A Mapping Study about Digital Transformation of Organizational Culture and Business Models

Eduardo C. Peixoto[1][a], Hector Paulo[1][b], César França[1][c] and Geber Ramalho[2][d]

[1]*Cesar School, Avenida Cais do Apolo, 77, Recife, Brazil*
[2]*Federal University of Pernambuco, UFPE, Av. Prof. Moraes Rego, 1235 - Cidade Universitária, Recife, Brazil*

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Abstract: According to some predictions, investments in Digital Transformation (DT) may reach US$ 6.8 trillion in 2023. Nevertheless, about 70% of DT initiatives struggle for success. In fact, few agree about what DT is, how a company becomes digital and how to measure its progress towards it. Organizational Culture and Business Models, however, are seen as key companies' dimensions. Then, in this article, we report a literature mapping study on the characteristics of Organizational Culture and Business Model in the context of DT. We also investigate how these dimensions are assessed by Digital Maturity Models (DMM). Our data reveal that the most frequent cited Organizational Culture characteristic is Organizational Learning, and that Data and People are companies' Business Models key resources in the context of DT. The selected studies did not provide enough information about how the characteristics of these two dimensions are evaluated by DMM. We concluded that companies' dimensions characteristics have not been exhaustively explored and further studies on how to evaluate them in the context of DT are needed.

1 INTRODUCTION

In August 2011, the founder of Netscape and investment fund Andreessen Horowitz published in The Wall Street Journal the article "Why Software Is Eating the World" (Andreessen, 2011). In the article, Andreessen pointed out the growing appreciation of purely software companies and the increased use and dependence on software in the operating model of many companies in different sectors. Less than 10 years later, in 2018, Apple, Alphabet/Google and Microsoft already figured as the main companies in the US capital market, dethroning the then-traditional, top of the ranking companies from a decade ago. During this period, many other digital companies caused a rapid migration of value from analog to digital markets. Nowadays, to stay competitive and defend against new entrants, being digital has become an imperative (Boulton, 2018).

Nevertheless, going through a Digital Transformation (DT) process has not been an easy task for any company. According to Tabrizi et al. (2019), 70% of all digital transformation initiatives fail.

A possible reason why companies and managers struggle in their DT initiatives is that going through a DT process is complex and therefore it affects simultaneously many company dimensions.

Teichert et al. (2019), for example, in a systematic review of the literature about Digital Maturity Models identified 15 company dimensions commonly used to evaluate a company status regarding DT.

Organizational Culture (OC) and Business Models (BM) were among the most relevant of these dimensions. "*Several surveys reported that company culture is considered as the number one hurdle to digital transformation. Hence, cultural change is a prerequisite and can become a bottleneck for digital transformation*" (Teichert, 2019). BMs, on the other hand, are strategic drive (Salviotti et al., 2019).

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[a] https://orcid.org/0000-0002-1396-7873
[b] https://orcid.org/0000-0003-0946-8462
[c] https://orcid.org/0000-0002-0863-3764
[d] https://orcid.org/0000-0001-8306-4410

According to Rogers (2016), the transformation "*is about new growth strategies and business models replacing old ones as established companies learn new ways of operating*". Other researchers associate DT with the transformation of BMs (Morakanyane et al., 2017; Schallmo et al., 2020) as well.

However, few studies explore the characteristics of these two dimensions of companies in DT. In this study, we followed guidelines for conducting a systematic mapping with aims to answer the following research questions:

1. RQ1: What are the characteristics of **organizational culture (OC)** associated to digital transformation?
2. RQ2: What are the characteristics of **business model (BM)** associated to digital transformation?
3. RQ3: How are these characteristics evaluated on **Digital Maturity Models (DMM)**?

By investigating what is in the literature about the characteristics of OC and BMs of in the context of DT, we aim to extend knowledge to help practitioners enhance their chance to succeed on DT initiatives. The results may also contribute to the elaboration of more accurate assessment of these two dimensions on digital maturity models.

