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Strategic capabilities for business model digitalization

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Abstract

Purpose – The purpose of this paper is to understand the association between the capacity to use enterprise architecture tools and the effectiveness of business model digitalization in companies.
Design/methodology/approach – The authors used two research strategies – survey and focus group – to analyze the relationship between maturity in using enterprise architecture (EA) and digital maturity, under the perspective of sociomateriality.
Findings – The use of EA is not a strategic competence that contributes to building sustainable competitive advantage, in the process of business model digitalization. On the other hand, top management's determination and clarity, expressed by its sponsorship to communicating the strategy, contribute to the integration, engagement and adaptability of those involved and are responsible for higher maturity in the digitalization of business models.
Research limitations/implications – The statistical treatment used does not allow understanding the causality between the variables.
Practical implications – It provides executives with important elements for clarifying and operationalizing digital business models.
Originality/value – The study operationalizes a theoretical and measurement model, through a strategy that used simultaneously a survey and a focus group, which allowed to know associations between technological capacities and maturity in digital business models.

Keywords Maturity in digital business models, Enterprise architecture, Sociomateriality
Paper type Research paper

Introduction

Digitalization was initially described as the conversion of analog processes into digital (Negroponte, 1995); however, with the extreme reduction of data processing, storage and transmission costs over decades, through increasingly sophisticated software, it has proven to be much more than that. It has modified countless forms of human work and strongly influenced the traditional foundations of the economy, with the emergence of new business models (Loebbecke & Picot, 2015). Some researchers consider it responsible for the emergence and disappearance of companies, with direct impacts on business competitiveness (Bleicher & Stanley, 2019; Valenduc & Vendramin, 2017).

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Executives also question how firms can achieve or keep a competitive advantage through digitalization, as traditional models, focused on static or dynamic resources, were built with assumptions that are not valid in today's digital environments (Loebbecke & Picot, 2015).

The range and social impacts of digitalization of business models can be understood by Katz and Koutroumpis's description (2013, p. 314), that it "encapsulates the social transformation triggered by mass adoption of digital technologies that generate, process, and transfer information". However, we cannot disregard the need for differentiated competencies for it to occur. Such competencies are strategic resources responsible for building and keeping competitive advantage (Porter, 1989), in the process of changing a conventional (or analog) business model into a digital one (Loebbecke & Picot, 2015; Ritter & Pedersen, 2020).

Digitalization in organizations, through digital business models, demands skills associated with individuals, processes and structure (Ritter & Pedersen, 2020). To achieve it, change agents need to be informed, know and understand the key requirements and principles of both models, the current and the future (intended by the company); this is not simple, as these characteristics often express immaterial dimensions (Goerzig & Bauernhansl, 2018).

Among the different technologies that contribute to the analysis and implementation of organizational strategies, enterprise architecture (EA) stands out, especially in digitalization, for translating the strategic business vision into business changes, through the creation, communication and improvement of key requirements, principles and company's models (Zaidan, 2015; Gartner, 2013). It comprises, among other definitions, a coherent set of principles, methods and models that are used in the design of the organizational structure, including business processes, information systems (IS) and infrastructure (Lankhorst, 2012). It brings a holistic view of the organization, allowing managers to act proactively toward the intended results (Gartner, 2013).

For Valenduc & Vendramin (2016), ignoring the existence or effectiveness of approaches such as EA can lead to business models' obsolescence or hinder their change, affecting organizations, especially those that compete with disruptive models in their sectors.

There are other views on EA's usefulness and reach, which stem from its various definitions (Saint-Louis, Morency & Lapalme, 2019). Nandico (2016) and Goerzig & Bauernhansl (2018) confirm Valenduc & Vendramin's (2016) observations, as they also show that it can contribute to creating sustainable competitive advantage, when used in the process of organizational modeling, by determining the logical components to use in applications, with their respective services, according to the established scope.

