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# EXAMINING DIGITAL CAPABILITIES AND THEIR ROLE IN THE DIGITAL BUSINESS PERFORMANCE

# EXAMINANDO CAPACIDADES DIGITAS E SEU PAPEL NO DESEMPENHO DE NEGÓCIOS DIGITAL

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## RESUMO

A economia digital tem avançado a partir do crescente investimento em tecnologias digitais pelas organizações no seu processo de transformação digital. Consequentemente, as organizações necessitam redefinir a estratégia visando obter ganhos no desempenho. No entanto, pesquisas prévias não discutem sobre quais as capacidades digitais podem auxiliar as organizações a melhorar seu desempenho. Para isso utilizamos a teoria das capacidades dinâmicas para examinar o papel das capacidades digitais na performance dos negócios digitais. Para atingir este objetivo a questão de pesquisa que norteou o estudo é: "Qual o papel das capacidades digitais no desempenho dos negócios digitais?". Inicialmente foi realizada uma revisão sistemática de literatura que permitiu conhecer melhor as capacidades digitais. Em seguida, utilizando uma abordagem qualitativa, foram realizadas 31 entrevistas com executivos que atuam em negócios digitais. A pesquisa faz várias contribuições através da conceitualização de capacidades digitais, fornecendo alguns resultados iniciais revelado no modelo conceitual prévio, baseado na revisão da literatura, composto por capacidades digitais (sensoriamento, responsividade, digitalização de processos e conectividade do ecossistema) relacionados ao desempenho de negócios digitais, e analisado empiricamente pelas entrevistas com executivos. O valor prático desta pesquisa aponta da relação entre capacidades digitais e o modelo digital de desempenho empresarial. Como resultado, apresentamos quatro capacidades digitais que melhoram a excelência operacional, o crescimento de receita e o relacionamento com clientes e os *stakeholders*.

**Palavras-chave**: Capacidades digitais. Tecnologias digitais. Performance do negócio digital.

**ABSTRACT**

The digital economy has advanced from the growing investment in digital technologies by organizations in their digital transformation process. Furthermore, digital technologies are reshaping traditional business strategies for performance gains. However, there is still no in-depth discussion regarding the skills and capabilities that can help organizations improve their performance. Thus, we apply the Dynamics Capabilities theory to examine the role of digital capabilities in digital business performance. To achieve this goal our research question is: "What is the role of digital capabilities in digital business performance?" Initially, a systematic literature review was carried out that allowed better understanding digital capabilities. Then, using a qualitative approach we interviewed 31 digital business executives. The research contributes towards the conceptualization of digital capabilities, providing some initial results revealed in the previous conceptual framework, based on the literature review, composed of digital capabilities (sensing, responsiveness, process scanning, and ecosystem connectivity) related to digital business performance, and empirically analyzed by interviews with executives. The practical value of this research rests on the relationship between digital capabilities and digital business performance. As a result, we present four digital capabilities that enhance operational excellence, revenue growth, and relationships with customers and stakeholders.

**Keywords**: Digital capabilities. Digital technologies. Digital business performance.

## 1. INTRODUCTION

The transition of the economies toward the digital era is determining the arising of a type of entrepreneurship based on factors and features quite different from established game rules. These changes disclose a series of opportunities for those firms which will be able to adapt to the new parameters and functionalities related to digital technologies diffusion (THOMAS; PASSARO; QUINTO, 2019).

This new type of economy implies not only technological but also and especially structural and process-related challenges and opportunities. The economic values created will change fundamentally in the digital economy. The definition of the digital economy is presented by Zimmermann (2000) as an economy based on the digitization of information and the respective information and communication infrastructure to be a digital economy.

Mergel, Edelmann, and Haug (2019) point out that the digital transformation in private organizations is at a more advanced stage than public sector organizations in general. Of course, there are exceptions on both sides. The authors compliment that digital transformation within the public sector is not a task to be fulfilled by public administrations alone. Therefore, we chose to research private companies.

With this in mind, the incoming of digital technologies in the realm of entrepreneurship represents a new challenge for entrepreneurs and policymakers. When applied to manufacture, digital technologies (such as social media, mobile computing, data analytics, 3d printing, cloud, and cyber solutions) lead to a remodeling of productive patterns originating new market opportunities, higher revenue streams, faster time-to-market, enhanced service provision, and increased productivity (THOMAS; PASSARO; QUINTO, 2019).

Moreover, digital technologies also deeply modify the boundaries of products and processes, in doing so transforming the nature of uncertainty inherent entrepreneurial processes

and outcomes, as well as the ways of dealing with such uncertainty (NAMBISAN; BARON, 2013; NAMBISAN et al., 2017).

Bharadwaj et al. (2013) point out that many firms are beginning to see the power of digital resources and understand the need for new capabilities that are more comprehensive in range and scope than the traditional ones. To become a digital business, firms in the retail market have substantially expanded their online retail strategies, which can be regarded as key digital resources. Firms selling products have also embarked on large-scale digitization efforts.

However, although there are several studies on digital capabilities, there are still few that highlight the relationship of these capabilities to the performance of digital businesses. Freitas Junior, Maçada, and Brinkhues (2017) analyze the relationship between digital capabilities and measures of performance, customer satisfaction, and reduction of time and costs.

On that account, Kohli and Grover (2008) and Fernandes et al (2017) argue that digital capabilities can create new business value and face the challenges of the digital economy. Thus, Müller, Holm, and Søndergaard (2015) add that new and disruptive technologies require building digital capabilities in a digital business context.

Since there is still no in-depth discussion regarding the skills and capabilities that can help organizations cope with the challenges presented by the digital economy, this paper aims to answer the following research question: "What is the role of digital capabilities in digital business performance?"

Our study is expected to make several contributions. First, we complement the concept of digital capabilities based on digital literature. Second, our research advances in identifying the key digital capabilities required to make a digital business model successful, making some adjustments to the conceptual framework previously presented. In practical terms, this research will be of value to executives as it demonstrates the role of digital capabilities in digital business performance.

The research objective is to examine the role of digital capabilities in digital business performance. The theoretical development opens the paper by presenting the propositions and research model, followed by the method. Then, the results are discussed, and the conclusions are presented.

