

Effective Digitalization of Business Processes

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ABSTRACT

Despite the vast research on digital technologies and digitalization, little is known about the drivers, requirements, challenges and implications of business process digitalization. The common understanding that emerges from the literature is that investments in digital technologies provide several benefits to firms. However, the drivers, requirements, challenges, and implications of business process digitalization still need to be explained. Additionally, in today's globally networked business environment, process digitalization should be investigated on a multi-firm setting. In order to investigate the process digitalization on a multi-firm setting, an exploratory approach can be embraced and multiple case studies can be conducted for data collection. Grounded theory can be used to analyse the data collected through the case studies.

Keywords

Business process, business process digitalization, digitalization, digital technologies.

INTRODUCTION

Digital technologies have been transforming the way firms work across the industries continuously. Due to the features inherent in digital technologies, firms expect to increase their capabilities such as responsiveness, innovativeness and competitiveness by digitalizing their business processes and align with today's rapidly changing business environment.

Studies show that advancements in information technologies (IT) have been renovating the business processes in a consistent manner. More than two decades ago, Davenport and Short [1] claimed that the transformation of business processes into IT enabled processes was inevitable and IT capabilities had a significant role when redesigning the business processes. In the recent past, traditional business processes have started to be considered as IT enabled business processes which are more information sensitive, customer-centric and complex [2].

Viewed as digital technologies, the combination of information, computing, communication, and connectivity technologies [2] created a new

understanding of IT which cannot be entirely separated from being digital. This extends to business processes where digital technologies are the main components of business operations. Characterized by the homogenization of digital data, programmable digital computing architecture, and self-referential nature [3], digital technologies reshape the conventional business processes into modular, distributed, cross-functional, and global ones [2].

Although the scope of digital technologies is wide and open to interpretation, sensors, radio frequency identification (RFID)/near field communications (NFC), beacons, machine-to-machine communication (to monitor machines and automate the production), robotics, 3D printing, drones, blockchain and cryptocurrencies, virtual and augmented reality, artificial intelligence, cognitive computing, machine and deep learning are specified as digital technologies [4]. In addition to these, some of the digital technologies associated with the digitalization of business process includes:

- Big data analytics tools and applications,
- Mobile tools and applications,
- Digital platforms that enable digital capability sharing such as cloud computing solutions and app marketplaces,
- Social media tools and applications,
- The Internet of Things, including connected devices and "smart" networks [5].

There is a common view that investments in digital technologies provide several benefits to firms. According to the Global Information Technology Report [6], digital technologies are pillars of winner-take-all dynamics in many industries, and early adopters have advantages over the followers. However, prior research also points out that the value generated by digital technologies is difficult to evaluate [7],[8].

PROBLEM STATEMENT

Despite this critical transformation with regard to business processes, the literature provides relatively little information about the digitalization process and does not cover all stages- from the discovery to the implications of business process digitalization. Insight into this aspect is important for improving our understanding of the drivers and requirements of business process digitalization and how firms decide when they reason about possibility of digitalizing their business processes.

Furthermore, previous research is dominated by the studies identifying positive outcomes of business process digitalization. The challenges that firms can face while embracing digital technologies, requirements and implications of business process digitalization are touched upon rarely and this field remains relatively unexplored.

Considering the gains derived from business process digitalization such as increased collaboration and availability of qualified information, it can be inferred that effective business process digitalization also depends on and extends to the firms' outer circle where the business relations are built and sustained. Therefore, business process digitalization should be examined in the context of multiple firms where reciprocal effects are addressed. Although the literature provides a number of studies on "IT-based cocreation of value" [7], this topic needs to be discussed further within the framework of business process digitalization.

RESEARCH QUESTIONS

As identified in the problem statement, knowledge on business process digitalization is heavily based on the explanations of transformational effects and benefits of digital technologies. In general terms, the literature focuses on the firms' alignment with digitalized business environments through the adoption of digital technologies rather than explaining how this alignment will be accomplished in practise. Emerging from this context, there are research questions which need to be answered are as follows:

1. What are the drivers, requirements, challenges and implications of business process digitalization?
2. Can multiple firms create business value collectively through digitalization of business processes?

