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The Effect of Digitalization on Innovation Capabilities through the Lenses of the Knowledge Management Strategy

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Abstract: In recent years, the knowledge management approach of the firm has emerged as the central theoretical perspective intended to address the question of adaptation to technological change. As for theoretical and practical implications, we proposed a comprehensive model that provides an integrative outlook on how the relationships between digitalization and knowledge management strategy predetermine the business results of the firm. To this purpose, we empirically analyzed the effect of digitalization on knowledge management, and how this contributes to the improvement of the company's results in the IT, technology, consulting, and programming sectors by testing the hypotheses through the Partial Least Squares (PLS) approach to Structural Equation Modeling (SEM). A group of 620 companies was targeted for collecting the data by quantitative means of analysis—a questionnaire. The final sample was composed of 78 companies, which corresponds to 12.58% (response rate). The research findings offer an explicit foundation, on which to base future research efforts in evaluating the ways companies should approach digital transformation, strengthen the knowledge management role in this process, develop the digital and innovation capabilities, and finally, ameliorate the effects on business performance, what also represents a certain value for the executives or individuals in the workplace.

Keywords: digitalization; innovation capabilities; knowledge management strategy; business performance; consultancy firms

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1. Introduction

While operating in complex and turbulent environments, modern companies are being increasingly seen to go digital to gain greater competitiveness and develop resilience to shocks (Ashwell 2017). Recently the situation shaped by COVID-19 propelled each organization to digitally transform to adapt to the disrupting circumstances and leverage the new business opportunities (Costa et al. 2021; Feroz et al. 2021; García-Madurga et al. 2022; Pérez-Calle et al. 2021). The benefits deriving from this digital adaptation, such as the optimization of resources, the reduction of inefficiencies, the multichannel integration, the deeper understanding of customers, and the innovation capacity consolidated the significance of the Digital Transformation (hereinafter referred to as DT) in the Industry 4.0 era. Thus, having embraced various spheres of life, digitalization became one of the most important ongoing transformations in our society (Gbadegeshin 2019).

Innovation is a multidimensional concept, which involves the organizational and procedural aspects of a company, aimed at improving the business performance in terms of production efficiency (Schumpeter 2000). As the efficiency-oriented focus of process management spreads to the centers of innovation, it starts affecting the organization's dynamic capabilities (Di Vaio et al. 2021). Dynamic capabilities are related to an organization-wide ability to adequately and timely adapt to the changes in the environment through the management and reconfiguration of internal or external processes, resources, and competencies (Eisenhardt and Martin 2000). The academic discussion around the phenomenon of developing innovation to guarantee organizational success has concentrated on the concept

of innovation capability (Saunila 2020). Lawson and Samson (2001) determine innovation capability as the ability to continuously transform knowledge and ideas into new products, processes, and systems for the benefit of the firm and its stakeholders.

The adoption of technological solutions for the development of new products and processes stimulates the innovation capacity of companies, enabling them to meet the needs of a continually changing market. And contrariwise, innovations generated within or absorbed by firms provide a variation to proactively shape or reactively respond to the technological transitions (Gil-Gomez et al. 2020). According to Ford et al. (2012), under the dynamics of the current market environment, gaining or developing the right innovation might expand infrastructural capabilities, increase strategic options, boost efficiency and drive quality to the limits of perfection. Fundamentally, as the marketplace is filled with more competitors and product life cycles are shortened, disruptive digital innovations change traditional operating models requiring dynamic capabilities (Karimi and Walter 2015). In this respect, (Adamczewski 2018) clarifies that technological innovations that change business models and operating conditions in individual enterprises and whole sectors come from outside. Therefore, the careful monitoring of what is happening in ICT is a requirement not only for ICT companies, banks or telecommunication firms, but primarily for all organizations that want to maintain their leading position on the market. Hence, the dynamic capabilities represent a suitable approach to studying the effect of technological innovation on organizations (Rialti et al. 2019).

In the organizational theory used to explain the groundbreaking influence of the DT on businesses, knowledge management (hereinafter referred to as KM) appears as an effective source for determining strategic directions and developing competitive advantages from the exploration and exploitation of data and information (Gaviria-Marin et al. 2019). Drawing from these grounds, KM could be understood as a driver for dynamic capabilities that serve to acquire and assimilate resources by incorporating tools, platforms and digital content to face constantly changing environments (Bresciani et al. 2021). Therefore, to approach the DT successfully, the knowledge management strategy (hereinafter referred to as KMS) should be oriented towards developing strong dynamic capabilities, such as innovation and digital capabilities (Bolisani and Bratianu 2017).

