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How are companies going to business digitalization? An explanation based on the implementation of e-commerce with data of SMEs

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ARTICLE INFORMATION

Article title

How are companies going to business digitalization? An explanation based on the implementation of e-commerce with data of SMEs.

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Keywords

Implementation of e-commerce; business digitalization; operational efficiency; corporate performance; PLS-SEM.

Abstract

The data presented in this article is based on a questionnaire survey regarding e-commerce and business digitalization of SMEs in Mexico answered by the CEOs of the companies. A valid sample of 4,121 Mexican SMEs was collected covering many industries, such as primary sector, extractive industries, manufacturing industries, energy, water, recycling, construction, trade, services, and others. The data includes information about the implementation of e-commerce, business digitalization, operational efficiency, corporate performance, and other demographic indicators of the sampling firms. The link between e-commerce and corporate performance is still underexplored in SMEs, even more so between companies from Latin America, being Mexico a perfect example to explore how different SMEs adapt and thrive due to the rapid growth of their e-commerce and the diversity of their business sectors (Santos-Jaén et al., 2023 [2]). Data analysis was conducted using SPSS and Smart PLS. The data are useful as the data can be reproduced, reused and reanalysed paying special attention to group-specific effects. This data article also opens up better research opportunities going forward through collaboration with other researchers.

SPECIFICATIONS TABLE

Subject	Management, Business.
Specific subject area	Innovation and Digitalization of Business.

Type of data	CSV files, SmartPLS 4.0.7 software, figures, and tables in the article.
Data collection	The data were collected through a telephone survey of CEOs of Mexican SMEs. The data were analysed using Smart PLS 4.0.7 software.
Data source location	Institution: Foundation for the Strategic Analysis and Development of SMEs (FAEDPYME). Country: Mexico The analysis builds upon a representative sample of Mexican SMEs. The companies included in the sample were chosen and arranged using a method called simple random sampling. The list of companies was obtained from the DENUE, a directory of Mexican companies under the National Institute of Statistics and Geography of Mexico (INEGI).
Data accessibility	Repository name: Mendeley Data Data identification number: 10.17632/x95yvmj8c2.1 Direct URL to data: https://data.mendeley.com/datasets/x95yvmj8c2/1 Santos, José Manuel (2024), "Digitalization in Mexican enterprises", Mendeley Data, V2, doi: 10.17632/x95yvmj8c2.1 [1]
Related research article	Santos-Jaén, J. M., Gimeno-Arias, F., León-Gómez, A., & Palacios-Manzano, M. (2023). The Business Digitalization Process in SMEs from the Implementation of e-Commerce: An Empirical Analysis. <i>Journal of Theoretical and Applied Electronic Commerce Research</i> , 18(4), 1700-1720. [2]

VALUE OF THE DATA

- The dataset is useful for researchers who want to study the antecedents of operational efficiency and corporate performance in SMEs through a large firm-level sample.
- Digitalization and e-commerce are two important means for companies to modernize their business in the digital transformation era. This dataset, which also includes measures related to operational efficiency and corporate performance, helps researchers to discern if they deserve their popularity and really help to improve competitiveness and company performance.- The dataset includes several control variables (e.g. CEO gender and education, family business condition, size, industry) that may be used for measurement validation and partitioning the data and estimating group-specific effects.
- The survey and data analysis procedure can serve as a guide to support comparative research on SME digitalization and e-commerce in the context of other nations. It would be interesting for practitioners and policy makers to test whether the variables contained in the dataset relate differently in the context of developed and developing countries.
- Using alternative quantitative data program processing techniques, researchers may be able to duplicate this data report and compare the outcomes from various software programs (such AMOS, LISREL, Warp PLS, PLS using R, Adenco, and so on).
- Managers can draw on the data to ascertain the contribution of digitalization and e-commerce to their operational efficiency and performance, comparing it to the costs of digital transformation, before deciding on the application of these technologies.

