Organizational Capabilities in Data-driven Value Creation: A Literature Review

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Abstract: Prior research has shown that organizational capabilities can help enhance competitive advantages. However, organizational capabilities are also required to develop in order to keep up with the dynamic environment or changing business environment. Over the last decade, data has been introduced as a new business resource in organizations, which brings both new opportunities and challenges in data-driven value creation in organizations. There is a need to understand what organizational capabilities are needed in achieving data-driven value creation for organizations. This study conducts an exploratory literature review to understand what organizational capabilities are related to data-driven value creation. Based on the selected 14 articles from the literature between years 2016 and 2020, the literature review shows that analytics capabilities are the most important capabilities in data-driven value creation together with other different capabilities. There is more room for research with regards to organizational capabilities in data-driven value creation, such as to examining what are the components of analytics capabilities and how organizations should combine different organizational capabilities for data-driven value creation.

1 INTRODUCTION

According to Barney (1991), a firm contains different resources which include knowledge, assets, capabilities, and know-how, resources that can be used in ways to create value. Resources contain both assets and capabilities, and capabilities are generated through organizational processes (Hooley et al., 1998). Organizational capabilities have been suggested to affect organizations' performance and can help realize value, and different types of capabilities have been suggested for value creation. For instance, organizations' operational capability is required to convert input into output whereas dynamic capability of organization is essential for reconfiguring existing operational capabilities (Lin et al., 2016). Dynamic capabilities are linked to competitive advantages or firm performance (Eriksson, 2014). Information Technology (IT) capabilities, the ability of a firm to mobilize and use its IT based resources in combination with other resources or capabilities, has been found to be positively linked with firm performance (Bharadwaj, 2000). In recent years, organizational capabilities has also been posited to lead to data-driven value

creation. For example, big data analytical capability can be used for creating value for product development by analysing review data (Zhou et al., 2018), and business analytics (BA) capabilities can support decision-making in organizations (Ashrafi & Zare Ravasan, 2018).

Data is seen as an important resource for creating value. For instance, it is used for identifying the most profitable customers or to develop new products and services (Saarijärvi et al., 2014). In the context of social networking websites, companies seek to create value to both customers and themselves by using customer data from their online platforms (Jussila & Madhala, 2019). Automotive industries that are heavily reliant on physical assets also use data to identify market value and for creating innovative products and services (Woźniak et al., 2015). Internet of Things (IoT) applications also provide possibility for data-driven value creation. According to Fantana et al. (2013), IoT applications can create a lot of value for industry, such as reducing production loss, reducing energy consumption, improving operation, safety and sustainability. Universities have also regarded information technologies as enablers to tacit knowledge transfer (Chugh, 2018), and data analytics

has been used to improve student retention (de Freitas et al., 2015).The above examples throw light on the potential of data-driven value creation in business.

As discussed above capabilities play an important role in creating value for organizations. But there is a lack of knowledge on how capabilities are linked with data-driven value creation. For instance, what types of capabilities are required in the process of data-driven value creation. As data-driven value creation is an emerging research topic in business and management field, it is necessary to understand the topic based on prior research, which will provide scholars on the current scenario of the role of capabilities on data-driven value creation and the potential future direction. Therefore, this study attempts to conduct an exploratory research into the topic of capabilities in data-driven value creation via a literature review and will aim to provide an initial picture of the role of capabilities in data-driven value creation by proposing answers to following research question (RQ): *"What kind of capabilities are needed for organizations to use data for value creation?"*.

In the next section, a theoretical background of capabilities and value creation is provided. Then the research method is presented. Following the research method, the findings of capabilities in data-driven value creation are presented. After which the research results are discussed. Finally, the conclusions and the limitations of the study are mentioned.

