

RESEARCH

From Big Data to Big Performance – Exploring the Potential of Big Data for Enhancing Public Organizations' Performance. A Systematic Literature Review.

Katharina Guirguis

Zurich University of Applied Sciences (ZHAW), CH
guir@zhaw.ch

This article examines the possibilities for increasing organizational performance in the public sector using big data by conducting a systematic literature review. It includes the results of 36 scientific articles published between January 2012 and July 2019. The results show a tendency to explain the relationship between big data and organizational performance through the Resource-Based View of the Firm or the Dynamic Capabilities View, arguing that performance improvement in an organization stems from unique capabilities. In addition, the results show that big data performance improvement is influenced by better organizational decision making. Finally, it identifies three dimensions that seem to play a role in this process: the human dimension, the organizational dimension, and the data dimension. From these findings, implications for both practice and theory are derived.

Keywords: big data; organizational performance; dynamic capabilities; systematic literature review

Dieser Artikel untersucht die Möglichkeiten zur Steigerung der organisatorischen Leistungsfähigkeit im öffentlichen Sektor mithilfe von Big Data, indem eine systematischer Literaturreview durchgeführt wird. Er umfasst die Ergebnisse von 36 wissenschaftlichen Artikeln, die zwischen Januar 2012 und Juli 2019 veröffentlicht wurden. Die Ergebnisse zeigen eine Tendenz, den Zusammenhang zwischen Big Data und der organisatorischen Leistungsfähigkeit durch den Resource-Based View of the Firm oder den Dynamic Capabilities View zu erklären, indem argumentiert wird, dass die Leistungssteigerung in einem Unternehmen durch einzigartige Fähigkeiten (capabilities) entstehen. Darüber hinaus zeigen die Ergebnisse, dass die Performancesteigerung durch Big Data von besserer organisatorischer Entscheidungsfindung beeinflusst ist. Schliesslich werden drei Dimensionen identifiziert, die in diesem Prozess eine Rolle zu spielen scheinen: die menschliche Dimension, die organisatorische Dimension und die Datendimension. Aus diesen Erkenntnissen werden sowohl Implikationen für die Praxis als auch für die Theorie abgeleitet.

Schlagworte: Big Data; Organisatorische Leistungsfähigkeit; Dynamic Capabilities; Systematischer Literaturreview

Cet article examine les possibilités d'accroître le rendement organisationnel dans le secteur public à l'aide de Big Data en effectuant une revue systématique. L'analyse comprend les résultats de 36 articles scientifiques publiés entre janvier 2012 et juillet 2019. Les résultats montrent une tendance à expliquer la relation entre Big Data et le rendement organisationnel au moyen de la théorie du management par les ressources ou des capacités dynamiques, soutenant que l'amélioration du rendement dans une organisation provient de capacités uniques. De plus,

les résultats montrent que l'amélioration de la performance de Big Data est influencée par une meilleure prise de décision organisationnelle. Enfin, il identifie trois dimensions qui semblent jouer un rôle dans ce processus : la dimension humaine, la dimension organisationnelle et la dimension des données. De ces résultats, on en déduit des implications tant pour la pratique que pour la théorie.

Mots-clés: *Big Data*; rendement organisationnel; *capacités dynamiques*; *revue systématique*

1 Introduction

Many scholars in the fields of public management and information technology have recognized the importance and potential impact of big data in their respective disciplines. Research suggests that big data can no longer be ignored in the public field: e.g. digitization of public services (see e.g. Agarwal, 2018; Giest, 2017), open data initiatives (see e.g. Giest, 2017) or performance based accountability (see e.g. Ingrams, 2018). Big data is thought to be a means to gain efficiency in administrative processes (Cavanillas et al., 2015) – and thus deliver the same public performance with less resources (Munné, 2016). However, aspects like privacy, transparency and even democracy play an enormous role when it comes to the use of big data in the public sector (e.g. Ingrams, 2018; Janssen & van den Hoven, 2015), both as chances as well as risks. As Cavanillas et al. (2015) suggest, risks can be identified as security and privacy concerns. Other authors identify risks in poor decision making at the individuals' expenses and argue that possible consequences could even go beyond – into social, economic and political spheres (Wigan & Clarke, 2013). Chances are improved transparency, public procurement, improvement of asset allocation, higher service quality and accountability and finally, better informed citizens (Cavanillas et al., 2015) as well as enhanced participation (Chen, Chiang, & Storey, 2012).