BACKGROUND

Within the innovation of business models, the biggest transformation that companies have undoubtedly faced in recent decades is their digitalization. This transformation has occurred at various speeds, influenced by the business areas concerned, the company's activity, and the size of the company. The process has been slower in SMEs because of the barriers to digitalization they face, including limited financial and human resources, internal resistance to change, and a slow adoption of business models pertinent to digitalization that could be more pronounced in micro and small than in medium-sized firms (Radici and Petković, 2023 [3]; Kádárová et al.[4]; Du and Jiang, 2022 [5]). However, a global event such as the spread of the COVID-19 pandemic forced new decisions regarding business models. The disappearance of social interactions forced the search for new ways of doing business such as e-commerce (Alwan et al., 2023) [6]. The need for the implementation of e-commerce as a means of survival highlighted the need to initiate a digitalization process in SMEs. However, the implementation of e-commerce does not imply digitalization, although it can lead to this transformation of the business model. To learn about the impact of e-commerce implementation on key aspects such as digitalization, operational efficiency, and corporate performance, a data collection among Mexican SMEs was designed to learn more about the process.

We chose Mexico because of the rapid growth of its e-commerce and the diversity of its business sectors, that allow for a thorough exploration of how different SMEs adapt and thrive [2]. At the same time, although there are now more and more publications showing how e-commerce improves corporate performance in SMEs (Kádárová et al.[4]; Andonov et al. [7]; Purba et al., 2021 [8]), not many of them address this link, and even fewer of them come from Latin American nations like Mexico.

The review of the academic literature on the topic, hypotheses, explanatory model, results, and conclusions was published in 2023 (Santos-Jaén et al., 2023) [2]. Nevertheless, there are details of the data collection that were not shared. In this work, we share all the details about the design and collection of the data that serve as the basis for the study.

DATA DESCRIPTION

The data comprising the file named Data Base.csv, located in the Mendeley repository, was collected at the beginning of 2022 through telephone surveys conducted by a specialized company. The data was obtained through the Strategic Foundation for the Development of Small Businesses (FAEDPYME). The survey targeted CEOs, as they possess the greatest knowledge about their company's current status and future plans (Van Gils, 2005) [9]. The study divided the group of companies into different categories based on their industry and size, considering the research objectives and available data on population characteristics. The researchers created two groups, one to represent the specific sub-sector of activity of the companies and the other to represent their size.

After eliminating incomplete or erroneous responses, the final sample was made up of 4,121 Mexican SMEs with the distribution shown in Table 1.

Table 1. Sample distribution

Industry	Total		Micro size		Small size		Medium size	
	N	%	N	%	N	%	N	%

Primary Sector	132	3.20%	52	2.28%	31	2.96%	49	6.23%
Extractive industries	67	1.63%	7	0.31%	12	1.14%	48	6.10%
Manufacturing industries	855	20.75%	395	17.29%	209	19.92%	251	31.89%
Energy, Water, Recycling	44	1.07%	22	0.96%	11	1.05%	11	1.40%
Construction	126	3.06%	41	1.79%	43	4.10%	42	5.34%
Trade	668	16.21%	460	20.13%	132	12.58%	76	9.66%
Services	1,630	39.55%	915	40.04%	468	44.61%	247	31.39%
Other activities	599	14.54%	393	17.20%	143	13.63%	63	8.01%
TOTAL	4,121	100%	2,285	100%	1,049	100%	787	100%

In Table 2, demographic data regarding general questions is shown.

