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CONCRETISING THE HAZY LINK BETWEEN DIGITAL BUSINESS MODELS AND DYNAMIC CAPABILITY IN THE AGE OF INDUSTRY 4.0: A RESEARCH AGENDA

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Abstract

Following three industrial revolutions, today, we have been experiencing the fourth industrial revolution, widely known as "Industry 4.0". In the age of Industry 4.0, digitalisation is of great importance since it fundamentally sparks off incorporating different technologies and transforms traditional business models into digital business models. In this shift, among various approaches, adopting the dynamic capability principles is especially critical for organisations due to its inherent nature of anticipating changes and responding to ever-changing conditions. This being the case, in order to keep up with the recent changes in the business ecosystem and to achieve competitive advantage, developing existing capabilities and providing new capabilities- digital and non-digital- become indispensable for the redesigned business models of organisations. Yet, on this matter, the extant literature remains vague for revealing the link between these two concepts. Accordingly, this research aims to concretise the hazy link between the concept of digital business model and the dynamic capability approach. Consequently, the current state analysis conducted in this research sheds light on the key role of dynamic capabilities in digital business models, which was insufficiently discussed by previous researchers. Additionally, the outcomes and proposed research agenda hold a potential to pave the way for focusing more on extant and emerging capabilities that organisations need to possess while implementing digital technologies.

Keywords: *Competitive Advantage, Digital Business Models, Dynamic Capability, Industry 4.0.*

1. INTRODUCTION

To date, the business environment has gone through four industrial revolutions. Among these, steam engines initiated the first industrial revolution while incorporating electric energy stimulated the second (Buhr, 2015) and information and communication technologies accelerated the third revolution (Barreto et al., 2017). Today, in the fourth industrial revolution, originated in Germany, various digital-based technologies, such as cyber-physical systems, big data, internet of things, internet of services, cloud computing, are placed at the centre of different research. In general, emerging digital technologies in this revolution have removed the boundaries between the place of production and the place of consumption. Besides that, new technologies have also paved the way for new practices to be used by organisations. As a result of these progresses and potential opportunities, the fourth industrial revolution, commonly known as "Industry 4.0", has received particular attention by both academics and practitioners in the business domain.

On the other hand, despite this growing interest, there is still a lack of understanding in the society regarding the concept and technologies of Industry 4.0 and, therefore, there is a need for clarification of Industry 4.0-oriented advancements (Alcácer and Cruz-Machado, 2019). More specifically, on the practical side, it is imperative to consider the effect of changes stemmed from digital technologies on business models. In this sense, the emerging nature of Industry 4.0 needs to be appropriately adopted by decision-makers in organisations since applying a holistic strategic perspective is critical for the fit of approaches into the proposed digital business model innovations (Loonam et al., 2018). In this need, as Teece (2017) underlined, possessing strong dynamic capabilities is key and helps organisations to obtain competitive advantage. However, there are insufficient discussions on what skills and abilities are needed for these emerging technologies (Freitas Junior et al., 2016). That is to say, the literature on business model change towards digitalisation and adopting the dynamic capability approach is still in its infancy (Witschel et al., 2019) and, as such, reveals vagueness about the link between these both concepts. Accordingly, this exploratory research sets out to concretise the hazy link between the concept of digital business model and the dynamic capability approach.

In order to achieve this research aim, the paper is organised as follows. In Section 2, the background information on digital business models and the dynamic capability approach is shared while in Section 3, the current state of the intersection of both concepts is discussed and

a research agenda is proposed. Finally, the research is concluded with remarks and insights into the discussed subject matters.

2. THE BACKGROUND OF THE LINK BETWEEN DIGITAL BUSINESS MODELS AND DYNAMIC CAPABILITY

In this section, the shift from traditional to digital business models is initially explained and, then, the dynamic capability approach is introduced. Overall, the noted discussions in two sub-sections provide a basis for understanding the link between these concepts, which leads up to a proposal of a research agenda, as indicated in the following section.

2.1. From Traditional to Digital Business Model

First of all, it is worth noting that there is no widely accepted definition of the business model concept and definitions vary depending on the purposes of researchers. Nevertheless, there are also several common points highlighted by different researchers. For instance, according to Osterwalder and Pigneur (2010, p. 14), a business model describes "*the rationale of how an organization creates, delivers, and captures value*". In a similar vein, Teece (2010, p.191) stated that a business model *"describes the design or architecture of the value creation, delivery and capture mechanisms employed*". As can be deduced from these broadly mentioned descriptions, there is a general consensus among academics and practitioners that it is a strategic tool to enable organisations to hold competitive advantage, although various expressions exist on the definition of a business model.

