

# Ten years of research on digitalization: Main outcomes in management domain



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## Abstract

In recent decades, digitalization with digital technologies has dramatically changed the world. This inevitable trend creates lots of opportunities for new entrances. At the same time, it changes or even disrupts current companies regarding their business model and strategies. Accordingly, digitalization generates lots of interests in the academic world. Many scholars have researched how digitalization affects the way that companies are doing business. However, there appears to be a lack of consensus regarding the impacts of digitalization. Thus, it is essential to investigate their research results to draft a comprehensive framework of it. Therefore, this research aims to review digitalization research to investigate its impacts on businesses.

In line with the research objective, a systematic literature review was conducted to investigate the impacts of digitalization on businesses. In total, 39 out of 632 articles were selected from business and management studies. Through thorough data analysis, three streams were developed to categorize the selected articles, which including *big data and big data analysis*, *digital business strategy*, and the *business model*. Altogether, they provided a comprehensive framework of how digitalization affects businesses. Firstly, the result shows that big data and big data analytics are the two most concerned digital technologies, so they are categorized together. Secondly, digital business strategy became influential in the company's general business strategy, and thus it received increasing attention in the academy. Finally, the impact of digitalization on business models was discussed in terms of the Environment-Strategy-Structure-Operations (ESSO) model; in this way, different aspects were taken into account.

In general, this paper shows that digitalization and digital technologies can benefit companies and create competitive advantages for them. More importantly, the findings show that to thrive and sustain themselves in the digital world, it is essential for companies to have proper management and open-minded cultures and environments. Based on these discoveries, managerial implications for companies to deal with digitalization are proposed. Furthermore, this research opens the possibility of further research that investigates the impact of digitalization on different aspects of businesses.

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# 1.0 Introduction

Assisted by digital technologies, digitalization has changed society enormously. Third industrial revolution (Industry 3.0) is received starting from the 1970s till now, and it involves a digital revolution. Later, the Fourth industrial revolution (Industry 4.0) goes on simultaneously and overlapping with Industry 3.0. Today, digitalization is tightly associated with big data, artificial intelligence, and connectivity, etc., and these new technologies are at the forefront of the world. Start from digitization, which is the process of converting information into a digital format (Rouse, 2007), digitalization is recognized as "the digitalized formats and data can change the business or business model" (Gobble, 2018). Yoo (2012) proposes a more comprehensive definition of digitalization "the encoding of analog information into a digital format and the subsequent reconfiguration of the socio-technical context of production and consumption of the product and services." In a broader context, digitalization can be seen as the revolution process towards the digital world, which "all aspects of daily life" are included (Gray & Rumpe, 2015). Nevertheless, in this research, the focus is the business domain, regarding the way that companies doing business.

Digitalization is supported by digital technologies, which is recognized as combinations of information, computing, communication, and connectivity technologies (Bharadwaj et al., 2013). Often, these technologies are applied by companies to improve efficiency. Together with digitalization, the impacts are far-reaching in both macro and micro perspectives. For example, the development of the internet and e-commerce creates a new buying channel, at the same time, it also shifts the power from the seller side to the buyer side by lower the difficulty in information access (Teece, 2010). Digitalization with Digital technologies are challenges for companies since they can change the company's operational commercial activities (Calia, Guerrini & Moura, 2007), as well as strategies and business model (Bharadwaj et al., 2013; Barrett & Davidson 2008). Furthermore, new digital technologies sometimes destroy business models of industries, (i.e., music industry); meanwhile, they create new business models even might lead to a new sector (Teece, 2010). Therefore, to keep the business alive and sustain competitive advantages, companies need to react to digitalization and innovative digital technology appropriately.

While, often, the reactions require changes in the way that companies doing business initially, in other words, the changes in business models (Zott & Amit, 2010). Business models are commonly recognized as the way that organizations create, deliver and capture values in various contexts, such as economic, social and cultural contexts (Osterwalder & Pigneur, 2010). In a dynamic perspective, BM can be identified as "How marketable information, products and services are generated by means of a company's value-added component. In addition to the architecture of value creation, strategic as well as customer and market components are taken into consideration, to achieve the superordinate goal of generating, or rather, securing the competitive advantage" (Wirtz et al., 2016). On the one hand, these definitions highlight the importance of business models; on the other hand, it indicates that the business model is complicated and involves the architecture of inside and

outside of the company. Accordingly, it is no doubt that the appropriate design of the business model is vitally important for companies (Zott & Amit, 2010).

In the research of Zott & Amit (2010), the authors build up the framework for business model development. The framework, called activity system, contains three design elements, including content, structure, and governance and they are driven by four value creations: novelty, lock-in, complementarities, and efficiency (Zott & Amit, 2010). As a good business model should be able to react to the environment, external factors should be concerned when designing the business model (Teece, 2010). Based on its activity system, Lim (2010) develops the Environment-Strategy-Structure-Operations (ESSO) business models, which determines business model in the environment, strategy, structure, and operations four aspects. In this way, the business model design is comprehensive.

Business strategy is also an essential element of the business. Business model and strategy are not mutually exclusive from each other. A strategy can be considered as "the contingency plan as to the business model it will use" (Casadesus-Masanell & Ricart, 2010). Often, the company's business model and product market strategy are tightly associated (Zott & Amit, 2008). Similarly, according to the findings of Teece (2010), although they are different in concepts, the core of the company business model embodies in its strategy. Therefore, business strategy is taken into consideration when speaking of business.

Accordingly, the purpose of this research to review digitalization research to investigate its impacts on business, regarding business model and strategy. Literature about digitalization has emerged massively, and these research articles primarily focus on how the impact on the contemporary world, surrounded by digital communication and media infrastructures (Brennen & Kreiss, 2016). Also, lots of digitalization research are business-oriented, and usually these researchers have a different focus on various aspects of the business. Therefore, a literature review to conclude scholars research results can gain an overview and accomplish the research objective. Additionally, it can outline the direction for further digitalization research. A systematic literature review can provide researchers with precise reviewing process (Tranfield et al., 2003), which is applied to understand digitalization in business from the scholars' point of views.

The structure of this report shows as follow. First, the methodology of this research is explained. Second, with the data analysis, the findings of the data are displayed. Third, a discussion included the analyzed results as well as the limitations, are conducted. Also, recommendations for future research are provided. Finally, a conclusion of this whole research is drawn.

## 2.0 Methodology Description

### 2.1 Methodology Description

This research followed a three-stage procedure, including planning the review, conducting the review and reporting & dissemination (Tranfield et al., 2003).

In this first stage, the objective of the research and the critical data source were identified. The research was to investigate the impact of digitalization on businesses, regarding business models and strategy. The objective was so broad that a database that includes as many as relevant articles was required. Also, the database should focus on social science. Accordingly, the database Web of Sciences was chosen, since this database contains a large number of articles from social sciences. At the same time, the index of Wed of Sciences was selected to include all the articles. The second stage of conducting the review contained five steps: (1) Identification of research (2) Selection of studies (3) Study quality assessment (4) Data extraction and monitoring progress (5) Data synthesis.