In this paper, we report a literature mapping study on the characteristics of Organizational Culture and Business Model in the context of DT and investigate how these dimensions are assessed by Digital Maturity Models (DMM). In Section 2, we review some important theoretical background. In Section 3, we describe the method and procedures used for this mapping study. We also discussed the threats of our study. In Section 4, we present the results: an overview of the selected articles and our answer to the research questions. In Section 5, we present our conclusion, final considerations and give suggestions for future research. In Section 6, we list the articles used as references in this study.

2 THEORETICAL BACKGROUND

2.1 Digital Transformation

A clear understanding of what Digital Transformation (DT) is remains in considerable confusion and misconceptions. The failure to distinguish between digital transformation and its related terms (digitization and digitalization) has created difficulties for practitioners to claim authority and

responsibility for the strategy and implementation of the digital transformation of their organizations (Gong, & Ribiere, 2021; Morakanyane et al., 2017).

There are certain convergences though. Morakanyane et al. (2017) conducted a systematic literature review to reconcile several definitions on 1- what DT is; 2- what characteristics DT has; 3- what drives DT; 4- what DT impacts and 5- what are the organization transformed areas. Henceforth, we refer to DT with the semantics they have proposed:

"*An evolutionary process that leverages digital capabilities and technologies to enable business models, operational processes and customer experiences to create value.*"

2.2 Organizational Culture (OC)

Schein, E. (2010) defined OC as a collection of assumptions, norms, values, beliefs, and rules of behavior shared by employees of an organization to portray culture. It is how employees of an organization obtain a sense of identity (Alvesson & Sveningsson, 2015).

Other authors say that culture factor is how the traditions, language, and laws (or rules of behavior) held in common by a nation, a community, or other defined group of people affect people on how they behave regarding digital transformation. It is a topic of organizational behavior, which commonly includes employee attitudes, engagement, identification, commitment, motivation, and climate (Trenerry et al., 2021). Many authors say that the culture of an organization is reflected in the behavior of its employees (Al-Faihani et al., 2020).

Schein, E. identifies three different levels of OC (Artifacts, Espoused Beliefs and Values, Underlying Assumptions). Underlying assumptions are the essence of culture and represent the belief system towards behavior, relations, and reality are manifested in values that become apparent in visible artifacts such as behavior, language, or technology (Hartl, & Hess, 2017).

Artifacts describes any organizational attributes that can be observed, felt, and heard in an OC (Duerr, 2018). Exposed Beliefs and Values, in turn, refer to goals, ideals, norms, standards, and moral principles.

In the context of digital transformation, Culture is seen as the perspective of the human being in relation to changes in the digital age, both in the role of leader and author of transformations as in the role of an instrument in the new configurations of societies and businesses (CESAR, 2021).

Morakanyane et al. (2017) noticed that culture is an essential driver of successful DT in organizations. According to Schallmo et al. (2018), incompatible culture is one of the main reasons why DT initiatives fail. Some studies even suggest that the most prominent barriers to digital transformation are managerial and cultural (Jones, Hutcheson, & Camba, 2021).

2.3 Business Models (BM)

Many authors produced definitions of what a BM is (Dasko & Sheinberg, 2005), and despite the academia effort to capture its core it has been frequently confused with other popular terms in the management literature (Dasilva & Trkman, 2014). Al-Debei, El-Haddadeh and Avison (2008) reconciled several definitions, from different basis (such as value proposition, revenue sources, business logic, current and future business reality simplification, among others) to produce the following definition:

"*The business model is an abstract representation of an organization, be it conceptual, textual, and/or graphical, of all core interrelated architectural, co-operational, and financial arrangements designed and developed by an organization presently and in the future, as well as all core products and/or services the organization offers, or will offer, based on these arrangements.*"

In the 2010's, Osterwalder (2010) proposed a graphical representation named Business Model Canvas (BMC), which became later standard to represent and explain the BMs.

