Digital Capabilities Applicable to the Education Sector

Capacidades Digitais Aplicáveis ao Setor Educacional

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ABSTRACT

The objective is to map the digital capabilities applicable to the education sector. The method used is a combination of systematic literature review and bibliometric analysis technique. The data were collected from the Web of Science and Scopus databases, considering the period from 1973 to 2021. The Vosviewer software was used to systematize the database. The selected sample consists of 69 articles. The results show five digital capabilities applicable to the education sector: digital enhancement capability; learning object development capability; digital accessibility capability; dominant platform development capability; and process digitization capability. This study brings two contributions to theory. First, indicate the main studies on digital capabilities applicable to the educational and second increase the science in the development of future research agenda. Regarding to the managerial contribution, the mapped capabilities can be used by managers of educational institutions and contribute to better performance in the transformation of digital processes of companies in this sector.

Keywords: Dynamic Capabilities; Digital Capabilities; Technological Innovation; Education.

RESUMO

O objetivo é mapear as capacidades digitais aplicáveis ao setor da educação. O método utilizado é uma combinação de revisão sistemática da literatura e técnica de análise bibliométrica. Os dados foram coletados nas bases *Web of Science* e *Scopus* considerando o período de 1973 a 2021. Para sistematizar a base de dados foi empregado o software *Vosviewer*. A amostra selecionada é de 69 artigos. Os resultados mostram cinco capacidades digitais aplicáveis ao setor educacional: capacidade de aprimoramento digital; capacidade de desenvolver objeto de aprendizagem; capacidade de acessibilidade digital; capacidade de desenvolver plataformas dominantes e capacidade de digitalização dos processos. O estudo contribui para teoria em dois momentos, primeiro ao indicar os principais estudos sobre capacidades digitais aplicáveis ao setor educacional e segundo

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RESUMO

o avanço na ciência na elaboração de agenda de futuras pesquisas. Com relação à contribuição gerencial, as capacidades mapeadas podem ser utilizadas por gestores de instituições de ensino e contribuir para o melhor desempenho na transformação dos processos digitais das empresas deste setor.

Palavras-Chave: Capacidades Dinâmicas; Capacidades Digitais; Inovação Tecnológica; Educação.

Introduction

The interest in applying technology to education is visible in some sectors. Entrepreneurs interested in expanding education, and adding teaching with content and technological tools, attract investment from technology companies, for example, EdTechs (Westerman, Bonnet, & McAfee, 2014; Williamson, 2018). Higher education institutions are starting digitalization of their processes, still shyly, but the demand for agility in preparing students for the labor market creates the need for expanding digital processes (Renz & Hilbig, 2020). The interest of entrepreneurs, together with the need of institutions, arouses attention in understanding digital capabilities developed by different sectors that could complement teaching through digital means, and foster technological education (Dias, 2012; Freitas, Maçada, & Brinkhues, 2017; Lampert *et al*., 2018).

In business sectors, managers arrange their resources' capabilities in order to extract skills that create value (Mishra, Konana, & Barua, 2007). Strategic resource management, together with the firm's experience in the market, brings a higher competitive advantage, producing capabilities that are difficult to imitate (Teece, 2007). The use of technology in education has proven essential, especially in preparing students for the labor market and carrying out vocational experiments, which foster meaningful learning that is difficult to forget (Lampert *et al*., 2018).

To extend the view on digital capabilities for use in the education sector, it is necessary to take a step back in the literature. Digital capabilities increase the value and competitiveness of a firm in aggressive and rapidly changing markets, triggered by technological innovation (Renz, Krishnaraja, & Schildhauer, 2020). Digital capabilities are skills that companies develop by using software and hardware to operate in

the digital and online market (Aretio, 2019). The identification of these capacities in a business leads to accelerated development and growth, which contribute to solving problems faster than its competitors (Vasconcellos, Freitas, & Junges, 2021).

The theory of dynamic capabilities provides a useful lens to support the studies of digital capabilities. Therefore, the latter originate from the unfolding of the former, which regard the manager's ability to build, identify, and reconfigure the firm's organizational resources (Teece, Pisano, & Shuen, 1997). To understand digital capabilities, this study brought the definition of the resource-based view (Mishra *et al*., 2007), its micro-foundations (Teece, 2007), and finally digital capacities, through the views of Camillo, Vasconcellos and Amal (2020) and Khin & Ho (2020), by presenting how added technology provides innovative solutions. This research aims to know how sectors are identifying, articulating, and introducing digital capabilities appropriate to educational institutions, since technology has become fundamental in educational processes.

Among the sectors that develop digital capabilities, educational institutions and technological education companies are a fertile field for studies. With the emergence of new technologies, education undergoes changes that require developments in teaching processes. Dias (2012) suggests the technological modernization of digital networks to enable access to education independently, quickly, and everywhere. Digital networks are shaping the way people interact, including learning and communication among individuals (Klimova & Poulova, 2015). Given this scenario, we developed this research question, "What digital capabilities can be applicable to the education sector for enabling digital access in educational institutions?"