The central theme of this research is digitalization. However, instead of using digitalization as a keyword solely, words with broader meanings were selected, including "Digital," "Cyber," "Big data," "AI," "Artificial intelligence," "Industry 4.0" and "Smart." In this way, the risk of missing important articles in the database could be lower down. Meanwhile, to avoid overlap, the operator "OR" was used to connect all keywords selected while searching. (TS=Digital\* OR Cyber\* OR Big data OR Artificial intelligence OR AI OR Industry 4.0 OR Smart\*). Keywords were used as a selection criterion for the topic. Taken the feasibility of research into consideration, so the time frame of research was limited to 2008 - 2018. Besides keywords and publication years, the initial search of the SSCI database was set as document types "article"; language "English"; subject area "business" and "management." To further restrict the quality of the database, the sources of the articles in the database had to be clustered. In this research, only 4 and 4\* journals according to Academic Journal Guide 2018 were concerned. In this way, all the articles in the database were of high quality in business and management fields.

This initial search gained a total of 632 articles, which used for further analysis. The initial dataset Information about the initial dataset in term of top publishers is shown in Table 1. The completed list is in Appendix A.

*Table 1 Top 10 journals publishing digitalization research*

Source title	Records	% of 632
Mis Quarterly	78	12.342
Information Systems Research	73	11.551
European Journal of Operational Research	67	10.601
Journal of Management Information Systems	56	8.861
Tourism Management	46	7.278

Management Science	45	7.120
Marketing Science	40	6.329
Journal of Product Innovation Management	30	4.747
Research Policy	28	4.430
Journal of Marketing	26	4.114

## 2.2 Grouping Publications

To further classify the articles, grouping was done. The grouping method followed the research of Crossan & Apaydin (2010). The first group (Group 1) contains only reviews and meta-analysis. The second group (Group 2) consisted of selected paper based on citation-based selection criteria to the initial dataset. The last group (Group 3) included residual articles from the initial dataset. Furthermore, there were no duplicate articles within each group. The sum of time cited per year is shown in Figure 1.

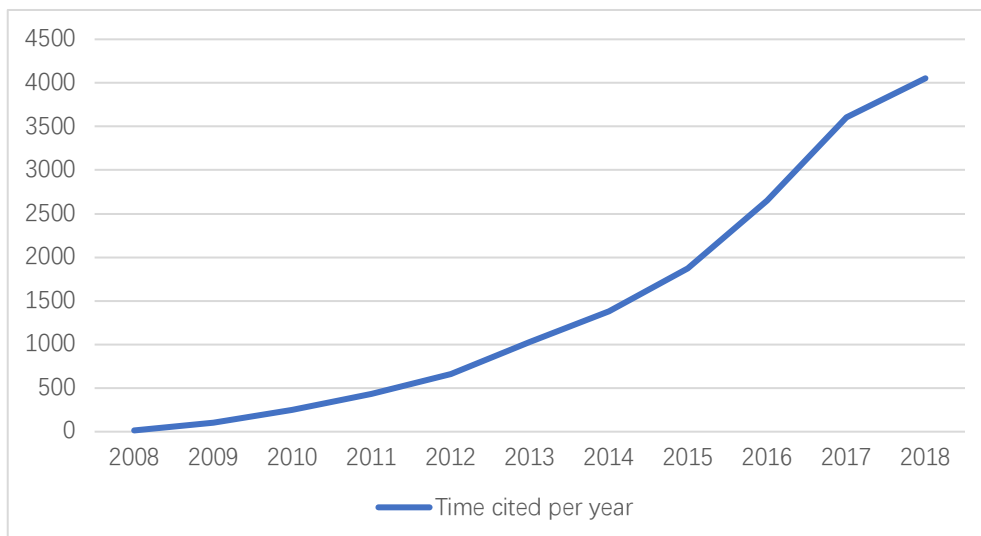


Figure 1 Sum of time cited per year (2008-2018)

### Group 1 Reviews and meta-analysis

To select reviews and meta-analyses, keywords “review” and “meta” were added in the search term based on topic (title, keywords, or abstract). (TS = “Digital\* OR Cyber\* OR Big data OR Artificial intelligence OR AI OR Industry 4.0 OR Smart\*” AND “Review OR meta”) As a result, 67 articles turned up and was sorted out in group 1.

### Group 2 Highly cited articles

Because no abstract analysis was done yet, the dataset remained 632 articles from the initial search. Following the standard of Crossan & Apaydin (2010) applied, articles with at least five citations per year were considered as highly cited article, and they were chosen in group 2. This filter gained 419 articles in group 2.

### Group 3 Residual articles / Recent articles

213 residual articles left from the filter in group 2. After a rough analysis, one possible explanation of these low citation rates was the recent publishing years, since they were mostly from 2016-2018 (Figure 2).

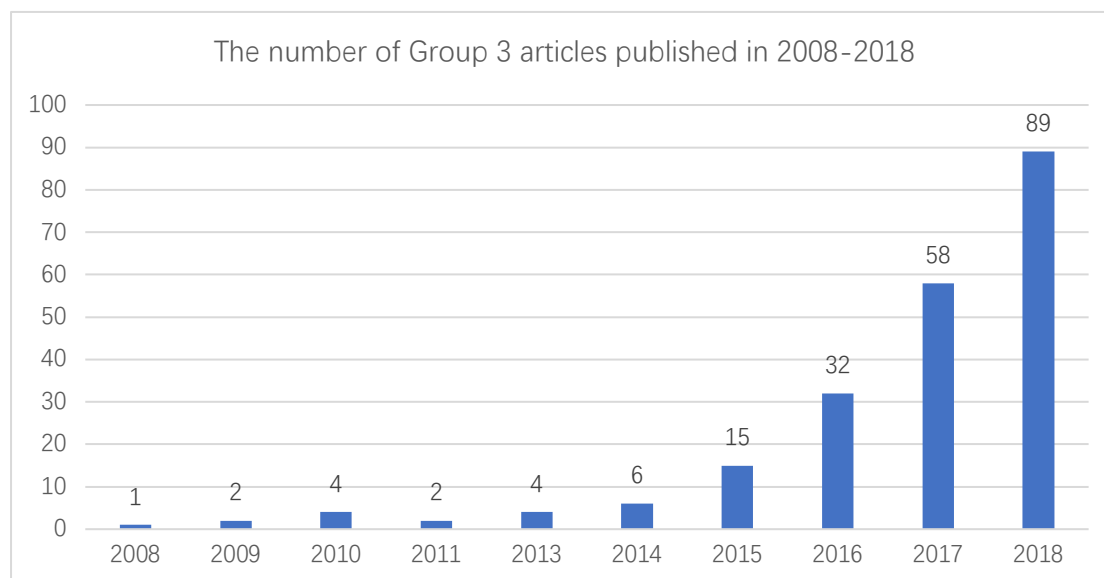


Figure 2 The number of Group 3 articles published in 2008-2018

The grouping result of the initial dataset is shown below:

Table 2 The grouping result of the initial dataset

Group	Initial dataset
Group 1 Reviews and meta-analyses	67
Group 2 Highly cited articles	419
Group 3 Recent articles	213
Total	632

## 2.3 Data extraction

To select articles that accord with the research objective, several filtering activities were conducted. First, an abstract analysis was done for all the articles in group 1. As a result, no paper was qualified. The excluded articles were either in the improper systematic literature standard or focusing on customer review. Next, the data extraction for group 2 & group 3 was done by three filtering processes: 1) screening the title, 2) screening the abstract and 3) abstract & content analysis.

