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ICT factors that contribute to improving MSME business performance

Factores de las TIC que contribuyen a mejorar el desempeño del negocio de las MIPyMES

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Abstract

The purpose of this article is to identify the information and communication technologies (ICT) factors, that could have an impact in the performance of the SMEs business, and with a resource-based perspective (RBV). Therefore, 51 owners of SMEs were interviewed, to determine the relationship of the proposed factors and the improvement of the business performance. The collected data was analyzed using the multiple regression model. As a result of the statistical analysis, a final model was obtained and shows that the financial investments, the capacities of use, the government and the strategies of implementation, as the ICT factors that contribute to improve the performance of the SMEs business, being the financial investments the ICT factor with the greatest impact on performance.

JEL Code: M1, M15, O10
Keywords: multiple regression; business performance; information technology

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Resumen

El presente artículo tiene como propósito mostrar los factores, de las tecnologías de la información y comunicación (TIC), que contribuyen a mejorar el desempeño del negocio de las MIPyMES, desde la perspectiva basada en recursos (RBV), para la realización del estudio se entrevistaron a 51 dueños de MIPyMES, para analizar la relación de los factores propuestos con la mejora del desempeño del negocio. Los datos recopilados se analizaron mediante el modelo de regresión múltiple. Como resultado, se obtuvo un modelo final que muestra a, las inversiones financieras, las capacidades de uso, el gobierno y las estrategias de implementación de las TIC, como los factores que contribuyen a mejorar el desempeño del negocio de las MIPyMES, siendo, las inversiones financieras de las TIC, el factor con mayor impacto en el desempeño.

Código JEL: M1, M15, O10
Palabras clave: MIPyMES, Regresión múltiple, Desempeño, Tecnologías de la información

Introduction

MSMEs are the backbone of the national economy due to their high impact on job creation and national production. According to data from the National Institute of Statistics and Geography (Spanish: Instituto Nacional de Estadística y Geografía, INEGI, 2014), there are approximately 4 million 15 thousand business units in Mexico, of which 99.8% are MSMEs, which generate 52% of Gross Domestic Product (GDP), and 72% of employment in the country. Manufacturing MSMEs represent 92.7% of the manufacturing sector, commercial MSMEs represent 97.2% of the sector, and service MSMEs represent 94.5%. In the state of Nuevo León (Mexico), there are 25,579 MSMEs, of which 67.50% belong to the commerce sector and are mainly in the city of Monterrey (Nuevo León) and its metropolitan area (INEGI, 2014).

Accordingly, MSMEs in Mexico are a fundamental and indispensable link for the growth of the country. Although GDP reflects the importance of these companies, MSMEs face differences between their performance and the efficiency of their operations, compared to large companies, since they do not have the financial resources, experience, and management skills, according to Consoli (2012). On the other hand, the literature suggests that using ICTs can be a successful factor in improving the performance of companies. According to Tarute and Gatautis (2014), ICTs can represent a competitive advantage and benefit for companies. Thus, Tan et al. (2007) also suggest that ICTs influence the competitiveness of companies, allowing them to position themselves in the market and integrate as part of the value chain of large companies.

Understanding how ICTs affect company performance is an important research topic. It allows entrepreneurs to know how the value of their financial investments relates to ICTs, which can be a key factor for innovations, organizational evolution, and performance improvement (Liang et al., 2010).

This study aims to determine which ICT factors contribute to improving the business performance of MSMEs. The literature review on this topic demonstrates that most research has been conducted on developed countries and large companies such as Johnson & Johnson, Walmart, and Kmart (Tarute & Gatautis, 2014; Fernández et al., 2014; Piget & Kossai, 2013; Chung et al., 2005).

Theoretical framework

Understanding the origin of competitive advantage in companies is one of the major research areas in strategic management (Porter & Millar, 1985). The literature suggests different theories to study the relationship between ICT resources and business performance, such as the knowledge-based theory (Alavi & Leidner, 2001; Pérez-López & Alegre, 2012). There is also the media richness theory, which has been mainly used to demonstrate that ICTs can perform better in a company (Daft & Lengel, 1986; Banker et al., 2006). Alternatively, the Resources Based View (RBV) allows ICTs to be seen as resources that can contribute to achieving sustainable competitive advantage. Barney (1991) argues that the management of resources can generate competitive advantages; thus, it was decided to use the Resources Based View (RBV) to determine the ICT factors that contribute to improving the business performance of MSMEs.