Meanwhile, the available scope of the academic literature in the studied research field stresses the scarcity of scientific evidence (Annarelli et al. 2021; Escribano et al. 2009; Mazzola et al. 2016; Passaro et al. 2018). For instance, there is a call for further investigation on how KM related to Industry 4.0 translates in different sectors by showing their value and the digital innovation mechanisms activated through them (De Bem Machado et al. 2022). Another example derives from the study of Garcia-Morales et al. (2018), which urges to us move forward in exploring the influence of digitalization itself on organizational performance through knowledge and innovation, having already discussed the role of social media technologies. Once more case stands for continuing research on how digitization efforts and knowledge management practices jointly affect process innovation (Nwankpa et al. 2021).

On that account, all premises considered, this study concentrates on the analysis of the relationships between digitalization and KMS. Once, these interdependencies are suggested to have an impact on the company's business and innovation results, the main goal of this research becomes to explore the effect of digitalization on KM, and how this contributes to the improvement of the innovation capabilities. In doing so, this paper establishes the following objectives to be addressed: (1) to study the impact of digitalization he business performance; (2) to analyze how digitalization directly contributes to the improvement of the company's innovation capabilities (3) to examine the impact of digitalization on KM and eventually (4) to scrutinize how KM influences the company's innovation capabilities.

In pursuing the research objectives, there is an important practical implication anticipated, consisting in providing entrepreneurs with tangible evidence of linkages between digitalization, KM and innovation capabilities, jointly aimed at achieving the strategic goals of operational excellence, improved value creation and environmental sustainability

(De Bem Machado et al. 2022). The rest of this paper is structured as follows: Section 2 describes the theoretical background and performs the hypotheses along with the proposed research model; Section 3 discusses the methodology; Section 4 presents the statistical analysis results and Section 5 concludes the article.

2. Theoretical Review and Hypotheses

2.1. Relationship between Digitalization and Business Performance

Digitalization goes far beyond the simple application of digital technologies, inducing a clear impact on business models and organizational settings in general (Bouwman et al. 2018; Hinings et al. 2018; Isaksson et al. 2018; Kelly 2020). Moreover, an essential task to support strategic decision-making can now be addressed with the new IT-based technologies (Ben-Gal 2019; Momin and Mishra 2015). Therefore, neglecting or ignoring digital technologies can lead to an increased risk of not occupying the top positions in highly competitive markets (Bloem et al. 2014; Bouwman et al. 2018; Degryse 2016; Sommarberg 2016). Having reviewed the literature, Ribeiro-Navarrete et al. (2021) disclosed that despite the fact that digitalization creates value for companies and offers a host of benefits, there has been little investigation so far regarding its effect on business performance. To this end, the first hypothesis of this research work can be formulated by stating that:

H1: *Digitalization has a positive impact on business results.*

2.2. Relationship between Digitalization and Innovation Capabilities

The adaptation to the DT requires companies to undergo substantial modifications in business processes, the way of working, and the manner, in which to relate to different agents involved in the production chain and the value systems of related industries (Reis et al. 2018; Stolterman and Fors 2004). Consequently, digitalization can be shown as a crucial enabler of dynamic capabilities with the capacity to sense changes, seize opportunities, and transform the firm (Felin and Powell 2016).

The current literature went forward in connecting digitalization and innovation capabilities (Akter et al. 2016; Gobble 2013; Wamba et al. 2015) by synthesizing the previous research, which showed that digitalization could enable the firm to retain and even reinforce its innovation performance in the long run (Guadamillas and Donate 2009). By and large, the implementation of new technologies can both bring prospering opportunities and also pose entangled challenges to companies trying to innovate, so it will be vital to analyze the impact of digitalization on innovation capabilities (Gunasilan 2019; Rachinger et al. 2018; Yoo 2010). Thereby, the second research hypothesis can be formulated as follows:

H2: *Digitalization positively influences innovation capabilities.*

2.3. Relationship between Digitalization and Knowledge Management

Knowledge is considered the most important strategic resource of the firms (Zack 2005), and this is especially important for DT. Knowledge management is an integral process that implies the procedures and practices that allow the companies to develop the creation, acquisition, transference, storage and application of knowledge, that is, the operations related to knowledge exploration and exploitation to improve firm performance (Bhatt 2001; Donate and Guadamillas 2011).

The implementation of DT in a company influences the different KM operations and needs the adaptation of its KM strategy. DT can improve the capability of tacit knowledge absorption and, through the learning process can lead to new explicit knowledge. The improvement of knowledge increases firm innovation capabilities (Donate and Guadamillas 2015). Many companies have perceived digitalization as the best way to upgrade and foster their operations and communication, effectively managing the vast amount of data (Davenport and Patil 2012). Specifically, the application of Big Data in the form of Data Analytics, aimed at improving the efficiency of business processes, provides great opportunities to benefit KM (Scarbrough and Swan 2001; Wang and Hou 2015). In addition, various authors,

such as (Parviainen et al. 2017), stated that the returns on digitalization incorporate a higher level of quality, accuracy and consistency, offering better monitoring of operations and results by means of enhanced and boosted KM.