THEORETICAL FRAMEWORK

In order to constitute the theoretical foundation to investigate digitalization of business processes, Diffusion of Innovation (DOI) Theory [9] can be used. DOI theory is a theory of "how, why, and at what rate new ideas and technology spread through cultures, operating at the individual and organisation level" [10] and emphasises the characteristics of technological innovations (e.g. relative advantage, complexity, compatibility, observability, triability) along with the internal and external characteristics of organization as the influencers of technological innovation adoption.

In previous literature, innovation is defined as "the creation and adoption of an idea, a product, a technology, or a program that is new to the adopting unit" and the innovations which enable the creation of new forms of digitalization is considered as "digital innovations" [3]. Since digitalization of business processes is realized through the adoption of digital technologies, it is appropriate to evaluate digital technologies as digital innovations and refer the DoI theory as theoretical foundation.

METHOD

In order to investigate the drivers, requirements, challenges and implications of business process digitalization, case study method can be applied in different case sites. Case study is a method which allows multiple ways of data collection including interviews, observations, pre-recorded documents, and secondary data for investigating a phenomenon intensively within its natural setting in one or a few sites [11]. Within the scope of the reserarch questions, the case study should be applied in more than one site to establish causality and generalize the findings from single case site to other case sites. This strategy is called "multiple case design" which includes replicating and comparing the analysis in different case sites with the aim of improving the generalizability [11].

The data collected through case studies can be analysed using Strauss and Corbin's [12] Grounded Theory Analysis. Grounded Theory Analysis [12] serves well the purpose when the aim is to discover new insights about an existing phenomenon and the topic of interest has been relatively ignored in the literature or has been given only superficial attention [13].

LITERATURE REVIEW

In this section, it is aimed to provide a clear understanding of business process digitalization by defining the concepts "business process", "digital technologies" and "digitalization". The section also provides the brief account of the existing knowledge in the fields of digital technologies and business process digitalization.

Definition of Business Process

One of the definitions of business process is "a set of logically related tasks performed to achieve a defined business outcome" [1]. Accordingly, business processes have two main characteristics. The first one is that they have customers both internal and external to the firm; and the second one is that they cross the boundaries of the firm [1].

Digital Technologies

As previously defined in this documents, digital technologies are combinations of information, computing, connectivity and communication technologies [2] which connect the products, processes

and services; transform the businesses at both strategic and operational levels [2], [14]

The transformative impact of digital technologies has been addressed by researchers in different studies [2], [8]. According to [2], these technologies provide dynamic capabilities for responding the changing requirements of internal and external environment of the firm, reshape the business strategy into a form which is time, distance and function independent and change the social relations of the firm by means of virtual networking. As a consequence, digital technologies give rise to the new business models such as peer-to-peer networks, freemium, delivering outcomes (mainly driven by Internet of Things), crowdfunding/crowdsourcing, as a service, ecommerce/ marketplaces and personalization [4]. Another transformative impact of digital technologies can be traced at the marketed products and services in which digital technology is embedded as an expansion of digital transformation [2], [8].

Digitalization

Digitalization is defined by addressing its difference from digitization as “by digitalization, we mean the transformation of socio-technical structures that were previously mediated by non-digital artifacts or relationships into ones that are mediated by digitized artifacts and relationships. Digitalization goes beyond a mere technical process of encoding diverse types of analog information in digital format (i.e., “digitization”) and involves organizing new socio-technical structures with digitized artifacts as well as the changes in artifacts themselves” [3].

From a business perspective, digitalization can be defined as “the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business” [15], [16]. Based on this definition, [16] indicates that digitalization improves the quality of buying and selling decisions, increase the efficiency of production, transportation and customer relations in business domains. In this sense, digitalization creates new channels where the information flows and communicates with both internal and external customers.

Prior Research on Digitalization of Business Processes

It is known that digitalization of business processes is a topic of interest for both academia and industry. The literature contains several studies related to business process digitalization which emphasize the significant operational, strategic and organizational changes that digital technologies create along with the benefits provided. At this point, it is important to note that the research on business process digitalization vary by the type of digital technology in question since digitalization can be realized through the adoption of different digital technologies [14], [17]-[26]. Among these, there are studies which focus on different digital technologies and explain how these digital technologies transforms the

business processes. Table 1 presents these studies according to the type of digital technology along with the sector/business unit or the process that it transforms.