The first filtering was title scanning. The irrelevant articles were removed after screening all the titles. This filtering process mainly focused on the below aspects: 1) Business-related topic. For example, articles that focus on society (e.g., presidential election, online dating),



human psychology and consumer behaviors were excluded. 2) Relevant keyword. Articles obtained because of irrelevant keywords were eliminated. For example, "Smartphone" from smart\*, or smart in the sense of intelligent. As a result, this filtering process excluded 142 articles from group 2 and 82 articles from group 3.

The second filtering process was screening the abstracts. Keywords: design, structure, strategy, and organization were related to this research topic and should be contained in abstracts. Therefore, abstracts that did not include the keywords mentioned above were excluded after screening. Additionally, articles that did not focus on business were excluded. As a result, group 2 remained 136 articles and group 3 remained 63 articles for further filtering.

The third filtering process combined analysis of abstracts and contents. The abstracts of all the filtered articles were studied. To make sure all the articles that remain in the dataset were qualified with the research objective; the contents of the articles were reviewed as well. Introduction and Conclusion / Discussion parts were demanded, and the rest of the pieces were viewed depends on articles. The selected articles were focusing on how companies/business deal with digitalization in terms of strategies and business models. Both technology providers and adaptors were taken into account. In the end, there were 30 articles left in group 2 and 9 articles left in group 3.

The summary of the entire identified articles for each filtering step is shown in table 3. All the excluded articles based on different filtering process are shown in Excel.

*Table 3: The summary of total identified articles for each filtering step*

<b>Groups\ Number of articles</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>
Initial dataset	67	419	213
First filtering process	1	277	131
Second filtering process	1	136	63
Third filtering process	0	30	9

A list of literature review questions (Table 4) was developed to classify the 39 selected articles. In this way, the essential data from these articles could be extracted. The questions included the research aim, research target, research method, type of digitalization, technology mentioned, business range, research contribution.

*Table 4: A list of literature review questions*

<b>No</b>	<b>Conceptual-decisions-related questions</b>
1	What was/were the aim(s) of the research?
2	What was/were the research target(s)?
3	What was the research method?
4	Which types of digitalization mentioned in the paper? (From 0 to 1 or Start from 1)

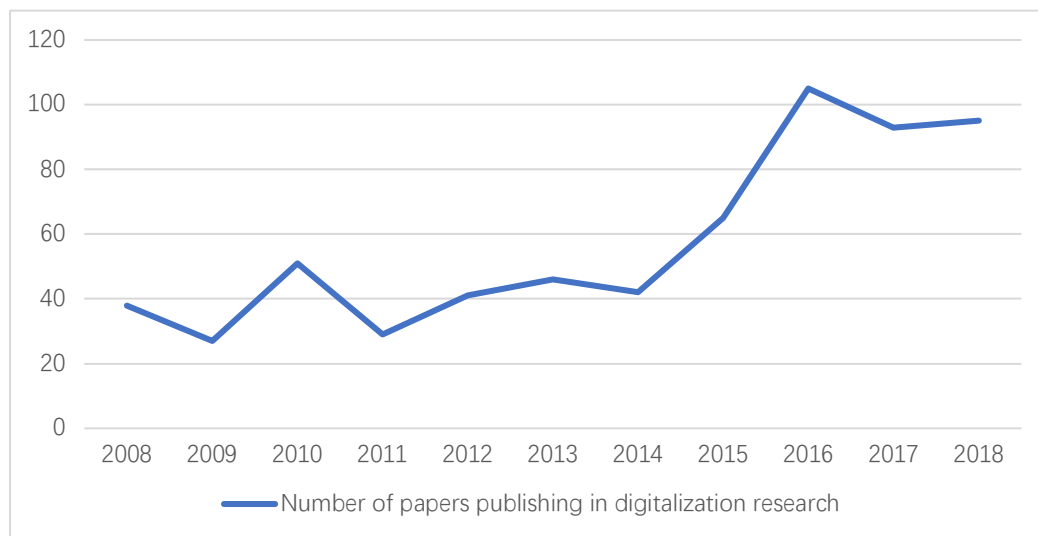
5	What was/were the technology mentioned in the research?
6	Which industry/types of business are research targets?
7	Which was/were the main contribution of this research?

The answers of all the questions could provide a preliminary understanding of the articles as well as the impact of digitalization on business. Additionally, they are helpful for further classification. All the responses to literature review questions from selected articles are shown in Excel.

## 3.0 Results

### 3.1 Descriptive Analysis

Overall, 39 articles were selected to be further reviewed after all the filtering procedures mentioned in the last chapter. Since 2014, the number of articles publishing in digitalization research increased (Figure 3). This change indicates that digitalization has received significant attention in management and business studies since 2014.



*Figure 3 The number of articles published in years (2008-2018)*

Among 39 articles, 30 articles were from group 2, and 9 articles were from group 3, and no paper left in group 1. Because of the small amount of articles, group 2 and group 3 were merged to make the analysis process more manageable. The conceptual-decisions-related questions (Table 4) served as a guide to select essential information for each paper, and it could benefit the synthesis process. After filling out all the questions for each article, a few exciting findings are addressed below.

#### *Research target/object*

The result shows that Big data & big data analytics are the main focus of the articles in the dataset. 23% of the articles are considered Big data & big data analytics as a research object. Following, the digital business strategy also takes up a significant proportion among selected articles. For the rest, digital channel and innovation are mentioned the most. The overall situation regarding research object is shown in the below figure (Figure 4)

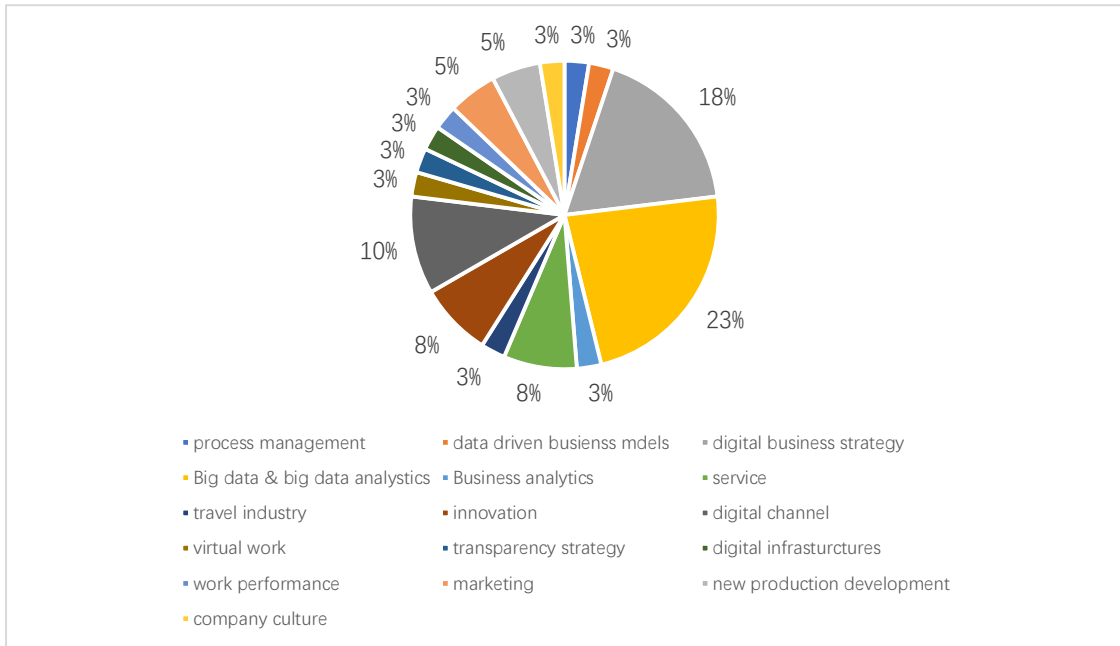


Figure 4 Breakdown of articles by research target/object

### Type of Digital technology

Different kinds of techniques mentioned in the articles are counted (figure 5). The result shows that except for Big data & big data analytics, the other technologies mentioned in articles are relatively vague or in a general way. Also, some techniques can be classified into the same group; for example, a corporate blog can be integrated into social media.