Some recent studies show that digitalization can improve KM potential (Di Vaio et al. 2020, 2021). Although, this does not guarantee a positive effect of digitalization on KM, because some problems arise in the process of integration. Managers sometimes focus only on collecting and digitizing of a large amount of data, the information technologies are constantly updated, the learning process is not designed and organized, and the process focuses only on the technological side to the detriment of the aspect concerning human resources management (Manesh et al. 2021; Sarina 2018). So, more research is needed about the relation between digitalization and KM. For all these reasons, the third working hypothesis states:

H3: *Digitalization positively influences knowledge management.*

2.4. Relationship between Knowledge Management and Innovation Capabilities

KM is becoming increasingly important for all types of organization because it positively influences the competitive advantage and business performance (Zbuchea and Vidu 2018). Specifically, KM emerges in the literature as a method for improving firm's innovation capabilities (Donate and Pablo 2015; López-Nicolás and Meroño-Cerdán 2011). In this sense, the knowledge management process favors the recording of data and its interpretation, through teamwork and empowerment, promoting the development of innovation capabilities in organizations (Guilló and García-Fernández 2013; Nunes et al. 2006; Vaccaro et al. 2010). The IT infrastructure and technologies associated with knowledge management practices might also influence innovation within organizations. More interaction, fast and personalized access to information and knowledge, as well as creative analyzing techniques, might lead to increased creativity and innovation (Zbuchea and Vidu 2018). In fact, some previous studies state that there is a positive link between the acquisition of market knowledge (knowledge from employees, suppliers and customers) and innovation capabilities development (Bocquet et al. 2013; Shafique et al. 2021). So, KM practices that promote the generation of new knowledge and organizational learning are fundamental for achieving advantages based on innovation (Zack 2005).

However, many KM systems have been unsuccessful due to diverse reasons, such as an overfocus on IT, inappropriate KM strategies, or ignorance of KM consequences. So, there is a research gap on how and under which circumstances KM strategies lead to better results (López-Nicolás and Meroño-Cerdán 2011). Thus, based on the above, the fourth hypothesis is formulated:

H4: *Knowledge management positively influences innovation capabilities.*

Figure 1 depicts the pattern of relationships between the variables that bring together different hypotheses, making up the proposed research model.

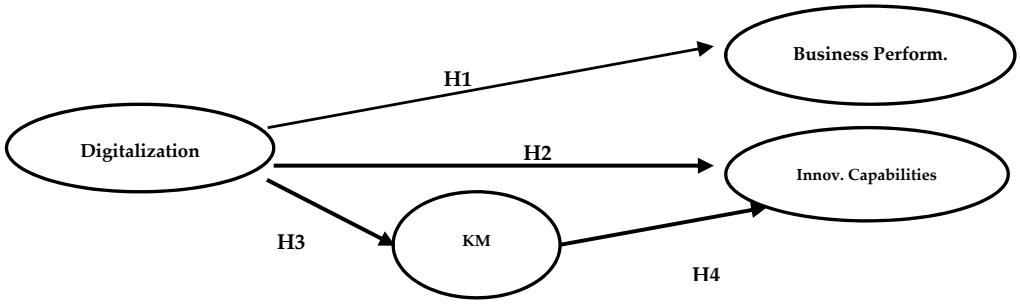

Figure 1. Proposed research model. Source: Own elaboration.

3. Methods

3.1. Population, Sample and Data Collection

Having set out the research hypotheses, we now move on to analyze and justify the choice of the study population. In this case, consultancy firms from several sectors IT (Puspitasari and Jie 2020; Strutynska et al. 2019), technology (El-Chaarani and El-Abiad 2020; Malik et al. 2021), consulting (Krivokapić et al. 2016; Vukotić et al. 2017), and programming (Alnahhal et al. 2021; Mitra and Avittathur 2018; Oujana et al. 2022) have been selected because of their strong links to innovation and digitalization strategies.

First, the information technology industry refers to an essential component of the knowledge economy of the 21st century (Mera Macías and Alonso 2019). This sector mainly encompasses IT services, e-commerce, and software and hardware products. This industry is also instrumental in the creation of information storage, processing and exchange infrastructures for important business operations (Sinha and Sengupta 2020).

Technological advances have completely restructured organizations making their business processes more efficient and fluid than ever before (Li et al. 2021). Business consulting, in turn, is a way to detect negative factors that are affecting the productivity of the business. Business consulting companies can not only help us detect and solve existing problems, but they can also keep us protected against various threats—which every business needs to prevent—and provide innovative ideas to improve the stability and profitability of your company (Vukotić et al. 2017).