2 THEORETICAL BACKGROUND

2.1 Capabilities

There are different definitions for capabilities in the literature. Before defining the term capabilities, it is important to understand the origin of capabilities and its link with the competitive advantages of a firm. The resource-based view (RBV) of the firm proposed by Barney (1991) states that a firm's competitive advantages can be sustained if its resources are valuable, rare, imperfectly imitable, and non-substitutable; these resources can be assets, capabilities, attributes, organizational processes, information and knowledge which can be used for enhancing efficiency and effectiveness. Prior research argued that each firm is unique or differentiated by the way in which it makes use of its resources or the possible services based on its resources (Kor et al., 2016).

A firm's resources can be classified into tangible and intangible resources (Wernerfelt, 1984). Both assets and competencies can be intangible in nature. For instance, capabilities with intangible nature can be classified into 'Having' capabilities (intangible assets like patents) and 'Doing' capabilities such as skills, tacit knowledge, and competencies. Capabilities can either be dependent of people or independent of people (Hall, 1993). For instance, the capabilities dependent of people include i) functional - involving know-how of different stakeholders such as employees and suppliers, and ii) cultural – perceptions of quality, perceptions of customer service, and the ability to change and innovate and in short, it involves skills (Hall, 1993). According to Hall (1993), the capabilities independent of people involve intangible assets namely data bases, contracts, trade secrets and intellectual property rights and a capability can be a result of an intangible resource. For example, a regulatory capability is an outcome of well-established distribution network or reputation and the key point is that sustainable competitive advantages can be a result of possessing appropriate capability differentials (Hall, 1993). According to Wójcik (2015), the intangible resource plays a direct role in supporting the resource-based view, because possessing intangible resource can act as an imitation barrier and can help sustain competitive advantages of a firm. He also argued that the conceptualization of capabilities was evolved from the traditional RBV of the firm, but also criticized the RBV for its lack of clear distinction between resources and capabilities (Wójcik, 2015).

Prior research has distinguished the differences between firm resources and firm capabilities. According to Amit and Schoemaker (1993), capabilities can be defined as the ability of firm to deploy or make use of resources, and these processes are usually tangible or intangible in nature and firm centric, which are refined and developed over a time due to the interaction with firm resources. Similarly, Day (1994) defines capabilities as complex array of skills and cumulative learning exploited through organizational processes that establish good coordination of operations, and firms can take advantages of assets via making use of capabilities, which acts like a glue that brings together all firm assets.

According to Winter (2000), an organization's capabilities are a collection of many routines and when combined with other inputs, the management can make significant outputs. Likewise, an organization's capability relates to the ability or capacity of an organization to execute balanced set of

tasks by making use of resources to achieve a certain outcome; a capability irrespective of its characteristic (operational or dynamic) is the capacity to achieve or implement a particular task (Helfat et al., 2009). A firm's capabilities, if sharpened, would allow the firm to perform its tasks efficiently (Teece, 2012).

Prior research states that a company's growth is steered by the capabilities it possesses and that these capabilities are subject to change; managing resources and capabilities are the key drivers to competitive advantages (Kor & Mahoney, 2000) and this can be a source of value creation for a firm (Wójcik, 2015). The process of embedding resources, capabilities and processes acts as a barrier for imitation and transferability. Therefore, the higher the difficulty for a competitor to imitate, the higher the competitive advantages a firm has. As more capabilities are intertwined with each other, it creates a capability embeddedness and therefore becomes a part of organizational culture and hence becomes a source of competitive advantages (Grewal & Slotegraaf, 2007; Wójcik, 2015). For organizations, they have different capabilities such as leadership capabilities, human resource capabilities, IT capabilities, social entrepreneurship capabilities, digital capabilities, operation capabilities, and analytics capabilities.

2.2 Value Creation

According to Bowman and Ambrosini (2000), organizations create value in two ways namely perceived use value and exchange value; the former is subjective and is defined by customers based on how they perceive the usefulness of the offering (e.g., product), whereas the latter is created when the product is sold and the exchange happens between the buyer and the seller (Bowman & Ambrosini, 2000). Organizations create value by working with the useful resources they acquire through people and processes, and value is created through exchange value, profit differentials between firms, and labour (generic, differential, unproductive, and entrepreneurial labour) (Bowman & Ambrosini, 2000). Value is created when the end users find a product or service as useful and when there is a new innovation or when existing products or technologies can be improved upon to serve something else (Pagani, 2013).