The BMC remains a well-known and easy to interpret representation of a BM. Therefore, for the purposes of this mapping, we considered the nine BMC elements to characterize BMs and seek for the literature on how they are cited in the context of DT.

2.4 Digital Maturity Models (DMM)

Maturity Models are tools generally designed to assess and evaluate the development of a company towards high-level productive processes. The term "maturity" refers to a state of being complete, perfect, or ready and is the result of progress in the development of a system (Morakanyane, Grace, & O'Reilly, 2017). They have become a popular management tool because they help to determine the baseline level of a company's maturity (Williams et al., 2019).

In the same sense, a Digital Maturity Model (DMM) specifically reflects the status of a company's

digital transformation (Morakanyane, Grace, & O'Reilly, 2017). It compares the company state to the ready or perfect state of a Digital Company and helps to identify gaps and can be used by practitioners to plan actions to overcome these company gaps to the digital mature state.

A DMM can be prescriptive, descriptive, or comparative. Prescriptive DMM needs to, by definition, provide actionable plans. A Descriptive DMM gives a good overview on the historical development of a company but offers little guidance on how to proceed (for planning, it is used in combination with a roadmap). In addition, a Comparative DMM allows for internal or external benchmarking and provides the opportunity to compare the maturity levels of similar business units or organizations (Kretzschmar, 2021).

Usually, a DMM has levels, dimensions, and attributes (or characteristics). Attributes are the elements of the dimension used to gauge the state of the company in relation to the perfect state of a dimension. The combined results of the state in each dimension point to the overall state, the level of the company in relation to what is being measured.

In his literature review, Teichert et al. (2019) describes 22 different DMMs, which shows that DMMs are abundant in the literature. OC and BMs appear in that work as two of the most common digital maturity dimensions.

3 METHODS AND PROCEDURES

According to Templier and Paré (2015) and Paré, G. et al. (2015), we can define literature reviews based on the review's purpose, which needs to be determined before the work is done. These ones can be to describe, test, extend, and critique.

For this article, our purpose is to examine the state of the literature as it pertains to a specific research question. Therefore, this kind of literature reviews – better known as Mapping Studies – do not aim to expand upon the literature, but rather provide an account of the state of the literature at the time of the review.

We followed the literature review guidelines proposed by Kitchenham, B., & Brereton, P. (2013) and adopted a qualitative approach centered on a content analysis of the literature (Schaller et al., Vatananan-Thesenvitz, Pulsiri, & Schaller, 2019).

The review steps are detailed in the following subsections.

3.1 Search Strategy

The search process started with a manual search in specific database chosen for their relevance to the subject, such as IEEE Xplore Digital Library, ScienceDirect, Emerald, Scopus. We basically searched for "Digital Transformation".

From this initial search, we selected a small set of candidate articles, according to their potential to answer our research questions. This initial step was conducted by two researchers, and the selection was made by consensus, based on title and abstract.

From this initial set of articles, we analyzed frequency and relevancy of technical terms that could help us to build a more comprehensive search string. These words were grouped by meaning (e.g., firm, organization, enterprise) – to assemble blocks of terms. After that, we simulated different combinations of search strings, checking if our initial set of articles were reached in the resulting lists, as a search quality control mechanism. We ended up with the search strings as shown in Table 1: Search String.

Table 1: Search String.

("review" OR "survey" OR "roadmap" OR "mapping") AND "digital" AND ("maturity" OR "levels" OR "phases" OR "progress" OR "states" OR "transformation")

Finally, applying Publish-OR-Perish (POP)[1], we used the search string (Table 1: Search String.) to perform an automatic search on "Title words" on Google Scholar and found 553 candidate articles for our research.

For this stage, we did not apply any temporal coverage, nor did we apply snowballs. All searches were automatic.