Finally, the choice of the programming sector should be clarified. The programming sector is the foundation of the future of business, ensuring that technology continues to develop and that new inventions emerge. Nowadays, computer programming is becoming very important in almost all areas since most of our world is automated. Humans should be capable of controlling the interaction between people and machines since computers and machines can execute a task so efficiently and accurately (Cachero et al. 2020). Furthermore, once it promotes the development of entrepreneurial creativity, we should use computer programming to harness that computing power. That is to say that while computer programming is essential today, it may be even more impactful in the future. As computer programmers around the world work on learning new ways to communicate with digital devices to ensure the economic growth of countries, this sector will continue to grow tremendously (Berger et al. 2019). That's why this is relevant to be analyzed in depth throughout this research (Alnahhal et al. 2021; Mitra and Avittathur 2018; Oujana et al. 2022).

To carry out this analysis, the data were obtained by means of a questionnaire with Likert-type questions 1–5. Before sending out the questionnaire, a pre-test was carried out by sending the questionnaire to four experts in the academic field of digitalization and innovation capabilities (colleagues from the University's business administration department), trying to verify that the measures included all the required items and that the language used was appropriate for senior business managers. Once the questionnaire was refined, an online survey was launched to the target population using the Google Forms survey application, which is included in the Google Drive file storage service. After the survey process, 78 valid questionnaires were obtained from different companies. Considering the selected sample, it is worth highlighting the importance of the participation of programming companies, representing almost half of the total sample under study (47.44%). The technical specification of the research work is shown in Table 1.

3.2. Measures

This questionnaire is divided into five sections, favoring the details of each variable (explained below). This scale, used as a data collection instrument, is optimized on a given methodology. In addition, it constitutes a scale model that adjusts to an ordinal measurement range (Castrillón and Mandakovic 2010), based on a succession of items regarding the reaction of each of the research subjects. In the same way, the realization of the questionnaire was initiated from data obtained from a series of evaluation guidelines

based on other models and works of several authors experienced in the proposed contents (Arenas and Andrade 2013; Donate and Guadamillas 2008, 2015; Lefebvre et al. 1992). The items of the scales assess the degree of agreement with the statement presented, from "strongly disagree" to "strongly agree":

Table 1. Technical specification.

Sample Population	620 Companies
Scope of application	Albacete, Ciudad Real, Cuenca, Guadalajara, Toledo y Madrid
Answers obtained	78 companies
Confidence level	95%
Response rate	12.58% (78 de 620)
Sampling error	10.78%; p = q = 0.5
Field work	May 2021–July 2021

Source: Own elaboration.

3.2.1. Digitalization

An eight-item scale was used to measure digitalization, containing items related to the importance of digitalization, Digital Transformation strategies, opportunities promoted by digital technologies, tools for business digitalization, innovation capabilities, corporate culture regarding digital concepts and the level of employee engagement with the function performed (Arenas and Andrade 2013; Donate and Guadamillas 2008; Ospina and Meneghel 2016).

3.2.2. Business Performance

Business performance has been measured through indicators such as average profitability of sales, return on company capital (compared to the industry average) and relationships with suppliers and customers (Donate and Guadamillas 2008; Hambrick et al. 1983; Lefebvre et al. 1992).

3.2.3. Knowledge Management

To assess the role of knowledge management, scales from several authors were examined (Alavi and Leidner 2001; Donate and Guadamillas 2008, 2015; Gold et al. 2001; Zahra and Bogner 2000), establishing seven items for this work: exchange of information, knowledge and experiences between employees and departments, contribution to the use of databases or intranets, creation of new knowledge, acquisition or use of external knowledge sources or the development of models based on People Analytics, among others.

3.2.4. Innovation Capabilities

The validated scales of Donate and Guadamillas (2015), Morgan and Berthon (2008) and Zahra and Das (1993) were used to measure innovation capabilities. The four indicators that make up the scale are the following: commitment to R&D development in the sector to which the company belongs, the commercialization of new products, the introduction of new or improved products and/or services in the market, the use of Data Analytics tools that favor the development of the activity or the implementation of new processes that have achieved the reduction of the manufacturing cycle, among others.

3.2.5. Control Variable

Regarding control variables, firm size (represented by the natural logarithm of the number of employees) was used for this research as a control variable, as it has been frequently used in the literature referring to the relationship between innovation capabilities and knowledge management (Darroch and McNaughton 2002; Donate and Guadamillas 2015; Zahra and Bogner 2000). Firm size can have an impact on business performance

and innovation capabilities development because large companies have access to more resources than small ones, which may allow them to invest in technology at higher levels than small firms (Carroll 1999; Zahra and Bogner 2000).

3.3. Common Variance Method Test

In order to assess the existence of common variance bias for the dataset, Harman test was applied to the questionnaire variables. An exploratory factor analysis (principal components with Varimax rotation) was performed considering the four main constructs of the model (digitalization, knowledge management, business performance and innovation capabilities), with results showing the existence of five factors with eigenvalues greater than 1, explaining 73.56% of the total variance. Since only 17.92% of the total variance is explained by the first factor, common variance does not seem to be a problem for the research (Podsakoff and Organ 1986).

