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ADDRESSING CHALLENGES AND CATALYSTS FOR THE ADOPTION OF E-COMMERCE IN SMEs

Huseyn Mammadov
University of Urbino
h.mammadov@campus.uniurb.it

Mara Del Baldo
University of Urbino
mara.delbaldo@uniurb.it

Isidoro Romero
University of Seville
isidoro@us.es

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Abstract

Purpose. *This study analyses the internal and external factors that determine hindrances in the adoption of e-commerce technologies within SMEs. Specifically, it elucidates the significant and potential threats that SMEs need to consider when adopting this technology.*

Design/methodology/approach. *The theoretical TOE model is employed, which holistically integrates three dimensions in the e-commerce adoption process within SMEs: technological, organisational, and environmental. To test the postulated hypotheses, the study employs a logistic regression specification.*

Findings. *The results highlight that, in terms of the technological dimension, the lack of funds/financing exerts a significant negative influence on e-commerce adoption. Investments in ICT, software, consulting, R&D, and innovation are exceptionally effective, and any constraints in these areas could exert a detrimental impact on e-commerce adoption. Constraints in digital competencies, sales forecasting, and the lack of entrepreneurial motivation associated with personal and professional development negatively affect the adoption of e-commerce by SMEs. In the environmental dimension, any reduction in the status of leading rivalry, cooperation with clients, and rivals constitutes a barrier to e-commerce adoption.*

Practical and Social Implications. *The outcomes of this study carry a wide range of managerial implications. Investing in human assets and education, particularly in training, is an essential component of any action plan aimed at addressing the obstacles to the adoption of e-commerce by SMEs. The importance of financing, including that of access to funds and their availability in the ecosystem, is highlighted. The findings from this study further underscore the significance of interaction and collaboration with other stakeholders. SMEs should aim to support the establishment of these networks and to integrate them into their existing organization.*

Originality of the study. *The empirical study employs a dataset obtained from a representative survey of the SME sector in Spain.*

1. Introduction

The modern rise of e-commerce has resulted in a fundamental change in global marketplaces. This innovative framework, based on technical advancements, has ushered in a new paradigm of business, and companies are leveraging online markets to remain competitive. In terms of definition, e-commerce is the activity of purchasing and trading items or services through the Internet (Turban et al., 2010), and it could be visualised as a game-changing platform for increasing international competition and encouraging business expansion (Ha, 2020; Susanty et al., 2020). In this regard, technological advancements, along with the development of user-friendly e-commerce platforms, have made it easier for SMEs to establish a digital identity. E-commerce enables SMEs to reach a global audience while incurring only a fraction of the expense of standard operations. However, SMEs continue to trail behind large companies in terms of e-commerce adoption (Alam et al., 2011; Govindaraju et al., 2015) due to their limited capacity and the high costs associated with integrating digital technologies (Scupola, 2009). In 2022, the percentage of companies engaged in e-commerce activities in Spain varied significantly in terms of company size: 62.53% for large companies (with 250 employees or more), 39.64% for medium-sized companies (ranging from 50 to 249 employees), 27.10% for small companies (with at least 10 employees but fewer than 50), and a mere 14.16% for microenterprises (Instituto Nacional de Estadística, 2023). It is therefore evident that firm size serves as a limiting factor in e-commerce adoption. Nevertheless, it is crucial to conduct further research to identify the specific factors that contribute to the low adoption rates among SMEs. This will enable the development of policy initiatives aimed at facilitating their access to this critical channel of distribution.

The aim of this paper involves ascertaining the possible obstacles and enablers that affect the adoption of e-commerce in SMEs. The prior literature has adopted various theoretical frameworks: the Technological Acceptance Model (TAM) (Rauniar et al., 2014), which focuses on the use of technology; the Theory of Planned Behaviour (TPB) (Cheng, 2019), which is a psychological theory linked to behaviour; and the Theory of Reasoned Action (TRA) (Vallerand et al., 1992), which also focuses on human action. The literature identifies three major concerns regarding SMEs' hesitancy regarding e-commerce adoption and usage: a lack of achievement, stagnancy in e-commerce awareness, and the impact of such stagnancy (Salwani et al., 2009; Akram et al., 2019; Saridakis et al., 2019).