According to Lepak, Smith and Taylor (2007), value creation occurs at three levels namely society, organizations, and individual. Specifically, at individual level, value is created by an individual which is perceived as valuable by employer, client, or customer; at organizational level, value is created

through innovative practices, unique organizational processes, assets, and capabilities, and at societal level, value occurs when programs and incentives are provided to encourage innovation in existing organizations and entrepreneurial ventures so value can be created to members of the society.

Data has become a significant resource in creation of new businesses and thereby promoting value creation (Alamäki et al., 2018). Data is becoming important in value creation and has attracted the attention of scholars to explore how data can be used to create value in different contexts. For example, in the context of automotive industry which is a physical intensive business, huge amounts of data can be collected to develop maintenance services, to support driving safety, and to support knowledge-driven product development, and value is created by enhancing after-market services with the help of data in the automotive industry (Johanson et al., 2015). With regards to companies operating online, they are extremely profitable from data. Online platform companies have accumulated huge amounts of customer data on their platforms, and have monetized data, which create significant value for them. Such as in 2017, Booking Holdings, an online travel platform, attained 98% gross profit margin (Wendy et al., 2018). This is a good example of business profits and value creation based on data. Manufacturing industries are turning into smart manufacturing where data-driven strategies are being used for creating value and to become more competitive (Tao et al., 2018). Obviously, data has been applied in business for data-driven value creation in different contexts.

3 RESEARCH METHOD

The primary focus of this research is to understand what type of capabilities can help with data-driven value creation. To find the right articles related to the topic, the keywords and phrases *"data driven value creation" OR "data-driven value creation" AND "capabilities"* was applied to search articles in the Web of Science database. The search was limited to one database to keep the search results manageable. In the following process, all the articles are read and filtered based on the keywords and phrases "value", "value creation", "data based value creation", "capabilities" to exclude some articles that are not really focussed on data-driven value creation and capabilities. The number of articles that were chosen for the final analysis was 14 out of 134 articles.

Table 1: Journal sources of the selected articles.

Journal	No of Articles	Year
Bottom Line	1	2020
Business Process Management Journal	1	2017
European Journal of Information Systems	1	2017
European Journal of Operational Research	1	2017
Government Information Quarterly	2	2018, 2019
International Journal of Information Management	1	2019
International Journal of Operations and Production Management	1	2019
Journal of Business and Industrial Marketing	1	2016
Journal of Product Innovation Management	1	2018
Journal of Services Marketing	1	2017
Measuring Business Excellence	1	2019
Service Science	1	2017
Technovation	1	2019
Total	14	2016-2020

Table 1 lists the different journals from which the articles were chosen. All the chosen articles were published between years 2016 and 2020. The articles were published in Service Science Journal, European Journal of Information Systems, Business Process Management Journal, Journal of Product Innovation Management, Journal of Services Marketing, International Journal of Information Management, Technovation, International Journal of Operations and Production Management, Journal of Business and Industrial Marketing, Measuring Business Excellence, Bottom Line, European Journal of Operational Research, and Government Information Quarterly.

4 FINDINGS

Table 2 presents different capabilities that have been discussed in data-driven value creation in the literature. Specifically, four different capabilities were discussed including IT capability, analytics capabilities (big data capabilities/big data analytics capabilities., supply chain analytics capabilities, business intelligence capabilities, business analytics capabilities, predictive analytics capabilities), dynamic capabilities, and mobile social media capabilities.

Different capabilities related to analytics capabilities have been discussed to explain their roles in data-driven value creation in different research contexts, such as big data capabilities/big data analytics capabilities., supply chain analytics capabilities, business intelligence capabilities, business analytics capabilities, and predictive analytics capabilities.

Prior research have investigated the role of different organization capabilities in data-driven value creation in diverse contexts, and focused on the different specific dimensions of data-driven value creation. For instance, IT capabilities has been suggested to be an important organizational capability closely related to data-driven value creation.