4. Statistical Analysis and Results

The Partial Least Squares (PLS) approach to Structural Equation Modeling (SEM) was used in this paper in order to test the hypotheses. For the development of the statistical analysis of this model, the Structural Equation Modelling (SEM) method was used, which allows for the analysis of relatively complex relationships between constructs or latent variables (Hair et al. 2017). PLS regression is especially useful when one wishes to analyze predictive research models that are in the early stages of theoretical development (Fornell and Larcker 1981), when small samples are available (Henseler et al. 2009), when some variables are strongly correlated and when missing values occur (Hair et al. 2013). This is why some previous research related to KM, innovation strategy and dynamic capabilities has applied PLS-SEM analysis (González-Ramos et al. 2018; Ortiz et al. 2018).

The PLS path method is applied in two stages: (1) measurement model analysis; and (2) structural model analysis. Through the measurement model analysis, the reliability and validity of the theoretical constructs are assessed, while the structural model is estimated to analyze the associations hypothesized in the research model. In this study, we used the statistical software Smart PLS 3.3.2, developed by Ringle et al. (2015).

4.1. Measurement Model

In this paper we have considered all the constructs as reflective. Following the PLS methodology, we first checked the reliability along with convergent and discriminant validity of the reflective constructs (Tenenhaus et al. 2005). This analysis tries to verify whether the theoretical concepts are properly measured by the observed variables.

4.1.1. Reliability of the Constructs

The reliability indicators are shown in Table 2. Both the composite reliability index (CRI) and Cronbach α offer acceptable values, exceeding the recommended levels of 0.8 and 0.7, respectively (Gefen and Straub 2005).

Table 2. Measurement model: Reliability and convergent validity.

Variables	Items	Loadings	Cronbach α	CRI	AVE
Digitalization	Digita1	0.636	0.879	0.907	0.587
	Digita2	0.829			
	Digita3	0.865			
	Digita4	0.805			
	Digita6	0.840			
	Digita7	0.664			
	Digita8	0.688			

Table 2. *Cont.*

Variables	Items	Loadings	Cronbach α	CRI	AVE
Knowledge management	KM1	0.755	0.861	0.896	0.590
	KM2	0.770			
	KM3	0.696			
	KM4	0.800			
	KM5	0.804			
	KM6	0.781			
Innovation capabilities	InnovCap1	0.814	0.866	0.909	0.714
	InnovCap2	0.879			
	InnovCap3	0.866			
	InnovCap4	0.819			
Business performance	BPerf1	0.901	0.900	0.932	0.775
	BPerf2	0.925			
	BPerf3	0.926			
	BPerf4	0.757			

Source: Own elaboration.

4.1.2. Convergent and Discriminant Validity

Convergent validity is analyzed by means of the loading weight of each indicator (item) on the latent variable (Chin 1998; Tenenhaus et al. 2005) and the average variance extracted (AVE). The higher the indicator's loading, the greater the evidence of the construct's validity. In this paper we removed two items (Digita5 and KM7)[1] since they did not meet the convergence validity criteria of being above 0.6 (Falk and Miller 1992). Regarding the AVE, all the values are above the recommended threshold of 0.5 (see Table 2). Convergent validity is thus assured for the study's model.

Discriminant validity is analyzed using two different methods suggested by Gefen and Straub (2005). Firstly, through the analysis of cross-loadings between all items and the different constructs (see Table 3); secondly, through the Fornell and Larcker matrix (Fornell and Larcker 1981) (see Table 4). According to this criterion, the square root of the AVE of a latent variable should be greater that the correlations between the rest of the latent variables. As Tables 3 and 4 show, discriminant validity is confirmed, as indicators show high loadings on their theoretical constructs and lower loadings on the other constructs. Moreover, the square root of the AVE for each construct is greater than the correlations with the rest of the constructs.

Table 3. Cross-loadings between indicators and constructs.

	Digitalization	KM	Innovation Capabilities	Business Performance
Digita1	**0.636**	0.504	0.463	0.429
Digita2	**0.829**	0.457	0.575	0.465
Digita3	**0.865**	0.585	0.584	0.464
Digita4	**0.805**	0.584	0.537	0.437
Digita6	**0.840**	0.504	0.481	0.376
Digita7	**0.664**	0.487	0.395	0.354
Digita8	**0.688**	0.571	0.544	0.456
KM1	0.579	**0.755**	0.547	0.605
KM2	0.573	**0.770**	0.482	0.572
KM3	0.577	**0.696**	0.398	0.509
KM4	0.503	**0.800**	0.496	0.427

Table 3. *Cont.*

	Digitalization	KM	Innovation Capabilities	Business Performance
KM5	0.490	**0.804**	0.602	0.559
KM6	0.468	**0.781**	0.501	0.435
InnovCap1	0.583	0.607	**0.814**	0.680
InnovCap2	0.571	0.547	**0.879**	0.489
InnovCap3	0.612	0.551	**0.866**	0.565
InnovCap4	0.509	0.519	**0.819**	0.586
BPerf1	0.426	0.561	0.574	**0.901**
BPerf2	0.474	0.592	0.597	**0.925**
BPerf3	0.483	0.605	0.597	**0.926**
BPerf4	0.574	0.615	0.639	**0.757**

Source: Own elaboration.