Dynamic capabilities studies provide a theoretical framework to understand firms that are creating digital capabilities (Yeow, Soh, & Hansen, 2018). The development of digital capabilities allows identifying opportunities and threats, in order to reconfigure the digital transformation and get answers for digitalization. In the digital ecosystem, some authors mention the strong connection between environmental turbulences, dynamic capabilities, and digital capabilities (Karimi & Walter, 2015). To understand digital capabilities already developed in several sectors, for the reconfiguration of digital activities, this article sought and identified in the literature the digital capabilities applicable to the education sector.

We found studies that have addressed digital capabilities from various perspectives, such as the one by Khin and Ho (2020), who present building digital capabilities in industries; however there is a lack of articles and reviews that approach digital capabilities developed for the education area (Beer, 2013; Williamson, 2018).

This article aims to fill the gap pointed out by Renz and Hilbig (2020), who forecast the education market with a high growth. However, it still lags behind other organizations that are growing in the digital transformation market. One of the barriers that cause slowness in digital education regards cultural changes, from traditional teaching methods to digital teaching, including new technologies.

From a theoretical perspective, this study continues previous research and identifies digital capabilities used in different sectors. In addition, it provides a future research agenda to assist scholars in the theoretical and methodological fields. Regarding its practical contribution, it provides companies and educational institutions with a set of digital capabilities already developed in the literature, which propose to summarize a set of skills and drive business efficiency in changing companies' digital processes.

Theoretical Background

DYNAMIC CAPABILITIES

Dynamic capabilities are skills that companies use, which arise from experiences to integrate, build, and reconfigure their businesses (Ardolino *et al*., 2018; Teece *et al*., 1997). Initially dynamic capabilities, and currently, digital capabilities, can be determinants in defining the competitive advantages of an organization; thus, they can assist managers in obtaining profits in competitive and rapidly changing markets (Fernandes *et al*., 2017).

Companies achieve dynamic capabilities through three stages: sensing, seizing, and reconfiguring (Garrido *et al*., 2020; Helfat & Peteraf, 2015; Teece, 2007). Sensing refers to the company being constantly searching opportunities, including research, new market practices, and technological updates. Seizing applies to the process of capturing an opportunity that may emerge from technology or the market. In addition, reconfiguring is to rebuild resources and activities developed within the

different areas of a company; for example, human resources, finance, administrative, and other areas that make up an organization's physical facilities (Teece, 2007).

Studies on dynamic capabilities were based on a sustainable competitive advantage, which began with the Resource-Based View (RBV), bringing a look to the company's tangible and intangible resources (Mishra *et al*., 2007). Therefore, dynamic capabilities are relevant intangible resources that provide agility for organizations to face uncertainties (Luo, 2000; Teece, Peteraf, & Leih, 2016).

We can summarize previous studies according to three moments. First, through the resource-based view, with a lens focused on the tangible and intangible assets of the company (Khin & Ho, 2020; Mishra *et al*., 2007). Second, by the theory of dynamic capabilities, with a concern for developing strategies (Helfat & Peteraf, 2015). Finally, the third moment, through digital capabilities that can give managers strategic advantages to operate in digital environments of uncertainty and fast changes (Freitas *et al*., 2017; Pereira, Ferenhof, & Spanhol, 2019; Warner & Wäger, 2019).

According to Yeow *et al*. (2018), the theory of dynamic capabilities is the main driver for developing digital capabilities. Literature shows that these capacities relate to digital innovation factors and the mediating role of innovation in organizations' performance (Khin & Ho, 2020). Margaryan and Littlejohn (2008) relied on the theory of dynamic capabilities to establish the link between new digital technologies and emerging discoveries that can encourage companies to seize new opportunities for becoming innovation leaders, and enhance digital performance in the education sector.

DIGITAL CAPABILITIES AND EXPANSION OF TECHNOLOGICAL EDUCATION

Digital capabilities are skills necessary to manage digital technologies, composed of key elements to achieve success in business change and create solutions (Freitas *et al*., 2017; Khin & Ho, 2020). Therefore, we can define them through the combination of skills that assist in businesses, adding value to products and services supported by digital platforms (Camillo *et al.,* 2020; Khin & Ho, 2020).

Implementing a digital transformation requires integration with new technologies and reformulation of the business model, in order to create new digital solutions in the online market (Ardolino *et al*., 2018; Westerman *et al*., 2014). The initial areas of the company that correspond to the core of digital capabilities are technology, innovation, and communication (Ardolino *et al*., 2018; Santos, 2016).