Penrose (1959) originated the RBV theory, which is the basis of the competitive advantage of a company since, according to the author, what motivates and at the same time limits company growth is management, which seeks an optimal use of the valuable resources, tangible or intangible, available to the company.

For Barney (1991), resources are all the assets, capabilities, processes, attributes, knowledge, and know-how that belong to a company and can be used to develop and implement competitive strategies. Sustained competitive advantage is determined by the key resources of a company, which must have the following characteristics:

- Valuable. The resource should enable a company to implement strategies to improve its efficiency and effectiveness.
- Rare. The valuable resource cannot be used or processed by different competitors.
- Non-imitable. The valuable resource should not be easy to imitate.
- Non-substitutable. Substitutes should not easily replace the valuable resource.

The basic argument of RBV is that a company determines its productivity by its resources. In this approach, ICTs are valuable organizational resources that can enhance a company's capabilities (Li & Ye, 1999) and eventually lead to improved productivity (Liang et al., 2010).

Measuring the benefits of financial investments in ICTs and their contribution to improving performance is one of the companies' main concerns (Johannessen et al., 1999). The literature suggests that the effect of ICTs on performance can be studied through indicators such as efficiency, growth, new products, sales, increase in market share, and new markets, among others (Abrego et al., 2016; Moriones et al., 2013). Ghobakhloo et al. (2015) define business performance as organizational effectiveness.

The literature identifies two main types of performance: operational and financial (Consoli, 2012; Santos & Brito, 2012; Liang et al., 2010), and this study considers these two types of performance.

Financial performance is generally represented as return on investments, return on resources, profits, sales, or market value of companies, among other financial indicators; these indicators usually check whether the company can generate profits (Shiheng et al., 2018; Santos & Brito, 2012; Liang et al., 2010).

Operational performance is associated with costs, savings, quality, time reduction, new product development, and customer service improvement, among other similar factors (Suprapto et al., 2017; Moriones et al., 2013; Lee et al., 2011).

The RBV perspective suggests that ICT infrastructure, knowledge, and investments can be valuable resources that contribute to improving performance (Ghobakhloo et al., 2015; Palomo & Islas, 2016). The authors also suggest that capabilities, governance, and strategy are key resources that make it possible to obtain a sustainable competitive advantage and contribute to improving companies' business performance (Lo & Leidner, 2018; Bharadwaj, 2000). The factors proposed in this study are addressed below.

ICT infrastructure is a relevant factor since there is evidence that relates it with an improvement in companies' performance; this construct facilitates massification and thus has an impact on business performance (Chae et al., 2018; López & Muneta, 2011). For example, Dell Computer Corporation and Walmart raised their profitability with the support of their technological infrastructure (Law & Ngai, 2007; Chung et al., 2005).

Ollo-López and Aramendía-Muneta (2011) also suggest that ICT infrastructure favors competitiveness, innovation, and performance of companies since it provides greater processing power, and the introduction of CRM contributes to cost reduction by improving production processes. The authors also suggest in their study that technologies such as Wireless LAN increase competitiveness.

ICT infrastructure is generally defined as everything related to hardware and software, i.e., databases, resource planning systems, customer management systems, or telecommunications (Suprapto et al., 2017; Rai et al., 1997).

According to Fernández et al. (2014), using ICT knowledge to leverage infrastructure contributes to improving business performance. This is because, unlike other applications whose skills are applicable only in certain areas (such as finance and marketing, among others), ICTs and knowledge of their use apply to a wider range of areas in companies (Boh et al., 2001, cited in Tanriverdi, 2006).

Holsapple and Wu (2011) found that knowledge management is directly related to company performance since knowledge contributes to improving usage capabilities, customer service, or resource optimization through ICTs. Furthermore, Fernández et al. (2014) suggest that ICT knowledge is a mediating variable between the other variables, thus contributing to achieving new ICT capabilities and improving company performance.

ICT knowledge is defined as the degree of knowledge a company has of its ICT infrastructure. ICT knowledge impacts different processes, such as the supply chain and performance, by applying state-of-the-art technologies, reflecting the company's strategic emphasis on using ICTs to influence business outcomes (Suprapto et al., 2017; Wu et al., 2006).