Borangiu and Polese (2017) highlighted the importance of IT capabilities on IT service management, and found that there is a significant impact of IT capabilities on service innovation. Nwankpa and Datta (2017) studied the relationship between IT capabilities and firm performance with a focus on IT capabilities and the importance of digital business intensity (DBI). They investigated the mediating and moderating role of DBI between IT capabilities and firm performance in the context of organizational investments in emerging technologies, and found that DBI promotes firm performance.

Based on the research in the educational context, Carillo (2017) posited that analytics skills and capabilities should be developed for future managers due to the shift towards data-driven business world. He also highlighted big data analytics and data science as important skills for future managers. According to Gantz and Reinsel (2012), big data is not only about data, but also includes the analysis of data, and data science is the principle of extracting information from data using different methods such as data mining and other algorithms (Provost & Fawcett, 2013).

In the context of smart services, Töytäri et al. (2018) emphasized the importance of dynamic capabilities as an approach to bring about a shift in organizational mindset and capabilities while responding to external environment, and value communication and shared activity system were identified as specialized and co-specialized capabilities for smart services. Dynamic capability is the ability of a firm to combine, build and to restructure internal and external competences to tackle rapidly changing environments (Teece et al., 1997). Kunz et al. (2017) discussed the effect of big data for both firm and customer in the context of customer engagement, the results show that big data analytics capabilities have a significant effect in understanding customers, the authors also provide a customer engagement framework using big data.

In the context of service systems, Akter et al. (2019) provided a framework for big data analytics based decision making which consists of six steps. Unlike the previous studies, Urbinati et al.(2019), focused on how big data solution providers create value from their solutions, and identified two innovation startegies for data-driven value creation, namely use case-driven and process-driven strategies.

Table 2: Capabilities in data-driven value creation, research context, method, and findings.