Some of the main drivers for starting a digital transformation and technological inclusion are new product development; inclusion of innovation in the company; improvement in customer service provision; and exclusive products (Alano, Souza, & Hernandez, 2019; Garcia & Calantone, 2002). The process involving digital capabilities links digital technology, adapting changes, and including new habits (Camillo *et al.,* 2020; Khin & Ho, 2020; Mishra *et al*., 2007).

The change model that ensures the survival of many companies includes digital media, web mobility, and big data, among others (Renz & Hilbig, 2020). Digital capacity helps the company in developing innovative skills, expediting problem solving (Barreto *et al*., 2017). A way to differentiate the company by digital transformation using digital capabilities can be conceived in three stages: customer experience, internationalization, and new business models (Santos, 2016).

Technological innovation in education strengthens the development of individuals in society. The physical and the virtual are part of a single character, encompass changes, and cause educational and professional growth (Aretio, 2019). Technological changes that foster digital education are slow, compared to other sectors, and education lacks disruptive innovation. Christensen, Horn, and Johnson (2008) advocate and discuss changes that should occur in education brought about by innovation, from the development of digital capabilities. Strengthening such studies, Alano *et al*. (2019) addressed the acceptance of technology in educational institutions, driving their interest towards the teacher's behavior in applying teaching practices.

For Christensen *et al*. (2008), disruptive innovation is crucial for digital capability, because it allows creating a product or service that, in a short period, will lead the market, replacing something that already existed, through online markets and existing software. The new product and service are born with the mission of activating changes, creating new proposals, generating good results, thus contributing to market's adequacy to the digital context (Aretio, 2019).

Methodology

To enable capturing nuances of digital capabilities in the literature, the methodological path employed a combination of methods: systematic literature review and bibliometric analysis technique.

Systematic literature review is a method that presents an argument for the study, based on the knowledge of one topic of interest to the researcher, who establishes a path to answer the study question (Gaur & Kumar, 2018). The systematic review intends to organize the reading of the collected data, and then identify the digital capabilities already mentioned in the literature, in addition to suggesting an agenda for future studies.

The bibliometric technique, on the other hand, is the statistical analysis of scientific research through publications (Chueke & Amatucci, 2015). It is particularly appropriate for this research because it assumes applying statistical methods to organize, analyze, and present articles in the literature. We comprised, for example, co-citations of authors, analyses and quotations, publication records, and frequent terms used in keywords (Chueke & Amatucci, 2015; Souza & Ribeiro, 2013).

To map digital capabilities, we carried out surveys in the Web of Science and Scopus databases. The keywords used in the search were “dynamic capabilities”, “digital capabilities”, and “education institutions”. We selected these words because they cover the issues of interest, and we noticed a high relevance at the time of search in the databases; hence we prioritized the filters by titles, abstracts, and keywords.

Web of Science is a database that gathers published articles from various journals. The Scopus database has a considerable number of articles, besides being one of the most relevant databases in citations of peer-reviewed articles. The areas considered for selection were Administration, Business, and Economics. After applying the criteria for data extraction, we identified 420 articles, published between 1973 and 2021.

We organized data in two ways: first, tabulation and organization on *Microsoft Excel,* and then exporting and analyzing through the *VosViewer* software.

Data exported from Web of Science and Scopus databases were arranged on Microsoft Excel. For the 420 articles, we applied the following exclusion criteria: first, after reading the abstracts, we excluded 215 articles not considered relevant to the study, since they did not explicitly address some type of digital capability, and focused on systems and codifications. After this cutting, 205 articles remained. Next, we applied the criterion of exclusion by duplicity, which resulted in excluding other 37 articles.

For the 168 remaining articles, we applied the last exclusion criterion, removing 99 articles that, read in full, did not meet the criteria established for the research.

After that, we chose 69 articles for reading, organized with the goal of mapping emerging digital capabilities in the educational field. Therefore, we tabulated specific parts of the most cited articles that dealt especially with the topic of digital capabilities in the educational sector.

In the second arrangement, we unified and exported databases to the VosViewer software, which prioritizes the visualization of bibliometric networks. The development focused on relational techniques that include the relationship of co-citation, terms with greater evidence, and bibliographic coupling (Van Eck & Waltman, 2010).

We developed the research proposal by reading the 69 selected articles. During tabulation and reading, we intentionally adopted a refined vision in searching digital capabilities that could enable digital access in educational institutions.

Figure 1 shows how we composed and excluded the articles selected for mapping digital capabilities present in the educational sector, which resulted in a sample of 69 articles.

Figura 1. Etapas aplicadas para seleção dos artigos.

Source: Adapted from Kauppi, Salmi & You (2018).

Bibliometric Analysis

Table 1 presents the fifteen most quoted articles in the sample, their authors, year of publication, journal that published, and number of citations. We selected these articles by considering the relevance of the total number of citations, which, in this sample of fifteen articles, represent over 70% of the citations of all collected material.