The impact of ICT financial investments on performance has become an important topic in empirical research since this relationship is complex and multifaceted (Lee et al., 2011). Therefore, ICT financial investments are a key concern in resource management (Moriones et al., 2013).

Johannessen et al. (1999) suggest that ICT investments, which are made to have a competitive advantage, are also made by competitors who take similar actions.

For Liang (2012), a company should invest in employee training, ICT improvement, and organizational alignment to eliminate the gap between capabilities and needs to contribute to improved business performance. The researchers Li and Ye (1999), in their study on the impact of ICT financial investments on business performance, suggest that such investments positively impact financial performance. They also consider it important to assess the environment, strategic orientations, and readiness of a management team. They suggest dividing the total ICT budget by the total ICT assets to measure this construct.

ICT financial investments are defined as ICT-related budget, expenses, and costs (Fernández et al., 2014; Li & Ye, 1999). The literature suggests that ICT investments positively impact company performance (Moriones et al., 2013; Lee et al., 2016).

From the RBV approach, empirical results indicate that using ICTs is a resource difficult to imitate or substitute, assimilating mechanisms such as time comprehension, economic disadvantages, and resource connectivity, among others. Furthermore, the development of new ICT capabilities allows

companies to achieve sustained high performance (Bharadwaj, 2000). ICT capabilities are related to ICT infrastructure, which plays an important role in business performance. ICT capabilities refer to identifying, using, and assimilating the ability of an organization to obtain a competitive advantage, i.e., there can be different capabilities in the company supported by ICTs, as suggested by Wu et al. (2006), who evaluate the supply chain capability as a capability supported by ICTs.

ICT capabilities are defined as how ICTs positively influence the company's processes and allow it to generate a competitive advantage to improve business performance. This definition suggests that leaders in companies should focus on creating necessary conditions for the development of ICTs since they play a fundamental role in improving business performance (Chae et al., 2018; Pérez-López & Alegre, 2012; Mithas et al., 2011; Wu et al., 2006; Subramani, 2003).

The ICT implementation strategy is an important construct, and it is crucial in understanding how organizations can translate their ICT deployment into real returns, as suggested by Bergerona et al. (2004).

Strategic alignment is another important issue, and it is crucial in understanding how organizations can translate their ICT deployment into real returns (Bergerona et al., 2004). ICTs must support business strategies, which, in turn, must support ICTs (Haki & Forte, 2010). Business-ICT alignment is the degree of fit and integration of the business strategy and ICT implementation strategy (Ullah & Lai, 2013).

For Johnson and Lederer (2010) and Li and Ye (1999), who study the relationship between the Chief Executive Officer (CEO) and the Chief Information Officer (CIO), and its impact on the ICT implementation strategy, it is necessary to highlight the importance that this represents. These researchers study the mutual understanding between these two authorities within the company and how this relationship facilitates the alignment of ICTs with business strategies.

The ICT implementation strategy is defined as the degree of proactivity in planning strategies for adopting, using, and improving ICTs in the company (Lo & Leidner, 2018; Rivard, Raymond, & Verreault, 2006). The implementation strategy can play an important role within the organization and become an important element when defining organization goals related to organizational efficiency, costs, and quality as factors of great significance (Lee, Choi, Lee, Min, & Lee, 2016; Haki & Forte, 2010; Johnson & Lederer, 2010; Li & Ye, 1999).

ICT governance is used to provide and develop the foundation that links ICT processes and resources to business strategies and objectives. ICT governance also integrates and standardizes best practices for planning, organization, acquisition, implementation, service delivery and support, and monitoring ICT performance to ensure that company information and related technologies support business objectives.

Companies have developed processes that increasingly rely on ICTs, so integrating ICT resources effectively and efficiently with other business management processes has become an important issue. The relationship between ICT capabilities and business performance has been extensively studied in research such as that of Zhang, Zhao, and Kumar (2016).

ICT governance is defined as ICT management policies. Previous literature on the subject suggests that ICT governance has become an important topic since effective ICT governance enables companies to build and develop ICT capabilities, which in turn results in improved company performance (Sirisomboonsuk, VChing, Q, &R, 2018; Zhang, Zhao, & Kumar, 2016). Based on the above, the general hypothesis put forward is as follows:

Hypothesis

General research hypothesis

Infrastructure, knowledge, usage capabilities, implementation strategies, financial investments, and ICT governance are factors of information and communication technologies that contribute to improving the business performance of MSMEs located in the Monterrey metropolitan area.