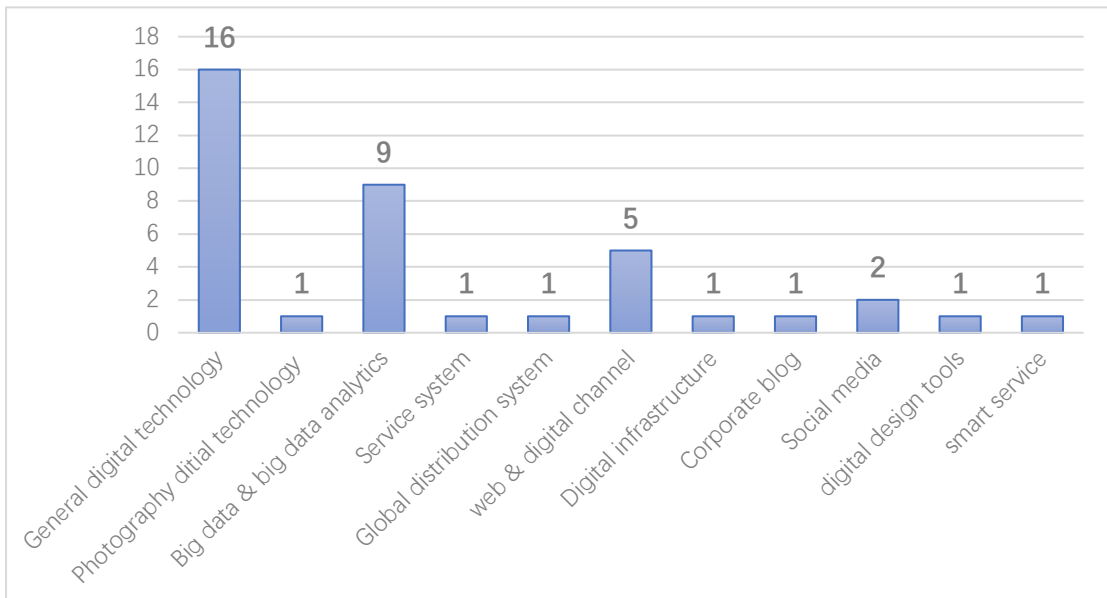


Figure 5 Breakdown of articles by digital technology

## 3.2 Data synthesis

Although all the selected articles focus on digitalization, they are embedded in disconnected literature streams. Therefore, a framework is developed to link the articles. Big data & big data analytics are solely discussed since they are the main focus of the selected articles. Next, the digital business strategy is highlighted among the selected articles. Therefore, articles about digital business strategy are listed separately. The rest of the articles focuses on different aspects of business models, and they are categorized together. As a result, 39 articles are classified into 3 streams: Big data & Big data analytics, Digital business strategy, digitalization in business model development. The overview of the category is shown in table 5.

Table 5 The category and number of articles in 3 streams

Streams	Number of articles	Reference
Big data & big data analytics	9	(Grover et al., 2018); (Lehrer et al., 2018); (Johnson, Friend & Lee, 2017); (Troilo, De Luca & Guenzi, 2017); (Gerard et al., 2016); (Chen et al., 2015); (Kache & Seuring, 2017); (Matthias et al., 2017); (Vidgen, Shaw & Grant, 2017)
Digital business strategy	7	(Bharadwaj et al., 2013); (Adomavicius, Bockstedt & Kauffman, 2008); (Woodard, Ramasubbu & Sambamurthy, 2013); (Drnevich & Croson, 2013); (Granados & Gupta, 2013); (Grover & Kohli, 2013); (Mithas & Mitchell, 2013)
Digitalization in business model development	23	(Mehra et al., 2018); (Ramaswamy & Ozcan, 2018); (Toytari et al., 2018); (Fayard, Gkeredakis & Levina, 2016); (Foucart, Wan & Wang, 2018); (Benner, 2009); (Chen et al., 2012); (Austin, Devin & Sullivan, 2012); (Ba, Stallaert & Zhang, 2010); (Eaton et al., 2015); (Granados et al., 2008); (Khouja & Wang, 2010); (Bailey, Leonardi & Barley, 2012); (Blohm et al., 2016); (Dong, Xu & Zhu, 2009); (Feng, Guo & Chiang, 2009); (Granados & Gupta, 2013); (Henfridsson & Bygstad, 2013); (Lu et al., 2015); (Lusch & Nambisan, 2015); (Mariani, Di Felice & Mura, 2016); (Marion, Barczak & Hultink, 2014); (Marion, Meyer & Barczak, 2015)

## 3.3 Big Data (BD) and Big Data Analytics (BDA)

Big Data (BD) and Big Data Analytics (BDA) have greatly influenced the traditional business; also, they have created many newly data-oriented companies. It thus the concept of Data-Driven Business Model (DDBMs) is introduced, which describes companies that built upon data (Hartmann et al., 2016). Usually, BD is defined as 3 Vs., Volume<sup>1</sup>, Velocity<sup>2</sup> and Variety<sup>3</sup>

1 Volume: the amount of data has increased a lot (e.g., Internet of Things) (Zikopoulos et al., 2012).

2 Velocity: the rate of generating information is much faster than the traditional system (Zikopoulos et al., 2012).

3 Variety: the types of data have increased, both structured and unstructured (Zikopoulos et al., 2012).

(Chen, Preston & Swink, 2015), and it has been broadened into more dimensions, including variability, veracity, and value (Matthias et al., 2017). While the original 3Vs remain the core (Matthias et al., 2017). Generally, BD is presented in 3 main fields, namely, administrative, social media and private sector data (Matthias et al., 2017).

On the other hand, BDA is defined as *“the application of statistical, processing, and analytics techniques to big data for advancing business.”* (Grover et al., 2018). Today, BDA has developed and become essential for lots of businesses. With the increasing advanced digital technologies, BDA can capture and process a vast amount of data (Chen, Preston & Swink, 2015). Together, they create opportunities for business in both corporate and supply chain levels (Johnson, Friend & Lee, 2017; Kache & Seuring, 2017; Chen, Preston & Swink, 2015). The summary of opportunities brought by BD and BDA is shown in table 6.