Table 2. Demographic data

	Company tenure			Family business			CEO gender			CEO with university degree?	
	N	%		N	%		N	%		N	%
<10 years	2,347	56.95%	Yes	1,668	40.48%	Male	2,576	62.51%	Yes	2,574	62.46%
10-50 years	1,712	41.54%	No	2,432	59.01%	Female	1,522	36.93%	No	1,523	36.96%
> 50 years	62	1.50%	DK/NA	21	0.51%	DK/NA	23	0.56%	DK/NA	24	0.58%

To ensure clarity in the survey, a preliminary test was conducted with eight reliable companies before commencing the fieldwork. Following the acquisition of the final sample, measures were taken to address issues related to non-response bias and common method bias. To mitigate non-response bias, the sample was split into two groups (with 80% of initial responses in one group and the remaining in the second), and an ANOVA test indicated no significant disparities in responses between them. To counteract common method bias, a single-factor test was administered (Podsakoff et al., 2003) [10], revealing that six factors explained 63.75% of the total variance, with the primary latent factor explaining 32.25%. Consequently, it can be inferred that no issues stemming from common method bias were encountered, facilitating the successful execution of the fieldwork (Hair, Risher, et al., 2019) [11].

The questionnaire was divided into two parts. In the first general part, questions of a general nature about the companies were asked, allowing for grouping and searching for differences. Questions such as the sector of activity, the gender of the manager, or the company's seniority were asked in this manner, among others.

In addition to the general questions, another series of questions were based on previous literature, allowing for the establishment of the four latent variables used in this article: E-commerce Implementation, Operational Efficiency, Business Digitalization, and Corporate Performance, and others. Within a structural equation modelling framework such as PLS-SEM, these variables are defined as composites in mode A, as a definitive relationship between the indicators and the latent

variables is presumed. Additionally, mode A (reflective) was chosen due to the high correlation between the indicators used to construct each variable. A 5-point Likert scale was used to measure each latent variable, with responses ranging from "strongly disagree" (1) to "strongly agree" (5). Table 3 displays the questions used and the variables created from them.

Table 3. Variables used in the research

General questions	
P001	Business sector
P003	How many years has your company been in operation?
P004	Company size: <input type="checkbox"/> Microenterprise 1 <input type="checkbox"/> Small 2 <input type="checkbox"/> Medium 3
P005	Do you consider the company to be a family business? <input type="checkbox"/> Yes 1 <input type="checkbox"/> No 0
P006	What is the gender of the manager? <input type="checkbox"/> Male 1 <input type="checkbox"/> Female 0
_ P007	Does the manager have a university degree? <input type="checkbox"/> Yes 1 <input type="checkbox"/> No 0
<p>Implementation of E-commerce. The extent to which a company has integrated electronic commerce practices into its operations, including the establishment of online sales channels, digital payment systems, and electronic customer interaction platforms. Yu et al.(2021) [12], Etumnu (2022) [13], Ha & Stoel (2009) [14], Horng & Wu (2020) [15], Zhao et al. (2015) [16], Nasiri et al. (2020) [17]</p>	
<p><i>Please indicate the importance to your company on a scale of 1 to 5, where 1 represents "not very important" and 5 represents "very important," of the following technologies commonly used in companies</i></p>	
EC_001	Own website
EC_002	Sales made on own e-commerce portal
EC_003	E-commerce in Marketplace
EC_004	Social networks for commercial purposes
EC_005	Big data and data analysis software
<p>Business Digitalization. The process of integrating digital technologies and strategies into various aspects of a business, including operations, processes, products, and services, with the goal of enhancing efficiency, innovation, and competitiveness in the digital economy. Eller et al. (2020) [18], Nasiri et al. (2020) [17], Niemand et al. (2021) [19]</p>	
<p><i>Please indicate your level of agreement or disagreement on a scale of 1 to 5 with the following statements regarding the digitalization strategy:</i></p>	
BD_001	We have a clear understanding of the possibilities and benefits of digitization
BD_002	We invest significant resources in digitizing our business
BD_003	We regularly assess and update our business model in terms of digitization
BD_004	Our employees are adequately prepared for the digital evolution of our company
BD_005	Our managers receive comprehensive training in digitalization
BD_006	Our company has a high degree of process automation
BD_007	We use digitization in the organizational management of the company
BD_008	We conduct regular training sessions for digital transformation within our company
<p>Operational Efficiency. The ability of an organization to optimize its internal processes, resources, and systems to achieve maximum productivity and minimize waste, thereby improving overall performance and reducing costs. Jiang et al. (2015) [20], Lin & Shao (2006) [21], Pérez-Rave et al. (2023) [22], Rho and An (2007) [23], Roriz et al. (2017) [24], Santa et al. (2014) [25], Fernández-Gómez et al. (2019) [26]</p>	
<p><i>Relative to your direct competitors, please specify your company's position on the following performance indicators. From 1 being worse to 5 being better</i></p>	
OE_001	Quality of your products

