a transaction over the Internet is not private
Managerial characteristics (Alam, Ali & Jani, 2011; Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; Van-Huy *et al.*, 2012; Rahayu & Day, 2015; Sánchez-Torres & Juarez-Acosta, 2019; Wymer *et al.*, 2008)	MC1	Interest to the top management
	MC2	Feeling on importance of e-commerce adoption
	MC3	Encouraging role of top management
Cost (Alam, Ali & Jani, 2011; Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011)	CT1	High set-up cost
	CT2	Additional staff required
	CT3	Difficult to justify cost and benefits

http://doi.org/10.18080/jtde.v9n3.403

Construct	Items	
Competition (Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; Grandon & Pearson, 2004; Sánchez-Torres & Juarez-Acosta, 2019)	CP1	It is easy for our customers to switch to another company for similar services/products without much difficulty
	CP2	Social factors are important in our decision to adopt e-commerce
	CP3	Competition is a factor in our decision to adopt e-commerce
Customer pressure (Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; Sánchez-Torres & Juarez-Acosta, 2019)	BS1	Our industry is pressuring us to adopt e-commerce
	BS2	Our customers and buyers are pressuring us to adopt e-commerce
	BS3	Our suppliers are pressuring us to adopt e-commerce
Innovativeness (Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011; Sánchez-Torres & Juarez-Acosta, 2019; Thong & Yap, 1995)	INN1	I have original ideas
	INN2	I would sooner create something new than improve something existing
	INN3	I often risk doing things differently
Organisational factors ICT (Van-Huy *et al.*, 2012; Sánchez-Torres & Juarez-Acosta, 2019)	ORG1	Employees and staff who are knowledgeable about e-commerce
	ORG2	Employees and staff who are competent about new technology
	OGR3	Financial resources to invest in e-commerce business plan
	ORG4	Human resources to invest in e-commerce business plan
Government support (Van-Huy *et al.*, 2012; Sánchez-Torres & Juarez-Acosta, 2019)	GS1	To receive financial support for e-commerce from the government
	GS2	Government support (orientation, direction, information, etc.) encouraging e-commerce development
	GS3	Positive policies related to the information security or information protection of the enterprise
Complexity e-commerce country (Van-Huy *et al.*, 2012; Sánchez-Torres & Juarez-Acosta, 2019)	CEC1	To be located in a country where inhabitants are used to credit cards
	CEC2	To be located in a country with good national IT infrastructure
	CEC3	To be located in a country with a high speed of development of IT infrastructure
	CEC4	To be located in a country with sufficient capability to control networks risks

http://doi.org/10.18080/jtde.v9n3.403