Research on EA's range, as a differentiated resource capable of creating sustainable advantage and not just an operational or tactical instrument (Venkatesh, Mathew & Singhal, 2019), fills a gap in the literature, besides helping organizations digitalize their business models accordingly.

Based on this context, the research guiding question emerged: *What are the associations between the capacity for using EA and the effectiveness of business model digitalization in companies?*

For operationalizing the research and ensuring its consistency and feasibility, we used the conceptual framework of sociomateriality as a basis, which helps understanding how the material part (a computer, a tool, any artifact), the people (the users of the material part) and the social context, in its time–space dimension, where different dimensions are present, intertwine for enabling the emergence of a technology (Leonardi, 2012; Orlikowski, 1992; Orlikowski & Scott, 2008).

To make the association of the variables "capacity to use EA" and "effectiveness of digitalizing business models" operational, we built a theoretical and measurement model that used the measures arising from the maturity of EA's use and digital maturity, which we present in the methodological procedures (Section 3).

In order to empirically assess the elements mentioned above, we carried out a survey in the financial services sector, with 92 experts in the use of EA and digitalization of business models, from a population of 1,300 identified professionals. Results were treated through multivariate analysis (ANACOR). Later, in order to deepen the opinions, we held a focus group with six executives from the chosen companies, whose content was recorded, transcribed and evaluated by content analysis (Bardin, 2011). We present and discuss the results in Section 4, followed by conclusions and final remarks.

Theoretical background

Sociomateriality

Sociomateriality was originally conceived for the area of IS, within an information technology (IT) context, and stands out for enabling to subtly express how the intertwining between the social and the technical in building technologies and their roles occurs, in the social contexts where they operate; thus, it has been increasingly used, as the world has become more and more digital (Cecez-Kecmanovic, Galliers, Henfridsson, Newell & Vidgen, 2014).

Sociomateriality defines the interaction between human agency (intentionality) and material agency (materiality, or agency of things) in organizational life. It considers materiality intrinsic to daily practice and assumes that organizations and technology only exist through "their temporally emergent constitutive entanglement" (Orlikowski & Scott, 2008, p. 455). The sociomaterial perspective is opposite to the ontological separation between people and technology as essentially autonomous entities that influence each other (Slife, 2004).

Material agency and human agency saturate each other because limits previously taken for granted are dissolved (Orlikowski & Scott, 2008). Based on the concept of performativity (Barad, 2003), materiality consists of executed relationships and not as preformed matter. Therefore, material agency emerges through impure dynamics that are "situated within a space of human purposes, goals, and plans" (Pickering, 1993, p. 577).

A key challenge in digital innovation is understanding how to act to introduce a new form of materiality into an established deployment of sociomateriality. Digital innovation emerges from the agency's extended dialectical dance, defined by resistance and accommodation between two distinct forms – material agency and human agency (Pickering, 1995, p. 22).

Enterprise architecture

EA is understood in several ways: for some, it is the IT unit's contribution to the successful execution of a company's dominant logic (Smith, Watson & Sullivan, 2012); for others, it is a comprehensive description of all key elements and relationships that make up an organization (Kang, Lee, Choi & Kim, 2010); or, still, a systematic and structured instrument to guide the development of the ICT scenario and provide a holistic view of the organization (Janssen, Klievink & Chun, 2012).

Gartner Consulting Firm (2013) defines EA as the process of translating the business vision and strategy into effective business changes, by creating, communicating and improving the main requirements, principles and models that describe the future state of the company and allow its evolution. It establishes a technological context that contributes to the organization's strategic positioning, by determining a digital apparatus capable of providing better answers to the needs of companies that undergo continuous changes in the business environment (Open Group, 2018).

In summary, EA defines concepts of digital value creation, contributing to a holistic view of the process, which allow us to make the most of digital opportunities, since through it we can build models and assess methods and tools (Goerzig & Bauernhansl, 2018).