Table 1. The use of different digital technologies in different sectors/business units or processes

Author, Year and Name of the Study	Type of Digital Technology Investigated	Sector/ Business Unit or Process
Chen, J., Yen, D., & Chen, K. (2009). The acceptance and diffusion of the innovative smart phone use: A case study of a delivery service company in logistics.	Smartphone	Logistics
Goebel, C., Tribowski, C., & Gunther, O. (2009). Adoption of cross-company RFID: An empirical analysis of perceived influence factors.	RFID	Logistics/Supply Chain Management
Elsenpeter, R. (2016). New Technologies, New Materials, New Workflows	CAD/CAM	Medical/Dentistry
Ferretti, M., & Schiavone, F. (2016). Internet of Things and business processes redesign in seaports: The case of Hamburg	IoT	Maritime Logistics /Transporstation
Bechtsis, D., Tsolakis, N., Vlachos, D., & Iakovou, E. (2017). Sustainable supply chain management in the digitalisation era: The impact of Automated Guided Vehicles	Smart Distribution Systems (Automated Guided Vehicle Systems)	Agriculture

On the other hand, there are studies related to digital technology use in business which do not focus on a specific digital technology; rather, they focus on the sector and the business unit that have been digitalized. Table 2 presents these studies according to the sector/business unit where the business process digitalization is realized.

Finally, the last group as a sample from the literature composed of the studies that focus on the type of the digital technology (e.g. IoT and Enterprise Mobile Applications) rather than the business unit/process that it directly transforms into a digital business process. These studies are presented in table 3.

Table 2. The use of digital technologies in different sector/business unit or process

Author, Year and Name of the Study	Type of Digital Technology Investigated	Sector/Business Unit or Process
Setia, P., Venkatesh, V., and Joglekar, S. (2013). Leveraging Digital Technologies: How Information Quality Leads To Localized Capabilities And Customer Service Performance	Not Specified	Banking/Customer Service Unit
Li, F. (2015). Digital Technologies and the Changing Business Models in Creative Industries	Not Specified	Creative Industries (art, music, fashion, etc.)

Table 3: The use of digital technologies in business

Author, Year and Name of the Study	Type of Digital Technology Investigated	Sector/Business Unit or Process
Giner, P., Cetina, C., Fons, J., & Pelechano, V. (2010). Developing Mobile Business Processes for the Internet of Things	IoT	Not Specified
Chung, S., Lee, K., & Choi, J. (2015). Exploring digital creativity in the workspace: The role of enterprise mobile applications on perceived job performance and creativity	Enterprise Mobile Applications	Not Specified
Del Giudice, M. (2016). Discovering the Internet of Things (IoT) within the business process management.	IoT	Not Specified

SIGNIFICANCE AND CONCLUSION

As stated earlier, the literature on business process digitalization is dominated with the studies which explain digital technologies’ effects on business processes. In prior literature, the investigation of digitalization of business processes starts from the phase in which the digital technology is already being adopted and/or used, skipping the previous phases where the critical factors of business process digitalization such as drivers and requirements reside. While the advantages of business process digitalization is being revealed, the disadvantages and challenges still remain hidden.

Therefore, there is a need to identify the drivers and requirements of business process digitalization in order to better explain the firm and sector specific factors to digitalize the business processes. Furthermore, internal dynamics of digital technologies can be expected to

reflect themselves while exploring the drivers and requirements of business process digitalization. To be more specific, the digitalized business processes drive the firms to renovate the processes continuously. This renovation can be monitored in case sites until the cyclical trend is observed and maturation of findings of the cases are approved.

Another significant contribution is to explain the effects and implications of business process digitalization in a multi-firm setting to create business value.

The research questions described and proposed in this research are of the interest to researchers and practitioners for at least two reasons. First, such a research can provide insights from the practitioners and present both the advantages and disadvantages of the business process digitalization. Second, it would to the future research on similar topics.

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