3.2 Selection Strategy

As selection criteria, we determined that the papers included in the review had to (E1) be written in English; (E2) published in peer reviewed conferences or journals, or as book chapters; (E3) be focused on OC and BM associated to digital transformation. For viability purposes, we limited our research on the period between 2017 and 2021 (the initial list with 553 studies contained 231 papers, 223 unique, that were published before 2017).

After removing duplicates, 69 articles remained, and were submitted to a full-text analysis. In this phase 12 articles were excluded because they either

(E4) do not contain answers to any of our research questions; or (E5) full text was not available.

Two researchers carried out the selection process, both of whom independently analyzed each paper. The exclusion criteria (E1 … E5) were carefully noted, and meetings were held to resolve any disagreements. Figure 1: Overview of the Selection Method depicts the search process, indicating numbers of papers at each step, for this review.
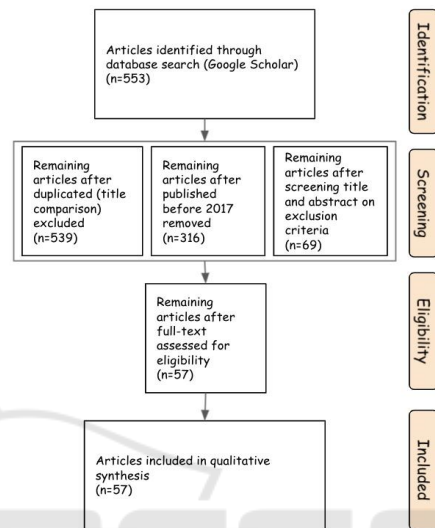

Figure 1: Overview of the Selection Method.

3.3 Validity Threats

There is a risk that we might have missed some good material because, in this specific subject, we would expected that the industry has advances as relevant as those documented in specific literature. Industry focused databases such as DUP, MIT SMR and HBR were not included in our research. To explore further and exhaust the possibilities, there are even other scientific databases not yet explored such as Emerald, Springer, JSTOR, SCOPUS, PsycINFO and ACM Digital Library that may bring different findings. Due to the novelty of the subject and the lack of confidence about the best scientific bases to search such a transversal subject, we decided on Google Scholar, because its ability to index several databases. We cannot guarantee that this is the best set of articles to look at, nor that the search will be exactly reproducible, but it returned a sensible number of articles (553).

The initial manual selection was quite arbitrary and represents another validity threat to our Method and Procedure of articles selection.

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[1] https://harzing.com/resources/publish-or-perish

4 RESULTS

4.1 Selected Studies Overview (N=57)

At the end of the search and selection process, 57 studies remained for analysis. They originated from institutions in 31 different countries, distributed in five continents. Figure 2 shows the number of articles per countries, with two or more articles. The country with the most publications was Germany (n=10), followed by Croatia (n=5) and the United Kingdom, Portugal, and Russia (n=3).

Figure 3 shows the distribution of studies per year of publication. It shows a steady increase in publications in recent years. We consider 2017 a tipping point year, because 39% more articles were published after 2017 (2017 included) than in all years prior to 2017.

Figure 4 shows the number of articles per those scientific databases, only two or more articles. We can see that the most important databases were ResearchGate, IEEE Xplore, Springer, Elsevier and Frontiers which indicates that this subject spreads in several relevant research forums.

Finally, Figure 5 shows the number of articles per publication type. Most selected papers have been published in Journals (n=27) and Conferences (n=22). A few of them were published like books (n=4), dissertations (n=2) and thesis (n=2).