OE_002	The efficiency of production processes
OE_003	Changes or improvements in existing products/services
OE_004	Changes or improvements in production processes
Corporate Performance. The overall effectiveness and success of a corporation in achieving its strategic objectives, as measured by key performance indicators (KPIs) such as financial performance, market share, customer satisfaction, and organizational productivity. García-Lopera et al. (2022) [27], León-Gómez et al. (2022) [28], Palacios-Manzano et al. (2022) [29], Cepeda-Carrion (2019) [30]	
<i>In comparison with your direct competitors, indicate where your company stands on the following performance indicators. From 1 being worse to 5 being better</i>	
CP_001	Customer satisfaction
CP_002	Speed of sales growth
CP_003	Profitability
CP_004	Employee satisfaction
CP_005	Level of absenteeism

Previously, it was mentioned that our model consists of four type A composites, and therefore, the measurement model aims to analyze the reliability and validity of the items that make up the constructs and the constructs themselves (Hair, Risher, et al., 2019) [11]. The results of the performed tests are shown in Table 4.

The reliability of the constructs is evaluated by examining the loads, which should exceed a value of 0.7 (Hair, Risher, et al., 2019)[11]. Except for two items, all others meet this criterion, although their values are still higher than 0.6, allowing them to remain in the model. To further confirm construct reliability, we calculated Cronbach's Alpha, composite reliability (Chin, 1998) [31], and the rho ratio (Dijkstra & Henseler, 2015) [32], all of which should exceed 0.7 to establish reliability, a requirement met by all constructs (Hair, Risher, et al., 2019) [11]. Additionally, we assessed the convergent validity of the variables using average variance extracted (AVE), confirming that all results surpassed the minimum threshold of 0.5 (Hair, Sarstedt, et al., 2019) [33]. The results of the performed tests are shown in Table 4.

Table 4. Measurement model results.

Composite indicators	Mean	SD	Loading	t-student*	α	ρ_A	ρ_C	AVE
Implementation of E-commerce					0.808	0.813	0.867	0.569
EC_001	2.616	2.062	0.810	130.086				
EC_002	2.049	1.962	0.842	153.669				
EC_003	1.787	1.927	0.724	69.308				
EC_004	3.278	1.828	0.667	64.945				
EC_005	1.779	1.907	0.713	75.144				
Business Digitalization					0.939	0.940	0.949	0.702
BD_001	3.654	1.249	0.695	71.181				
BD_002	3.109	1.358	0.851	150.978				
BD_003	3.008	1.369	0.857	174.739				
BD_004	3.145	1.304	0.847	145.059				
BD_005	3.305	1.317	0.852	159.828				

BD_006	2.922	1.314	0.847	147.708				
BD_007	3.024	1.334	0.877	202.844				
BD_008	2.961	1.363	0.864	173.057				
Operational Efficiency					0.774	0.778	0.854	0.595
OE_001	4.211	0.927	0.791	104.048				
OE_002	4.061	0.924	0.772	98.517				
OE_003	3.638	1.554	0.775	83.675				
OE_004	3.454	1.585	0.746	72.133				
Corporate Performance					0.813	0.830	0.870	0.574
CP_001	4.324	0.863	0.784	104.917				
CP_002	3.967	0.971	0.811	113.763				
CP_003	3.980	0.931	0.795	93.947				
CP_004	4.173	0.897	0.777	83.718				
CP_005	3.719	1.146	0.601	41.823				

Significance and standard deviations (SD) performed by 10,000 repetitions Bootstrapping procedure. α : Chronbach's alpha; ρ_A : Dijkstra–Henseler's composite reliability; ρ_C : Jöreskog's composite reliability; AVE: Average Variance Extracted; ***: All loadings are significant at a 0.001 level.