Information technology scholars on the other hand emphasize that predictive analytics can lead to an increase in business value and firm performance (Gunasekaran et al., 2017; Ji-fan Ren et al., 2017). In information technology research, the focus mostly lies on technical tools that can be used to analyze big data in order for it to be used as an economic asset (e.g. Grover & Kar, 2017). The relevance and potential of big data thus has reached the research agenda of many scholars undermining the importance of reviewing findings on the subject so far.

One possible application of big data is to link it with organizational performance. The basic idea behind this connection is simple – better performance through evidence-based data-driven decision making (McAfee & Brynjolfsson, 2012). Many organizations are interested in improving their performance and as such many companies have already incorporated the use of big data for performance enhancement (Ghasemaghahi, 2018). Unsurprisingly, there has also been an emergence of research investigating the relationship between big data and organizational performance (see e.g. Gunasekaran et al., 2017). Particularly, there is a lot of research done by management scholars – e.g. operations management, supply chain management and marketing (Sena et al., 2019).

What is striking, however, is the lack of research on the relationship between big data and organizational performance in the public sector. This can be partially explained by the fact that performance has other implications in the public sector than in the private sector (see e.g. Zheng, Wang, Liu, & Mingers, 2019). Whereas performance in a private company can often simply be defined as financial success, this definition does not apply for public organizations (Zheng et al., 2019). Performance in the public sector is more about creating value than about financial performance (Zheng et al., 2019). This does not mean that performance in public management is irrelevant. In fact, quite the opposite is true and public demand for high public performance persists (Dooren, Bouckaert, & Halligan, 2015).

Existing literature on big data and public performance suggests that there could be a positive impact of big data on organizational performance (see e.g. Gamage, 2016) even if literature focusing on the public sphere is scarce. Nevertheless, van der Voort et al. (2019, p. 36) state that the impact of big data on decision making in the public context is disputable as “[...] big data – including its new methods and functions – must inevitably encounter existing political and managerial institutions”. More research is needed to fill this gap in existing literature, displaying both highly practical as well as theoretical relevance. In order to contribute to knowledge creation, this article conducts a systematic literature review. A literature-based approach is chosen as it is well suited to assess the current state of research conducted in the different disciplines. It combines the knowledge created in the different disciplines where research on big data and organizational performance has been conducted. The guiding question of this work is:

What is the state of research on how big data can enhance organizational performance in the public sector?

To answer the research question, the article is structured as follows. First, there is a clarification of the central terms, namely big data and organizational performance, which is followed by a description of the methodology used. The findings and their discussion and implications for practice and research are addressed afterwards.

2 Big Data and Organizational Performance

Big data as well as organizational performance are concepts that are difficult to define as they both can be interpreted in different ways. Nevertheless, many authors agree in defining big data as digital data that is too large, too raw and/or too unstructured to be analyzed through conventional relational database techniques (Kim, Trimi, & Chung, 2014). Typically, big data is attributed with the 5V's – volume, variety, velocity, veracity and value (Fosso Wamba et al., 2015).

Performance in the public sector is about the value an organization creates for its stakeholder groups (Zheng et al., 2019). Performance of any organization can be measured with performance indicators – financial as well as non-financial ones (Fryer, Antony, & Ogden, 2009). Defining those indicators holds certain difficulties. For public organizations, Fryer, Antony & Ogden (2009) argue that it is even more challenging. They claim that there are still challenges to public performance management regarding “improvements in performance, accountability, transparency, quality of service and value of money” (Fryer et al., 2009, p. 491).