The complete list of selected articles can be downloaded from https://doi.org/10.5281/zenodo.57 33316.
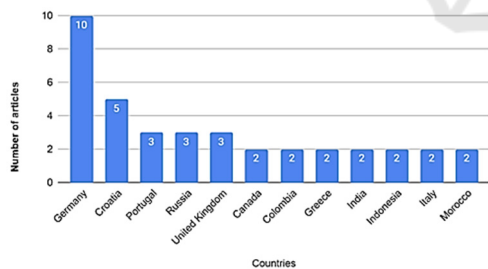

Figure 2: Number of Articles per Country.
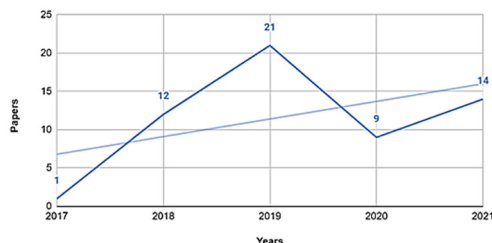

Figure 3: Distribution of Papers Included in the Review across Years.
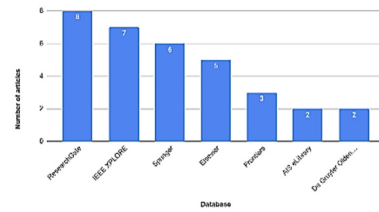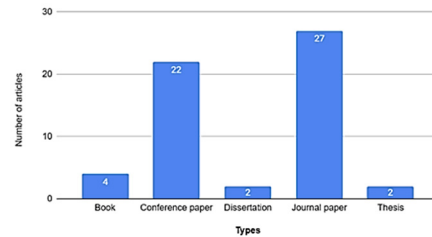

Figure 4: Studies Selected in per Database.

Figure 5: Articles per Type.

4.2 RQ1: What Are the Characteristics of Organizational Culture (OC) Associated to Digital Transformation?

Our analysis found several characteristics of OC associated to digital transformation, which means that companies' digital transformation efforts are driven to design environments that value these cultural aspects. Nevertheless, with the data we collect it is not possible to infer which factors have the greatest impact (see the complete list of OC characteristics associated to digital transformation in Table 2: Characteristics of OC associated to digital transformation.). Seventeen studies provided answers to RQ1 on a perspective of OC characteristics. We adopted the framework of Edgar Schein to organize these characteristics data according to their cultural nature.

In terms of **artifacts**, OC is described based on the use of new digital technologies (social media, mobile, analytics or embedded devices) to enable major business improvements, like enhancing customer experience, streamlining operations, or creating new BMs and ICT competencies of employees. Employees must know how to extract the best from technologies at work as we can see in the following excerpts: *"Use of new digital technologies, such as social media, mobile, analytics or embedded devices, in order to enable major business improvements like enhancing customer experience, streamlining operations or creating new business models"* [S54, p7] and "*employees need to know how technologies can be used to work, as well as how they can be used to improve the work*" [S34, p8].

The use of data science and analytics to guide business decisions (Schallmo et al. 2020) and sharing knowledge and assets (Bumann & Peter, 2019) are other examples of cultural artifacts associated to digital transformation.

Regarding **culture values and beliefs**, the research identified that about 80% of the examined studies include mention goals, ideals, norms, standards, and moral principles. For these studies, attributes like organizational learning, innovation, collaboration, customer centricity, agility and flexibility, empowerment and openness towards change are the most important characteristics.

Concerning **Organizational Learning**, companies in the context of DT may translates this value to practice through educational activities and investing in continuous learning to enhance digital skills and capabilities of employees: "*Plan and pursue massive educational activities/programs for both clients and employees*" [S06.2] and "*empowerment of employees, working in teams, and enhancing digital skills and capabilities*" [S27].

In addition, these companies pursue stimulating environments that encourages employees to experiment and learning through small, incremental, and iterative changes.

As **innovation** value, we can find the prevalence of behaviors that support risk-taking, disruptive thinking, and the exploration of new ideas: "*The culture in digitally mature firms is collaborative and more risk taking*" [S37]. These companies often fund innovation, and innovation is carried out regularly through open innovation programs extent of partnerships with external networks such as third-party vendors, startups, or customers: "... *using agile methods, involving customer into innovation process, funding innovation, innovation conducted regularly.*" [S11].