From a practical standpoint, the use of EA aims to optimize, throughout the organization, the legacy of processes, often fragmented (manual and automated), in an integrated environment that responds to changes and supports business strategy (Open Group, 2018). Executives are driven by the optimization/maximization of value delivery in organizations, and the effective use of information and business transformation from conventional into digital processes are key factors for their success and are increasingly perceived as indispensable means to achieve competitive advantage.

To enable the adoption of EA, The Open Group Architecture Framework (TOGAF), one of the standards used, was developed through the collaborative efforts of the entire *Open Grou*p community, composed of several consulting and technology firms. The usage of TOGAF standard leads to a consistent EA that reflects stakeholders' needs, uses the best practices and considers both current and future business requirements (Open Group, 2018). The language pattern used by the Open Group is ArchiMate, developed by a group of researchers with the intention of making it an open standard. It prioritizes the consistent alignment of the organization's abstraction layers (business, systems and infrastructure) (Lankhorst, 2012).

Despite the robust backgroup, according to a study by Gartner (2020), nearly two-thirds of EA projects were never successful, which led to the use of maturity models in EA to help understanding how different techniques, technologies and competencies associated with EA can contribute for better results. What has been observed, in light of the analyses performed, is that the real challenge for organizations is to develop a viable EA implementation path for achieving the expected benefits (Périe, 2014).

There is a recurrent issue in organizations that use EA and in the studies carried out so far. On the one side, it contributes to defining a structured proposal for value delivery (Frank, Mendes, Ayala, & Ghezzi, 2019); on the other side, it is considered very complex and responsible for the slowness of the transformation processes, which is incompatible with the digitalization of business models, especially for small and medium-sized companies (Goerzig & Bauernhansl, 2018).

Digital economy

Digital Economy is more than a subdomain of industrial economy, and it does not only review classic issues of industrial economy, such as online prices, differentiating strategies between physical and online offers, regulation of the digital market or the effect of advertising; it addresses new research issues such as platform economy, big data and privacy (Einav & Levin, 2014).

Digital technologies affect the economy in several ways, both through their reflexes on basic industries, which end up being exported to other markets, and on support industries, meeting local needs (Beira, 2002). The effects of digital technologies on basic industries stem from various demands, such as the demand for intellectual and human capital for local markets, in addition to financial capital (Silva, 2019).

The second type of economic impact occurs when digital technologies make economies and organizations more efficient. Through them, needs are identified, resources allocated and goods produced quickly and with lower indirect costs. All of this is possible because digital technology is a form of capital, replacing labor and other forms of capital, including equipment, facilities, materials, etc. (Beira, 2002). Digital technology changes the nature of capital and labor: The former becomes more intangible and the latter more intellectual. Therefore, companies that are based on traditional tangible assets are losing value compared to companies based on intangible digital assets.

The third type is the even deeper economic impacts, arising from two basic aspects of digital technology (Beira, 2002): digital products are easy to customize and cost next to nothing to reproduce; and the value of digital goods depends on connections to other digital

goods. Hence, digital economic activities tend to be more distributed, although grouped, than analog production and are organized in a less hierarchical way, much more flat and open.

Digitalization and digital maturity

According to Chanias & Hess (2016), digital maturity is the "status of a company's digital transformation" and describes "what a company has already achieved regarding its digital transformation efforts". The efforts include changes implemented from an operational point of view as well as capabilities acquired for mastering the transformation process. Thus, many digital maturity models (DMMs), offered by consulting firms, "measure" the current level of a company's digitalization, in addition to providing a trajectory model for digital maturity. Such models are subject to criticism and inaccuracies, due to the lack of deeper studies.