3 Methodology

The method applied is a systematic literature review, which is a method to summarize and categorize existing literature on a topic (Fisch & Block, 2018). Reviewing existing literature on a subject fosters theory development and helps identifying gaps in existing research and literature (Webster & Watson, 2002). Among others, it is a well suited approach to establish knowledge on emerging topics where a common understanding does not yet exist (Camargo Fiorini et al., 2018). Because of the interdisciplinary nature of the subject, all found articles were considered for this systematic literature review, regardless of the discipline of the journals they were published in.

Big data in connection with volume, velocity and variety was first described in 2001 (Grable & Lyons, 2018, p. 17). Because of rapid evolvement of technology, only articles published between January 2012 and July 2019 were included. The search was conducted in the EBSCO Host Business Source Premier database.¹ It is a business research database but also contains academic journals from the public sphere. Due to the interdisciplinary nature of the topic and the fact that most existing literature stems from the private sector, this database promises to be a suitable source for literature to be examined in this literature review. Two different searches with different keywords were conducted. Both searches were conducted in August 2019: The first one with the keywords ‘big data AND organizational performance’ and the second one with the keywords ‘big data AND public management OR public administration AND public performance’.² The first search created 112 articles. After filtering for academic articles a total of 71 articles resulted. The second search generated 815 articles of which 750 were from academic journals. Of these 821 articles in total the abstracts were read in order to decide upon their inclusion in the study. Literature stemming from the public sector is scarce and only four of the identified articles provided an explicit connection to the public sector. It was thus decided not to exclude articles from other disciplines, as findings from different disciplines can provide valuable insights for the field of public administration. Articles that define performance management in a human resource context (e.g. the management of an employee's performance) were excluded due to a different understanding of the term. Ones where a lack of a clear connection to the concept of big data³ was identified were further removed from the list. Finally, articles that would not fit the scope of the research question of this study for other reasons were excluded (e.g. articles dealing with theory application in big data research questions, articles focusing on other industry 4.0 topics, etc.). A total of 60 articles fulfilled the inclusion criteria and were therefore included in the analysis. During the analysis of the articles, another 24 articles were defined to be unfit for this study and further excluded, resulting in a total of 36 articles that

¹ <http://web.b.ebscohost.com/>.

² The ‘AND’ and ‘OR’ served as Boolean Operators, thus serving as conjunctions to combine the keywords.

³ A lack of connection to big data often occurred because ‘data’ is mentioned in many articles for example that engage with empirical data. However, they lack a connection to the concept of ‘big data’ relevant for this article.

are included in this literature review. The contents of these 36 articles were aggregated in the findings that are presented in the following.

4 Results

The presentation of the results is structured as follows. First, light is shed on the underlying theoretical assumptions between big data and organizational performance. Afterwards, results that describe the relationship between big data and organizational performance are presented. These results reflect how and through which moderating and mediating variables big data is thought to have an impact on organizational performance. Finally, attention is paid to the aspect of performance management.

4.1 Big Data as a Dynamic Capability

The literature reviewed in this paper shows a broad consensus about the theoretical thoughts behind the connection between big data and organizational performance. Some authors ($n = 5$) suggest the application of the resource-based view of the firm (RBV). Most ($n = 11$), however, advocate for the dynamic capabilities view (DCV). Some suggest other theories such as the ambidexterity theory (Boe-Lillegraven, 2014) and the complexity theory (Mikalef, Boura, Lekakos, & Krogstie, 2019).