Collaboration appears associated to teamwork, cross-functional collaboration, concentrates on eliminating a sense of hierarchy to focus more on horizontal collaboration, and readiness for cooperation with external partners: "*eliminates a sense of hierarchy to focus more on horizontal collaboration that cuts across organizational boundaries.*" [S05, p9].

A **client-centric approach** refers to the orientation to focus on, and continuously adapt to, customer needs. It may imply practices such as personalized products/services, customer experience analysis, co-creation for new products, and others: "*focus on customer choice, flexibility and agility required to adjust as the customer preferences*" [S37]

and "*tracking of customers' experiences, prediction of their needs.*" [S34].

Table 2: Characteristics of OC associated to digital transformation.

Schein Level	Organizational Cultural Characteristics	References
Artifacts	Digital Technologies	[S02], [S06], [S11], [S28], [S34], [S37], [S42], [S49], [S54]
	Data-driven decision making	[S01], [S18], [S30], [S66]
	Knowledge sharing	[S01], [S11], [S26]
	Sharing assets	[S39], [S64]
Values and Beliefs	Organizational learning	[S01], [S06], [S11], [S14], [S19], [S23], [S27], [S28], [S34], [S39], [S49], [S64]
	Innovation	[S11], [S19], [S23], [S26], [S27], [S28], [S30], [S31], [S34], [S37], [S39], [S49], [S64]
	Collaboration	[S05], [S11], [S19], [S23], [S26], [S27], [S28], [S31], [S37]
	Customer Centricity	[S02], [S06], [S11], [S27], [S31], [S34], [S37], [S64]
	Empowerment	[S01], [S05], [S11], [S19], [S27], [S28], [S39]
	Agility and Flexibility	[S05], [S11], [S19], [S23], [S27], [S31], [S34], [S37], [S49], [S64]
	Openness towards change	[S01], [S05], [S11], [S27], [S28], [S37]

Moreover, it is possible to identify **empowerment** elements, in decision-making process that are taken together, allowing employees to pursue ideas and developing their capabilities: "*culture should be transformed into a culture of involvement, in which decisions are taken together ...*" [S19] and "*allowing employees to pursue ideas in an interdisciplinary and decentralized way ...*" [S39].

As a value of OC, **agility and flexibility** can be viewed as the organization's acceptance to change, and efforts applied to act and re-structure, being flexible and adaptable. Companies in the context of DT have a quickly sensing/responding to changes as strategy to gain market share and sustain their competitive advantage: "*Agility and Open Innovation are considered an essential factor for maintaining competitiveness and ultimately for the survival of a company*" [S19].

Openness towards new ideas refers to readiness to accept, implement and promote change. This kind of company maintain supportive environments for changing ways of work [S28].

Concerning values and beliefs the research identified leadership, failure culture, creativity, digital-first mindset, startup mentality and problem-solving culture.

4.3 RQ2: What Are the Characteristics of Business Model (BM) Associated to Digital Transformation?

The BM characteristics associated to digital transformation have several distinct characteristics, but one appears in intensity above all the others: it is how data appears in most elements of the BM. Moreover, the study revealed that data and people are indisputable key resources. BM characteristics were extracted from 33 papers, (see the complete list in Table 3: Characteristics of business model associated to digital transformation.).

Other characteristics of the BMs in the context of DT are also worth mentioning and are depicted in the paragraphs that follows.

Customers are either digital or non-digital, the company must deal with a much broader customer spectrum than non-digital companies. Customers, nevertheless, are embedding digital technology within their daily routine to become more informed, independent, and demanding. They can shape opinion for good of for bad and the decision-making process of others: "*An important implication of these changes is that customers no longer see themselves as captives of the firms with which they transact*" [S30].