DDBMS are different from traditional companies in several aspects: these companies use data as key sources, and accordingly, the key activities in companies are also related to data (Hartmann et al., 2016). As for value propositions, three types of new values are identified, raw data, processed data as information/knowledge and non-data products or service (Hartmann et al., 2016).

BD and BDA can support the business through different aspects. They can improve decision-making process (Johnson, Friend & Lee, 2017; Grover et al., 2018; Chen, Preston & Swink, 2015) new product development process (Johnson, Friend & Lee, 2017) and information management (Kache & Seuring, 2017). For example, BD can generate strategic advantages by helping managers to decide what kinds of new products to launch. Also, it can increase the efficiency of the company operation by improving data sharing (Troilo, De Luca & Guenzi, 2017; Kache & Seuring, 2017; Grover et al., 2018). Meanwhile, BD and BDA can stimulate service innovation (Troilo, De Luca & Guenzi, 2017; Kache & Seuring, 2017; Grover et al., 2018; Lehrer et al., 2018), and it is achieved by enhancing customer experience through dynamic customization, increasing service process efficiency and building service concept (Troilo, De Luca & Guenzi, 2017). Additionally, implementing BD and BDA create symbolic value to the company, which is obtained through delivering an innovative image or maintaining the reputation and retaining customers (Grover et al., 2018).

BD and BDA can contribute to business on supply chain level. Similarly, BD and BDA can bring positive impacts on operation and logistics on the supply chain (Kache & Seuring, 2017). Besides, they can increase visibility and transparency by providing real-time and end-to-end information sharing (Kache & Seuring, 2017). Additionally, BD and BDA can create values through increase asset productivity<sup>4</sup> and business growth<sup>5</sup>, which are two performance indicators (Chen, Preston & Swink, 2015). Asset productivity can be obtained by better matching its resources to the supply and demand, at the same time, BDA can create opportunities for innovations which can gain short term success for the company (Chen, Preston & Swink, 2015). As a whole, they can support the integration of the supply

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<sup>4</sup>Asset productivity: the way that business uses the current assets and fixed assets, commonly measured through asset turnover rate and profitability (Chen, Preston & Swink, 2015).

<sup>5</sup> Business growth: the ability that a company is obtaining a serious short-term advantage (Chen, Preston & Swink, 2015).

chain (Johnson, Friend & Lee, 2017; Kache & Seuring, 2017). Vice versa, supply chain collaboration and integration can build trusts, which encourage information sharing within the chain (Kache & Seuring, 2017).

While some challenges are facing by applying BD and BDA, access and reliability of these technologies are one of the problems (Matthias et al., 2017). Also, data quality is essential for applying BDA (Vidgen, Shaw & Grant, 2017). Another challenge is about people, regarding their thinking, reacting and responding to these new things (Matthias et al., 2017). It indicates that the culture and environment of the company are essential for applying BD and BDA. For example, the study of Johnson, Friend & Lee (2017) shows that big data application on new product development is determined by environment and customer turbulence. Additionally, the business strategy and mission should fit with the technology implantation, since they decide the company direction (Kache & Seuring, 2017). Similarly, the advantages created by BDA dramatically relies on the environment and technology (Chen, Preston & Swink, 2015).

Table 6 The summary of opportunities brought by BD and BDA

Level	Opportunities	Reference
Corporation level	Decision making	(Johnson, Friend & Lee, 2017); (Grover et al., 2018); (Chen, Preston & Swink, 2015)
	New product development	(Johnson, Friend & Lee, 2017)
	Service innovation	(Troilo, De Luca & Guenzi, 2017); (Kache & Seuring, 2017); (Grover et al., 2018); (Lehrer et al., 2018)
	Operation	(Troilo, De Luca & Guenzi, 2017); (Kache & Seuring, 2017); (Grover et al., 2018)
	Information management	(Kache & Seuring, 2017)
	Function & Symbolic value	(Grover et al., 2018)
Supply chain level	Supply chain integration	(Johnson, Friend & Lee, 2017); (Kache & Seuring, 2017)
	Supply chain performance	(Chen, Preston & Swink, 2015)
	Visibility & transparency	(Kache & Seuring, 2017)
	Operation	(Kache & Seuring, 2017)
	Logistics	(Kache & Seuring, 2017)

### 3.4 Digital Business strategy (DBS)

In the digital era, digital business strategy (DBS) has become popular in both business and academic world. The definition of digital business strategy differs in scholars. In the research of Woodard et al (2013), a DBS is considered as *"a pattern of deliberate competitive actions undertaken by a firm as it competes by offering digitally enabled products or service."* This definition focuses on the actions of DBS. While, in another research by Bharadwaj et al (2013), the authors focus more on the "results." Following, they define DBS as

"organizational strategy formulated and executed by leveraging digital resources to create differential value." Furthermore, the finding of Mithas, Tafti & Mitchell (2013) indicates that DBS is not only limited to the company and its surrounding since it also has impacts on the general digital business competitive environment. Nevertheless, they all agree on the importance of DBS in both academic research and managerial practices.

In the beginning, digital related strategies were considered as a functional level strategy which was part of the company's business strategy (Bharadwaj et al., 2013). While, with the development of information technology (IT), digitalization has become an irreversible trend and digital technology plays an essential role in company strategy. Firstly, the interconnectedness and interdependencies of digital technologies increase the difficulty of static analysis and decrease the time limit of strategic positioning (Grover & Kohli, 2013). Secondly, Micro-applications, replacing the traditional large systems, have become the competitive advantage (Grover & Kohli, 2013). On the other hand, within the company, the value creation is changed by the IT (Drnevich & Croson 2013), as well as the infrastructure regarding the interconnections of products, processes, and services (Bharadwaj et al., 2013). As a result, the importance of DBS is widely recognized because of their roles in business.

The differences between DBS and traditional IT business strategies can be determined in the following four aspects: the scope, the scale, the speed and the sources (Bharadwaj et al., 2013). 1) Scope: Compared with traditional IT business strategies, DBS is cross-functional with more extensive business range 2) Scale: unlike conventional strategy, the scale of BDS includes the digital aspect. 3) Speed: digitalization increases the speed of the business in several aspects: including product launches, decision making, supply chain orchestration and network formation and adaptation. 4) Sources: the company's values can increase from more sources beyond traditional business, such as information, multisided business models. These differences have generated interests to researchers about DBS. On the research of Woodard et al (2013), design moves<sup>6</sup> and design capital<sup>7</sup> are identified as the underlying logic of digital business strategy. Understanding the two concepts and the connections between them are beneficial for the decision making of BDS (Woodard et al., 2013). While, the strategic posture of a company in the competitive industry environment also have impacts on company DBS, in term of general IT investment and IT outsourcing investment (Mithas, Tafti & Mitchell, 2013). The strategic posture can be seen as "*the company's level of activity in a given strategic dimension relative to the industry average.*" For example, if the IT investment of a company is higher than the IT investment of the average industrial level, then the company has high strategic posture regarding IT investment. On the other hand, the ideal competitive environments: turbulence, concentration, and growth also moderate the strategic posture of a company in different ways (Mithas, Tafti & Mitchell, 2013). These interactions indicate that the failure of DBS is not only responsible for the IT department, but also the executives who were lacking the insight into industry conditions (Mithas, Tafti & Mitchell, 2013).