Authors arguing through the resource-based view of the firm (RBV) share the basic idea of the RBV that a sustainable competitive advantage is gained through an organization's resources that are characterized by value, rarity, imperfect imitability and non-substitutability (Eisenhardt & Martin, 2000). "Big Data is an example of such a resource as its deployment is quite unique to the business and its effectiveness will be conditioned by other resources like skills and infrastructure" (Sena et al., 2019, p. 224). Research shows that these characteristics (value, rarity, imperfect imitability and non-substitutability) are challenged by big data (Braganza, Brooks, Nepelski, Ali, & Moro, 2017).

Eleven researchers suggest the application of the Dynamic Capabilities View (DCV) instead, which argues that a firm's capabilities need to be able to change (see e.g. Teece, Pisano, & Shuen, 1997). "The rationale is that RBV has not adequately explained how and why certain firms have competitive advantage in situations of rapid and unpredictable change" (Eisenhardt & Martin, 2000, p. 1106). In changing environments, the DCV thus seems promising to assess how big data can lead to competitive advantages (Sena et al., 2019). Braganza et al. (2017, p. 328) argue that big data "overturns many of [the resource-based theory's] assumptions about resources to achieve competitive advantage".

4.2 The Relationship of Big Data and Organizational Performance and the Role of Decision Making

In general, results show that the assumed relationship between big data and organizational performance might exist (e.g. Cao & Duan, 2017; Gunasekaran et al., 2017). Also the link between big data and decision making is supported in different studies as shown in **Figure 1** (e.g. Acharya, Singh, Pereira, & Singh, 2018). It is argued that big data can remove uncertainty in the decision making process by providing additional information (Sivarajah, Kamal, Irani, & Weerakkody, 2017; Trieu, 2017). This in turn can increase organizational performance (e.g. Şerban, 2017).

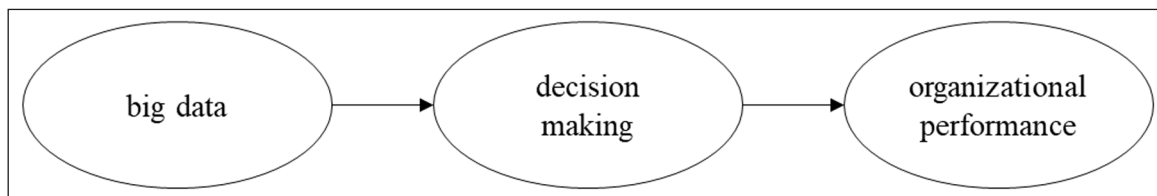


Figure 1: Framework on big data, decision making and organizational performance.

When it comes to factors mediating or moderating these relationships, results vary and authors have chosen different perspectives. As Sena et al. (2019, p. 226) state: "A common theme [...] is that the technological capability of exploiting Big Data needs to be complemented by a number of additional organizational resources that can eventually lead to enhanced performance".

When analyzing the literature considered for this review, three perspectives on aspects influencing the relationship between big data and organizational performance repeatedly became evident. There is literature focusing on the nature of data like data quality or data availability (e.g. Hazen, Boone, Ezell, &

Jones-Farmer, 2014; Janssen, van der Voort, & Wahyudi, 2017). Other authors emphasize the importance of human aspects, like analytical skills or managers' abilities (e.g. Akhtar, Frynas, Mellahi, & Ullah, 2019; Merendino et al., 2018). On the other hand, some scholars focus more on organizational aspects like for example organizational agility (e.g. Côte-Real, Oliveira, & Ruivo, 2017). Some authors suggest a combination of different perspectives. Kościelniak & Puto (2015) for example emphasize the importance of the data source as well as management rules and individual measures for gaining competitive advantages against competitors.

In the following, the examined literature is structured along these three dimensions (human dimension, organizational dimension, data dimension), allowing for deeper insights on the relationship between big data and organizational performance.