Companies in the context of DT have a **Value Proposition** not only for customers, but for itself as well. At first, the customer in the center of the business: customer experience is a core value, and availability and convenience are sought all times: "*markets have evolved from organisational centricity, in which manufacturers and service providers largely define what to produce and market to customers; to individual centricity, in which consumers demand insight driven, customised experience*" [S62]. It delivers value through personalization and customization. Value is obtained with co-creation, through explicit actions or implicit, through data capturing and intelligently data processing. For the company itself, it uses technology and data to reduce costs for the customer.

Channels are hybrid, a mixture of physical and digital, but must be perceived as an omni channel: "*boundaries between physical and online industry*

structures, including the convergence of physical products and digital services, merging the physical world with online content, and creating an omnichannel environment for the customer" [S02].

Companies builds **Customer Relationship** in the context of DT for direct and personalized communication to customers. Customers on their side demand transparency and need to be in the center of the companies' attention: "*business transparency has become an essential requirement, as nowadays*" [S11].

Table 3: Characteristics of business model associated to digital transformation.

Business Model Characteristics	References
Customer Segments	[S01], [S02], [S6.1], [S27], [S30], [S35], [S37], [S39]
Value Proposition	[S02], [S03], [S05], [S6.1], [S6.3], [S08], [S11], [S12], [S14], [S20], [S28], [S30], [S35], [S39], [S62], [S69]
Channels	[S01], [S02], [S6.1], [S35], [S39]
Customer Relationship	[S01], [S03], [S6.1], [S6.3], [S11], [S34], [S37], [S69]
Revenue Streams	[S01], [S03], [S6.1], [S6.3], [S20], [S21], [S37]
Key Resources	[S01], [S02], [S03], [S05], [S6.1], [S6.2], [S6.3], [S11], [S23], [S29], [S30], [S32], [S33], [S34], [S37], [S39], [S42], [S49]
Key Activities	[S01], [S02], [S03], [S05], [S6.1], [S6.2], [S6.3], [S08], [S11], [S12], [S14], [S18], [S27], [S28], [S30], [S33], [S35], [S37], [S39], [S64], [S66], [S69]
Key Partnerships	[S01], [S02], [S03], [S11], [S30], [S33], [S37]
Cost Structure	[S02], [S05], [S69]

Revenue Streams are based on a service logic, which also implies lower tickets and continuous transactions. The dematerialization of physical goods into a digital remotely monitored asset enables a company to charge customers for what products deliver, instead of charging for the product itself: "*transform from a pure product business to a service business and ultimately to data-driven, outcome-based service models*" [S06.3].

Companies' **Key Resources** in the DT context are 1- digital technology, 2- data and 3- people (with digital skills leadership with soft skills). Data collected through channels, products or services, or digitized assets is used to perform micro segmentation (sometimes to the level of an

individual), or to constantly reimagine products or services to create (new) value for customers or for the company optimization: *"for instance, firms adopting digital technologies consider data streams to be of paramount importance and assign to them a central role in supporting their digital transformation strategies"* [S03].

Data is a source for better decision making and allows for value co-creation with customers or partners. Educating and training employees for digital is another **Key Activity**: *"organisations should harness the benefits of digital technologies by collecting customer data and using customer insights, for instance to predict customer behaviour and to provide tailored and personalised products and services with a better customer experience"* [S39].

Knowledge and resources sharing among companies and **Key Partners** and value co-creating with customers are good indicators of a more intense open innovation activities in DT context. The digital platforms also changed the sequential organization of a production value chain to a more dynamic and flexible network of partners: *"the value chain has become far more distributed in times of digital transformation —particularly value creation and value capture."* [S01].

Digital assets are easy to carry or replicate, and data captured allows a better coordination of physical assets and process optimization, leading to a better **Cost Structure**: *"with regard to economics, DT may result in improved firm performance and new forms of value, caused by an improved service quality or cost reductions"* [S02].