The examination of the measurement model proceeds with the assessment of discriminant validity, which involves applying the Fornell-Larcker criterion (Fornell & Larcker, 1981) [34]. According to this criterion, the correlations between any pair of variables should not exceed the square root of the average variance extracted (AVE) for each variable. As shown in Table 5, the variables included in the model meet the requirements of the Fornell-Larcker criterion. Furthermore, discriminant validity is confirmed by ensuring that all heterotrait-monotrait (HTMT) ratio values do not surpass the maximum threshold of 0.85 (Hair, Risher, et al., 2019) [11].

Table 5. Discriminant validity.

	I	II	III	IV
I Business Digitalization	<i>0.838</i>	0.358	0.729	0.499
II Corporate Performance	0.302	<i>0.758</i>	0.301	0.830
III Implementation of E-commerce	0.644	<i>0.236</i>	<i>0.754</i>	0.409
IV Operational Efficiency	0.415	<i>0.684</i>	<i>0.322</i>	<i>0.771</i>

HTMT ratio over the diagonal (bold). Fornell–Larcker criterion: square root of AVE in diagonal (italics) and construct correlations below the diagonal.

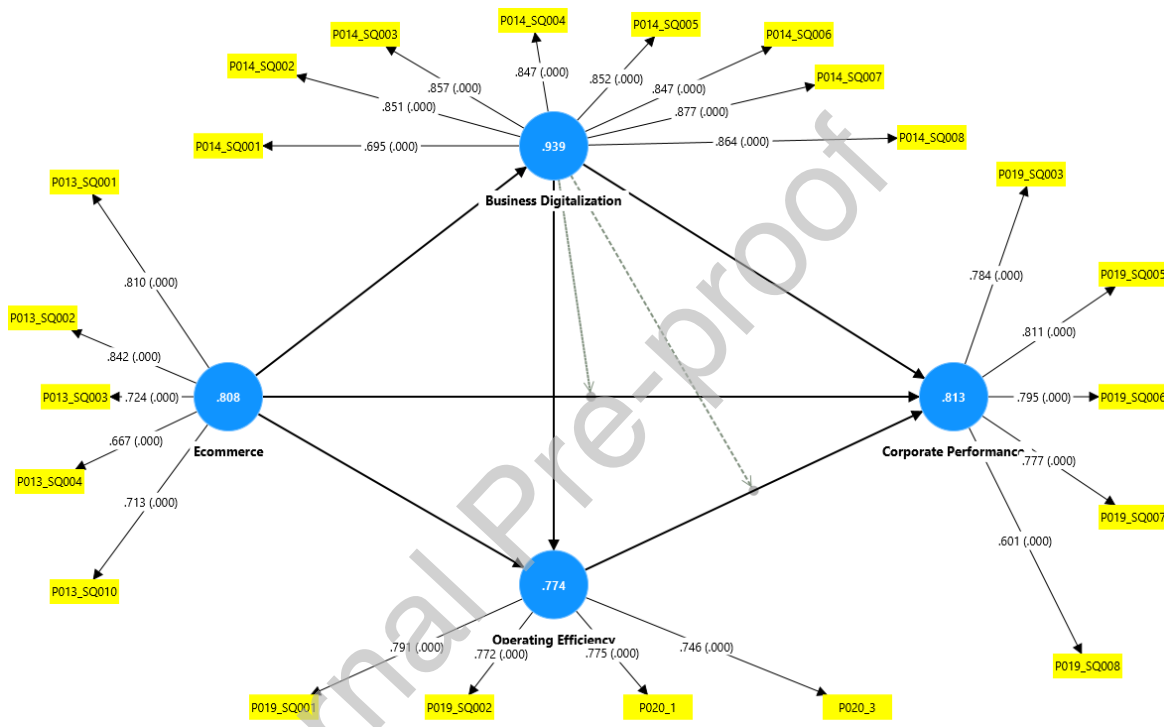
We conclude the examination of the measurement model by confirming the absence of multicollinearity issues. This was achieved through an analysis of the Variance Inflation Factor (VIF). As depicted in Table 6, the VIF values range from 1 to 1.934, well below the recommended maximum value of 3 (Hair, Risher, et al., 2019) [11]. Based on these findings, we can confidently dismiss concerns regarding multicollinearity.