## 2. THEORETICAL BACKGROUND

Digital Business seemingly became popular in the decade of 2000, when consumers witnessed a growing trend of e-business and e-commerce. For traditional businesses beginning to operate in the digital world, the firms must review their organizational logic and IT infrastructure use, which require new capabilities (YOO; HENFRIDSSON; LYYTINEN, 2010). So, this section presents the results of a systematic literature review and theoretical framework. The description of methodological procedures applied is presented in the Appendix - Systematic Review Of The Literature.

### 2.1 Dynamic Capabilities

Analyzing the main theories adopted in the studies, we noticed that of 28 studies theory of Dynamic Capabilities is present in the majority of all paper. The Dynamic Capabilities approach

is defined as the ability to integrate, build, and reconfigure internal and external capabilities to respond to rapid environmental changes (Teece et al., 1997).

Eisenhardt and Martin (2000) point out that dynamic capabilities can be used to improve configurations of existing resources to achieve a competitive advantage. Thus, we believe that the base of this theory provides a complete view of the capability studied in this work, i.e., Digital Capability.

DC emphasizes the development and renewal of these resources and the development of new capabilities that will be necessary to confront organizational changes. Taking into account recent major technological changes and the ever-increasing speed and volume of information, the dynamic capabilities theoretical lens becomes more relevant and is well suited for this study. Besides, DC explores the velocity of information, presenting its relationship with organizational processes and people. Karimi and Walter (2015) argue that DC is positively associated with building digital capabilities.

## 2.2 Digital Capabilities

Analysis of the 28 reviewed papers demonstrated that only five clearly define digital capabilities. Another observation is that most of the articles just mention the term "digital capability" or "Digital Capabilities" and do not specify what these capabilities are.

Another relevant point is that even as we analyzed the 91 articles found in the first search, we did not find clear definitions, descriptions of these capacities, or studies that measured the relation of digital capabilities with business performance.

Before studying the capabilities' characteristics, we decided to comprehend the definition of Digital Capabilities. To gain an understanding, Table 1 summarizes the definitions found in the literature review.

**Table 1** - Definitions of Digital Capabilities

| ***Journal*** | **Definition** | **Authors** |
|---|---|---|
| *Journal of the Association for Information Systems* | It is a business capability developed by the interaction of technology with a variety of complementary assets, such as process redesign, training, and incentive structures, that can be considered as sources of business value, | Kohli and Grover (2008) |
| *Organization Science* | It is the organizational ability "used throughout the organization to support its different functions based on Digital Technology Platforms." | Yoo et al. (2012) |
| *MIT Sloan Management Review* | **"The skills needed** to go beyond pure IT to include **specific technologies,** such as social media or mobile, as well as analytic skills **to drive value** from big data." | Westerman, Bonnet, and McAfee (2012) |
| *MIS Quarterly* | It "can be conceptualized as services that one system provides to another through **value-creating,** provider-user interactions." | Srivastava and Shainesh (2015) |
| *Journal of Strategic Information Systems* | A Digital Capability is "an **organization's** focused deployment of information and communication technologies (ICTs), **abilities to develop, mobilize, and use organizational resources** effectively, for instance, customer relationship management, new product development, and knowledge collaboration." | Tams, Grover, and Thatcher (2014) |

Source: The authors

As can be observed, there is no standard definition. However, we can notice that these definitions indicate that digital capabilities allow organizations to give instantaneous answers,

either internally or externally, by using digital technologies and digital platforms that contribute to generating value for the business.

We propose a new definition based on the analysis of these five definitions to standardize and support future studies. To do so, we enumerated the list of definitions found in the extant literature, as presented in Table 5 above. Then, we conducted a cross-comparison of what has already been defined to formulate a precise, comprehensive definition for the term "digital capabilities."

Subsequently, we wrote the terms considered key to constructing the definition in bold letters, as described next. However, we also took into consideration the analysis of the papers. With this study, we noticed that it is not clear whether the mere acquisition and possession of packages of resources is enough to achieve superior performance, especially when most of the firms have access to markets with similar factors. On the contrary, organizations should develop new capabilities by adding resources that would make them more valuable and inimitable.

Some authors use the term "digital capability" and others the plural form, "digital capabilities." Dig C can be understood by the theories of resources and capabilities, which explain the construction of capabilities. They refer to the firms' capacity to integrate, build, and reconfigure capabilities and internal and external resources to create superior capabilities that are incorporated into their social, structural, and cultural context (GRANT, 1991; SAMBAMURTHY; BHARADWAJ; GROVER, 2003).

The mobilization of resources and new organizational capabilities becomes vital, focusing on people, facilities, structures, to ensure quality, speed, storage, and information flow, which will enable improvements in processes and client relationships and, thus, superior performance in the digital world.

So, we can synthesize Table 1 with the definition: "*Digital Capabilities are the combination of skills and processes of a Digital Business to develop, mobilize, and use organizational resources supported by Digital Technologies to respond to the environment and add value to the organization.*"

This definition indicates that digital capabilities allow organizations to give instantaneous answers either internally or externally by using digital channels that contribute to generating value for the company. These capabilities permit improvement in processes and customer relationships, thereby refining digital business, impacting operational and strategic fields (WESTERMAN; BONNET; MCAFEE, 2012), as we demonstrate in the following propositions.

## 2.3 Proposition Development

In determining which resources and capabilities, when integrated and reconfigured, encompass digital capability based on the literature review, it was possible to identify four components which are presented next.

### 2.3.1 Sensing

As this study observes, organizations are dealing with the challenges of the digital economy and the changes that digital technologies have brought. Hence, it is essential to monitor the market, customer demands, and any other data that can be useful for the business.

So, sensing capability can help the digital businesses to monitor the competitors, to know the market trends, to understand the customers' necessities, and to be able to compete in a digital world (KOLHI; GROVER, 2008; MÜLLER; HOLM, SØNDERGAARD, 2015; NAMBISAN ET AL., 2017; LYYTINEN; YOO; BOLAND JR, 2016).

This capability is defined as the ability of a digitized artifact to monitor and respond to changes in the environment (YOO, 2010). For it, the sensing capability allows the organizations to keep constant contact, which entails new levels of digital sensing and tracking, producing big data that represent heretofore invisible behaviors (Barret et al., 2015).

Kolhi and Grover (2008, p.28) complement this idea and affirm the importance of a "quick sense-and-respond to market demands by pricing, designing, sourcing, manufacturing, and distributing a product." Also, Drnevich and Croson (2013) highlight the importance of monitoring competitors' actions and how they can improve business performance.