4.2.1 The Human Dimension

Many of the approaches arguing with the RBV or DCV – when speaking of resources and capabilities – emphasize human aspects like skills and abilities of managers or teams. Akhtar et al. (2019) for example confirmed a positive impact of big data savvy teams' skills and big data-driven actions on business performance and further identified big data-driven actions as a mediator in such a relationship. "This means that those organizations that extensively make use of such resources perform better compared to those that focus less on such applications and on the relevant insights drawn from big data" (Akhtar et al., 2019, p. 265). They argue that the combination of different big data skills in teams can be leveraged to capabilities that are rare and difficult to imitate – emphasizing the RBV's assumption of competitive advantage through rare and difficult to imitate capabilities (Akhtar et al., 2019). Amankwah-Amoah & Adomako (2019) refer to analytic capabilities to predict business failure. They assume that different access to data and different analytic capabilities lead to different conditions that influence the chance of business failure. In their model, firm performance is the competitive advantage gained through valuable and rare capabilities as well as improved understanding of market trends which are positively impacted through big data analytics capabilities (Amankwah-Amoah & Adomako, 2019). Wang et al. (2019) examined how business value in healthcare can be created through big data analytics. They identify data interpretation capability as a core competency and explain that big data analytics alone are not sufficient to create value. Rather, they argue that it is a combination of big data analytics capabilities and analytical personnel's skills as well as organizational resources and capabilities which foster value creation. These examples show that big data analytical skills and interpretation skills seem to play a role when it comes to generating value through big data. Another recurring pattern in literature is concerning an organization's board level or its management's skills.

Sivarajah, Kamal, Irani, & Weerakkody (2017, p. 274) define management challenges as the challenges faced when "accessing, managing and governing the data." Sena et al. (2019, p. 224) state that "big data generates value if the ability of the management can integrate them in the process and routines". An example for a big data resource they draw from their case study is Customer Relationship Management Analytics (CRM Analytics). However, to generate value from CRM Analytics, they argue that "it needs to be transformed into a dynamic capability" (Sena et al., 2019, p. 224). In semi-structured interviews, Merendino et al. (2018) explored if big data has an influence on board level decision making. They found that there are limited capabilities for dealing with big data at that level and suggest that boards need to develop valuable big data capabilities. Related to management support, Singh & El-Kassar (2019, p. 1271) explain that "corporate commitment influences big data assimilation through acceptance and routinization routes, which, in turn, enhances firms' sustainability performance." Management ability and commitment thus seem to be another factor that is important when using big data for enhancing organizational performance.

4.2.2 The Organizational Dimension

Subsumed under the organizational dimension are aspects concerning organizational information processing, firm size, organizational agility and strategy. Braganza et al. (2017, p. 336) state that "[d]ynamic capabilities in the field of big data are required at two levels: first, business processes and second, changes required to organizational resources to implement findings from big data analytics". Sivarajah et al. (2017, p. 273) explain that "[p]rocess challenges are the group of challenges encountered while processing and analysing the data that is from capturing the data to interpreting and presenting the end results". Chen et al. (2015) draw on the Dynamic Capabilities View to explain the creation of competitive advantages through big data analytics. They conclude that big data analytics "enable greater dynamic information processing capability" which then leads to a better knowledge base for the decision makers in an organization "enabling

them to produce better resource configurations and reconfigurations that create competitive advantages" (Chen et al., 2015, p. 6). Information processing is thus identified as a dynamic capability that can lead to value creation and help an organization to generate competitive advantages (Chen et al., 2015).