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<sup>6</sup> Design move: the separate strategic actions that can change the product or system of a company and can bring competitive advantages to the company (Woodard et al., 2013).

<sup>7</sup> Design capital: the aggregate result of all the design moves (Woodard et al., 2013).



### 3.5 Digitalization in Business model development

For stream 3, the Environment-Strategy-Structure-Operations (ESSO) model (Lim, 2010) was applied to connect all the articles. This ESSO model covers different aspects of business models so that it could provide an overall picture to understand the impacts on business models. The framework is shown below (Figure 6).

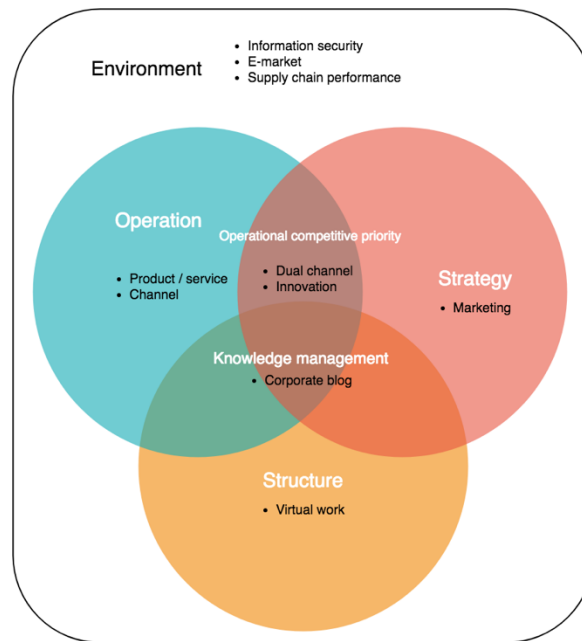


Figure 6 Digitalization in ESSO model

#### 3.5.1 Digitalization in operation

Digitization is the process of converting information into a digital format (Rouse, 2007). Compared with their physical forms, these digital formats have advantages in transports and sharing (Austin, Devin & Sullivan, 2012). Accordingly, this change also has an impact on the operation regarding key activities, resources, partners & competitors and the cost & revenue.

Traditional channel is greatly affected by digitalization regarding digital channel. Digital channel has many advantages compared with physical retail shops, such as no rent of physical stores and 24/7. On the other hand, this development has negative impacts on traditional brick-and-mortar stores. Showrooming is one consequence of it, which describes the behaviors that customers go to offline stores to find out / try the products but buy online where offers a lower price (Mehra, Kumar & Raju, 2017). This free-riding behavior often leads to price competition and results in lower profits of both players (Mehra, Kumar & Raju, 2017). The existence of online channel also affects manufacturers. Manufacturers might be able to increase sales through adding the online channel, for the reasons that more potential clients can be reached, and the search costs can be lower (Wu, Ray & Whinston, 2008). The research of Wu, Ray & Whinston (2008) shows that manufacturers are likely to

do so, when product information is beneficial and digitalized, or when the product information is invaluable (Wu, Ray & Whinston, 2008).

The product can be digitalized as well, such as experience products like music and movie. This digitization has decreased the overall profits of traditional experience product supply chain, from producers to retailers (Khouja & Wang 2010), since less physical activities and resources are required. Besides, the digitization also happens to service. Compared with traditional human-based service, digital service can decrease the operating costs and improve service efficiency (Ba, Stallaert & Zhang, 2010). With the development of digital technology, the concept of service has expanded. The digital service system is considered as a complicated aggregation which consists of different actors and resources (Eaton et al., 2015). Furthermore, smart service is introduced, which change the values of business fundamentally (Toytari et al., 2018). Today, digital service has a wide range of applications in industry, not only traditional brick-and-mortar shops but also legal services, accounting tax services (Ba, Stallaert & Zhang, 2010).

The internal process within the company also has been significantly affected by the development of digital technologies. Traditional tools, such as email, contribute to the new product development process (NPD) through team collaboration, generating concepts/prototypes and management evaluations (Marion, Barczak & Hultink, 2014). Lately, social media tools also have been applied in NPD, and they mean to facilitate the communication and knowledge exchange both inside and outside the organization (Marion, Barczak & Hultink, 2014). However, not all new tools affect NPD positively. In the same research shows, new media tools that create collaboration spot, such as Google Docs, are associated with NPD positively (Marion, Barczak & Hultink, 2014). On the other hand, social networking tools have no direct relation with team collaboration or generating concepts; what's worse, they influence management evaluation negatively (Marion, Barczak & Hultink, 2014).

Zooming in NPD, defined as "the design and specification of inherent subsystems, components, and interfaces between subsystems," product architecture plays a vital role in NPD and have a positive impact on project outcomes (Marion, Meyer & Barczak, 2015). Similarly, not all digital tools have the same effects on it. IT infrastructure, the enabler of collaboration within the organization, encourages modular product architecture, while digital design tools like CAD do not work the same (Marion, Meyer & Barczak, 2015). These results indicate that companies have to be careful when implementing new media tool since not all of them work effectively.

Digitalization also appears in supply chains. Correspondingly, supply chain management (SCM) started focusing on information-based integration along the chain (Zhu, 2004). However, the benefits rely on IT-related resources (Dong, Xu & Zhu, 2009). IT contributes to supply chains mainly by enabling digital integration at the process level (Dong, Xu & Zhu, 2009). Effectively using technology to improve upstream, downstream and internal operations could improve chain process, so that values are created (Dong, Xu & Zhu, 2009).

However, it cannot be achieved without IT-related sources such as managerial skills and partner support (Dong, Xu & Zhu, 2009).

### 3.5.2 Digitalization in Strategy

Social media tools are applied to connect people. This day, Social media are widely used by companies as marketing tools also. For example, Facebook is served as a marketing tool for Italian Regional Destination Management Organizations to promote their regions (Mariani, Felice & Mura, 2016). In this research, the authors find out that visual contents and moderately long posts increase the users' engagements in their Facebook pages while various posts and early timing posts work reversely. Besides, Digitalized Interactive Platform (DIP), such as Apple Watch NikePlus (AWNPN), is created so that it opens the possibility for co-marketing (Ramaswamy & Ozcan, 2018). The corporation between several companies can develop higher values through the interaction between them, and the interaction with consumers at the co-created environment (Ramaswamy & Ozcan, 2018).

### 3.5.3 Digitalization in Structure

Digitalization has an impact on company structure in term of change the way of people working. A new type of working style -- virtual work is created, which breaks the geographic limitations. In the research of Bailey, Leonardi & Barley (2012), the authors investigated three types of current virtual work, namely, virtual teams, remote control, and simulations. 1) Virtual teams: The improvement of digital communicated tools enables people to interact and communicate with far distant, and representations are not essential. 2) Remote control: Different from virtual teams, remote control focuses more on objects instead of people. People manage the data collected through a physical system and then change the system through feedback. In this case, the purpose or the physical system serve as representations. For these two types of virtual works, the geographic limitation is broken by digital technology. On the other hand, 3) Simulation focuses on study and experimentation instead of the distance, although geographic limitation is not a problem in this case. In this way, the traditional company structure is considerably changed.