Considering the value of information for business, sensing capability allows the organization to reduce information complexity and uncertainty by delivering data and information in an appropriate, quality format, thus improving the quality of information flow. Therefore, we offer the following proposition.

**Proposition 1 (P1)**: Sensing is related to Digital Business Performance.

### 2.3.2 Responsiveness

Digital capabilities are a foundation upon which other firms can develop complementary products, technologies, and services (Barrett et al. 2015). In this context, responsiveness is an ability that requires the velocity and flexibility of processes in an organization and to quickly respond to a new customer need.

Tams, Grover, and Thatcher (2014, p.299), citing the studies of Lavie (2006) and Peppard, Galliers and Thorogood, (2014), emphasize that "Digital Capabilities and practices have become increasingly important for organizations to improve organizational agility and responsiveness. As a result of the improvements in agility and responsiveness, firms can achieve greater performance and competitive advantage, even sustainable competitive advantage."

In this context, Kolhi and Grover (2008) underscore responsiveness as a digital capability, defining it as the capacity to respond quickly to the firm's internal and external demands. Consequently, this digital capability can meet the digital economy's challenges (BARRET et al. 2015; KOLHI; GROVER, 2008; TAMS; GROVER; THATCHER, 2014)

Müller, Holm, and Søndergaard (2015) also highlight the importance of being responsive to market responses, consumers, and other stakeholders and suggest the use of platforms and cloud computing. Fernandes et al. (2014) emphasize that the organizations' response speed can imply an improvement in their performance. Therefore, we make the following proposition.

**Proposition 2 (P2)**: Responsiveness is related to Digital Business Performance.

### 2.3.3 Process Digitization

Lyytinen, Yoo, and Boland Jr. (2016, p. 49) affirm that "increasing the level of digitization in our everyday socioeconomic system involves representing, processing, storing, and communicating the widest possible range of matter, energy, and information comprising our world."

Kolhi and Grover (2008) argue that firms should develop the ability to gain visibility into their processes so that they can react to problems or changes. In this sense, process digitization is a digital capability that can build with organizations to let them fast, improve the process like decision making and the business can respond to market demands (TAN; TAN; PAN, 2016; MISHRA; KONANA; BARUA, 2007; YOO, 2013).

This capability will bring speed to the processes and is linked to responsiveness. Once the process is digitized, the response can be instantaneous. Mishra, Konana, and Barua (2007) provide an example of process scanning that improves the quality of information flow within the organization. The authors say that firms with high process digitization can leverage their infrastructure, experience, and knowledge to implement e-procurement solutions readily and, consequently, improve the organization's performance.

For instance, it is reported that more than 175 billion search queries are conducted worldwide each month, including more than 115 billion that are held via Google […] Most queries are a window into someone's intention or interest. 'Google Trends' provides publicly available reports on the query volume of any search phrase providing those data by on a regional and a longitudinal basis […] Such data allow for 'predicting the present' as well as – contingent on certain assumptions – the future (LOEBBECKE; PICOT, 2015, p 150).

To Lyytinen, Yoo, and Boland Jr. (2016), digitization makes it possible to completely reconfigure the conception and production of almost all products of the industrial age. In this regard, process digitization is a capability that permits sharing our business processes within our firm and outside of it with partners. The authors also note that digitization can reduce information complexity and uncertainty by delivering data and information in an appropriate format, thus improving the quality of information. Hence, the following proposition is given.

**Proposition 3 (P3)**: Process digitization is related to Digital Business Performance.

### 2.3.4 Ecosystem Connectivity

In the ecosystem, firms are busily developing new strategies that cater to emerging market dynamics by competing head-to-head on some fronts (e.g., both Apple and Amazon sell hardware) and collaborating on others (e.g., Amazon offers reader applications) (Yoo, Henfridsson, and Lyytinen, 2010).

Nambisan et al. (2017) suggest that new digital infrastructures and their associated capabilities can critically complement a firm's practices, for example, collaboration with customers or a broader ecosystem of external partners. Furthermore, the ecosystem's architecture can be built according to the company's needs and structure and can also combine with one or more ecosystems. This way, the firm can belong to more than one ecosystem, being responsible for itself and a member of others, such as partner companies, suppliers, etc. So, the ecosystem connectivity capability allows for integrating information from all corners of the organization

This capability can sustain firms to deal with challenges of the digital economy and improve the connections and relationships among all stakeholders, as pointed by Hylving,

Henfridsson, and Selander (2012); Yoo (2012); Alam and Campbell (2016); Barret et al. (2015); Drnevich and Croson (2013); and Nambisan et al. (2017).

Finally, according to Tan, Tan, and Pan (2016), ecosystem capabilities increase the possibility of a firm to seek, explore, acquire, assimilate and apply knowledge to resources and opportunities and how resources can be configured to examine opportunities. As a result, the fourth proposition offers the following.

**Proposition 4 (P4)**: Ecosystem Connectivity is related to Digital Business Performance.

### 2.3.5 Digital Business Performance

There are several ways to measure the performance of a business, for this study we follow the authors' Rai, Patnayakuni, and Seth (2006) that emphasize three areas of analysis to measure performance should be observed the relation of the performance of a company about its competition: operational excellence, revenue growth, and the relationship with customers and other stakeholders involved in business processes.

Operational excellence is defined as the ability of a company to respond to customers and productivity improvements about its competitors (RAI; PATNAYAKUNI; SETH, 2006). To illustrate, one could cite the integration of the supply chains of e-commerce companies to improve the competitiveness of a firm based on time, compressing cycle times which improves business performance. The supply chains integrated to the business provide visibility, coordination, and streamlined flow of goods that shorten the time interval between a customer's request for a product and its delivery (HULT; KETCHEN; SLATER, 2004).