4.4 RQ3: How Are These Characteristics Evaluated on DMM?

Many of the studies investigate DMM dimensions, and sometimes, the dimension characteristics (or attributes), but very few describe how these characteristics are evaluated. From our 57 selected studies, only 6 ([S31], [37], [S38], [S39], [S42] and [S43]) contained some description of the characteristics of the OC in a digital maturity model, but none describes how those characteristics are used to evaluate a company maturity regarding digital transformation.

The same happened to BMs. Few studies ([S06.2], [S31], [S39], [S42], [S60] and [S64]) contained some description of the characteristics of the BM in a DMM, but none described how they are evaluated to gauge the maturity of a company regarding digital transformation.

We randomly dive into the cited DMM (snowball on some articles that reviewed DMM) to further investigate the issue, but without success. So, we suspect that even the articles describing the DMM do not document how the dimension and its characteristics are evaluated.

5 CONCLUSIONS AND FINAL CONSIDERATIONS

DT is a relatively new topic that can be studied in different aspects. In this study, we collected evidence that OC and BM are company dimensions that seem to be key to DT and are frequently used on DMM to gauge DT progress on companies. OC can be a barrier or a driver to the DT. To many authors, transforming the company BM is the end goal of DT. To help practitioners set and follow better transformation goals and increase DT initiatives chances to succeed, this mapping study reviewed the literature to find out how these company dimensions are characterized in the context of digital transformation. We also investigate how these dimensions are assessed in Digital Maturity Models.

This study was carried by systematically selecting and examining 57 articles. The research results indicate that several OC characteristics are associated with artifacts and values. The artifacts are associated with a use of new digital technologies to enable major business improvements like enhancing customer experience, streamlining operations, or creating new BM and ICT competencies of employees. In addition, regarding culture values and beliefs, to these studies, organizational learning, innovation, collaboration, customer centricity, agility and flexibility, empowerment and openness towards change are the most important characteristics.

Furthermore, our study reveals that, in the context of digital transformation, a successful company is a true engine that uses digital technology to continuously capture customer data, directly through their products or services, or through third-party products and services or through their customer channels, to increase customer value. In this sense, it implements a digital positive feedback loop, fed by customer data, to continually increase or create value for their consumers, which in turn allows more data to be captured. The data captured from the company's physical assets are also feedback, so that the company can improve resource usage efficiency. In other words, data is key as a resource and working with data (innovating or optimizing through it) is a key activity.

To master the use of data, companies constantly train its employees on digital technologies.

How the characteristics of these two dimensions are evaluated on DMM could not be investigated, as the selected articles for the study did not contain sufficient data to answer RQ3. Then, there is an indication that the characteristics of company's dimensions in the context of DT are not sufficiently documented in scientific papers. Nevertheless, knowing how these characteristics are evaluated is an important source to understand the state of plenitude regarding companies' DT. It is also mandatory to validate or use a digital maturity model.

We collected data from a fair number of studies from several countries (see Figure 2) and several industries. We did not selected articles based on any company characteristics, like revenue amount, market size etc. Therefore, our finds are, in principle, applicable, but not specific, to any kind of company. Researches more fine-tuned to a specific type of company (like industry or SME) may bring different results.

Although many selected articles for this study are literature reviews (and may have used articles published before 2017), more than 70% of the selected studies were published after 2018, and then are updated with the state of the knowledge.

There are some limitations we faced that threaten the validity of the results found: 1- the use of freely accessible web search engine such as Google Scholar with no guarantee that it would provide the best set of articles, nor that the search will be exactly reproducible; 2- not exploring gray databases such as DUP, MIT SMR and HBR and some scientific databases such as Emerald, JSTOR, SCOPUS, PsycINFO and ACM Digital Library.

To understand the state of completeness regarding companies' DT, future studies should deepen the analysis on how OC and BM characteristics are evaluated in DMM. An analysis on companies' other characteristics in the DT context could also contribute to the development of a clear and grounded understanding of what the companies' characteristics associated to Digital Transformation are.

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