### 3.5.4 Digitalization in operational competitive priority

Innovation is vitally essential for company development since it can create competitive advantages. In fact, for companies that are actively seeking change, digital technology brings many opportunities for this pursue (Fayard, Gkeredakis & Levina, 2016). The research of Austin, Devin & Sullivan (2012) shows that digital technologies and digital systems can improve accidental innovation through different channels. Firstly, random variation can be generated into the process, as well as the opportunities to explore. Also, when digital systems are facilitating the collections, random retrievals might be created which encourage accidental innovation. Additionally, design systems might reduce the time to assess the results of each innovation iteration, to benefit the innovation process. Nevertheless, innovation does not always push technology forwards; instead, it could create technological

comebacks (Foucart, Wan & Wang, 2018). For example, digital music (third generation) can negatively affect CD (second generation) but positively affect vinyl (first generation) (Foucart, Wan & Wang, 2018). The vintage trend is another example of it.

Digital technologies play an important role in service innovation. Often, they act as an operand resource and as an operand resource (Lusch & Nambisan, 2015). When these ITs are positioned as operand resources, they trigger service innovation through influencing the actors of the company, on the other hand, they facilitate the value creation of the company when acting the operand resources (Lusch & Nambisan, 2015). With the more advanced digital technologies coming out, the value proportion of these two sources is shifting to operand resources (Eaton et al., 2015). Nevertheless, to implement service innovation or maintain the competitiveness are quite challenging. The research of Toytari et al (2018) shows that two barriers commonly facing when achieving these service innovated outcomes are the internal mindset and internal capability. To deal with the obstacles, it requires the company alters its mindset, regarding beliefs, norms, rules, and values, as well as abilities including skills, routines and assets (Toytari et al., 2018).

After ideas generated, evaluations are required to structure the thoughts and improve decision quality, and this evaluation process can be enhanced by digital technology as well (Blohm et al., 2016). In the research of Blohm et al (2016), two evaluation mechanisms are investigated: rating scale-based task and market-based task, and the result shows that rating scale works better since it brings higher decision quality.

### 3.5.5 Digitalization in knowledge management

Knowledge management is essential for companies; it includes internal knowledge transferring and external knowledge generating. The soft culture of companies influences on its reaction towards digital technologies that facilitate the learning creating. For example, companies with different culture would react differently to crowdsourcing, a tool to generate knowledge (Fayard, Gkeredakis & Levina, 2016). Similarly, the process management practices also have impacts on companies' responses to new technology vice versa (Benner, 2009). Some management practices might cause distances between companies' capabilities and the changing environment. As a result, some companies, especially incumbents cannot react to rapid technological change (Benner, 2009).

Corporate blogs, one of the social networking tools, are applied by companies internally to increase communication & knowledge exchange and stimulate innovation and improve job performance finally (Lu et al., 2015). However, corporate blogs cannot guarantee high job performance, since different people differ in participation which results in different outcomes (Lu et al., 2015). Additionally, work and nonwork-related blogging have different impacts on participation (Lu et al., 2015).

### 3.5.6 Opportunities and threats from the environment

Digitalization has created a brand-new market- E market. Generally, Information technology (IT) can shake traditional markets through 3 conditions: newly easy to enter, attractive to attack and difficult to defend (Granados et al., 2008). These conditions happen mainly due to the low costs that brought by IT. Started 1990s, the internet has provided a new channel which decreased the barrier to enter markets, and Amazon.com in book markets is one example of it (Granados et al., 2008). When the customer, product, or activity profit-ability gradient happens, markets are attractive to attack (Clemons, Gu & Lang, 2002), and new entrants can target these markets with lower costs that provided by IT (Granados et al., 2008). Plus the fact that incumbents are generally reluctant to defend, markets can be challenging to protect (Granados et al., 2008).

Within the digital channel and E market, the business-to-consumer (B2C) channel has expanded to consumer-to-consumer (C2C) (Feng, Guo & Chiang, 2009). Several factors lead to this change. Firstly, the web has created opportunities for consumers to participate, and this participation is encouraged by better online infringements (Evangelista, 2002). Another factor that contributes to this C2C channel is the digital right management (DRM) (IFPI, 2007), which is created to protect ownership and copyright (Feng, Guo & Chiang, 2009). The prevalence of social media and the development of information technologies also promote the new channel (Feng, Guo & Chiang, 2009). Nevertheless, new and better technology does not always replace the old one completely. On the contrary, they sometimes exist at the same time, and in some circumstances, the old version might be appreciated more by certain types of consumers because of physical features (Foucart, Wan & Wang, 2018).

The internet and mobile technologies have changed the information transferring in the traditional market, and this information exposure change brings two-fold impacts on markets (Granados & Gupta, 2013). On the one hand, information sharing can reduce information asymmetry; on the other side; it can expose the company in front of its competitors (Grover & Kohli, 2013). Commonly, companies react through defensive denial (resistance the inevitable trend) or the passive reaction (no reaction but just waiting) (Granados, 2008). However, these two actions are not long-term oriented; instead, companies should react it with transparency strategy (Granados & Gupta, 2013). The central theme of the transparency strategy is to reveal information based on different parties through different strategic actions (disclose, distort, bias, or conceal) (Granados & Gupta, 2013).

## 4.0 Discussion, Recommendation and Conclusions

Digitalization has become an important topic in both the academic and business world. Therefore, to identify how digitalization has changed the business, a systematic literature review is done. In total, 39 out of 632 articles were selected and studied in this research to achieve the research objective.

The research process has some limitations that should be considered. First of all, because of limited time and resource, only Web of Science was selected as the database. The earliest publishing years set as 2008, however, the digitization has started earlier than it. Correspondingly, for future research, the longer time frame and more databases are recommended to include more relevant articles. Furthermore, more words related to digital technology or more vague word can be considered as keywords. For example, using "digi\*" instead of "digital\*" as the keyword. Another limitation is that all the filtering process was done by one researcher, which might lead to the bias problem. This possible bias problem might also reveal in the analysis process. In future research, an external expert to check and monitor the procedure is recommended to reduce bias. Additionally, building the conceptual framework through a preliminary literature review on digitalization before the official systematic literature review is suggested. By doing so, the framework can provide the guideline and reduce the difficulties when conducting the proper research.

Since the research scope is quite broad, regarding both digitalization and business, the number of selected articles was not significant enough to provide an in-depth understanding of the impact. The selected 39 articles focus on different aspects in term of business. As a result, 3 streams were built up to construct these disconnected articles, including big data & big data analytics, digital business strategy and business model. Together, they explained the impact of digitalization on business as a whole. It is worth to mention the classification is not absolute, since many articles cover more than one aspects of business and its overlap.

Big data and big data analytics take a prominent position among the articles. It indicates that they are tightly connected to digitalization, and it might because data is the new money in this digital era. The results show that they can benefit the business in both the corporate level and supply chain level (Johnson, Friend & Lee, 2017; Kache & Seuring, 2017; Chen, Preston & Swink, 2015). Additionally, the application of big data and big data analytics trigger the business model innovation and new types of business models which embrace data created (Hartmann et al., 2016). Generally speaking, the positive influences brought by big data are mainly by offering numerous data and the technique to process these data in a fast way.