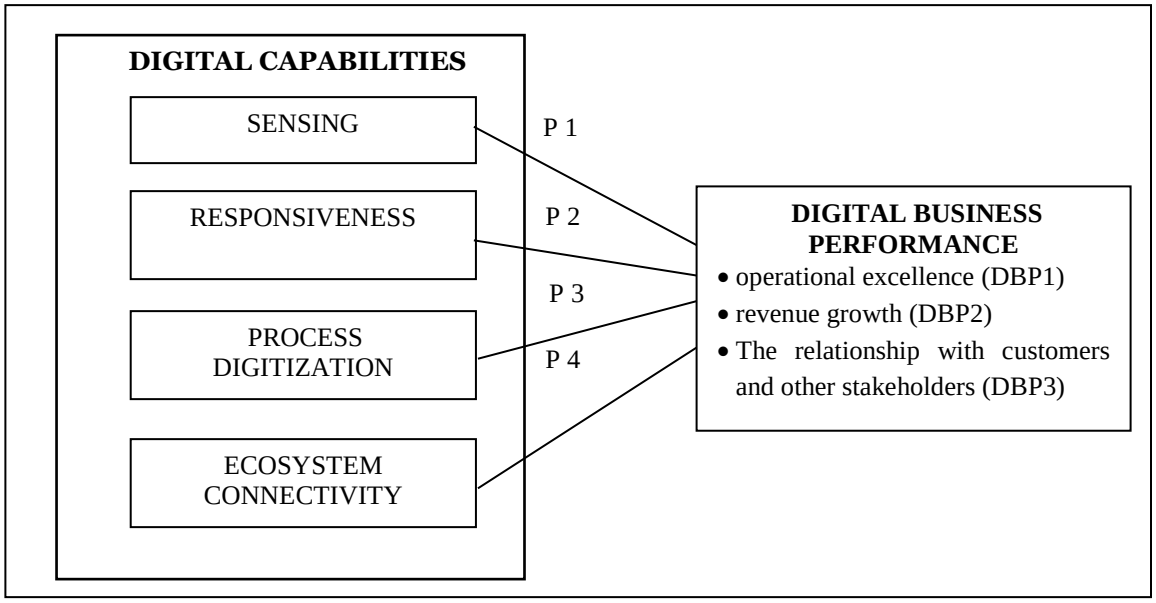
The relationship with customers and other stakeholders involved in business processes is an essential performance indicator according to authors Rai, Patnayakuni, and Seth (2006). The authors bring affirm that the decrease in time impacts the relationship with clients, and it is possible to broaden this view, with the satisfaction of all the actors involved in the processes both internally and externally.

Finally, financial performance is also an indicator of performance. This performance can be analyzed by revenue growth, but also, by the return on investments and by the relation between the operating profit, as observed in the study of Chi, Zhao, and Li (2016).

## 2.4 Conceptual Framework

Finally, what follows is the conceptual framework that illustrates the relationship between Dig C propositions and Digital Business performance.

**Figure 1 - Conceptual Framework**




Source: the authors.

By observing the conceptual framework, theoretically, digital capabilities are related to the digital business performance by their means of sensing, responsiveness, process digitization, and ecosystem connectivity. This model emphasizes that digital business requires extreme responsiveness and digitization flexibility (YOO et al., 2010; LYYTINEN; YOO; BOLAND JR, 2016), as well as sensing and the presence of an ecosystem capable of improving digital business performance (TAN; TAN; PAN, 2016). Next, we present the methods used in this research.

## 3. METHODS

We adopted a qualitative research method to explore digital capabilities. To do so, we conducted interviews with 31 managers and specialists who work in Digital Business. To Sarker, Xiao, and Beaulieu (2013), there is no recommended number of interviews, but the number of meetings must be reported and well-detailed.

We selected respondents from native digital companies and traditional ones that started working with digital, such as e-commerce. This sampling of different-sized organizations from distinct industry sectors contributes to the study's analytical generalization (BENBASAT et al. 1987). The respondents are executives in IT, business, and company strategy.

### 3.1 Data Collection and Analysis

The interviewees were asked a series of questions based on a semi-structured instrument that was developed as Myers and Newman (2007) suggest. We prepared beforehand some questions based on the literature review. Three specialists validated the qualitative study's

protocol, and, to double-check, we conducted a pilot interview before initiating data collection. Only after all these steps were completed did we begin to collect data. Only one researcher conducted all the interviews.

The pilot was conducted at a multinational retail company headquartered in South Brazil. This company is the most significant retail clothing company in the country and with the best financial result in the last years. Were interviewed three managers with experience in digital business, the CIO, the director of E-commerce, and the director of Digital Marketing. Subsequent participants were obtained through a snowball sampling of these participants, as well as an advertisement made to the community of a university located in one of the state capitals in South Brazil. We were able to reach out to the authors' networks and reach participants from around the country and made a subsequent snowball sampling of all those contacts. All interviewees participated voluntarily without compensation.

In addition to the experience with digital business, we take into account the characteristics of the companies that work. Companies were chosen according to the following rank: profit, revenue, and market share. In the e-service companies and the IT consultant, it was observed whether the companies served met the representativeness indicated above.

The interviews were audiotaped, professionally transcribed, and analyzed, according to suggestions by Walsham (2006). The average interview length was 45 minutes, with interviews as short as 28 minutes and as long as one hour and 17 minutes. However, it is worth mentioning that the unit of analysis is the interviewee. The average experience of the interviewees is 12 years in the area of IT or digital area, being the interviewee with less time has six years and the most experienced, 27 years. A synthesis of our 31 interviewees is provided in Table 2.

**Table 2.** Characteristics of respondents

| Type of enterprise | Gender/Number of interviewees | | | Business System/ Service | Origin | |
|---|---|---|---|---|---|---|
| | Male | Female | Total | | Digital Native | Digital Immigrant |
| Retail E-commerce company: Clothing and Accessories | 3 | 2 | 5 | B2C | X | |
| E-Commerce: Shoes | 2 | 1 | 3 | B2C | | X |
| E-commerce Retail stores groups: electronics and furniture | 2 | 3 | 5 | B2C | | X |
| E-business Ecosystem and marketplace | 3 | 1 | 4 | B2B e B2C | X | |
| Industry | 1 | 1 | 2 | B2B | | X |
| Private Bank | 1 | 3 | 4 | Financial Service | | X |
| State Bank | 2 | 1 | 3 | Financial Service | | X |
| e-Service | 4 | - | 4 | IT Solutions | X | |
| IT Consulting | 1 | - | 1 | IT Consulting | | X |

Source: the authors

Finally, we analyzed the results by utilizing the content analysis technique (BARDIN, 1977). The analysis, with the use of the qualitative analysis software N'VIVO. This analysis was performed by all the researchers, following a qualitative coding analysis protocol developed for this research, which due to lack of space, could not be included here.