Gill & VanBoskirk (2016) created the 4.0 DMM, better known as the "Forrester construct" (Forrester Research Inc.). This model shows four different levels of maturity: skeptics, adopters, collaborators and differentiators: (a) skeptics are slow companies in relation to technology – focused on robust financial services, telecommunications and public-sector firms – that have little experience in innovating or applying an external approach to strategy; (b) adopters have greater digital practice and are willing to invest in the basic architecture they need to achieve their goals; (c) collaborators, regardless of their size, cooperate internally and externally to implement digital practice and innovation and (d) differentiators are organizations that have a strong revenue growth, tend to sell only or with a strong focus on e-business and are more skilled than the average in all marketing and e-commerce functions, including management, customer insights and direct marketing.

Thordsen, Murawski & Bick (2020) suggest that a DMM should observe the following aspects: (i) the dimensions of digital maturity, (ii) the procedure for measuring digital maturity and (iii) the model's positioning in relation to existing theories.

Ryan, Fenton, Ahmed & Scarf (2020) investigated digital maturity in the event industry, under four dimensions (business culture, technology use, organization support and data insights), using the Forrester construct. This study used information from 52 professionals in the field and revealed a low level of digital maturity in this industry.

Ifenthaler & Egloffstein (2020) developed a DMM for educational organizations, by assessing six dimensions: infrastructure, strategy and leadership, organization, employees, culture and educational technology. The model procedures focus on people, with a multidimensional targeting function.

Valdez-de-Leon (2016) presented a DMM for telecommunications service providers, with seven dimensions: strategy, organization, customer, technology, operations, ecosystem and innovation. Based on these dimensions, digital maturity can be qualified from the lowest level (not started) to the highest level (pioneer, when the organization is adopting new paths).

In contrast to this author, Mettler & Pinto (2018) observe that, as technology continuously evolves, and there are very few cases that reach a stage of final perfection, digital maturity is a relative concept, as far as work environment and time are concerned. That is, it improves or worsens over time (thus, the status of "pioneering" is momentary). For example, the authors show, by assessing digital maturity in healthcare, that hospitals have a strong internal focus, and digitalization is implemented reactively.

Tadeu, Duarte & Taurio (2019) researched digital maturity through a survey with 246 Brazilian executives and evaluated 10 dimensions: (i) digital strategy, (ii) digital technologies, (iii) analytical and predictive skills, (iv) customer relationship, (v) network relationship, (vi) organizational structure and digital processes, (vii) people and culture, (viii) risks and investments, (ix) legal and ethical aspects, and (x) new digital business models. The results showed a strong commitment of executives and organizations toward digitalization, but

digital transformation in these organizations still faces several challenges, such as organizational culture, operational structure, availability of resources and regulatory aspects. They concluded that there are also difficulties in carrying out tests, or pilot experiences, although some of these companies already have units or sectors responsible for digital transformation projects.

Thus, DMMs are tools to define the current and expected maturity stages; however, they are not prescriptive, as they do not suggest a better way to reach the goal. Therefore, complementary tools must be developed to help define the paths of digital transformation.

Methodological procedures

From the literature review, we were able to establish a conceptual model that articulates maturity levels in the use of EA and maturity levels of business models in the digital economy in financial organizations, through sociomateriality.

Measures

To measure maturity in EA, we employed the U.S. Government Accountability Office (GAO) construct (Hite, 2002), developed by the U.S. Government Accountability Office, and widely used in empirical research. GAO identifies five stages for measuring maturity in the use of EA. The first stage shows awareness regarding EA; the second assesses the basis for managing EA, comprised of people, leaders, technologies, professionals' level of qualification, etc.; the third adds formal policies and documentation to ensure the continued use of EA; the fourth stage completes the products' architecture, evaluating the adequacy of investments for the intended purposes of EA and the fifth stage manages the change, establishing a steering committee for EA, and metrics to evaluate its benefits.

We measured digital maturity by using the Forrester construct (Gill & VanBoskirk, 2016), which has already been tested in several studies and meets the purposes of this research.

Research strategies

The empirical approach used two complementary strategies to understand the process of sociomaterialization of business model digitalization. At first, through a survey, whose objective was to know experts' perception about the maturity levels or stages in the use of EA, and the stages of digital maturity in organizations that used EA. Then, we held a focus group with executives who were also experts in the tool.