Specific hypotheses

H1: ICT infrastructure positively impacts the business performance of MSMEs
H2: ICT knowledge positively impacts the business performance of MSMEs
H3: ICT capabilities positively impact the business performance of MSMEs
H4: ICT implementation strategies positively impact the performance of MSMEs
H5: ICT financial investments positively impact the performance of MSMEs
H6: ICT governance positively impacts the business performance of MSMEs

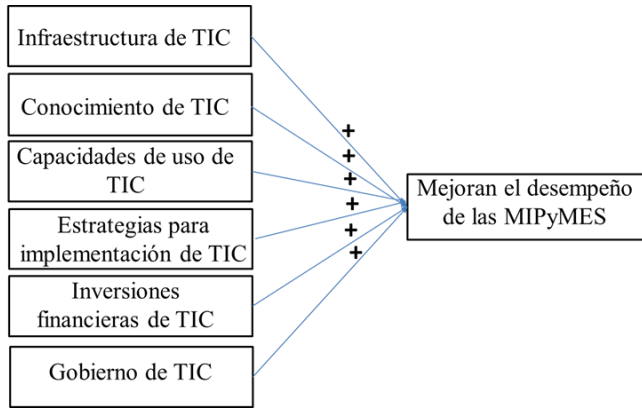

Figure 1. Proposed factor model.
Source: created by the author.

Methodology

This study analyzed MSMEs in the Monterrey metropolitan area through an electronic survey using Google Forms. The survey raised issues such as the IT infrastructure variable, and two of the points were: if the company develops customized solutions or if the technical support is sufficient. For ICT knowledge, the question was whether there was ICT training to automate processes. Regarding capabilities, the issue is whether ICTs were used to receive payments, process orders, or serve customers. For performance, whether ICTs had an impact on market share or cost reduction. The survey was designed based on previous literature (Ali *et al*., 2015; Fernández *et al*., 2014; Schwarz *et al*., 2010).

For measurement, the survey used a 5-point Likert scale, with two scales, the first for investment performance with percentage (1-5, 6-10, 11-15, 16-20, 21- or more), and the second scale for the rest of the variables (Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree). It is important to highlight that the survey was sent to 12,859 MSMEs registered in SIEM with data extracted in November 2017. Responses were only obtained from 51 companies from December 2017 to July 2018. It is worth mentioning that the sample size was 99 companies, according to the formula of Hernández Sampieri (2010), with an alpha type I error of 0.05.

Of the 51 companies, 20 are micro, 14 are small, and 17 are medium-sized. The survey was administered to the companies' owners or general managers since they are responsible for making strategic decisions and defining ICT-related policies. This study has a non-experimental, correlational-causal, and explanatory design.

A confirmatory factor analysis was performed at the beginning of the methodology to validate the fit of the items in each variable within the measurement instrument. Following the factor analysis, a Cronbach analysis measured each variable's reliability, including the dependent variable. It was possible to confirm that the items loading in each variable have internal consistency, according to the measurements obtained in the Cronbach's alpha indicator.

Table 1 presents the analysis results with the variables with the most items eliminated for each one, according to the Cronbach's alpha methodology.

Table 1
Cronbach's alpha

Variable	No. of original items	Alpha value	Final No. of items
ICT infrastructure (TINF)	7	0.827	5
ICT knowledge (TKNO)	6	0.866	4
ICT capabilities (TCAP)	5	0.902	4
ICT implementation strategy (TSTR)	6	0.895	4
ICT financial investments (TINV)	5	0.916	5
ICT governance (TGOV)	6	0.936	4
Business performance (TDES)	5	0.967	4
Total	40		30

Source: created by the author using SPSS 23

Table 1 presents the number of original items and the final number of each variable. A total of 10 items were eliminated from the measurement instrument. All variables lost items except for ICT financial investments. The Cronbach's alpha for each variable has a value above 0.80 and is reliable for the study being conducted.