In summary, the data analysis codes were initially grouped into inductive themes based on the literature, while the data analysis revealed new themes. The analytical categories were established based on this set of themes. For this paper, we employed the categories that correspond to digital capabilities (sensing – responsiveness – process digitization - ecosystem connectivity). Next, we present the results.

## 4. DATA ANALYSIS AND RESULTS

This section presents the results of the interview analysis. For each category, a table is presented with evidence that aims to verify the relationship between the digital capability and digital business performance and then discussed it with the literature.

Although other pieces of evidence emerged, we opted to present evidence that is mentioned by at least more than two interviewees. To do so, we consider the general idea, not literally the same words, but the general idea and the subcategorization provided by N'Vivo.

So, we select some pieces of evidence to illustrate, each table brings four pieces of evidence. The right column of the table expresses to which degree the evidence and proposition relate, according to the analysis extracted from the N'Vivo program, based on the representativeness, according to other managers. We consider high when the idea is mentioned by more than half of respondents, medium when is said by seven to fifteen, and low when mentioned by two to seven.

Besides, we took into consideration the digital business performance indicators presented in section 2, and we evaluate the relationship between the evidence and each indicator. We named each of them as DBP1 - Operational excellence, DBP2 - Revenue growth, and DBP3 - The relationship with customers and other stakeholders) to help the visualization in the tables of evidence that will be presented in each category, as shown next.

### 4.1 Sensing

**Table 3.** Sensing evidence

| Proposition | Interviewee | Evidence | Performance | Degree of relation |
|---|---|---|---|---|
| P1 – Sensing *is related to Digital Business Performance* | Industry IT Manager | We now have hourly sales reports, SMS, and e-mail. Besides, every morning, we have all the previous day's sales volume, and those reports have graphs and are on the managers' IPads. | DBP1 | High |
| | CIO of E-business Ecosystem and marketplace | we access information to the internal and external environment. It is reactive and proactive. We get clippings and various types of information from market analysts, BI, analytics areas, and social media. Also, some tools are used for each unit for monitoring customer and competitor actions. My managers have their decision level and can act accordingly to the situation. | DBP2 | High |
| | Digital Business | The bank has developed solutions for clients and our internal team. We are always analyzing the market. Now, Fintechs exist. | DBP2 | Medium |

| | | | | |
|---|---|---|---|---|
| | Manager of State Bank | We have to be fast, and the client must be satisfied. One example is our applications that make it possible to access account data and perform practically all financial operations and communicate with the bank, e.g., every transaction the client receives an SMS, so he can confirm or not the operation, which increases the security and confidence of the client. | DBP3 | |
| | CEO of E-Commerce Shoes | Everyone involved in the ecosystem receives an access level and, can give and receive input, participating, and viewing information according to each one's role in the ecosystem, including product development. For example, last month, a director went to a shoe fair in Milan. There, he saw the trends, such as designs and colors, he sent photos from his cell phone to our internal communication system, and the discussions to develop those shoes began with people involved in the project. This reduces time, costs, and improves productivity. | DBP3 DBP1 | Medium |

Source: the authors

The results from the observations and the respondents suggest that organizations are dealing with the challenges of the digital economy and the changes that digital technologies have brought. Hence, it is important to monitor the market, customer demands, and any other data that can be useful for the business.

The pieces of evidence presented in table 3 indicate that sensing is the capability to display business information visually, presenting data and information in an appropriate format, as defined by Yoo et al. (2012). Moreover, data and information are available in all adequate platforms such as laptops, mobile devices, and websites (BACIC; FADLALLA, 2013; TAN; TAN; PAN, 2016).

The relation to performance is evident once in the declarations made by the CEO of Shoe E-Commerce he shows the importance of monitoring the environment. The bank director also corroborated with this idea, and he is always analyzing the market because it requires surveillance of market trends and new technologies to sense and seize opportunities (KOLHI; GROVER, 2008).

## 4.2 Responsiveness

**Table 4.** Responsiveness Evidence

| Proposition | Interviewee | Evidence | Performance | Degree in relation |
|---|---|---|---|---|
| P2 – *Responsiveness is related to Digital* | CIO of E-commerce Retail stores groups: electronics and furniture | We try to be fast in our responses to the clients and also to the market in general. We must capture the latest trend to win our competitors. We have an area that looks at the client and another market intelligence area that looks at the competition. When we look at them internally, the latest trend has to pass through various other sectors, such as style, purchases, production, and even supplier. The supplier must receive this same information in a nutshell since they have to produce with agility to quickly make the product available to the client to let them be satisfied. | DBP1 DBP2 | High |
| | IT Director of Private Bank | We have friendly navigation for mobile, the responsive site. It answers itself with the screen's resolution. We brought | DBP3 | Medium |

| | | | | |
|---|---|---|---|---|
| *Business Performance.* | | improvements to the user's navigation area. The stakeholder users are more satisfied, and we measured that our sales through mobile increase even more. | | |
| | Industry Digital Marketing Director | Being responsive involves changing the culture, seeking to digitalize processes. For example, one of our clients decides to open a virtual store, so they need to load our products' data, such as images, videos, among others. Thanks to the agility that our resources provide, we can transmit all these data instantly, and they can load up their site quickly and safely, without losing data, which demonstrates our excellent performance, helping our sales. | DBP1 DBP2 | Medium |
| | CEO of E-business Ecosystem and marketplace | A digital business must be agile, so it must always provide the client with a better experience, the ability to obtain product information at any moment through systems and programs or BackOffice personnel. | DBP1 DBP3 | Low |

Source: the authors

As mentioned by Kohli and Grover (2008), responsiveness is the capability of organizational process flexibility and flexible, fast implementation of operational changes. Responsiveness is the ability to respond to the Market and internally, according to Setia, Venkatesh, and Joglekara (2013).

As we can see in table 4, there are internal and external evidences. Externally, this can be evidenced by declarations made by the CIO and Director of Clothing and Accessories Retail E-Commerce, who remind us that a physical store can change its display window each season or, at most, once a month. A digital store changes every minute according to each client's characteristics. It is an example of operational excellence and the relationship with customers, this way it is possible to improve the performance.