Table 1. The 15 most cited articles

Class.	Authors	Year	Journal	Number of Citations
1	Wei, Teo, Chan, & Tan	2011	*Information Systems Research*	176
2	Mishra et al.	2007	*Information Systems Research*	143
3	Ardolino et al.	2018	*International Journal of Production Research*	126
4	Williamson	2016	*Journal of Education Policy*	113
5	Lampert et al.	2018	*Acta Polytechnica Hungarica*	86
6	Gaskin, Berente, Lyytinen, & Yoo	2014	*MIS Quarterly*	73
7	Grover & Kohli	2013	*MIS Quarterly*	65
8	Macleod, Haywood, Woodgate, &Alkhatnai	2015	Techtrends	42
9	Margaryan & Littlejohn	2008	*Journal of Computer Assisted Learning*	42
10	Somyürek, Atasoy, & Ozdemir	2009	*Computers & Education*	37
11	Kassymova et al.	2019	*Bulletin of the National Academy of Sciences of the Republic of Kazakhstan*	34

12	Bayne	2015	*Teaching in Higher Education*	30
13	Edwards	2015	*Pedagogy Culture and Society*	23
14	Liebenberg, Chetty, & Prinsloo	2012	*Education & Educational Research*	20
15	Emejulu & McGregor	2019	*Critical Studies in Education*	18

Source: Elaborated by the authors (2021).

The areas/topics that stood out the most among the journals in Table 1 were education, innovation technology, information technology, strategic management, information system, and information sciences, which enable mapping digital capabilities developed in different sectors. When analyzing the scope of these journals, within these areas/topics, the words that emerged the most were digital education, digital technology, and digital learning.

The analyses show the concentration of studies that include the **educational area** and the approach of digital capabilities; in addition, education journals present technologies mediating education. The *corpus* of this review study is applied mostly to the development of new tools or to comparing existing resources, aiming to understand their agility in developing processes for business environments, educational institutions, educational governance, and end users (Lampert *et al*., 2018; Macleod *et al*., 2015).

In the most cited article, Wei *et al*. (2011) explore how digital access divide can influence digital capacity; therefore, based on the social cognitive theory, which focuses on **social** behavior, and using a quantitative approach, the authors describe the relationship between home computers, school computers, digital access divide, and learning outcomes. They show that the divide between home and school digital access can affect learning results.

The second most cited article is by Mishra *et al*. (2007), who address process digitalization. Using a qualitative study, the authors examine the background and consequences of Internet use in the business sector procurement process. They also developed an interactive model to analyze the digital process as a whole, which includes the search for a certain product, the acquisition process, and the conclusion of the purchase (Gaskin *et al*., 2014; Mishra *et al.,* 2007).

Regarding educational institutions and government practices, Williamson (2018) contributes with a data-driven tracking study, mediated by graphic designers and software developers. This tracking enables educational governance to measure student behavior in the learning process. The results foster advancement in classroom teaching processes, mainly through pedagogical assumptions.

With a digital look towards **industrial companies**, Ardolino *et al*. (2018) address aspects on manufacturers' trajectory of digital transformation. The research is qualitative, uses case studies, and covers three main strands: the Internet of Things, cloud computing, and predictive analysis. The results present theoretical insights on digital capabilities, based on the analyzed services.

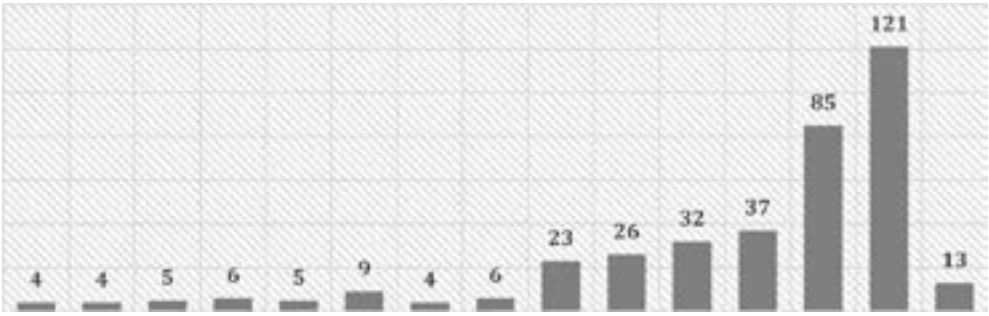
In the digital environment, scholars dig into the development of new tools, but the study field provides a diverse range of investigations that seek to contribute to improving and speeding up processes. Focusing on the **business environment**, Lampert *et al.* (2018) measured the agility in workflow completion by comparing three ways of communication: email with attachment (linguistic description), google drive (digital content), and MaxWhere (technological tool). The research was quantitative, and results for the same tasks done through the distinct devices show a 50% agility for MaxWhere.