In contrast to previous studies, our approach to this issue is grounded in the Technological, Organisational, and Environmental (TOE) model, with particular emphasis on the environmental dimension. Engagement with other ecosystem stakeholders is crucial. Unlike the existing literature, which predominantly highlights technological determinants, our study therefore underscores the significance of the environmental dimension. We stress the vital importance of interaction and collaboration with other stakeholders as pivotal factors within this context.

An additional shortcoming of the previous literature is found in its predominantly qualitative nature, with only limited quantitative evidence available. To address this gap, our empirical study utilises a dataset consisting of 802 SMEs in Spain. This dataset was collected through a survey conducted in the second quarter of 2022, and our sampling approach was designed to ensure its representation of the entire Spanish SME sector. To test the hypotheses postulated, the representative study uses a logistic regression specification.

The findings of this study carry direct implications for business management that can foster the e-commerce adoption of SMEs. The results outlined in this paper underscore the significance of digital skills and business cooperation. SMEs should actively strive to foster connections with partners and integrate themselves into networks. Furthermore, our findings suggest that both achieving a leading status in competitive actions and entrepreneurs' motivation for personal and professional development exert a positive influence on e-commerce adoption. Likewise, the results highlight that the increase in funds/financing is a necessary component of any action plan to address the challenge of e-commerce adoption. Moreover, it is critical for SMEs to engage in R&D activities and innovation, since these could have a direct relationship with investment in ICT, software, and consultancy, thereby favouring the adoption of e-commerce. This engagement is also connected to the financing factor.

The remainder of the paper is organised as follows. The theoretical foundation of this study is presented in Section 2, along with a review of the body of previous research and the research hypotheses. The collected data and the techniques employed in this study are described in Section 3. The results are introduced and discussed in Section 4. The paper ends with a conclusion section that summarises the main findings and derives certain management and policy implications.

2. Literature review

2.1 Theoretical Background

According to previous studies, scholars have been attentively investigating the emergence and implementation of e-commerce (Nogoev et al., 2011; Akram et al., 2019). It is commonly accepted that e-commerce technology offers numerous tangible opportunities and advantages since it helps companies close the gap between themselves and their clients, save time, reduce expenses, and increase income (Al-Qirim, 2007; Saridakis et al., 2019). The major and principal benefits indicated by the existing literature include increased cost-effectiveness, a rise in sales, performance improvements, faster processing, a broader market presence, and enhanced customer satisfaction (Turban, 2010). In general terms, technological development has a direct and substantial impact on an SME's operational, commercial, and organisational effectiveness and, in particular, e-commerce is a key factor for SMEs

to acquire a competitive advantage (Ledwaba et al., 2019).

The transition from classic trade to digital platforms poses a significant challenge for SMEs (Wang et al., 2011) since the digital world presents increased rivalry and competition. In this regard, this environment creates more pressure than does the traditional environment (Zhu, 2004). Large enterprises are leading the way in the development of e-commerce use for their businesses, while SMEs are typically slow to adopt this technology (Van Akkeren et al., 2003; Alam et al., 2011; Govindaraju et al., 2015) due to their constrained capacity and the high cost of integrating digital technologies (Scupola, 2009). Consequently, access to resources constitutes an essential component in the adoption of digital technologies (Abebe, 2014).

On the other hand, previous studies have also explored factors that may serve as obstacles and enablers for the adoption of e-commerce. In this regard, the prior literature mentions several aspects: the role of government (Raed et al., 2021); the technological awareness of entrepreneurs/managers (Zheng et al., 2004); their managerial expertise (Chuang et al., 2007); trust in e-commerce channels (Inna and Murat, 2023); limited resources, particularly financial (Scupola, 2009); and the level of technological readiness (Alam et al., 2011; Abou-Shouk et al., 2016).