Shortlisted Articles Authors	Capability	Research Context	Research Method	Findings
Borangiu & Polese (2017)	IT capability	Service design and innovation	Conceptual study	IT capability has a significant influence on service systems with regards to their formalization, modelling, design, and applicability leading to data-driven value creation, such as the development of knowledge intensive services and service innovation.
Nwankpa & Datta (2017)	IT capability	Organizational investments in emerging technologies	Quantitative empirical study	There is significant impact of DBI on data-driven value creation, such as promoting organizational performance. DBI has an influence on IT capabilities with regards to organizational performance. IT capability is a necessary capability for an organization to achieve performance.
Carillo (2017)	Analytics capability	Educational context	Conceptual study	Analytics capability should become an organizational component that permeates through all departments and employees for data-driven business.
Töytäri et al. (2018)	Dynamic capabilities	Adoption of smart services	Qualitative empirical study	Firms should coordinate changes with regards to logic and capabilities both within the organization and with their network (business) for successful adoption of smart services.
Kunz et al. (2017)	Big data capabilities	Customer engagement	Conceptual study	Big data analytics enable firms to evaluate both the firm and consumer value in real-time which provides possibility to perceive the customer through multidimensional profiles and everchanging adjustments. Deeper understanding of customer with the help of big data analytics has the capacity for companies to enable their customers to make easier choices and good decisions which encourages the motivation for customer to engage with the company.
Akter et al. (2019)	Big data capabilities	Service systems	Conceptual study	The paper proposes a framework that offers a useful guidance to make use of big data analytics in decision making. The six steps are problem recognition, review of previous findings and context, selecting variables and developing the model, collecting data, analyzing data, and finally taking actions on insights.
Urbinati et al. (2019)	Big data capabilities	Service design	Qualitative empirical study	The research identifies the important role that big data play in several domains such as customer need detection, risk management and decision-making, data-driven knowledge, product and service design, quality management and opportunity recognition and creation.
Fosso Wamba & Akter (2019)	Supply chain analytics capability	Supply chain management	Quantitative empirical study	Supply chain analytics capability has a positive impact on firm performance and supply chain agility. In the context of the big data analytics environment, supply chain agility has a significant positive impact on firm performance and acts as a mediator between supply chain analytics capability and firm performance.
Bolat, Kooli, & Wright (2016)	Mobile social media capability	Social media	Qualitative empirical study	Mobile social media capability creates competitive advantages and helps in the development of new services and products. In marketing and advertising, this capability leads to costs savings through decreased spending without compromising innovation.
Ratia et al. (2019)	BI capabilities	Healthcare	Qualitative empirical study	The authors recommend BI tool utilization as an important capability and the value it creates are as follows 1) data-driven decision making 2) customer reporting and data utilization, and 3) new core businesses emerging from data. For instance, social BI ecosystems emerging from external data.
Medeiros et al. (2020)	Analytical capabilities (data science for business)	Public sector organizations	Conceptual study	Some of the benefits/value of using data science for business are 1) data quality dimension - improvement of data quality and forging data-driven culture 2) analytical intelligence dimension – agile decision-making 3) dynamic capabilities dimension – sharing of data, integrating information, organizational learning and generation of knowledge 4) competitive advantage dimension – increased productivity and business profitability.
Vidgen, Shaw & Grant (2017)	Business analytics capabilities	Public sector organizations	Mixed methods empirical study	The identification of challenges that organizations or firms face when building up business analytics capabilities. Most important of these challenges being 'value' and 'people'. The study also provided 21 recommendations to help create value from big data and is divided into three categories, namely i) data and value; ii) organization and process; and iii) people and technology.
McBride et al. (2019)	Predictive analytics capabilities	Open government data (OGD) driven public services	Qualitative empirical study	Six factors lead to the creation of open government data-driven public service co-creation and in the context of predictive analytics capabilities. With regards to the case, the factors for the food safety inspection forecasting model to occur are: 1) motivated stakeholders. 2) innovative leaders, 3) good communication, 4) already existing open government data portal, 5) external funding, and 6) agile development.
Chatfield & Reddick (2018)	Big data capability (Big data enabled customer	Government on-demand public services	Qualitative empirical study	Three determinants for efficient use of big data and big data analytics: i) process-level strategic alignment; ii) (digital) infrastructure; and iii) absorption of big data technologies. Improved customer agility and responsiveness through productive use of big data and big data analytics.

With regards to supply chain context, Fosso Wamba and Akter (2019) identified three important antecedents for a dynamic supply chain analytics capability model which has a positive link to firm performance, and found that supply chain analytics capability has an interconnected process that can produce insights for decision-making in real time using managerial, technological, and personnel

capabilities. In the reviewed articles, the capabilities mentioned related to big data and data analytics can be grouped under analytics capability, such as big data analytics and supply chain analytics capability.

Ratia et al. (2019) investigated the role of BI capability in decision-making. They highlighted the use of capabilities possessed by individuals for efficient BI tool utilization for data-driven value creation, and found that BI capabilities can support data-driven decision making, customer reporting and data utilization, and new core businesses emerging from data. Medeiros, Hoppen, Maçada (2020) emphasized data science for business as an important analytics capability, and suggested that analytics capabilities can help improving data quality and forging data-driven culture, support agile decision-making, and dynamic capability enhancement (such as data sharing, integrating information, organizational learning and generation of knowledge) and achieving competitive advantages (such as increased productivity and business profitability). Vidgen, Shaw and Grant (2017) defined business analytics capability as a facilitator between the generation of organizational data, internal and external accesses, and the value that can be leveraged with that data through decision making. They also identified the management challenges with regards to business analytics capabilities. In the context of the healthcare, McBride et al. (2019) explored open-government-data(OGD)-driven co-created services and discover six factors that allow for the OGD-driven services to take place in the form of predictive analytics or forecasting model to create value. In the context of on-demand services, big data was found to enable customer agility for a governmental service agency, and big data analytics can improve customer agility and responsiveness; customer agility is an organization's dynamic capability that is vital when it comes to customer-oriented services (Chatfield & Reddick, 2018). Bolat, Kooli and Wright (2016) identified mobile social media capability in value-creation based on social media data, and found that mobile social media capability are very important for effective marketing and adverstising.