With technological development, people, educational institutions, and organizations use the virtual environment for storing personal documents, schoolwork, customer database, among other large volumes of data. IT companies develop software and tools to map these data, changing them into materials for analysis, organization, and control (Edwards, 2015).

Bayne (2015) observes that digital, in the teacher's view, can be seen as a technological promise or threat. The automation process for using digital is challenging for teachers. What is at stake is their quick adaptation to it. For the **educational institution**, on the other hand, is to exploit its resources, in this case the teacher, without losing the rich knowledge added by his/her long journey.

In Figure 2, which shows the portfolio of published articles per year on digital capabilities, there was a higher number in 2018, 2019, and 2020, and their sum represents 64% of the total. To increase our knowledge on the growth of publications on digital capabilities in that period, we organized the papers by titles and keywords. The categories that showed the highest frequency were digital capabilities, education, learning, and information and communication technology (ICT).

Figure 2. Publication records per year.



Source: Elaborated by the authors (2021).

According to Khin and Ho (2020), studies that explore digital platforms or environments highlight innovative solutions and digital capabilities for value creation. Zhou, Yim, and Tse (2005) state that digital capabilities consist of skills, talents, and knowledge achieved by managing digital technologies. Other studies analyze student behavior in the technological environment, and the digital literacy process (Li, Zhou, & Cheng, 2019; Falloon, 2020). Dynamic capabilities studies mention the business ecosystem that reflects a timeline with RBV studies on the competencies developed to achieve digital capabilities (Sun *et al*., 2020).

On education, the studies extend research on "Selfie", a tool from the European Commission. The implementation of this tool was responsible for evaluating the use of technology to improve teaching and learning at schools (Bocconi, Panesi, & Kampylis, 2020).

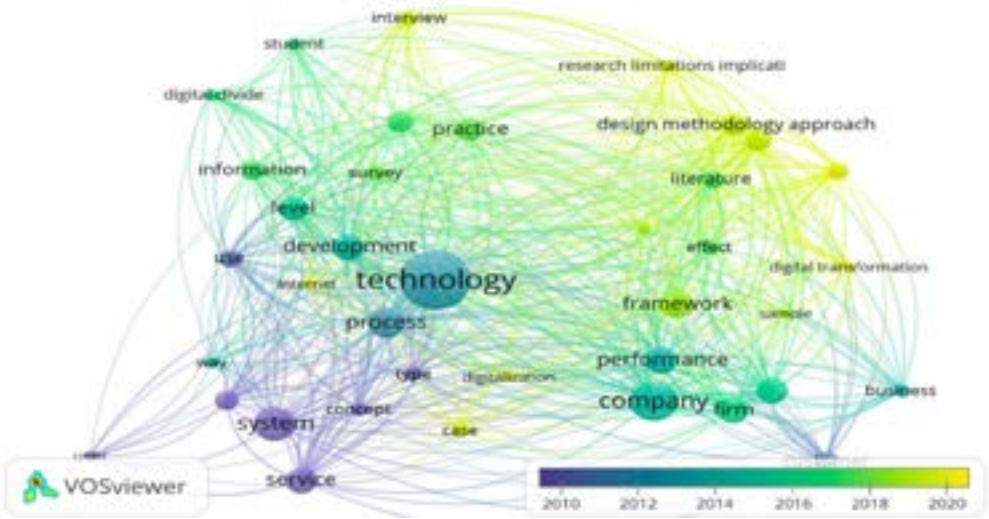
Studies on learning analyze mainly students' behavior. Guri-Rosenblit (2018) shows the challenge for students to learn in the digital environment without the teacher; in contrast, the research shows the difficulties of the teacher and educational institutions to adapt to digital tools.

Researchers concerned with information and communication technology (ICT) seek to understand the factors of digital exclusion. This topic arouses interest since the early days of the Internet. Exposure to ICT use requires the market to develop digital capabilities. The whole context of digital exclusion is strongly linked to the economy and new digital skills for innovation, and this includes the labor market (Basantes-Andrade, Cabezas-González, & Casillas-Martín, 2020; Hidalgo *et al*., 2020).

From the analysis of keywords of the articles published in 2020, the following stood out: digital capabilities and education. Thus, the evolution in the studies on digital capabilities is evident, as well as the relevance of the literature regarding knowledge directed to technological education.

As assumption, we explored the terms and words most used in the sample, seeking to identify greater relevance from the titles and abstracts. Regarding this analysis, the VosViewer software shows the connections between the terms and the evolution, according to the year of publication. On a timeline, we can explain the colors represented in the graph: the purple color regards older articles, for example, in 2005. The green color, in the year 2010, regards studies of 10 years ago; in 2015, the light green color shows the evolution in the studies; and the yellow color, in 2020, refers to current studies. Figure 4 presents the analysis of the unified terms, as explained.

Figure 4. Analysis of unified terms



Source: Elaborated by the authors (2021).