E-commerce has become increasingly important for companies, and online channels enable new prospects, low fixed costs, increased competitive advantages, comprehensive product positioning, and expanded market opportunities (Lefebvre, 2005; Al-Qirim, 2007; Saridakis et al., 2019). At the firm level, the existing literature mentions the importance of the level of technology in small enterprises, and emphasises the significant role of readiness in e-commerce adoption (Abou-Shouk et al., 2016). Furthermore, one of the most studied factors in the literature is that of the firm's resources, especially regarding limited financial resources as being a significant obstacle (Scupola, 2009; Saridakis et al., 2019). Additionally, when it comes to the individual level, researchers state that the expertise level of managers and entrepreneurs in management (Chuang et al., 2007) and their technological awareness (Zheng et al., 2004) play a crucial role in the adoption of this technology.

In this vein, the Covid pandemic was a game-changer, where e-commerce boomed by 19% in the global environment (Statista, 2022a). Since this pandemic exerted a huge impact on worldwide competition between firms, SMEs should reframe their mindset in operating their businesses by incorporating new technologies (Winarsih et al., 2020). It can therefore be assumed that the epidemic has provided opportunities for innovation in e-commerce that SMEs should be made aware of.

Overall, the previous literature mainly focuses on technological determinants of e-commerce for SMEs and, more precisely, on the resources of the firm in this respect (Scupola, 2009; Abebe, 2014; Saridakis et al., 2019). However, along with the technological dimension, our analysis also involves the organisational and environmental dimensions. In this regard, and in contrast to previous studies, the importance of the environmental dimension is acknowledged by highlighting the significance of interaction and collaboration with other actors.

2.2 Research Framework

In the e-commerce literature, several models of Technological Acceptance (TAM) (Rauniar et al., 2014), including the Theory of Planned Behaviour (TPB) (Cheng, 2019) and the Theory of Reasoned Action (TRA) (Vallerand et al., 1992), as well as the Technological, Organisational, and Environmental Framework (TOE), have been studied and implemented. From among these models, we have chosen the TOE model (see Fig. 1 below) as the theoretical foundation for our research, first and foremost because it explores not only technical aspects but also investigates organisational and environmental factors. It is widely acknowledged that a framework with multiple aspects can provide superior analytical effectiveness compared to that of a framework focusing on only one aspect (Molla & Licker, 2005). Moreover, this approach is recognised as adopting a dynamic viewpoint that suggests modifications within an enterprise are driven not only by individuals within the firm but also by the firm's characteristics (Hameed et al., 2012). In a prior study, the TOE framework has been employed to examine the moderating impact of entrepreneurial orientation (EO) on the correlation between technological, organisational, and environmental variables and e-commerce adoption in micro-enterprises (Li et al., 2022). Despite the aforementioned positive features, this model also faces criticism for its lack of consideration of the individual characteristics of entrepreneurs/managers and employees (Ghobakhloo & Tang, 2013).

2.3 Research hypotheses

In this section, the research hypotheses to be tested in the empirical part of this study are presented and classified in the light of the research framework proposed in Section 2.2 (Figure 1). These three key categories are the technological dimension, the organisational dimension, and the environmental dimension.

A - Technological Dimension

The technological dimension corresponds to the collection of technologies, resources, compatibility, and costs that influence e-commerce technology adoption. Financing and a lack of funds play a significant role in this process, where any constraint in these financial resources could make SMEs cautious about their investment and capital spending. In this regard, financial constraints constitute a major impediment (Scupola, 2009; Saridakis et al., 2019).

Likewise, firm innovativeness, as defined by a proactive orientation towards research and development (R&D) and innovation, plays a crucial role in driving e-commerce adoption among SMEs (Sitong et al., 2010; Ciampi et al., 2021). Companies with stronger innovativeness are more inclined to create new or enhanced products and exhibit a greater motivation to market them internationally through online platforms.

Conversely, SMEs may find it necessary to invest in information and communication technology (ICT), software solutions, and consulting services to facilitate the development of their e-commerce operations (Matlay et al., 2003; Yadiati et al., 2019). This underscores the significance of technological resources in successfully implementing online selling strategies.