Fundamentally, after introducing information and communication technology in the third industrial revolution (Barreto et al., 2017), the fourth industrial revolution emerged as the combination of physical and network structures (Maslarić et al., 2016). The elements of Industry 4.0 allow organisations to gain strategic advantages over others, and to become (or remain) competitive in their sectors. The information technologies developed during this revolution, especially the digitalisation of production, consumption, and manufacturing, have changed the conditions of business ecosystem by enabling faster as well as more efficient exchanges of knowledge and information. Failing to follow these advances can make organisations decline and lose their competitiveness. Therefore, today, organisations strive for redesigning their business models by following these changes and are in quest for implementing applicable digital technologies in their digitally-driven business models.

Although diverse technological developments have recently occurred in business models with a shift from traditional to digitally-driven models (Jerman et al, 2019), the non-uniformity

is also same in the definition of a digital business model. To exemplify, Weill and Vitale (2001, p.34) characterised e-business models as "*a description of the roles and relationships among a firm's consumers, customers, allies, and suppliers that identifies the major flows of product, information, and money, and the major benefits to participants*". In parallel, the differentiating characteristics of digital business models were generally summarised by Remane et al. (2017) as follows: digital products and services can be reproduced with zero marginal cost and become more valuable as more users join, value is established in practice, the balance between various stakeholders is found on digital platforms. The researchers also stated that bikesharing, carsharing, ridesharing, and intermodal travelling types are among the examples of digital business models.

In this new era, organisations see their roles less in industries yet more in virtual platforms where customers and organisations work together to sustain products and services. In this progress, the organisations that align their internal processes with external digital technologies hold a potential to leverage strategic advantages in their industries (Loonam et al., 2018). For this attempt, it is crucial to determine critical success factors and capabilities affecting business models. In this regard, as Jerman et al. (2019) emphasised, leadership and management orientation becomes prominent since business models are alive platforms. However, despite these changes and transformations in organisations and their business models, numerous organisations, especially the small- and medium-sized companies, face a difficulty of understanding new digital technologies and their influences on business models (Muthuraman, 2020). In this vagueness, the dynamic capability approach holds a great potential to depict the set of required skills in this change and to scientifically explain this need (Witschel et al., 2019).

2.2. The Dynamic Capability Approach

The concept of dynamic capability dates back to early 1990s. As a concept, it was initially introduced by Teece and Pisano (1994) as the capacity of an organisation for transforming its knowledge into actions by considering internal and external parameters. According to Teece (2017), capabilities, which are referred to as the activities that allow organisations to generate a particular outcome, can be ordinary and dynamic. In this sense, the researcher indicated that ordinary capabilities are about the skills to manage current production plan whilst dynamic capabilities are inherently future-oriented and have an interrelationship with strategies.

Theoretically, the concept of dynamic capability stems from sensing business opportunities, seizing them, and transforming current assets to responsive resources and is based on the fact that, if an organisation holds resources and competencies without dynamic

capabilities, it then becomes competitive in a short term (Augier and Teece, 2009). For overcoming this limitation, the dynamic capability approach advocates that organisations need hard-to-imitate capabilities in order to achieve sustainable competitive advantage and should reconfigure internal resources with external changes. This being the case, several capabilities, such as managerial skills, employee abilities, and leadership styles come to the fore more in this competition while reshaping business models in line with emerging advancements. That is to say, the critical role of adopting the dynamic capability approach is of utmost importance for competitiveness of organisations in the business domain.

As a result, given the recent changes relying on digital technologies in this era, the dynamic capability approach remains as suitable for understanding the offers of digitally-driven business models, as Witschel et al. (2019) noted. Indeed, foreseeing changes, responding to advancements, and adjusting business models in the business environment are among the intrinsic activities of the dynamic capability concept (Teece, 2017). Therefore, the link between the dynamic capability approach and digital business models is centred at the focal point of this research.

3. THE INTERSECTION OF DIGITAL BUSINESS MODELS AND DYNAMIC CAPABILITY

In this study, in order to concretise the hazy link between digital business models and the dynamic capability approach, the extant literature was reviewed in a structured manner. In this regard, several keyword pairs were mainly searched within the abstracts, titles, and keywords of the peer-reviewed articles and reviews indexed in three databases, which are: ABI/INFORM Global, ScienceDirect, and Scopus. Moreover, the identified keyword pairs were searched at two stages. In the first stage, the keyword pairs were as follows: "*digital business model*" ; "*industry 4.0*" whereas the following keyword pairs were used in the second stage: "*digital business model*"; "*dynamic capability*". After these two stage searches, nine studies were revealed from the selected databases; however, only five of them were accessible via the university database system of the author and these studies constituted the main body of the literature of this research.