The E-commerce Director complements by citing that the client previously needed to go to the store to make a complaint. With the digital transformation, the client posts the complaint to the store's site. Accordingly, digital has enabled consumer empowerment. If a community begins to complain and makes the store apologize or change its attitude, it can viralize in seconds. Thus, whoever wants to have a strong brand must be more careful and agile, capable of responding instantly, immediately to the client's needs, whether good or bad. Again, it is another example of how to improve the relationship with customers and other stakeholders

Internally, responsiveness is observed in various situations, such as decision making. A situation that exposes this internal agility is one related by the CIO, who said that on the day iPhone 7 was launched in Brazil, online sales were not being converted. The e-commerce platform's systems analysis verified that the clients were not buying because of delivery time, which was longer than that of the competition. Immediately, the CIO contacted the CEO and logistics Director and found an alternative to decrease delivery time, which was done on the site, and, minutes later, sales began to increase. All this activity reveals how responsiveness is a digital capability related to business performance, particularly in the factor's operational excellence and the relationship with customers and other stakeholders.

### 4.3 Process Digitization

**Table 5.** Process digitization evidence

| Proposition | Interviewee | Evidence | Performance | Degree of relation |
|---|---|---|---|---|
| *P3 - Process digitization is related to Digital Business Performance.* | CEO of E-commerce Retail stores groups: electronics and furniture | We do not need to make any more manual decisions based on outdated reports. Our processes are digitalized, and that reflects in the results and revenue. For example, product restocking was manual. What we sold would come out from there. Someone there would decide how to buy and make the purchase orders. With our digital transformation, we only need to program the system and follow the stock levels, and the system sees how much sells and restocks, even suggesting: do not even restock this product here anymore because we are having market difficulties. So, this process digitization reduces costs and lead time, and consequently increase the revenue. | DBP1 DBP2 | High |
| | Director of E-Commerce Clothing and Accessories Retail | Process digitization improves information flow internally and externally. For example, if we look ten years ago when we began this E-commerce operation, there was no payment gateway. There was no online reconciliation of payments at the firm. Reconciliation was manual, was done by the financial office manually, so there was no online reconciliation. Even the analysis of that credit risk was made manually. The firm needed to adapt to digital solutions, to bring that to the e-commerce universe, to improve the flow of the e-commerce process. Today all these processes are digitized what reduces losses and lets our clients and partners more confident. | DBP1 DBP2 DBP3 | Medium |
| | IT director of a Retail E-commerce company. | We work with the server in the cloud, so we throw information there for the client to see the order, shoot an e-mail. What changes in our digital process are the possibility of negotiations, the client can chat with us and negotiate because we want to hear our clients. At the same time, there is another technology service that we offer and to check at the same moment if some competitor is offering a lower price. So, we can adjust our offers. With it, our client is always satisfied because we can interact with the client helping them in their searches and give an adequate price of the product. | DBP1 DBP2 | Medium |
| | IT Consultant | The software permit decisions to be made more quickly and more precisely, to execute part of the work, to be supplied data analysis. In short, it will speed up decisions. It is a question of survival. We cannot be slow, and there is no way to be fast doing things manually. Process digitization is the result of the search for efficiency. Process digitization is synonymous with quality; it is a question of survival. Also, we can say that process digitization allows information to flow more quickly. | DBP1 DBP3 | Low |

Source: the authors

The evidence featured unveils a relationship between process digitization and business performance, highlighting the flow of information, improvement in data quality, reductions in costs, and lead time, coinciding with what Lyytinen, Yoo, and Boland Jr. (2016) affirm. This capability also contributes to a quick response to the environment.

According to Loebbecke and Picot (2015) in the digital economy era organizations collect, mine, and exploit data that are increasingly available from an enormous variety of internal and external sources. These digital processes are possible due to the digital technologies that allow the processes to become digital. As we can see in the pieces of evidence on table 5 "the role of technology evolved from the focus on functionality and usability in the early days, to a means for online communication and persuasion, and finally to an intelligent entity (XIANG, 2017, p2)

Besides the improvement in information flow the digitization permit processes such as decision making to be made more quickly and more precisely and this implies revenue growth and operational excellence as pointed by the CEO of E-commerce Retail stores and most of the other respondents. So, it is possible to notice that through the evidence that process digitization is related to digital business performance.

### 4.4 Ecosystem connectivity

**Table 6.** Ecosystem connectivity evidence

| Proposition | Interviewee | Evidence | Performance | Degree of relation |
|---|---|---|---|---|
| P2 - E*cosystem connectivity is related to Digital Business Performance*. | Director of E-commerce Retail stores | Our ecosystem is very broad. We have the e-commerce platform and an ERP that manages all of the entire company's BackOffice, and then we have to relate this ERP to the platform because product registration, financial management of payments, orders, all these mechanisms must be related to the site. Through it, there exists an integration of these agents in our ecosystem. | DBP1 DBP2 DBP3 | High |
| | IT Director | Ecosystem architecture can be constructed based on the characteristics of a firm. In our case, BI and Analytics tools connect to operating systems, and the information provided is used by managers for ecosystem wide. These systems such as ERP and SCM, connect with partners to carry out their tasks, such as logistics companies for land and air travel, and Distribution Centers. There are connections to various suppliers. | DBP3 | High |
| | CIO of E-business Ecosystem and marketplace | Today, a digital operation is very complex. There are more than 200 players connected to one platform. There are payment methods, delivery methods, display windows, risk analysts, recommendation software. In short, there are many partners. To keep that working is complicated, and there will be other systems that will have to connect with the platform, ERP, CRM, and making that stick is a difficult job. Our IT sector offers a platform that allows the interconnection of all these actors and systems here. | DBP1 DBP2 DBP3 | High |
| | IT Consultant | The big companies' ecosystems enable organizational performance [...] the platforms that compose the ecosystem generate information online to mobile devices. It is a tendency; we need to use it to help our customers. Also, we can consolidate Dashboards, which speeds up the directors' shares, in addition to the stakeholders' integration, which improves results because it decreases lead time and it is possible to sell more. | DBP1 DBP2 DBP3 | Medium |

Source: the authors

The ecosystem architecture can be constructed based on the firm's characteristics—its needs, internal and external clients, suppliers, etc.—or it can be adapted. Also, the ecosystem connectivity allows for condensing large volumes of information from the organization (GARBANI, 2015).