Based on the information available for the study, it is feasible to use multiple linear regression, which is a multivariate statistical technique that allows for the analysis of the relationship between a dependent variable and a set of independent variables. To determine the model, it is necessary to estimate the beta coefficients, which measure the average intensity of the effects of the explanatory variables on the response variable:

$$\text{Performance} = \beta 0 + \beta 1 \cdot \text{TINF} + \beta 2 \cdot \text{TKNO} + \beta 3 \cdot \text{TCAP} + \beta 4 \cdot \text{TINV} + \beta 5 \cdot \text{TGOV} + \beta 6 \cdot \text{TSTR}$$

Table 2 presents the partial Pearson coefficients concerning the dependent variable based on the model above. The variables TCAP and TINV have a strong and positive correlation with TDES, while TSTR maintains a moderate correlation. Unexpectedly, three negative coefficients were also found.

However, although some of these coefficients are not significant, the bivariate correlation of these three independent variables was performed, with a high correlation being found between them. This

indicates the presence of multicollinearity. Therefore, it is recommended not to take these results as final and wait for the regression results together with the diagnosis of multicollinearity.

Table 2
Pearson correlation

	TDES	TINF	TKNO	TCAP	TINV	TGOV	TSTR
Pearson correlation	1	-.351*	-.172	.662**	.629**	-.276*	.242
Sig. (2-tails)		.012	.228	.000	.000	.050	.087
N	51	51	51	51	51	51	51

* The correlation is significant at a level of 0.05 (2 tails)
** The correlation is significant at a level of 0.01 (2 tails)
Source: created by the author using SPSS 23

Results

This section presents the results of the multiple regression model. Table 3 shows the summary of the models calculated by SPSS with the stepwise option. Of the four models presented, the accepted model is Model 4.

The selection criterion is to identify the model that maximizes the r^2 value and, at the same time, fulfills the significant criterion. Model 4 is the one that has the largest number of explanatory variables with an r^2 of 0.819 and a Fisher F-distribution significance > 5%, and P-value < 0.05. Model 4 explains 82% of the variance in the response variable.

Table 3
Model summary

					Combined Statistics					
Model	r	r^2	Adjusted r^2	Standard error of estimate	Combined r^2	Combined F	gl1	gl2	Combined F significance	Durbin-Watson
1	.662[a]	.439	.427	.32220	.439	38.301	1	49	.000	
2	.842[b]	.709	.696	.23456	.270	44.459	1	48	.000	
3	.886[c]	.784	.771	.20390	.076	16.523	1	47	.000	
4	.905[d]	.819	.804	.18861	.035	8.930	1	46	.004	1.859

Source: created by the author using SPSS 23

The Durbin-Watson (DW) statistic presented in Table 3 indicates that the model meets the requirements of no autocorrelation in the residuals according to the value of 1.859.

Model 4 in Table 4 presents the impacts of the non-standardized coefficients TCAP (0.632), TINV (1.112), TGOV (0.438), and TSRT (0.221). These values are part of the equation used to construct

the model. The non-standardized coefficients in Model 4 also prove that the negative correlations obtained in Table 2 are neither true nor significant since the explanatory model does not include them. Interestingly, the TSRT variable included in Model 4 now appears with a positive coefficient, which is consistent with the empirical and theoretical framework (Johnson & Lederer, 2010; Li & Ye 1999).

Table 4
Table of coefficients

Model		Non-standardized coefficients		Standardized coefficients	t	Sig.
		B	Standard error	Beta		
1	(Constant)	.210	.107		1.958	.056
	TCAP	.735	.119	.662	6.189	.000
2	(Constant)	-.085	.090		-.952	.346
	TCAP	.631	.088	.568	7.175	.000
	TINV	.735	.110	.528	6.668	.000
3	(Constant)	-.644	.158		-4.076	.000
	TCAP	.621	.076	.559	8.124	.000
	TINV	1.168	.143	.839	8.150	.000
	TGOV	.469	.115	.415	4.065	.000
4	(Constant)	-.756	.151		-5.010	.000
	TCAP	.632	.071	.570	8.932	.000
	TINV	1.112	.134	.799	8.311	.000
	TGOV	.438	.107	.387	4.086	.000
	TSTR	.221	.074	.189	2.988	.004

Source: created by the author using SPS 23

$$\text{Performance} = -0.756 + 0.632 \,.\, \text{TCAP} + 1.112 \,.\, \text{TINV} + 0.438 \,.\, \text{TGOV} + 0.221 \,.\, \text{TSTR}$$

The non-standardized coefficients measure the degree of change in the response variable for each unit increase in the independent variables. On the other hand, the standardized coefficients demonstrate the magnitude of the impacts for each variable. As presented in Table 4, the variable TINV (0.799) has the greatest impact on the response variable "performance." The impacts that follow are TCAP (0.570) and TGOV (0.387). The variable with the least impact is TSTR (0.189).

$$\beta\text{TINV} > \beta\text{TCAP} > \beta\text{TGOV} > \beta\text{TSRT}$$

Table 5 presents the diagnosis of collinearity based on the condition index (CI). Model 4 fulfills the non-collinearity criterion with a value of 14.144, which is the result of the main and interaction effects of the four variables included in the model.