Furthermore, numerous studies have also emphasised the advantages of having reliable Internet connectivity (Belloc et al., 2012; Falch and Henten, 2018). Broadband internet usage can enhance SMEs' productivity and streamline their adoption of e-commerce practices (Haller and Lyons, 2015). Consequently, issues related to Internet connectivity have been identified as a significant factor in the success of e-commerce initiatives (Prieger, 2013). In this respect, the following hypotheses are postulated regarding the technological dimension of e-commerce adoption:

H1: A lack of funds hinders the adoption of e-commerce by SMEs.
H2: Difficulties in attaining a proper Internet connection (stable, with sufficient capacity and reasonable cost) hinder the adoption of e-commerce by SMEs.
H3: Low innovativeness hinders the adoption of e-commerce by SMEs.
H4: Low investment in ICT, software, and consultancy hinders the adoption of e-commerce by SMEs.

B - Organisational Dimension

The organisational dimension discusses the company's features that might affect the adoption of e-commerce technologies, particularly digital competencies, sales and purchase forecasts, and the desire for personal and professional development of managers/entrepreneurs. According to several previous investigations on e-commerce adoption by SMEs, digital competencies have a significant effect on e-commerce adoption and usability (Hong & Zhu, 2006; Saffu et al., 2008). Similarly, running a sales forecast activity is also necessary to adopt e-commerce (Liu et al., 2019). Staff's ability and knowledge advancement can support and boost the adoption of new technologies, aligned with the concept of "knowledge barriers" (Attewell, 1992; Ciampi et al., 2021). Since SMEs face significant risks and challenges with digitalisation due to inadequate understanding, improved knowledge held by managers/entrepreneurs would reduce the degree of ambiguity associated with new technology adoption (Caldeira and Ward, 2003; Cioppi et al., 2003; Veglio et al., 2020). In this regard, the expertise level of managers and entrepreneurs in management (Chuang et al., 2007) and their technological awareness (Zheng et al., 2004) play a major role in the adoption of this technology.

In this respect, the following hypotheses are postulated regarding the organisational dimension of e-commerce adoption:

H5: Low digital competencies negatively influence the adoption of e-commerce by SMEs.
H6: The absence of sales and purchase forecast activity negatively influences the adoption of e-commerce by SMEs.
H7: A low level of motivation held by managers/entrepreneurs for personal and professional development negatively influences the adoption of e-commerce by SMEs.

C - Environmental Dimension

The environmental dimension encompasses external factors such as cooperation with customers and competitors and rivalry actions (especially those concerning pressure from competitors) that directly influence e-commerce adoption. The level of pressure that a company faces from competitors within its industry is commonly known as competitor pressure. Therefore, in cases where industry competition is more intense, there is a higher likelihood of increased e-commerce adoption, since it provides an additional channel for marketing the firm's products (Zhu & Kraemer, 2005). On the other hand, cooperating with other entities in their business ecosystem, such as suppliers, customers, and competitors, can help SMEs accelerate the adoption of new technologies (Romero & Martínez-Román, 2015; Sussan et al., 2017).

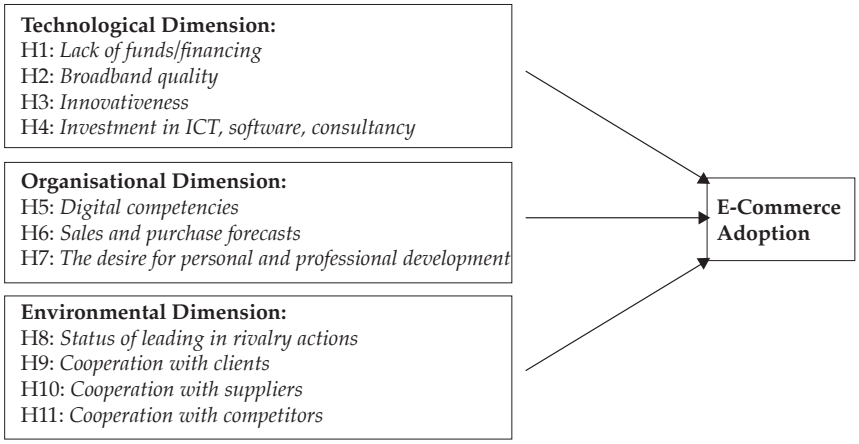
H8: A decreased level in the status of leading in rivalry actions negatively influences the adoption of e-commerce by SMEs.