Questionnaire preparation

The questionnaire contained three groups of information: The first aimed to identify the respondents, their expertise in the topics involved, their function, type of company where they worked, etc.; the second sought to identify the level of maturity of EA used in the company and the third referred to the maturity of business model digitalization at the organization.

The questionnaire was previously tested and validated by a group of eight experts who did not participate in the final sample. Questions related to the stages of maturity are presented in Appendix, which was made available to respondents through individual links.

Sample definition and application of questionnaires

We chose the sample by convenience, since they are professionals with very specific profiles and, at the same time, highly skilled. Hence, we chose to access them through the corporate social network LinkedIn. Respondents were identified by LinkedIn's SalesNavigator tool, considering all positions of Directors, Managers, Analysts, and Specialists, and the word

"Architecture" in their working environment, with information on the company sector, size (based on SEBRAE's criteria, 2017), the origin of the capital, the respondent's position, time in the company and how long he/she had been using EA.

Through the researcher's LinkedIn tool, 1,300 profiles were located and the following filters were applied to search for professionals: (i) location: the whole national territory (Brazil); (ii) sector: banks, insurance, investment banking, financial services, other segments; (iii) level of experience: executive director, directors, managers, partners, owners, seniors, vice-presidents; (iv) position: business architect, project architect, systems architect, software architect, solutions architect, senior solutions architect, IT architect, senior architect, architecture director, information architecture director, systems architecture director, solutions architecture director, director of information technology architecture, director of enterprise architecture, architecture specialist, systems architecture manager, solutions architecture manager, IT architecture manager, enterprise architecture manager and technical architecture manager.

From January 2019 to April 2019, we sent a message to all previously identified professionals with information on the research and its main objectives. We used LinkedIn and sent individual links, in order to minimize the possibility of the questionnaires being answered by other people. Of the 1,300 contacted, we got responses from 750, but only 120 were complete. We assessed them, and 92 were valid, according to the established criteria.

Survey data analysis. We assessed the data through a multivariate statistical methodology, analysis of variance (ANOVA), using the measure of proximity χ^2 and the perceptual map. Such methodology is suitable for evaluating associations between two variables, represented by categories. ANOVA is one of the most used tools for this type of study, as it is a statistical approach capable of examining observed differences in group means (based on expected variances) and unexplained variances due to chance, for example (Fukushi, 2017).

Conducting the focus group

For the focus group, we selected six participants with professional profiles (Directors, Managers and Senior Experts, who use EA and are involved in the processes of digitalizing business models), who allowed us understanding the phenomena that occur due to the use of technologies and their contribution to the development of digital business models. Participant 1: country manager of the open group, Participant 2: technology manager, Participant 3: enterprise architect, Participant 4: infrastructure manager, Participant 5: enterprise architect and Participant 6: ADM leader.

Based on the statistical analysis previously carried out, we prepared a report that we sent to focus group participants, clarifying the research objectives and providing conceptual elements on sociomateriality. In addition, participants had access to the first conclusions of the statistical analysis done with the survey data, in order to have time for reflecting on eventual causes/motivations that led to those findings.

The focus group activity was carried out and recorded through Skype Business conference on July 5, 2019, from 10.30 a.m. to 12.00 p.m. (Brasília time), then transcribed and used to get evidence.

Focus group analysis. The transcribed content of the interviews was submitted to content analysis, following Bardin (2011), in four stages: preanalysis, coding, categorization and inference. The preanalysis consisted of preliminary reading procedures and formulation of questions relating the elements of maturity levels (EA and digital economy). As for the coding phase, we defined the rules for text cut from elements identified in the literature review, in order to consider them as evidence to answer the research question.

The focus group aimed to identify the elements that would allow showing the process of sociomateriality of the digitalized business models, in contexts that used EA.