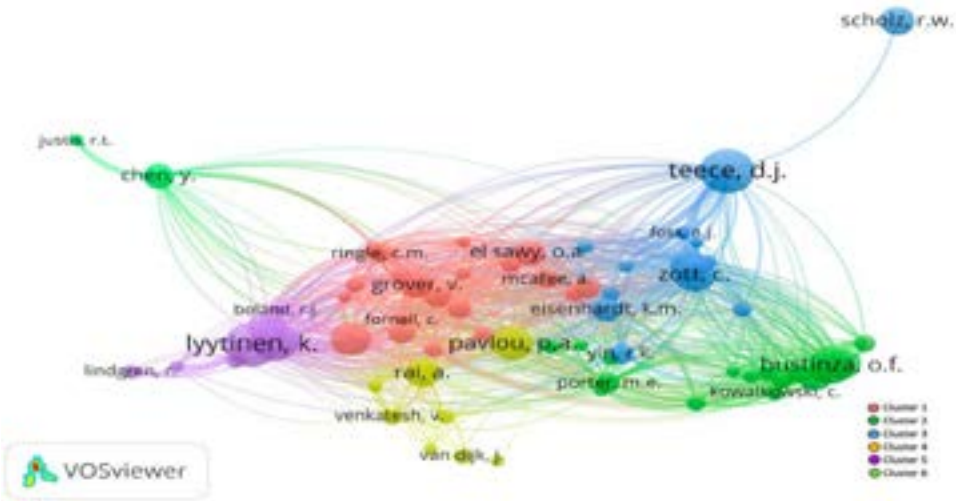
Constata-se pelo mapeamento efetivado, que o termo com maior relevância nos estudos é *technology,* que apresenta estudos sobre categorias de divisão digital (WEI et al., 2011).

We can see, through the mapping, that the term with the greatest relevance in the studies is *technology*, which comprises studies on digital divide categories (Wei *et al*., 2011).

The term *technology* connects with previous studies that deal with the terms *system*, *technique*, and *user*, and address digital capabilities developed in organizational human routines (Yoo, Henfridsson, & Lyytinen, 2010). Still in connection with *technology*, the terms *development*, *practice,* and *building* describe digital capabilities in the institutional context of students and teachers in the classroom (Thorell *et al*., 2015).

As of 2015, Figure 4 presents the following terms: *industry*, *digitalization*, *design methodology approach*, and *case study*, which address the importance of students' capabilities for the development of meaningful teaching, and the importance of organizations developing capabilities to achieve greater competitive advantage (Maity, Sahu, & Sen, 2021). Figure 5 presents the co-citation clustering.

Figure 5. Authors' co-citation in the sample *corpus*



Source: Elaborated by the authors (2021).

The co-citation analysis represents the range of the main authors cited in the selected articles. This view is different from the amount of citations per article, and

extends the focus of the developers in the path of studies that include digital capabilities. The article by Teece *et al.* (1997) is the most cited, and addresses dynamic capabilities and business strategies. The article that connects in the sequence is by Amit and Zott (2001), who approach the theoretical foundations of value creation, and suggest that a firm's business model is the *locus* of innovation. The article by Yoo *et al*. (2010) presents an essay of digitalization as a product, while Vendrell-Herrero *et al*. (2017) analyze the emergence of digital e-books as a new business model. Co-citation focuses on the study field of digital innovation and technology.

Results and Discussion

We identified digital capabilities arising from the analysis of several study phenomena: educational institutions, distance learning (DL), game-based learning, companies and entrepreneurship, which cover different segments of the educational sector; however, the mapped capabilities can be applied to the educational sector. Therefore, the five digital capabilities suitable to this context are: Digital enhancement capability; Capability to develop learning objects; Digital accessibility capability; Capability to develop a dominant platform; and Process digitalization capability. Table 2 present them.

Table 2. Digital capabilities applied to the educational sector

Digital capabilities	Study phenomenon	Authors
Digital enhancement capability	Companies; entrepreneur.	(Emejulu & McGregor, 2019; Khin & Ho, 2020; Rodrigues et al., 2021; Zhou et al., 2005)
Capability to develop learning objects	Education institution; Distance Learning (DL); Game-based learning	(Heery & Anderson, 2005; Margaryan & Littlejohn, 2008; Rehak & Mason, 2003)

Digital accessibility capability	Education institution; Game-based learning	(Aetdinova, Nikolaeya, & Demyanova, 2019; Liebenberg et al., 2012; Maity et al., 2021; Nguyen, 2018; Rehak & Mason, 2003; Somyürek et al., 2009; Sorokova, 2020)
Capability to develop dominant platforms	Companies; entrepreneur	(Dalton et al., 1999; Lenka, Parida, & Wincent, 2017; Mu et al., 2017; Sun et al., 2020)
Process digitalization capability	Companies; entrepreneur	(Grover & Kohli, 2013; Kassymova et al., 2019; Mishra et al., 2007)

Source: Elaborated by the authors (2021).