H9: SMEs that do not cooperate with their clients are less likely to adopt e-commerce.

H10: SMEs that do not cooperate with their suppliers are less likely to adopt e-commerce.

H11: SMEs that do not cooperate with their competitors are less likely to adopt e-commerce.

Fig.1 Research Framework



Source: Authors' own

3. Data and Methodology

3.1 Data and variables

The study is based on a survey of Spanish SMEs with at least one employee and up to 200 workers and is carried out in the second quarter of 2022. Small and medium-sized businesses were chosen at random from the Iberian Balance Sheet Analysis System (SABI) database to participate in the study. By using simple random sampling and considering that the population is binomial (p=q=0.5, most unfavourable condition), the stratified sample is representative of the SME population in Spain with an error of 5.0% at a confidence level of 95%. Computer-assisted telephone interviewing (CATI) is the survey method employed. A response rate of 21.5% is recorded in the fieldwork and there is no observed bias between respondents and non-respondents. The final data set for this analysis consists of 802 valid observations.

A - Dependent Variable

The dependent variable considered in this study is the following:

- E-commerce adoption. This variable is a binary indicator that captures whether the company makes any sales of their goods or services via web or mobile applications.

B - Explanatory variables

The explanatory variables considered in this study are the following:

i) Technological dimension

- Lack of funds/financing. The entrepreneurs/managers were asked to indicate the importance of financial constraints as an obstacle to the digitalisation of their businesses. The answers were coded as an ordinal variable that takes values from 0 to 3, whereby 0 implies no constraints, and 3 implies a high level of constraints.
- Broadband quality. The managers interviewed were asked whether they "experience difficulty in attaining a proper Internet connection". The answers were coded as an ordinal variable that takes values from 0 to 3, whereby 0 indicates a low level of difficulty, and 3 is high.
- Innovativeness. The entrepreneurs/managers interviewed were asked whether their companies place significant emphasis on research and development (R&D) activities and innovation. The answers were coded as an ordinal variable that takes values from 1 to 5, whereby 1 implies none and 5 great importance.
- Investment in ICT, software, and consultancy. The entrepreneurs/managers interviewed were asked to approximate the percentage of total expenditure on information and communication technologies (including computers and peripheral equipment, electronic components, and other ICT goods and components), software and services, as well as ICT consulting, in the period 2019-2021 relative to the entire budget.

ii) Organisational Dimension:

- Digital Competencies. This variable serves as a composite metric to assess the extent of digital skills within businesses. It encompasses ten key competencies, including those related to the usage of email, printer and scanner operation, basic office software, digital certificate, social media, cloud system usage, financial institution platforms, electronic billing, marketing analytics tools, and comprehensive management of business operations through computerised ERP systems. The index is scaled from 0 to 10, reflecting the level of digital competence.

- Sales and purchase forecasts. The entrepreneurs/managers interviewed were asked: "Does your company periodically forecast sales/collections and purchases/payments?" This binary variable takes the value of 1 if the company does indeed forecast (0 otherwise).
- The desire for personal and professional development. This variable indicates to what extent the individuals interviewed became entrepreneurs motivated by personal or professional development. The answers were coded as an ordinal variable using a Likert scale that ranges from 1 to 5, whereby 1 means totally disagree and 5 totally agree.
- Escape unemployment and job insecurity. This variable indicates to what extent the individuals interviewed became entrepreneurs due to necessity-based motivation. The answers were coded as an ordinal variable using a Likert scale that ranges from 1 to 5, whereby 1 means totally disagree and 5 totally agree.
- Risk-taking propensity. The entrepreneurs/managers interviewed were asked whether their companies were inclined to take on high-risk projects (which could potentially yield substantial returns). The answers were coded as an ordinal variable using a Likert scale that ranges from 1 to 5, whereby 1 means totally disagree and 5 totally agree.

iii) Environmental Dimension:

- Status of leading in rivalry actions. The entrepreneurs/managers who were interviewed were requested to express their level of agreement with the following statement concerning their company: "Compared to competitors, it is usually my company that takes the lead in initiating actions to which competitors then respond." The answers were coded as an ordinal variable that takes values from 1 to 5, whereby 1 means totally disagree and 5 totally agree.
- Cooperation with clients. This variable captures cooperation with clients in aspects related to digitalisation. This binary variable takes the value 1 for those companies that have cooperation with clients (0 otherwise).
- Cooperation with suppliers. This variable captures cooperation with suppliers in aspects related to digitalisation. This binary variable takes the value 1 for those companies that have cooperation with suppliers (0 otherwise).
- Cooperation with competitors. This variable captures cooperation with competitors in aspects related to digitalisation This binary variable takes the value 1 for those companies that have cooperation with competitors (0 otherwise).
- Difficulties in finding cooperation partners, advisors, or suppliers. The entrepreneurs/managers interviewed were asked how im-

portant "difficulties in finding cooperation partners, advisors, or suppliers" were in hindering the digitalisation of their companies. The answers were coded as an ordinal variable that takes values from 0 to 3, whereby 0 implies none, and 3 implies a high level.

- Lack of customer demand/interest. The managers interviewed were asked how important "lack of demand/interest from customers" was in hindering the digitalisation of their companies. The answers were coded as an ordinal variable that takes values from 0 to 3, whereby 0 implies none, and 3 implies a high level.

C - Control Variables

The estimated models incorporate a set of control variables to effectively isolate the impact of the primary explanatory variables.

- Firm size (employees). The analysis incorporates the company's size, quantified as the number of employees.
- Sectorial dummies: SMEs within the sample were categorised into 4 sectors: industry (manufacturing, water, and energy) construction, trade, and services (which was established as the base category in the model).

Several of the preceding variables were derived from questions included in our survey, taken from the questionnaire employed by the National Institute of Statistics of Spain in their Survey of Information and Communication Technology and Electronic Commerce Usage in Companies (Instituto Nacional de Estadística, 2021).

Regarding the innovativeness, risk-taking, and proactivity variables, the questions used have been adapted from the instrument developed by Covin and Slevin (1989) for the assessment of a firm's entrepreneurial orientation. Several other variables have also been operationalised in accordance with previous studies (Martínez-Román and Romero, 2017; Fernández-Serrano et al., 2019; Martín-Martín et al., 2022).

Table 1 presents descriptive indicators of our dataset.

Table 1. Descriptive indicators

Variable	Min.	Max.	Mean	Stand. Dev.
Technological dimension				
Lack of funds and financing	0	3	1.026	1.141
Broadband quality	0	3	0.417	0.787
Innovativeness	1	5	3.488	1.288
Investment in ICT, software, consultancy	0	100	11.333	16.626
Organisational dimension				
Digital competencies	1	10	7.830	1.940
Sales and purchase forecasts	1	4	2.879	1.146
Risk-taking propensity	1	5	2.209	1.219
The desire for personal and professional development	1	5	3.831	1.380
Escape unemployment and job insecurity	1	5	2.338	1.449
Environmental dimension				
Status of leading in rivalry actions	1	5	3.001	1.250
Cooperation with clients	0	1	0.247	0.432
Cooperation with suppliers	0	1	0.283	0.451
Cooperation with competitors	0	1	0.111	0.314
Difficulties in finding cooperation partners, advisors, or suppliers.	0	3	0.639	0.918
Lack of customer demand / interest	0	3	0.891	1.048
Control Variables				
Employees	1	200	19.310	27.268
Industry	0	1	0.138	0.345
Construction	0	1	0.131	0.337
Trade	0	1	0.209	0.407
Services	0	1	0.522	0.500

3.2 Econometric methodology

In this study, the logistic regression approach is employed to assess the effect of independent variables on the e-commerce adoption variable. This econometric model is summarised as follows:

$$\ln\left(\frac{p}{1-p}\right) = z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k \quad (1)$$

In (1), p stands for the probability that $y = 1$, where y represents the

e-commerce adoption, x_j are the independent variables (explanatory variables), and b_j denote the regression coefficients $(j = 1...k)$.