Results and discussion

Survey results

Among the questionnaire respondents, 63% worked in national capital companies and 37% in foreign capital companies; 40% worked in banks, 14% in insurance companies and 46% in other segments (we used this classification to characterize the results for companies).

Through multivariate analysis techniques (ANOVA), we evaluated associations between different variables collected in the questionnaires. We identified statistically significant relationships between origin of capital and company segment, between company size and segment and between origin of capital and time of involvement with EA, as shown in Table 1.

There is a statistically significant association (that is, the association cannot be considered random) between company size and segment, origin of capital and segment, origin of capital and time of involvement in EA projects and company segment and time of involvement in EA projects.

We also observed the perceptions on the levels of digital maturity and the use of EA in the organizations where respondents work. Based on the answers, 37% of the firms are at the basic level, where there is no maturity (zero level); 30% are at the first maturity level; 18% at the second; 1% at the third; 2% at the fourth and 11% at the fifth maturity level. Considering the results for the same companies, from the perspective of their digital maturity, 15% fall into the first level of digital maturity, 47% are at the second level, 33% at Level 3 and 5% at Level 4. Table 2 summarizes this information.

We could not confirm the association between maturity in the use of EA and digital maturity because the sample did not show statistical significance ($p = 0.156 > 5\%$), as shown in Table 3.

Through Pearson's correlation coefficients, we observed the low degree of association between the EA maturity and digital maturity variables. These values represent a

Table 1. χ^2 values statistically significant

Analyzed relationship	Degree of freedom	χ^2	Pr
Company size × segment	8	20.0234	0.010**
Origin of capital × company segment	2	9.7698	0.008**
Origin of capital × time of involvement in EA projects	2	5.7375	0.057*
Company segment × time of involvement in EA projects	4	13.4538	0.009**

Note(s): *Significant $p < 0.05$/**significant <0.01

Table 2. Correspondence between EA maturity and digital maturity

	Maturity in EA						
Digital maturity	0	1	2	3	4	5	Total
1	4	7	2			1	14
2	18	13	7	1		4	43
3	10	8	8		1	3	30
4	2				1	2	5
Total	34	28	17	1	2	10	92

Table 3. χ^2 values obtained in the correspondence analysis between enterprise architecture maturity and digital maturity

	Degree of freedom	χ^2	Pr
Enterprise Architecture Maturity × Digital Maturity	15	20.4199	0.156

Note(s): *Significant $p < 0.05$/**significant <0.01

preliminary reference to the existing relationships between the main variables used in the research, as to the influence of EA maturity on digital maturity; that is, the correlations indicate that EA maturity does not affect directly digital maturity. We noticed that there are companies digitally mature, but with no maturity in EA.

Figure 1 helps to understand the impossibility of asserting the existence of a correlation between levels of digital maturity and use of EA, since it shows organizations with very low levels of EA maturity (zero level), but which are already at Stage 2 of digital maturity. It also shows that there are companies at Stage 1, both in EA maturity and in digital maturity, and others at Stage 2 of EA maturity and Stage 3 of digital maturity.

Focus group: the influence of enterprise architecture in the digitalization process of business models

The second stage of the empirical approach was the use of focus group, which showed, through experts' perceptions, how the process of sociomaterialization occurs in the digitalization of business models, considering the use of EA.

The Focus Group approach used the perspective of sociomateriality, regarding two principles: EA maturity and digital maturity.

As for the maturity in the use of EA, we studied the factors that influence it; in the participants' perception, it is directly associated with governance elements that aim to ensure its use. On the other hand, digital maturity is more strongly associated with cultural barriers, beliefs and values, which may or may not contribute to a higher level of maturity. Participants did not disregard the relevance of the whole technology apparatus that supports the processes of digitalization of business models, but, in their perception, this is not the main factor for the success of this process.