Table 6. Multicollinearity assessment.

	I	II	III
I Business Digitalization		1.934	1.709
II Implementation of E-commerce	1.000	1.771	1.709
III Operational Efficiency		1.412	

Figure 1 represents the results of the measurement model analysis. Each of the variables indicates the Cronbach's alpha result.

Figure 1. Measurement model analysis



EXPERIMENTAL DESIGN, MATERIALS AND METHODS

This data article used a quantitative research method approach. The data analysis unit was organisations. The research population consisted of the companies listed in DENUE. DENUE, which is part of the National Economic Information Subsystem (SNIE), is a business directory aimed to provide users, both specialized and non-specialized, with the identification, location, and contact details of companies in Mexico. The sample was selected and organized using a method called simple random sampling.

The execution of the simple random sampling was as follows: The population consisted of all companies listed in the DENUE directory, which includes a comprehensive list of companies operating in Mexico. The sample size was determined based on the desired confidence level and margin of error, resulting in a final sample of 4,121 Mexican SMEs. Each company in the DENUE directory was assigned a unique identification number. We used the SPSS statistical software to generate random numbers corresponding to the identification numbers of the companies in the population, ensuring that each company had an equal chance of being selected. The companies that matched the randomly generated numbers were selected to form the sample. To ensure randomness

and avoid any biases, the generation of random numbers was carefully monitored and verified for uniqueness.

The questionnaire data were collected in the first quarter of 2022. The questionnaire data that were collected and found to be suitable for the analysis were 4,121 questionnaires from Mexican SMEs. The response rate of the data collection was 68,25%. The data collected were analyzed into SPSS for common method variance to evaluate whether the research indicators were free of bias.

According to Mayr et al. (2007) [35] and Ringle et al. (2022) [36], the most suitable technique for analysing the relationships between variables was PLS-SEM since the model consisted of four type A composites. SmartPLS 4.0.7 software was used for the measurement model evaluation and structural model evaluation (Santos-Jaén et al., 2023) [2]. To assess the viability of the research indicators, the Smart PLS data was first analyzed using the measurement model evaluation. It is stated that every indicator complied with the general guideline. The structural model evaluation came after the assessment of the measurement model. The relationship between the research variables was investigated using the structural model evaluation, and either significant or no findings were obtained. To ensure accuracy, the bootstrapping procedure was conducted with 10,000 samples.

LIMITATIONS

This article is not without limitations. One of the main limitations is that our sample is limited to only one country. For future studies, it would be beneficial to utilize a broader database including other countries for greater generalizability of the findings. Additionally, it is important to note that our study focuses exclusively on small and medium-sized enterprises (SMEs), which may limit the applicability of our results to larger businesses.

ETHICS STATEMENT

The authors have read and followed the ethical requirements for publication in Data in Brief, and confirm that the current work does not involve human subjects, animal experiments, or any data collected from social media platforms.

CRedit AUTHOR STATEMENT

José M. Santos-Jaén: Methodology, Software, Writing, original draft preparation, supervision. **Fernando Gimeno-Arias:** Conceptualization, data curation, Visualization, Supervision. **María Pemartin González-Adalid:** Conceptualization, Investigation, Writing- Reviewing and Editing, supervision, validation.

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DECLARATION OF COMPETING INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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