The probability that a company adopts e-commerce as a result of the application of the TOE model, for a given value of x_j, is given by the following expression:

$$p = \frac{\exp\left(\beta_0 + \sum_j \beta_j x_j\right)}{1 + \exp\left(\beta_0 + \sum_j \beta_j x_j\right)} \quad (2)$$

This logistic regression model is estimated using the maximum likelihood method.

4. Findings

The results of e-commerce adoption are presented in Table 2. Concerning the technological dimension, lack of funds/financing has a strong negative influence on the adoption of e-commerce by SMEs (H1). Likewise, both R&D activities and innovation (H3) as well as investments in ICT, software, and consultancy (H4) exhibit noteworthy and positive effects on the adoption of e-commerce. In contrast to H1, H3, and H4, there is no significant effect observed of access to a proper Internet connection in the firm, as mentioned in H2.

Table 2. Logistic regression: E-commerce adoption

	β	S.E.	p-value	Exp(β)
Technological dimension				
Lack of funds and financing	0.245 (***)	0.088	0.005	1.277
Broadband quality	0.028	0.119	0.817	1.028
Innovativeness	0.185 (**)	0.081	0.022	1.204
Investment in ICT, software, consultancy	0.012 (**)	0.006	0.039	1.012
Organisational dimension				
Digital competencies	0.174 (***)	0.056	0.002	1.190
Sales and purchase forecasts	0.201 (**)	0.087	0.021	1.223
Risk-taking propensity	-0.064	0.083	0.443	0.938
The desire for personal and professional development	0.147 (**)	0.072	0.041	1.159
Escape unemployment and job insecurity	-0.030	0.063	0.633	0.970
Environmental dimension				
Status of leading in rivalry actions	0.168 (**)	0.084	0.046	1.183
Cooperation with clients	0.750 (**)	0.295	0.011	2.117
Cooperation with suppliers	-0.402	0.284	0.157	0.669
Cooperation with competitors	0.590 (*)	0.317	0.063	1.803
Difficulties in finding cooperation partners, advisors, or suppliers.	0.315 (***)	0.118	0.008	1.370
Lack of customer demand/interest	-0.092	0.103	0.374	0.912
Control Variables				
Employees	-0.009 (**)	0.004	0.036	0.991
Industry	-0.255	0.280	0.363	0.775
Construction	-0.545 (*)	0.299	0.068	0.580
Trade	0.529 (**)	0.230	0.021	1.697
Constant	-4.612 (***)	0.607	0.000	0.010
Goodness of fit				
-2 Log likelihood	728.186			
Chi-square	144.462			
Nagelkerke R Square	0.268			
% correct predictions	74			

Number of valid observations = 802. S.E. = Standard Error. (*) Statistically-significant at the 0.10 level. (**) Statistically-significant at the 0.05 level. (***) Statistically-significant at the 0.01 level. Cut-off point = 0.50.

Source: Author's own

Regarding the organisational dimension, hypotheses H5, H6, and H7 are supported by the results presented in Table 2. Therefore, any identified

constraints in terms of digital competencies, sales and purchase forecasting, as well as lack of entrepreneurial motivation associated with personal and professional development, would exert a negative influence on the adoption of e-commerce by SMEs.

Lastly, with regard to the environmental aspect, the significance of leading rivalry actions (H8) is statistically evident, which indicates that any reduction in this factor could potentially hinder the adoption of e-commerce. Along the same lines, cooperation with clients (H9) and with competitors (H11) has a positive effect on e-commerce adoption. However, cooperation with suppliers (H10) does not exert a significant effect on the adoption of e-commerce by SMEs. Similarly, the absence of customer demand or interest is not observed to be a significant obstacle to the adoption of e-commerce.

5. Discussion and Conclusion

This paper delves into the examination of potential barriers and facilitators that influence the adoption of e-commerce in SMEs, and into the ways in which these businesses can manage the affordability of this technology. The study aims to address a research gap by assessing barriers to e-commerce adoption in SMEs from a holistic perspective and by considering several factors that have been overlooked in the previous literature. In this regard, unlike the prevailing body of work that predominantly underscores technological influences (Scupola, 2009; Abebe, 2014; Saridakis et al., 2019), we recognise the importance of the environmental aspect in our research. In this way, we emphasise the role of interaction and collaboration with other actors in the ecosystem as key factors in this context.