Table 4. Descriptive statistics, correlations, and AVE (square root).

	Mean	S.D.	Digitalization	Knowledge Management	Innovation Capabilities	Business Performance
Digitalization	3.75	1.18	0.766			
Knowledge management	3.56	1.17	0.694	0.768		
Innovation capabilities	3.73	1.20	0.676	0.660	0.845	
Business performance	3.46	1.07	0.561	0.679	0.688	0.880

Diagonal: square root of the average variance extracted (AVE). Off-diagonal elements: correlations between constructs. Source: Own Elaboration.

Furthermore, the Heterotrait-Monotrait Ratio (HTMT), based on a comparison of the correlations "heterotrait-heteromethod" and the "monotrait-heteromethod", shows discriminant validity, since all the HTMT values are below 0.9, as we can see in Table 5 (Henseler et al. 2015).

Table 5. Heterotrait-Monotrait Ratio (HTMT).

	Digitalization	KM	Innovation Capabilities
KM	0.795		
Innovation capabilities	0.767	0.758	
Business performance	0.625	0.763	0.774

Source: Own Elaboration.

4.2. Structural Model

To assess the structural model, we estimated the path coefficients or standardized regression weights (β). The structural model validity is usually checked by means of: (1) Student's T: significance levels of path coefficients; (2) R^2 value for each dependent variable; (3) Q^2 value for each dependent variable and (4) SRMR value (see Figure 2 and Table 6).

Path coefficients exceed the value of 0.3 for the relationships established in the first, second, third and fourth hypotheses. These results support the existence of a significant relationship between variables. The first hypothesis is supported with $p < 0.001$, indicating that the more the firm develop digitalization practices, the greater its business performance is. The second hypothesis is also supported with $p < 0.001$, indicating that the more the

digitalization level in the company, the greater its innovation capabilities development is. Finally, the third and fourth hypotheses are supported with $p < 0.001$, indicating that knowledge management has a partial moderation effect between digitalization and innovation performance.

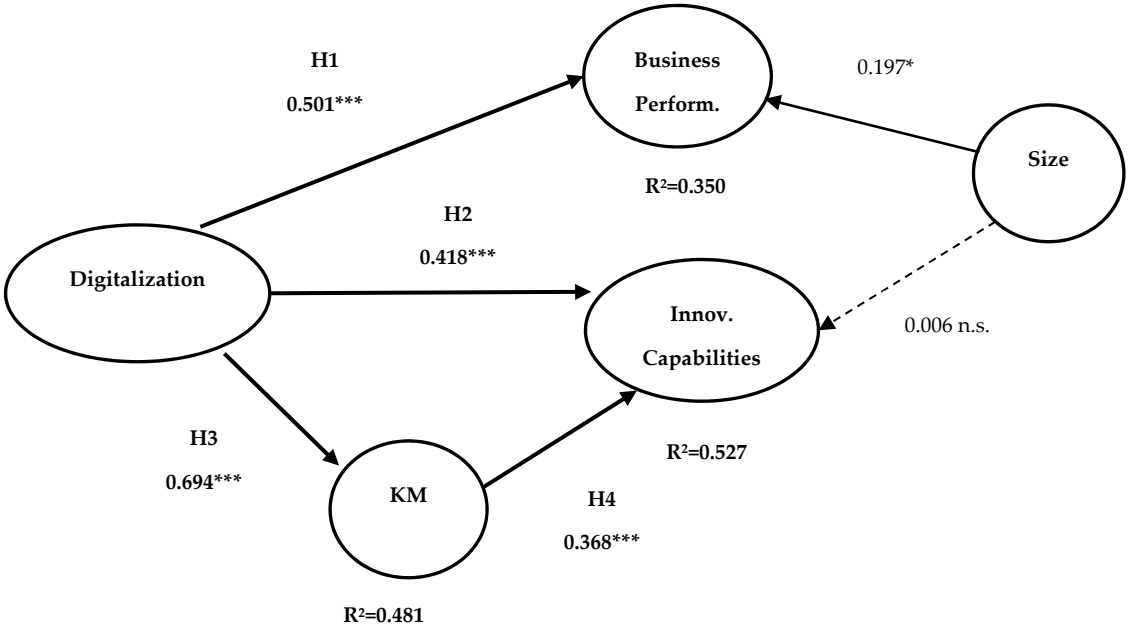

Figure 2. Research model and results. * Significant with $p < 0.05$; *** significant with $p < 0.001$; n.s.: not significant. Source: Own elaboration.

Table 6. Relevance of the predictive model.