5 DISCUSSION AND CONCLUSIONS

This research aims to provide understanding of the different types of capabilities related to data-driven value creation based on a literature review.

Prior literature indicates that different types of capabilities are associated with data-driven value creation, including IT capabilities, analytics capability (big data capabilities/big data analytics capabilities., supply chain analytics capabilities, business intelligence capabilities, business analytics capabilities, predictive analytics capabilities), dynamic capabilities, and mobile social media capability. Prior studies have investigated the different dimensions of data-driven value in different contexts. In the context of service design and innovation, IT capabilities help with the development of knowledge intensive services and service innovation. In the context of private organizational investments in emerging technologies, IT capabilities play an important role in achieving organizational performance. In educational context, analytics capabilities add value to all businesses by creating a data-driven mindset for managers. In the context of smart services, effective coordination of dynamic capabilities leads to successful adoption of smart services. In the context of consumer engagement, big data capabilities provide deeper understanding of customer and contribute in motivating consumers to engage with companies. Big data capabilities are also helpful in decision-making in service systems In the context of service design big data capabilities play an important role in decision-making, quality management and risk management. In the context of supply chain management, supply chain analytics capabilities positively affect firm performance. In the context of social media, mobile social media capabilities play important roles in creating strategic value for social media providers by influencing market sensing, relationship management, branding, and content development. IT capabilities, analytics capabilities (such as big data capabilities, supply chain analytics capability) and dynamic capabilities seem to be important in data-driven value creation, and social media capabilities is also mentioned. Clearly, different capabilities and value propositions based on data have been validated in different research contexts though analytics capabilities are highlighted in data-driven value creation.

In the context of healthcare, BI capabilities are needed to create value at different levels namely decision making, combining data sources and customer reporting, and for future business concept development. Data science for business helps in forging a data-driven culture, agile decision making, organizational learning, increased productivity and business profitability whereas business analytics capabilities help create value by increasing revenues, reducing costs, and improving service quality. Predictive capabilities create value by predicting food

safety issues in the context of open government data-driven services. In the context of government on-demand services, the government agencies improved service responses through use of big data analytics capabilities. Analytics capabilities (BI capabilities, analytical capabilities, business analytics capabilities, predictive analytics capabilities, and big data analytics capability) have been identified to be an important capability in data-driven value creation in different contexts.

Prior literature highlights the importance of analytics capability in data-driven value creation though they differ in terms of value dimensions. This study focuses on organizational capabilities and data-driven value creation. There are no consistent findings because different capabilities are related to different dimensions of value. However, the research findings in this study show that analytics capabilities are the most highlighted capabilities in data-driven value creation. The findings from the literature open a couple of directions for future research. First, future research can go deeply into how analytics capabilities can help with data-driven value creation via exploring the mechanisms or the strategies that make it work. Second, future research can investigate what are the basic and advanced skills needed in analytics capabilities and the role of these skills in data-driven value creation. Third, further study can explore whether analytics capabilities can work with other organizational capabilities to achieve data-driven value creation. Fourth, there is a need for further research on analytics capabilities to investigate the components of analytics capabilities. Further research in the above area will provide organizations with more detailed practical guidelines on how to realize data-driven value and what they should do.

Different capabilities can help with value creation in different dimensions. Based on the literature review we found that the research topic is not mature, and more research should be conducted to increase the understanding of the role of capabilities in data-driven value creation. In addition, analytics capabilities has been found to be important for data-driven value creation, which indicates that data as business resources should be applied in business for different value based on different data analytics techniques.

This study has its limitations. First, this study focuses on capability in data-driven value creation. However, there are many other factors related to data-driven value creation, such as digitalization in organizations, investment in data, and data-driven organizational culture. Second, this study only found a small number of articles in the research area, which might limit the generalization of the research findings. Future research can also consider expanding the scope of databases for article search to yield a larger number of relevant articles.

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