The answers from the focus group partially confirmed the evidence achieved through the questionnaires and statistical analyses. According to the participants, EA can be useful in digitalizing business models; however, for this to happen, top management's sponsorship is

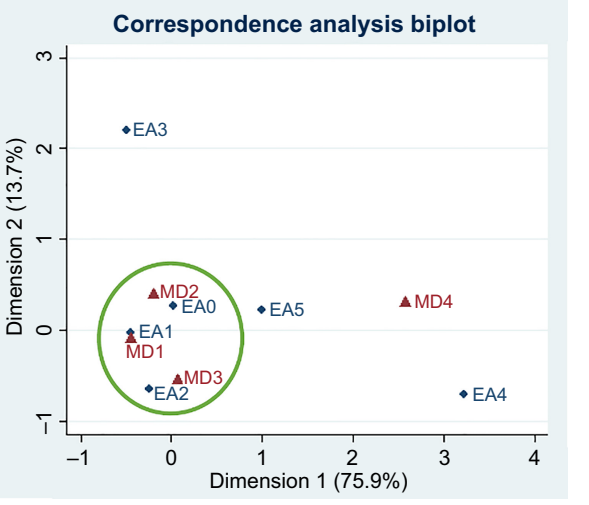

Figure 1.
Biplot correspondence analysis

Note(s): Number of observations = 92; Pearson Chi² = 20.42; Prob > Chi² = 0.1564; Total inertia = 0.2220; Number of dimensions = 2; Inertial exploration = 89.52

essential, especially because it demands a lot of work. This finding confirms the statements by Schneider, Smith, Taylor & Fleenor (1998) who consider that the precursor and leaders' profile and values, in addition to the organizational culture, influence and lead to the relative similarity of members' profiles.

Another relevant aspect is that the lack of investments in communication and in efficient ways to share the digitalization process among people from different departments, to inform that it is built by those involved, can lead to a false understanding that the use of technologies provides ready-made solutions. This confirms Pickering (1993) for whom technology cannot be seen as something turnkey, but shaped by human beings within a network of relationships and artifacts. The author (p. 20) further states that material agency emerges through impure dynamics, which are "situated within a space of human purposes, objectives, and plans".

Result discussion: integration of evidence achieved through the survey and focus group

Evidence obtained in the empirical research does not allow us to state the existence of an association between higher levels of maturity in the use of EA and higher levels of maturity in the digitalization of business models. However, according to the perception of experienced executives involved in such activities, EA can contribute to the development of digital business models, if used correctly.

On the other hand, to reach an EA satisfactory level of maturity, the company must be aligned with its principles; thus, it is necessary, above all, the sponsorship of top management and its influence throughout the organizational structure, a fact considered critical by research participants. The need for excellent relationship, communication and engagement of people in different areas of the company was also expressed (in order to break the various "silos"), and they are aware of the relevant value that EA can add to the company. Furthermore, there is a perception that the performance of the chief architects of EA is one of the central elements for promoting an appropriate awareness of those involved, which confirms Schneider *et al.*'s results (1998).

In light of the results, we can say that, for the process of business model digitalization, based on sociomateriality (Orlikowski, 2007), intentionality or, in other words, the human agency is what enhances the material attributes and makes them integrated or not to the social technologies that are built, that is, to digital business models.

Conclusions and final remarks

This study answered the following research question: *What are the associations between the capacity for using EA and the effectiveness of business model digitalization in companies?* and was operationalized empirically through the use of maturity scales for EA and digital maturity.

The research strategies used – survey and focus group – contributed to the understanding and analysis of the relationships between maturity in the use of EA and digital maturity, with sociomateriality as the theoretical lens.

The statistical analysis of the data obtained from the survey enabled us to state that there was no statistically significant association between maturity in the use of EA and digital maturity, among the sample respondents.

On the other hand, the specialist executives who participated in the focus group realize that EA can contribute to the efficient development of the company and of digital models, if used effectively. And to reach a higher level of digital maturity, the organization needs to be aligned with the principles of EA, that is, it must have a governance structure that ensures its use and the strong sponsorship of top management, in order to communicate the value that can be achieved from its use. Executives also perceive that higher levels of digital maturity

are associated with top management sponsorship, clear strategic orientation, adaptability, communication and people engagement in the company's different departments.