Generally speaking, the studies accessed in this research showed that different topics were emphasised by previous researchers. For instance, Muthuraman (2020) aimed at causally connecting the components of business models with the characteristics of digital technologies in order to comprehend the impact of technology on digitally-driven business models, where cloud computing, internet of things, machine learning, robotics, mobile technology, and big

data are of critical importance. Cezarino et al. (2019) focused on the Brazilian context and explored the relationship between the concepts of Industry 4.0 and circular economy, through structuralism, in order to reveal the potentials and limitations of these concepts in implementation. In the smart manufacturing concept, Alcácer and Cruz-Machado (2019) initially drew attention to the guidance of the Reference Architecture Model Industrie 4.0 and introduced the key Industry 4.0 components for manufacturing systems and, then, presented their final remarks based on the discourses. To sum up, these three studies show that the link between the dynamic capability approach and digital business models were largely neglected and the discourses remained rather technical.

Regarding capabilities in terms of the smart concept, Jerman et al. (2019) examined the changes of business models of an organisation, which is a smart factory, and identified the key factors that affect the business model by using the semi-structured interview technique with managers of the case company and the content analysis. Their findings showed that machines will have a major change to be used wisely in production, followed by the employees during creativity expression. Moreover, the key factors indicated by the researchers were as follows: top management and leadership orientations, motivation of employees, collective wisdom, creativity, and innovations. Similarly, in a more related study in line with the purpose of this research, Witschel et al. (2019) examined how and under what conditions companies develop and implement digital business models, through a multiple case studies of leading German firms from different industries, and concluded that companies need to adopt the dynamic capability approach for responding to changing external conditions. Their empirical findings demonstrated that there is a moderating role of the organisational context on the relationship between dynamic capabilities and business model change and there needs to be an alignment between strategy, organisational design and suitable leadership mindset.

All in all, the reviewed five studies in this research unfolded that the intersection of digital business models and the dynamic capability approach is currently a nascent area and still in need of further studies to clarify the haziness between these two concepts. In the age of Industry 4.0, bridging this gap is especially crucial since digitalisation has an increasing trend and impact in the business environment and the dynamic capability is a robust approach to explore both the current practices and the forward-looking expectations. In this respect, based on the reviewed literature, it becomes clear that digital business models need to be encompassed by existing critical and emerging capabilities -digital and non-digital- , such as creativity, knowledge sharing, integration with different stakeholders (e.g. customers, partners), agile and

innovative thinking, leadership and management orientation, awareness and motivation of employees. Accordingly, in today's complex and ever-changing business ecosystem with the progress in digitalisation, digitally-driven business models tend to require considering both extant and emerging dynamic capabilities, particularly by advancing the existing critical capabilities.

4. CONCLUDING REMARKS

Following three industrial revolutions, the fourth industrial revolution, widely known as Industry 4.0, offers significant advancements to the business ecosystem. In the new digital era, implementing emerging technologies can cause a strategic advantage in competitiveness of organisations. However, given the academic and practical progress in relation to Industry 4.0 technologies, it is explicit that approaching to Industry 4.0 without giving particular emphasis on the connection between digital business models and dynamic capabilities can remain meager. In this regard, although some researchers have already made efforts to conceptually and technically emphasise the need of the dynamic capability approach in business model change towards digital business models, the link between these two concepts has received very limited interest, and, as such, causes vagueness in the business domain. Accordingly, this research aimed at concretising the hazy link between digital business models and the dynamic capability approach.

In order to achieve the aim of this research, the extant literature was initially reviewed through identified keyword pairs conducted at two stages. As a result of the discussions made in relation to the reviewed studies, the present research has provided some insights into the intersected area of the subject matters. First, the current state analysis performed by virtue of the structured literature review revealed that there is a research gap in the area of studying digital business models and the dynamic capability approach from the strategic viewpoint. In this respect, it can be concluded that the outcomes of this research enrich the literature since existing small number of studies remain predominantly technical and case-based. Additionally, both the mentioned outcomes and the needed capabilities summarised in this research offer to shed light on the intersected area and to advance the clarity of the hazy link between these two concepts in terms of both academic and practical aspects. Thus, relying on these insights, the study provides a research agenda that also calls for further research in the focused area. In this sense, in future studies, digital and non-digital capabilities needed in digital business models can be empirically and conceptually recognised by adopting the strategic management

perspective for different contexts rather than providing a technical discussion or practicing a case-based approach.

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