DIGITAL ENHANCEMENT CAPABILITY

The digital enhancement capability shows that technological innovation is beneficial for product development, in order to meet customer needs (Khin & Ho, 2020; Li *et al*., 2019). Thus, companies should dedicate themselves to inserting this capability, by maximizing inherent enhancement capacities, operating with training, making alliances with joint ventures, among other actions to strengthen innovation. Building digital capability stems from skills that are developed as a result of the experience in acting directly with digital technology (Khin & Ho, 2020). Digital citizenship is similar to digital literacy, which means the way a citizen accesses, knows, and develops himself digitally, to make use of teaching through online interactions (Emejulu & McGregor, 2019).

The digital enhancement oriented to education brings the school and the student closer, meeting with higher quality the needs for improving the development process. The capacity of digital enhancement in Educational Institutions can be expressed in the resources that facilitate student's browsing on the school website, that have a clear communication, and oriented to customer service through innovative tools such as the chatbot, which simulates the human assistance (Rodrigues *et al*., 2021) or by WhatsApp.

CAPABILITY TO DEVELOP LEARNING OBJECTS

In mapping this capability, the terms 'integration' and 'aggregation of teaching contents' emerged frequently. To compose the two terms, Learning Object Repositories (LORs) support practices of sharing and reusing teaching and learning resources. The capability to develop learning objects comprises the concept of blended learning. A definition that best describes learning development is a virtual environment that connects and organizes knowledge contents affordably (Rehak & Mason, 2003). Another definition in the literature is that LORs are digital storage sites with specific characteristics of learning and teaching contents (Heery & Anderson, 2005; Margaryan & Littlejohn, 2008).

DIGITAL ACCESSIBILITY CAPABILITY

Digital accessibility capability facilitates access of different audiences - teachers, students, and professionals of educational institutions - to information and learning tools (Maity *et al*., 2021). Rehak and Mason (2003) highlight that digital accessibility capability is closely linked to the democratization of technology and the ability to develop learning objects. Distance learning provides this closeness of students through the online environment, digital exclusion loses strength, and students from different social classes begin to interact (Liebenberg *et al*., 2012).

Students' lives were changed by the engagement with digital technologies: computers, laptops, and mobile devices. Hence, technology brings the student closer to knowledge through different tools, for example, the platforms, Zoom, Teams, Skype, and Google Classroom, among other digital platforms that provide agility and adequacy for teaching in the virtual environment (Sorokova, 2020). Educational institutions are also including in their methodologies teaching through game-based platforms, which offer students learning through games. On the other hand, social media should not be used for educational purposes, as they are not considered neutral technologies, and put users' freedom and privacy at risk (Nguyen, 2018; Somyürek *et al*., 2009).

CAPABILITY TO DEVELOP DOMINANT PLATFORMS

In a business-driven ecosystem, the capability to develop dominant platforms results from the skills to create interactions between customers and the company,

generating strong connections between platforms, markets, and firms (Lenka *et al*., 2017). This digital capability can bring several advantages as a driving key to technology, such as strengthening the relationship between company and customer, and exploiting data and market analysis for achieving better results (Dalton *et al*., 1999). As a cycle, the company supports the networks that enable constant development for business value creation, which shapes the important components to strengthen competitiveness through the ability to develop a dominant platform (Mu *et al*., 2017; Sun *et al*., 2020).

PROCESS DIGITALIZATION CAPABILITY

In a digital business strategy perspective, processes are defined steps of interaction with a software to create a capability (Kassymova *et al*., 2019). Process digitalization happens when defining the steps for interacting with a system to create a capability; this requires caution, because a pure and simple process digitalization can turn a competitive advantage into something easily imitated (Grover & Kohli, 2013). Additionally, Mishra *et al*. (2007) observe that companies with high process digitalization can leverage their infrastructure, experience, and knowledge achieved from the use of information technology solutions to acquire and implement internet-related solutions.

Conclusion

The theoretical framework brought the perspectives of RBV (Mishra *et al*., 2007), dynamic capabilities (Teece *et al*., 1997), and digital capabilities (Westerman *et al*., 2014; Ardolino *et al*., 2018; Khin & Ho, 2020; Camillo *et al*., 2020; Renz & Hilbig, 2020). The study followed these approaches to show that digital capabilities stem from previous studies conducted within firms, by exploiting their tangible and intangible resources, based on RBV. Dynamic capabilities are behaviors, skills, and knowledge governance, intended to bring about change and innovation to firms. The elements that make up this set are developed throughout the organizational experience, and digital capabilities are part of the set of dynamic capabilities.

Intentionally, this research gathered relevant knowledge to represent the growth of digital capabilities developed in various sectors, namely education, business, social, and government practices (Lampert *et al*., 2018; Mishra *et al*., 2007; Wei *et a*l., 2011; Williamson, 2016). The exploitation of these capabilities can create new skills in education, as well as develop digital processes in the teaching environment.