The online environment is inspired by biological systems and is actively populated by agents that enable communities to collaborate. It can also be socio-technical processes that offer ultimately affordable and trustworthy cooperative solutions through investment and engagement by local stakeholders (GATAUTIS; MEDZIAUSIENE 2014). It is supported by a digital platform that enables a continued connection of all corporate partners beyond the traditional supply chains, including customers (and consumers) (KARIMI; WALTER, 2015; NAMBISAN et al., 2017).

Noticing this throughout the analysis was possible. The digital businesses examined possess this connectivity capability through the ecosystem, and it is directly related to digital business performance, which can be verified by evidence in Table 6.

### 4.5 Synthesis of the relation between Digital Capabilities and Digital Business Performance

This article contributes theoretically to the discussion on the digital economy's challenges, which is summarized in the appendix. With this study, it was possible to broaden comprehension of the digital phenomenon for businesses through the lenses of dynamic capabilities. Other contributions can be found in the discussions on the concept of digital capability, which, as can be seen, is a recent topic with few studies presenting a specific definition for dynamic capabilities, as well as the resources and capabilities that compose it.

Furthermore, this study also contributed to the understanding that digital capabilities allow a firm to rethink and upgrade their processes, their commitment to clients and business models, thus improving information flow (WESTERMAN; BONNET; MCAFEE, 2012).

Moreover, it was possible to identify the degree of the relationship between each digital capability and digital business performance. All capabilities analyzed in tables 3, 4, 5 e 6 are related with the performance indicators used in this study, operational excellence, revenue growth, and the relationship with customers and other stakeholders (RAI; PATNAYAKUNI; SETH, 2006; HULT; KETCHEN; SLATER, 2004; CHI, ZHAO; LI, 2016). So, based on the evidence all propositions are confirmed, and we can highlight that each capability influences more than one indicator of business performance, as illustrated.

We could notice that the Ecosystem's connectivity capability and sensing capability have higher degrees of relation, only high and medium degrees of relation. Most respondents highlight the importance of stakeholder integration and the ERP which is still the core technology. The Ecosystem's connectivity allows integration and connection to all the business's systems, thereby improving communication, information flow, and promoting better internal collaboration. Concerning the sensing capability, it is very important to spot the market trends, to know the competitors, to monitor the environment, and to look for business opportunities.

The other two capabilities, responsiveness and process digitization, are also related to the previous ones. For example, to respond quickly it is necessary to know precisely the market demands, so sensing capability is fundamental to the responsiveness. Similarly, for processes to work, good connectivity of the ecosystem is required.

Responsiveness increases all the stakeholders' satisfaction, mainly the clients, and speeds up decision making. Finally, process digitization leads to a reduction in lead time and restocking, impacting the final consumer's satisfaction. It also contributes to internal collaboration and improves the quality and security of data and information. Therefore, the evidence presents in the interviewees' statements and the observations highlight the importance of all capabilities to improve the digital business performance.

Most of all respondents are undergoing a digital transformation. The origin, i.e. digital native business or digital immigrant does not bring differences in the respondent's perceptions concerning digital capabilities. Thus, the findings contribute to companies that think of turning into digital businesses or even those that already are, to improve their performance. Sometimes the investment seems high, but the results presented in this study prove that the development of a digital ecosystem adds value to the business. Finally, the use of high-performance digital technologies is necessary for business success because they support sensing, responsiveness, and process digitization capabilities.

## 5. CONCLUSIONS

This paper presented broad research on digital capabilities and their relationship with the digital business's performance. Initially, a systematic literature review was carried out that allowed us to understand these capabilities and to advance theoretically in the discussion of the theme. Then, we developed our proposition based on four digital capabilities, sensing, responsiveness, Process Digitization, and ecosystem connectivity. So, we performed qualitative research with thirty-one interviewees.

This way, the following question guided the present study: "Which the role of digital capabilities in digital business performance?" To sum up the study results, we could answer this question presenting some evidence that allow us to verify that, in general, these capabilities improve the performance of the digital business, and some points deserve to be highlighted.

Ecosystem connectivity and sensing capabilities form the bases for all the others. The former enables collaboration and cooperation among all actors and improves internal communication, but requires platforms that are interconnected to the digital business. The latter is the ability to spot, interpret, and pursue opportunities in the environment.

The responsiveness capability is tied to sensing, allowing the company to act quickly, providing data and information that can be accessed by stakeholders. Consequently, fast response leads to the client's satisfaction and reduces operating times and costs.

The process digitization capability supports many processes like the decision-making process, which impacts on the client's satisfaction and the company's image. Process digitization also improves informational flow and the quality, security of data and information, and can reduce cost and increase the revenue.

Thus, we could understand that it is essential to be connected and integrated into a digital ecosystem, to monitor the environment to respond to the market and customer through the digital business process to achieve operational excellence and a satisfactory relationship with customers and other stakeholders, and consequently to have revenue growth.

So, this study contributes to the academic field by offering the conceptualization of digital capabilities, a conceptual framework (figure 1), and the preliminary results from the qualitative

part of the study. These results indicate not only the next steps to be taken in this research but offer insights for other researchers and for IS research as a whole. The practical value of this research rests on demonstrating the relation between digital capabilities and the digital business performance model.

The qualitative nature of this study is a limitation because it means the results cannot be generalized, and the capabilities' impact on digital business performance cannot be measured. Therefore, in future studies, we recommend verification of the model through quantitative research that identifies each digital capability's level of impact on digital business performance. It is also suggested that this study encompasses other digital businesses beyond e-commerce and public organizations can be studied as well.

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APPENDIX - SYSTEMATIC REVIEW OF THE LITERATURE

**Description of Methodological Procedures and Finding**

To develop this study, we conducted a full-text search to find articles containing the terms "Digital Capability", and after, the same term in the plural, i.e. "Digital Capabilities". We follow the procedures suggested by Wolfswinkel, Furtmueller, and Wilderom (2013). The search and selection of the papers occurred from September 2 – 17, 2020. The following search parameters were utilized: considering that the topic is new, and the research was exploratory to understand the concept of digital capabilities, it was decided not to determine a time limit and academic articles published in a journal which adopts a double-blind review.

We have chosen the Association for Information Systems electronic library (AISel), which is a central repository for research papers and journal articles relevant to the information systems academic community. Additionally, we also searched in EBSCOhost and the Web of Science database for the same terms, researching only papers from journals that adopted the double-blind review.

During this execution, the abstract, keywords, and introduction were read. In addition to following the inclusion/exclusion criteria, for an article to be included in the study, it must have been related to IS and addressed the digital capability topic.