Table 5
Condition index

Model		Eigenvalue	Condition index	Variance ratios (Constant)	TCAP	TINV	TGOV	TSTR
1	1	1.907	1.000	.05	.05			
	2	.093	4.530	.95	.95			
2	1	2.728	1.000	.02	.02	.03		
	2	.186	3.834	.03	.30	.84		
	3	.086	5.623	.95	.68	.13		
3	1	3.440	1.000	.00	.01	.01	.01	
	2	.406	2.910	.00	.00	.13	.12	
	3	.132	5.108	.02	.94	.13	.04	
	4	.022	12.599	.98	.04	.74	.83	
4	1	4.258	1.000	.00	.01	.00	.00	.01
	2	.406	3.237	.00	.00	.13	.11	.00
	3	.202	4.588	.00	.31	.00	.00	.64
	4	.111	6.181	.02	.63	.20	.10	.33
	5	.021	14.144	.97	.05	.67	.78	.02

Source: created by the author using SPSS 23

Table 6 presents the Breusch-Pagan (BP) test, which confirms that the accepted model does not present heteroskedasticity given that the BP significance is 0.006, a value less than 0.05 (li & Yao, 2018).

Table 6
Breusch-Pagan test

------- Breusch-Pagan and Koenker test statistics and sig-values --------

	LM	Sig
BP	18.008	.006
Koenker	17.789	.007

Null hypothesis: heteroskedasticity not present (homoskedasticity)
if sig-value less than 0.05, reject the null hypothesis
Note: Breusch-Pagan test is a large sample test and assumes the residuals to be normally distributed
------ END MATRIX -----

Source: created by the author using SPSS 23

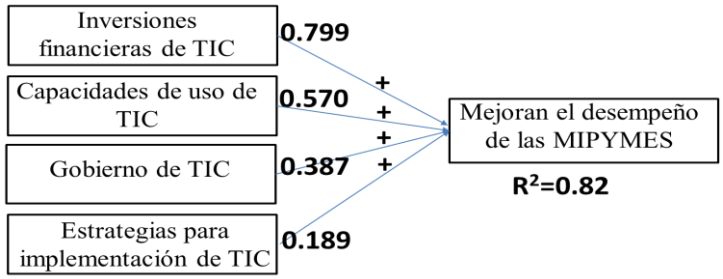

Figure 2. Final proposed factor model.
Source: created by the author.

Discussion

The proposed model (Figure 2) found that the variables TCAP, TINV, TGOV, and TSTR are critical factors that contribute to improving business performance, not only in large companies but also in MSMEs (Tarutė & Gatautis, 2014; Fernández *et al*., 2014; Piget & Kossai, 2013; Chung *et al*., 2005). From these results, the variable that stands out the most is TINV as the variable with the greatest impact on business performance, with an impact of 0.799, confirming the specific hypothesis H5: TINV. This result is consistent with previous studies suggesting that ICT investments positively impact performance (Lee *et al*., 2016; Moriones *et al*., 2013; Li & Ye, 1999; Rai *et al*., 1997). This result indicates that ICT investments contribute to improving business performance by optimizing business processes and, in parallel, by developing new ICT capabilities with an impact on performance.

The variable TCAP (H3) is the variable with the second-highest impact in the proposed model, with a value of 0.570, confirming the specific hypothesis H3. According to previous studies, ICT capabilities play an important role in improving performance, so the results are consistent (Ghobakhloo *et al*., 2015; Liu *et al*., 2013; Rivard *et al*., 2006; Bharadwaj, 2000). The research results demonstrate that ICT capabilities acquired by MSMEs positively impact their performance. Companies should, therefore, focus on the development of new capabilities through the use of ICTs, such as customer service or selling products/services through a web application, or process optimization, allowing the reduction of time or costs.