Digitalization also has impacts on business strategy. From as a part of business strategy to become a business strategy itself, digital business strategy received more and more attention. Compared with traditional business strategy, digital business strategy is superior regarding scope, scale, speed, and source (Bharadwaj et al., 2013). Nevertheless, all these 4

aspects are related to data and digital technology. An important strategy related to digital is the investment strategy, and it is also discussed (Mithas, Tafti & Mitchell, 2013).

With the expedite proceedings of digitization, increasing products and services turn into digital formats and start replacing physical forms. These digital products and services not only provide different user experience but also changed the way to produce and deliver them (Austin, Devin & Sullivan, 2012). Following, traditional business models even some industries are starting to collapse. At the same time, new business models as well as sectors, are created. Right now, digital service is not entirely separated from human service (Ba Stallaert & Zhang, 2010), and with the service innovation, service system (Eaton et al., 2015) and smart service (Toytari et al., 2018) are created and become popular. As for digital products, the findings show that not all the digital format can fully replace the physical products; in fact, some digital products trigger the re-demand of their previous physical forms (Foucart, Wan & Wang, 2018).

Correspondingly, the digital channel is created to deliver these digital products & services. The results show that digital channels have negative impacts on traditional physical channels, regarding retailers and manufacturers (Mehra, Kumar & Raju, 2017; Wu, Ray & Whinston, 2008; Feng, Guo & Chiang 2009). This negative effect is due to the "low costs" and "easy to assess" features of the digital channel (Mehra, Kumar & Raju, 2017; Wu, Ray & Whinston, 2008). Accordingly, to deal with this channel disruption, dual channel is adopted by many companies who were only delivering product offline (Mehra, Kumar & Raju, 2017; Wu, Ray & Whinston, 2008). However, more challenges are coming. Within the digital channel, the feature of easier access creates the opportunity for C2C markets, which breaks up the B2C monopoly (Feng, Guo & Chiang 2009).

Social media and social networking tools could benefit new product development process and produce architecture design through increase collaboration, idea generating (Marion, Barczak & Hultink, 2014; Marion, Meyer & Barczak, 2015). However, some social media tools work negativity in management evaluation during the process (Marion, Barczak & Hultink, 2014). On the other hand, social media tools have become an essential element of marketing strategy, since they are applied as marketing tools widely (Mariani, Felice & Mura, 2016). Gradually, these platforms offer the opportunity for co-marketing between different companies (i.e., Nike and Apple) (Ramaswamy & Ozcan, 2018). In this way, the interaction between companies as well as their customers can create higher values for the customers and benefit the business ultimately (Ramaswamy & Ozcan, 2018).

Within the company structure, a new type of working- virtual work is created (Bailey, Leonardi & Barley, 2012). The prevalent of virtual working which changes the traditional organization structure also brings a challenge in management, since company structure and working environment are no longer limited to geography. Innovation is essential for companies to retain their competitive advantages. In fact, innovation is tightly associated with digital technology these days. From the idea-generating to the idea evaluations, all these processes can be assisted by digital technologies (Fayard, Gkeredakis & Levina, 2016;

Austin, Devin & Sullivan, 2012; Lusch & Nambisan, 2015; Blohm et al., 2016; Toytari et al., 2018). However, the realization of these innovations requires the company to alter its mindset. In other words, a business model and strategic plan should be the foundation for innovation. This company mindset also links to knowledge management, in term of external knowledge generating and internal knowledge transferring (Fayard, Geredakis & Levina, 2016; Lu et al., 2015). Although it can also be assisted by digital technology, applying the right kind of technology is more critical for the successful implementation.

Although adopting the development of the digitalization can benefit the business, the threats from the digital environment cannot be ignored. The biggest threats from the digitalization environment are data security and data quality (Vidgen, Shaw & Grant, 2017; Grover & Kohli, 2013). The information exchange requires companies to expose their data, which could be a threat since competitors might use the information (Grover & Kohli, 2013). Therefore, transparency strategy is necessary for companies. The other risk would be data quality. The various data quality might create the difficulty of data analysis since data quality is essential for the analyzed results (Vidgen, Shaw & Grant). Therefore, how to obtain suitable and high-quality data is the key for data-driven companies. What is more, it is worth to mention that digital technology does not always keep moving forward; instead, technology comebacks exist, such as vinyl and analog films (Foucart, Wan & Wang, 2018).

#### *Research implication:*

Digitalization is a relatively broad concept and actives in many domains, while this research is business-oriented. During the literature review process, the findings show that many articles discuss digitalization implicitly. For example, some articles discuss how digital technology affect businesses under the preestablish digital environment. Also, in some articles, digitalization, technology development and technology innovation are considered the same thing. This lacking clear definition created a challenge for digitalization research. Also, the concept of digitalization is evolving based on eras. Correspondingly, research on better define digitalization is recommended, regarding the scope and the range accord with the times.

On the other hand, digitalization is carried by digital technology, which is a large aggregation of different kinds of techniques. Some articles discuss general technology while others prefer to mention the specific types of technology like big data. Therefore, research to classify these digital technologies might be helpful to further understand the impacts on businesses brought by digitalization, since different technologies work differently. What is more, digital technologies update rapidly and differ at times. Therefore, for literature review on digital technology, the specific type of technology should accord with the time frame.

3 streams are built to analyze the impacts on businesses in this research. Accordingly, they can be directions for future digitalization research to focus. Furthermore, this research is to investigate the impacts of digitalization on businesses, however, businesses also affects the



digital technology innovation and the progress of digitalization. Therefore, a reverse relationship between digitalization and could be an exciting topic to explore in the future.

*Managerial implication:*

Digitalization is an inevitable trend. Companies have to adopt this trend to retain and sustain their businesses, and by doing so, open attitude towards innovative digital technology is required. The research results show that digital technology could bring competitive advantages by improving company performance in various aspects, also open the possibility for new businesses. However, it does not mean that all the company can succeed or survive from digitalization.

The research findings show that the key for the company to succeed or survive is implementing a suitable type of digital technologies. Digital technology innovation and implementation typically require a significant investment in the beginning. While no technologies or products can last forever and they are upgrading fast so that not all the investments can get it back. What is worse, a wrong investment decision might ruin a company. A good strategy helps to select the right technology, and the implementation should fit with the company business model. More importantly, this requires an open-minded company environment as well as proper management, since digital technology innovation cannot exist without management innovation. In conclusion, sound business models design, and strategy can allow the company to take advantage of digitalization and create competitive advantages.

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## Appendix A

*Table 1 4 & 4\* Journals publishing digitalization research*

<b>Source title</b>	<b>Records</b>	<b>% of 632</b>
Mis Quarterly	78	12.342
Information Systems Research	73	11.551
European Journal of Operational Research	67	10.601
Journal of Management Information Systems	56	8.861
Tourism Management	46	7.278
Management Science	45	7.120
Marketing Science	40	6.329
Journal of Product Innovation Management	30	4.747
Research Policy	28	4.430
Journal of Marketing	26	4.114
Organization Science	22	3.481
Journal of Marketing Research	21	3.323
Journal of Applied Psychology	20	3.165
International Journal of Research in MARKETING	17	2.690
International Journal of Operations Production Management	16	2.532
Journal of Consumer Research	16	2.532
Operations Research	16	2.532
Journal of Retailing	15	2.373