Dependent Variable	R^2	f^2	Q^2
Business performance	0.350	0.349	0.230
Innovation capabilities	0.527	0.332	0.352
Knowledge management	0.481	0.928	0.261

Source: Own elaboration.

Regarding the predictive power of the model, the goodness of fit is determined by the strength of each structural relationship, analyzed through the R^2 value (Falk and Miller 1992). Table 6 shows that all dependent variables have R^2 values above 0.2, which seems to indicate that the model has sufficient predictive power (Chin 1998). Moreover, Table 7 shows direct and indirect effects of the relationships established in the model.

To assess the model's predictive relevance, we also show the Stone-Geisser test (Q^2) and the f^2 value. According to Chin (1998), the predictive power of a construct is relevant if the test offers values of $Q^2 > 0$, which is confirmed for the three dependent variables of our model (Table 6).

According to (Henseler and Sarstedt 2013), the overall Goodness-of-Fit (GoF) criterion is suitable for multi-group comparisons, but not for comparing models. Thus, they consider it more appropriate to use the SRMR measure (Standardized Root Mean squared Residual) and especially the Bootstrap-based exact fit.

An approximately well-fitting model is a model with SRMR < 0.08, but also a model that does not include any large residual values (Asparouhov and Muthén 2018). In this paper, the SRMR value is 0.095. However, larger SRMR values can frequently occur when the sample size is lower than 200 (as is the case in this paper). Nevertheless, this is not a reason to doubt that the conclusion of exact fit holds (obtained through Bootstrap). In small samples, there is less certainty in the sample and in the estimated correlations, and

there is natural sampling variation that contributes to the larger SRMR values. Regardless, when the exact fit through Bootstrap holds (as is our case), even if SRMR > 0.08, the model should be considered well-fitted (Asparouhov and Muthén 2018).

For the control variable, the results show that size has a significant influence on business performance, but it does not have a significant influence on innovation capabilities. Anyway, the inclusion of company size into the model does not modify the significance of the relationships between digitalization, knowledge management, business performance and innovation capabilities in this study.

Table 7. Structural model: decomposition of effects.

Path	Standardized Coefficients					
	Direct Effects (Path Coefficient)	**t-Value**	***p*-Value**	**Indirect Effects (Path Coefficient)**	**t-Value**	***p*-Value**
Digitalization → Business performance	0.501 ***	3.919	0.000			
Digitalization → Innovation capabilities	0.418 ***	8.312	0.000			
Digitalization → Knowledge management	0.694 ***	8.156	0.000			
Knowledge management → Innovation capabilities	0.368 ***	3.329	0.000			
Digitalization → Innovation capabilities				0.255 **	2.990	0.001

** Significant with $p < 0.01$; *** significant with $p < 0.001$; n.s.: not significant. Source: Own elaboration.

5. Discussion and Conclusions

This study analyses the impact of digitalization on business performance and innovation capabilities, as well as the mediating effect of KM on the relation between digitalization and innovation capabilities. This is an important breakthrough in the defined research line, particularly, in the background of the recently explored relationship between digitalization and KM from the theoretical perspective (Marchegiani 2021), or newly-established focus on the impact of information and communication technologies on knowledge management systems and innovation (Santoro et al. 2018). Moreover, this research advances in the study of the interrelations between digitalization, KM and its effect on innovation capabilities providing an empirical evidence to some previous investigation, where the relationship between KM and innovation capabilities was found to be uncertain (López-Nicolás and Meroño-Cerdán 2011).

In this respect, we have analyzed the impact of digitalization on the development of the company's innovation capabilities through the KMS. Likewise, we have analyzed the direct relationship between digitalization and business performance. That is to say, the specific objectives were achieved. Thus, our research seeks to theoretically contribute to moving forward the empirical evidence on the innovation capabilities' drivers by stressing the role of digitalization and KM, which was explored earlier to some extent by (Hess et al. 2016; Santoro et al. 2018).

All the hypotheses of the present paper are significant. The first hypothesis indicates a clear and positive impact of digitalization on firm performance. This is coherent with an increasing number of papers that analyze the effect of different digitalization practices on business performance: Horváth and Szerb (2018) focus on the impact of management practices and digital tools on business performance, while Bouwman et al. (2018) center on the business model and Isaksson et al. (2018) analyze the impact on control and operation. Our findings contribute to this stream of research by showing that a holistic orientation of the digitalization of the company considering the strategic orientation, knowledge and engagement of employees, tools and values, improves business performance.

Our results also show that digitalization positively influences innovation capabilities (H2), endowing companies with greater competitiveness. This helps to deepen the overall understanding of the relation between digitalization and innovation, which complements the previous studies (Akter et al. 2016; Gobble 2013; Rachinger et al. 2018; Wamba et al. 2015). Also, we found a positive effect of digitalization on KM (H3), confirming that the digital orientation of the company can improve KM results.