As a result, we identified 104 papers in the first round and excluded nine articles due to overlap, resulting in 93. The second step was to verify the context of the studies. It is worth mentioning that only the business context was considered in this review, rather than other areas, for example, teaching, which denotes other concepts, such as the digital divide. As a result, 37 articles were found, and after checking for possible overlap, nine articles were disregarded, leaving 28 articles that were exhaustively studied. These papers are present in the appendix at the end of this paper.

Once the papers have been chosen, Wolfswinkel, Furtmueller, and Wilderom (2013) indicate going to the analysis and the presentation structure of the results. In this study, we used the software N'Vivo to support the analysis. First, we read all the papers, and then we utilized open coding to create tentative labels for chunks of data to summarize our understanding. We looked for definitions for Digital Capabilities, what the main capabilities required by digital business are, the challenges for digital business, and digital transformation.

It is worth highlighting that in this review only the business context was considered, rather than other areas, for example, teaching, which presents other concepts such as the digital divide. It is important to say that many articles simply mention the term "digital capability," but do not offer definitions or further implications for this study, so these papers were also excluded from the analysis.

Next, we began axial coding to identify relationships among the open codes, and then we moved onto selective coding to figure out the core variable that includes all the data. So, we were able to correlate Digital Capabilities with the theories, and the results of this analysis are presented in Table 7, which lists the papers in alphabetical order by author(s), the year, title, and journal.

**Table 7 - List of All Papers Containing Description of "Digital Capabilities" Concept**

| No | Author(s)/ Year | Title | Journal |
|---|---|---|---|
| 1 | Aaker (2015) | Four ways digital works to build brands and relationships. | Journal of Brand Strategy |
| 2 | Aakhus et al. (2014) | Symbolic Action Research in Information Systems: Introduction to the Special Issue | MIS Quarterly |
| 3 | Alam and Campbell (2016) | Understanding the Temporality of Organizational Motivation for Crowdsourcing | *Scandinavian Journal of Information Systems* |
| 4 | Barrett Davidson, Prabhu, and Vargo (2015) | Service innovation in the digital age: key contributions and future directions | MIS Quarterly |
| 5 | Chellappa, Sambamurthy, and Saraf (2010). | Competing in crowded markets: Multimarket contact and the nature of competition in the enterprise systems software industry | Information Systems Research |
| 6 | Davis, Mora-Monge, Quesada, and Gonzalez (2014) | Cross-cultural influences on e-value creation in supply chains. | Supply Chain Management: An International Journal |
| 7 | Drnevich and Croson (2013) | Information Technology and Business-Level Strategy: Toward an Integrated Theoretical Perspective | MIS Quarterly |
| 8 | Fernandes et al. (2017). | The dynamic capabilities perspective of strategic management: a co-citation analysis. | Scientometrics |
| 9 | Gaskin, Berente, Lyytinen and Yoo (2014). | Toward Generalizable Sociomaterial Inquiry: A Computational Approach for Zooming In and Out of Sociomaterial Routines. | MIS Quarterly |
| 10 | Grover and Kohli (2013) | Revealing Your Hand: Caveats In Implementing Digital Business Strategy. | MIS Quarterly |
| 11 | Hylving, Henfridsson, and Selander (2012) | The Role of Dominant Design in a Product Developing Firm's Digital Innovation | *Journal of Information Technology Theory and Application* |
| 12 | Knight (2015) | Delivering the digital region: Leveraging digital connectivity to deliver regional digital growth. | Australian Planner |
| 13 | Kohli and Grover (2008) | Business value of IT: An essay on expanding research directions to keep up with the times | JAIS |
| 14 | Liang, Bharadwaj, and Lee (2011) | Interactive and Iterative Service-Composition-Based Approach to Flexible | International Journal of Web Services Research |
| 15 | Lyytinen, Yoo, Boland (2016) | Digital product innovation within four classes of innovation networks. | Information Systems Journal |
| 16 | Mishra, Konana, and Barua (2007) | Antecedents and consequences of internet use in procurement: an empirical investigation of US manufacturing firms. | Information Systems Research |
| 17 | Müller, Holm, and Søndergaard (2015) | Benefits of Cloud Computing: Literature Review in a Maturity Model Perspective. | *Communications of the Association for Information Systems* |
| 18 | Nambisan, Lyytinen, Majchrzakand, and Song (2017) | Digital Innovation Management: Reinventing Innovation Management Research in a Digital World. | MIS Quarterly |
| 19 | Rai and Bush (2007) | Recalibrating Demand-Supply Chains for the Digital Economy | Systèmes d'Information et |

| | | | |
|---|---|---|---|
| | | | Management. |
| 20 | Roberts et al. (2012) | Absorptive Capacity and Information Systems Research: Review, Synthesis, and Directions for Future Research | MIS Quarterly |
| 21 | Srivastava and Shainesh (2015). | Bridging the Service Divide Through Digitally Enabled Service Innovations: Evidence from Indian Healthcare Service Providers | MIS Quarterly |
| 22 | Tams, Grover, and Thatcher (2014) | Modern information technology in an old workforce: toward a strategic research agenda. | The Journal of Strategic Information Systems |
| 23 | Tan, Tan, and Pan (2016) | Developing a Leading Digital Multi-Sided Platform: Examining IT Affordances and Competitive Actions in Alibaba.com | Communications of the Association for Information Systems |
| 24 | Westerman; Bonnet, McAfee, Andrew (2012) | The digital capabilities your company needs | MIT Sloan Management |
| 25 | Yoo (2010) | Computing in everyday life: A call for research on experiential computing. | MIS Quarterly |
| 26 | Yoo (2013) | The tables have turned: How can the information systems field contribute to technology and innovation management research? | JAIS |
| 27 | Yoo, Boland, Lyytinen, and Majchrzak (2012) | Organizing for innovation in the digitized world. | Organization Science |
| 28 | Yoo, Henfridsson, and Lyytinen (2010) | Research Commentary-The new organizing logic of digital innovation: An agenda for information systems | Information Systems Research |

Source: the authors

As noted in our literature review, the topic of “digital capability” is rather new and has only recently garnered more attention. As observed from the Table, the first publication to mention the term “digital capability” was in 2007, and the number of studies about this topic has increased over the last five years, with 20 of the 28 papers analyzed being from this period.