From this background, the study provides an overview of the literature on digital capabilities and their links to education, by mapping five digital capabilities applicable to the education sector, and showing some interactions in this context. As the main point, these well-developed digital capabilities enable a technological view of the business and can strengthen the implementation of effective educational business models.

According to Yeow *et al*. (2018), digital capabilities are an unfolding of the theoretical framework of dynamic capabilities. In a business environment with rapidly changing processes, companies that develop digital capabilities can achieve a higher degree of competitiveness. Looking at the digital capabilities already developed in various industries expands the opportunity to apply these capabilities in education.

Literature shows companies that foster environments that increasingly favor the development of digital capabilities (Mishra *et al*., 2007). The five capabilities mapped in this study comprise several industries that can assist the educational sector, since many companies are already born digital.

The five digital capabilities identified show the importance of innovation and digital transformation, and as they derive from other industries, they can also expand to the management of other types of organizations.

LIMITATIONS AND FUTURE RESEARCH

This paper provides a basis for several future studies on the nuances of digital capabilities. First, the bibliometric approach is in line with the studies of Camillo *et al.* (2020) and Teece (2007), by proposing studies of digital capabilities that contribute to the digitalization of businesses in several areas. The five digital capabilities identified assist in the digitalization of some processes in education; however, the isolated studies of digital capabilities limit the possibility of generalizing their results, for example, to business digitalization and internationalization. Hence, we propose that future qualitative studies should identify competencies developed by entrepreneurs to boost digital capabilities.

Second, future quantitative studies with significant samples of digital companies could test the research proposal. The systematic review methodology led to mapping the five digital capabilities as a set of indicators (Gaur & Kumar, 2018). Thus, the limitation of the studies lies in the need to seek a more accurate picture of the barriers for developing new digital capabilities. As a suggestion for further research, it is relevant to understand the constant growth of digitalization and the challenges of born digital companies.

Third, this research relied on previous studies, mainly on the digital capabilities literature. The scenario of several industries with already developed capabilities is suitable to identify new competencies that stimulate digital capacities, in order to apply them to other sectors, aiming at increased competitiveness through process digitalization.

Table 3 presents the gaps identified in the literature, which provide potential paths for future research.

Table 3. Suggestions for future studies

What structures can be developed in repository systems to enhance and support learning?	(Heery & Anderson, 2005; Margaryan & Littlejohn, 2008; Rehak & Mason, 2003)
How to relate technological factors in order to meet the growing digital innovation?	(Barreto et al., 2017; Khin & Ho, 2020; Mishra et al., 2007; Renz & Hilbig, 2020; Zhou et al., 2005)
How new paradigms can help companies to build digital capabilities?	(Barreto et al., 2017; Li et al., 2019)
Developing digital skills in students can extend the citizen's ability in the digital world?	(Maity et al., 2021; Starkey, Sylvester, & Johnstone, 2017; Thorell et al., 2015; Yoo et al., 2010)
What skills could be developed for applying new forms of teaching in traditional assessment structures?	(Adhikari, Mathrani, & Scogings, 2016; Garcia & Calantone, 2002; Klimova & Poulova, 2015)
What studies does the literature present on IT use mechanism and its organizational implications?	(Lampert et al., 2018; Mishra et al., 2007)

Source: Elaborated by the authors (2021).

Final Remarks

The following digital capabilities are applicable to the education sector: digital enhancement capability; capability to develop learning objects; digital accessibility capability; capability to develop dominant platforms; and process digitalization capability. They can be articulated in the educational context to provide greater interaction between companies (educational institutions) and customers (students), enabling a technological vision of the business, including strengthening the implementation of more effective educational business models.

Literature presents the development of these digital capabilities emerging from different sectors. Therefore, we realize that the capabilities developed in business environments can be employed in the educational context, allowing the development of skills that provide competitive advantages through the emergence of digital solutions.

The study contributes to theory by expanding the knowledge on digital capabilities that can be used in the education sector, identifying five different capabilities. The process of mapping that identified these five digital capabilities can serve as a source for exploring these capacities in future qualitative studies, to check "how" educational institutions coordinate these capabilities practically, leading to multiple case studies.

Regarding the practical contribution, managers of educational institutions can use the mapped capabilities to develop digital capabilities internally, contributing to a better performance in changing their digital processes.

As for research limitations, one of them is the lack of exclusive focus on educational institutions or language schools, colleges, and public schools. The other limitation stems from the fact that it did not explore in more detail the methodologies applied in the sample to show the need for new studies, focused on less explored methodologies. However, it is essential to carry out a qualitative study to understand how companies that provide technological education articulate these capabilities in practice, in order to advance knowledge on digital capabilities applicable to the education sector.

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