It is important to remark that the mediating effect of KMS is partial to the relationships between digitalization and innovation capabilities because the direct relationship between digitalization and innovation capabilities continues to be significant when KM is included in the model. In this sense, it can be affirmed that: (H1) digitalization has a direct and positive influence on business results; (H2) digitalization has a positive and direct effect on innovation capabilities; in addition, (H3 and H4) it has shown that digitalization has an indirect and positive effect on innovation capabilities through KMS. The effect of KM on the relation between digitalization and innovation capabilities is one of the main contributions of this paper.

The research findings resultant from the application of the proposed measurement items, linked to all the tested variables, justify the outcome of the existing scientific evidence (Ben-Gal 2019; Eggert and Alberts 2020; Guadamillas and Donate 2009; Gunasilan 2019; Wang and Hou 2015), and additionally conclude that digitalization is a key enabling factor in providing internal efficiency in organizations, as well to provide external opportunities.

On this basis, we can formulate the implications for companies. Many business leaders are looking forward to getting their firms more agile. However, there is no "one-size-fits-all" solution, and organizations need to possess various dynamic capabilities to address the business environment changes caused by digitalization and, as a result, achieve the sought agility (Björkdahl 2020). In this way the study shows that while digitalization offers a wide array of opportunities to the companies for value creation through dynamic knowledge mobilization, the most advanced approaches to KM have to be studied since it determines the overall strategy for DT. To elucidate, this paper found KM to be closely connected to the process of digitalization by means of the KMS developed to adapt to complex and turbulent environments in order to reach a high level of competitiveness and improve innovation capabilities. With this state of the question in mind, in parallel, the research findings offer an explicit foundation, on which to base future research efforts in evaluating the ways companies should approach the DT, strengthen the KM role in this process, develop the digital and innovation capabilities, finally, ameliorate the effects on innovation performance.

Analysis Limitations and Future Research Lines

Taking into consideration that there is no research exempt from limitations, the only facet to be elucidated regards the multiplicity of the sectors targeted instead of focusing on a specific one, what can be justified by the intention to favor and obtain more representative results. Searching for the possibility to advance on a wide range of fronts, the future research agenda stands for the analysis of the strategic and organizational factors that determine the implementation of the DT in an effective way and how these could foster the importance of KM in improving the company´s results.

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Appendix A

Research questionnaire

Strongly disagree	Disagree	Neither agree nor disagree	Agreed	Totally agree
1	2	3	4	5

1. Digitalization

1.1. Assess the importance that digitalization can have on your business.	1	2	3	4	5
1.2. Your company has a Digital Transformation strategy.	1	2	3	4	5
1.3. Your company identifies opportunities promoted by digital technologies.	1	2	3	4	5
1.4. Learn about the tools available to digitize your business.	1	2	3	4	5
1.5. You have sufficiently trained personnel dedicated to the digitization of your business. *	1	2	3	4	5
1.6. Your company culture values the digitization of your company.	1	2	3	4	5
1.7. Through digital technologies, your company identifies the level of employee engagement with the role they perform.	1	2	3	4	5
1.8 Your company considers that teleworking favors the development of its activity	1	2	3	4	5

2. Knowledge management

2.1. Digitalization has facilitated the exchange of information, knowledge and experiences between employees and departments.	1	2	3	4	5
2.2. Digitization has contributed to the use of databases or intranets, useful for collecting and managing data and information.	1	2	3	4	5
2.3. Digitalization has contributed to the creation of new knowledge.	1	2	3	4	5
2.4. Your company acquires or uses external knowledge sources (universities, research centers, potential customers, etc.).	1	2	3	4	5
2.5. Digitalization has made it easier to develop innovation with other agents (companies, universities, etc.).	1	2	3	4	5
2.6. There are databases that allow employees to use the knowledge and experience previously collected in them to promote product and process innovation.	1	2	3	4	5
2.7. Your company develops models based on People Analytics for decision-making in people management. *	1	2	3	4	5

3. Innovation capabilities

3.1. My enterprise contributes to the commercialization of new products.	1	2	3	4	5
3.2. My company contributes to the introduction of new or improved products and/or services in the market.	1	2	3	4	5
3.3. My company is concerned about introducing improvements in products and/or services.	1	2	3	4	5
3.4. My company is concerned with implementing new processes that reduce the manufacturing cycle or improve production flexibility.	1	2	3	4	5

4. Business performance

4.1. Over the last four years, digitalization has boosted its average annual sales growth compared to the industry average.	1	2	3	4	5
4.2. Over the past four years, digitalization has boosted the average profitability of its sales compared to the industry average.	1	2	3	4	5
4.3. Over the past four years, digitization has boosted your company's return on capital compared to the industry average.	1	2	3	4	5
4.4. Digitization has contributed to relationships with suppliers and customers.	1	2	3	4	5

Note

[1] The removed items are marked with an asterisk in the Appendix A.

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