To achieve this, the TOE theoretical framework (Molla & Licker, 2005) is employed in this paper to understand the impact of three dimensions of enablers: technological (lack of funds/financing, broadband quality, R&D activities and innovation, investment in ICT, software, consultancy); organisational (digital competencies, sales and purchase forecasts, entrepreneurial motivation); and environmental (status of leading rivalry actions and cooperation with clients, suppliers and competitors).The TOE theory presented in this paper as a robust model for the investigation into adoption of e-commerce in SMEs. Importantly, this framework encompasses not only technological contexts but also organisational and environmental contexts, and provides a comprehensive perspective (Hameed et al., 2012).

The investigation postulates quantitative empirical evidence on this topic using a sample representative of the SME sector in Spain. According to the findings, in terms of the technological dimension, financial constraints are confirmed as a major impediment, which was also highlighted by Scupola (2009) and Saridakis (2019). Similarly, investment in ICT, software, consulting, R&D, and innovation is also highly effective, and any constraints could detrimentally impact e-commerce adoption.

Concerning the organisational dimension, in the context of digital competencies, sales and purchase forecasting, and entrepreneurial motivation

associated with personal and professional development, we validate the points raised by Hong & Zhu (2006) regarding the significance of digital competence, by Liu et al. (2019) concerning the essential nature of sales forecasts, and by Martín-Martín et al. (2022) regarding the impact of entrepreneurial motivation on the digitalisation of SMEs.

In the context of the environmental dimension, we recognise the significance of interaction with other actors. In this regard, the challenges associated with cooperation with partners, advisors, or suppliers influence the adoption of e-commerce.

The outcomes of this study yield far-reaching and significant theoretical, managerial, and policy implications. Firstly, with regard to theoretical implications, we recognise the importance of the environmental dimension when analysing the adoption of e-commerce in SMEs. Accordingly, we advocate for the appropriateness of the TOE model in studying this issue, as it explores not only technical aspects but also investigates organisational and environmental factors. This theoretical approach has been under-utilised in the existing literature within this context.

In terms of managerial implications, our findings unequivocally establish that investing in human assets, by specifically enhancing digital knowledge and skills, is a crucial component within any comprehensive action plan to overcome the hurdles hindering SMEs' adoption of e-commerce. Additionally, the results presented in this paper underscore the paramount importance of financial considerations, including access to funds and their availability within the broader ecosystem.

The findings further emphasise the significance of fostering interaction and collaboration with other stakeholders and actors within the industry, and confirm prior studies in similar contexts (Govindaraju et al., 2012; Pagano et al., 2021). It is imperative for SMEs to actively support and nurture the establishment of such networks, by seamlessly integrating them into their existing organisational structures to fully leverage their potential benefits, which aligns with the prior literature (Hussain et al., 2020).

When it comes to policy implications, public administrations could contribute to the objective of investing in human assets through fostering the access of SMEs to training initiatives and external consultancy. Moreover, public administration can play a catalytic role in building and developing digital ecosystems in which SMEs can interact with other actors thereby benefitting from collaborative relationships and the access to external knowledge.

Given the limitations of this research within the context of the COVID-19 period and its impact on e-commerce, several factors should be taken into account. Firstly, the study's findings may be influenced by the unique circumstances and rapid changes experienced during the pandemic (Cueto et al., 2022), which has potentially limited the generalisability of the results to other time periods. Secondly, due to the dynamic nature of the e-commerce landscape during this period, the specific strategies and practices adopted by businesses may have varied significantly, leading to potential heterogeneity in the data. Thirdly, the TOE model encompasses

broader categories, which can potentially oversimplify the complexities of real-world scenarios. In practical application, there may be subcategories that need consideration.

Concerning future research directions, we propose conducting a comprehensive analysis of e-commerce adoption in SMEs, considering both pre- and post-COVID periods. Furthermore, we recommend investigating cybersecurity challenges associated with the adoption of e-commerce in SMEs.

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