The sociomateriality perspective contributed to the understanding that the commitment and engagement of those involved, the sponsorship of top management and awareness are attributes considered as part of human agency, that is, intentionality, and that it has a predominant role in building social technologies, a group in which digital business models fall. Although there is little or no materiality arising from the use of EA in some organizations that took part in the research, intentionality moved organizational resources toward digital business models.

Based on the research results, we conclude that the use of EA is not considered a critical strategic competence for building sustainable competitive advantage. However, top management's determination and clarity, expressed by its sponsorship and explicit positioning as to the expected strategic objectives, seem to make others involved use their capabilities, through adaptation, integration and engagement, perceived as responsible for higher maturity in business model digitalization. These results strengthen the importance of managerial skills for defining, communicating and managing strategy in building competitive advantage.

Finally, in view of the achieved results, we suggest further studies to deepen the understanding on the relationship of strategic competencies that contribute to the maturity of digital business models, using, for example, the conceptual framework of dynamic capabilities (Teece, Pisano & Shuen, 1997; Kump, Engelmann, Kessler & Schweiger, 2019) or the approach of coercive or enabling bureaucracies (Adler & Borys, 1996).

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Appendix
Stage of Maturity in the use of Enterprise Architecture

Stage 5
There is a written/approved policy for keeping EA.
The EA steering committee and the council approved EA investments
There are metrics for measuring EA benefits

Stage 4
There is an approved policy for investments in technology with EA
The sequencing plan describes the company's current and future environment
The policy is approved by the Information Director

Stage 3
There is a written/approved policy for developing EA
EA products are under configuration management
EA products describe de company's businesses, data, applications and technologies
EA products describe the current and future environment

Stage 2
There is a committee responsible for EA
There is an EA central office
There is a Chief architect
EA uses automated tools
The plans describe the businesses, data, applications and technologies
The plans describe the current and future environment

Stage 1
The organization is aware of EA

Stage of Digital Maturity

Culture
C7 – We believe that our competitive strategy depends on a digital approach
C6 – Our Administrative Council and our Executive Directors support our digital strategy
C5 – We have the right leaders to implement our digital strategy on a daily basis
C4 – We invest in education and digital training targeted at all levels of our organization
C3 – We communicate our digital vision clearly, internally and externally
C2 - We take calculated risks to enable innovation
C1 – We prioritize the customer's general experience regarding the performance of any individual channel

Organization
O7 – Our organizational structure prioritizes customer journeys over functional silos
O6 – We dedicate appropriate resources to digital strategy, governance, and implementation
O5 – The team that supports our digital functions works with the best market practices.
O4 – We have digital skills incorporated to our whole organization
O3 – Our organization model encourages interfunctional collaboration
O2 – We define and repeat processes to manage digital programs
O1 – Our partners (suppliers) add value that improves our digital competencies

Technology
T7 – Our technology budget allows the change of priorities quickly
T6 – Our marketing and technology resources work together to cocreate our digital technology script
T5 – We have a flexible, iterative, and collaborative approach for developing technology
T4 – We take advantage of modern architectures (APIs, cloud, etc.) to achieve speed and flexibility
T3 – We measure our technology teams by business results, and not just by the applications uptime
T2 – We use customer's experience resources, such as personas and travel maps, to guide our technology project
T1 – We use digital tools to promote innovation, collaboration, and employee mobility

Perception
P6 – We have clear and measurable goals for assessing the success of our digital strategy
P5 – All employees understand how their performances are linked to the corporate digital objectives
P4 – We use metrics centered on the customer, such as the *Net Promoter Score* or the lifetime value, to measure success
P3 – We measure how channels work together to achieve an intended result
P2 – The customer's perception guides our digital strategy actively
P1 – Customer perceptions direct the design and development of the digital platform

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