The study also confirms the relevance of the variable TGOV (H6) with a moderate relationship and impact of 0.387 on performance, thus confirming the specific hypothesis H6. This result is consistent with the theory (Zhang *et al*., 2016). The results demonstrate that the variable TGOV is also applicable to MSMEs. Therefore, the use of frameworks such as ITIL and other similar frameworks should also be considered by MSMEs to manage their ICTs efficiently.

The study results demonstrate that STRT (4) is the variable with the least impact in the final model, with an impact of 0.189 on performance, and confirms the specific hypothesis H4. This result is different in order of magnitude from that reported in the literature (Haki & Forte, 2010; Rivard *et al*., 2006). This difference may be due to the size of the companies in this study (MSMEs). Compared to large companies, MSMEs do not have defined strategies for ICT implementation aligned with the company's long-term goals.

In this study, it was also significant that variables TINF and TKNO have no impact on the proposed model, so the specific hypotheses H1 and H2 are excluded in the final model, which contrasts with the literature reviewed—previous studies suggest that these variables have an impact on performance (Fernandez *et al*., 2014; Pérez & Alegre, 2012, 2011; Tanriverdi, 2006; Bharadwaj, 2000; Rai *et al*., 1997).

However, according to this study, the variables TINF and TKNO have no impact due to the size of the studied companies (MSMEs) since they do not have as much infrastructure or ICT knowledge as large companies. MSMEs focus mainly on having the essentials for the operation of the business, so the variables TINF and TKNO are not priorities.

Conclusions

This study analyzed 51 surveys of companies in the same sector in the Monterrey metropolitan area to determine the ICT factors that contribute to improving MSMEs' financial and operational business performance. The topic is addressed using a resource-based approach that considers the variables of ICT financial investment, usage capabilities, governance, and usage strategies. These variables explain the model and can be seen as valuable, rare, non-imitable, and non-substitutable resources that make it possible to achieve a competitive advantage and increase the companies' business performance.

First, the general research hypothesis is partially proven since only four factors of the six proposed have a positive impact on the business performance of MSMEs. Second, it is confirmed that ICTs contribute to improving MSMEs' business performance through ICT financial investments, which allow for the generation of new ICT capabilities and efficient ICT governance and ICT usage strategies aligned with company objectives.

Third, financial investments (TINV), usage capabilities (TCAP), implementation strategies (TSTR), and ICT governance (TGOV) are factors that contribute to improving the business performance of MSMEs and, according to Penrose (1959), are valuable, rare, non-imitable and non-substitutable resources. Fourth, in conclusion, ICT financial investments are the most important factor in the model (0.799) and significantly impact MSMEs' business performance. These investments contribute to optimizing processes such as inventories, sales, purchases, supply chains, or the main business process through the use of hardware and software solutions, such as Enterprise Resources Planning (ERP) or Customer Relationship Management (CRM), which can be acquired through free or paid licenses.

The ICT capabilities factor (0.570) is the second-most important factor and consists of taking advantage of financial investments in ICTs to generate new capabilities for existing ones. These capabilities include using software to improve customer service by creating real-time help conversations, software for sales support (CRM), or the analysis of information from social networks to improve products and services.

Proper and standardized management through ICT governance also contributes to performance improvement. This factor has the third-highest significance (0.387) since ICT governance can be implemented by applying frameworks such as COBIT or ITIL, which have a section for MSMEs. The use

of these frameworks contributes to a better use of ICTs, generating new ICT capabilities through the standardization of basic processes, such as periodic backups of company information, the planning of computer equipment maintenance, or software solutions.

Although the ICT usage strategies (0.189) factor has the lowest impact, this factor is important for the model. It suggests aligning business strategies with ICT investment strategies and using ICTs to support the company mission and vision.

These results can be useful to the directors or owners of MSMEs since this study suggests that, by focusing on the factors of the final model, they contribute to the improvement of business performance. Alternatively, they can focus on one of these factors specifically. For future research, it is possible to address the issue of ICTs and MSMEs' performance by taking a representative sample of each of the business sectors that comprise MSMEs and making a comparison. Performance analysis should also be done by specific approaches, i.e., market, financial or operational, without forgetting the possibility of approaching the analysis through the statistical technique of structural equations. It is worth pointing out the limitations of the study that should be considered for future studies. The study took place in the Monterrey metropolitan area, on MSMEs in the commercial sector. It is also important to compare the manufacturing or services sector and comply with the number of companies required for the sample.

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