Côrte-Real et al. (2017) shed light on another organizational aspect – organizational agility. They explain that organizational agility is a dynamic capability fostered by big data analytics enablers (Côrte-Real et al., 2017). Boe-Lillegraven (2014, p. 27) draws on ambidexterity theory, which "suggests that the ability to simultaneously explore and exploit is linked to firm performance". Some authors argue that the context of an organization is often neglected in research (Dubey, Gunasekaran, Childe, Blome, & Papadopoulos, 2019; Mikalef et al., 2019). Shedding light on organizational context, Dubey et al. (2019) explain that firm size has a significant effect on operational performance, suggesting that big data predictive analytics could improve operational performance rather in larger than smaller firms. Mikalef et al. (2019, p. 271) also argue that specific organizational contexts need to be considered when studying the impact of big data analytics resources and organizational performance: "[...] understanding the constituent components that enable such a fusion between big data analytics and business strategy, and that as a result lead to performance gains, is critically important". They suggest the application of the complexity theory for investigating "the configurations of resources and contextual factors that lead to performance gains from big data analytics investments" (Mikalef et al., 2019, p. 261). Their results imply that considering big data analytics as a solely technical challenge is insufficient and that it should rather be assessed as an organizational one which is in line with the business' strategy. In the cases that they examined, big data analytics strategy, organizational inertia and ethics and legislation were identified to be important influence factors (Mikalef et al., 2019). Șerban (2017, p. 188) highlights the role of strategy as well: "As we saw, big data brings opportunities for those companies that are prepared, those who include big data in their strategy". Further, he emphasizes the role of skills, IT investments and organizational culture (Șerban, 2017).

Gnizy (2019) found further organizational components in the relationship between big data usage and performance: market orientation, entrepreneurial orientation and learning orientation. Their "findings indicate specifically that [big data] enhances performance through the customer value provision element of [market orientation] since it allows firms to focus their processes and activities on creating foreign customer value by leveraging insights about overseas market needs" (Gnizy, 2019, p. 334).

Summing up, many organizational aspects have been identified that potentially play a role in the relationship between big data and organizational performance.

4.2.3 The Data Dimension

The data dimension mostly evolves around the aspect of data quality. Hazen et al. (2014) for example argue that data based management highly depends on the quality of the underlying data. Sivarajah et al. (2017) emphasize the importance of data quality and identify data challenges as one of the major challenges regarding big data.

The data dimension is often emphasized in combination with other dimensions. Janssen et al. (2017, p. 344), arguing that value from big data is created through improved decision making quality, say that "the quality of the source data, the processing of the data and how the transfer of the data is handled influences the quality of decision making". Ji-fan Ren et al. (2017, p. 5012) "argue that the quality of system and information in [big data analytics] environment have significant impact on business value, which in turn will influence the [firm performance]". They emphasize the possibility of gaining competitive advantages by the usage of analytics, stating that analytics comprises systems and information (Ji-fan Ren et al., 2017). The data dimension – especially data quality – thus is seen as important but usually not as the single dimension to be considered.

4.3 The Role of Performance Management

Some authors argue that there need to be performance management measures to display an organization's performance enhancement (see e.g. Campos, Sharma, Jantunen, Baglee, & Fumagalli, 2017; Heymann, 2018; Raffoni, Visani, Bartolini, & Silvi, 2018). For gaining competitive advantages against competitors, Campos et al. (2017) advocate the use of a modified Balanced Scorecard as a tool to support performance management. Heymann (2018) as well refers to the Balanced Scorecard, arguing that big data can serve as a means to measure to optimize the desired outcome of a company in a specific field (e.g. customer satisfaction).

Raffoni et al. (2018) focus on Business Performance Analytics and state that interest in data-based performance measurement has increased with the emergence of big data. They identify factors, that are of great importance for the implementation of Business Performance Analytics: the definition of strategy-based

priorities, “availability of a reliable set of information” as well as “the development of an analytical culture” and professional analytical skills (Raffoni et al., 2018, p. 64).

5 Discussion

The aim of this literature review was to assess the current state of research on the question of how big data can lead to increased organizational performance in the public field. **Figure 2** summarizes the findings of the investigated literature. It is assumed that the effect of big data on organizational performance is mediated by more evidence-based decision making. Many authors' works suggest other mediating and moderating variables that can be summarized as belonging to the 'organizational dimension', 'data dimension' or the 'human dimension'. Further, there are scholars advocating for performance management in order to adequately measure increased performance.

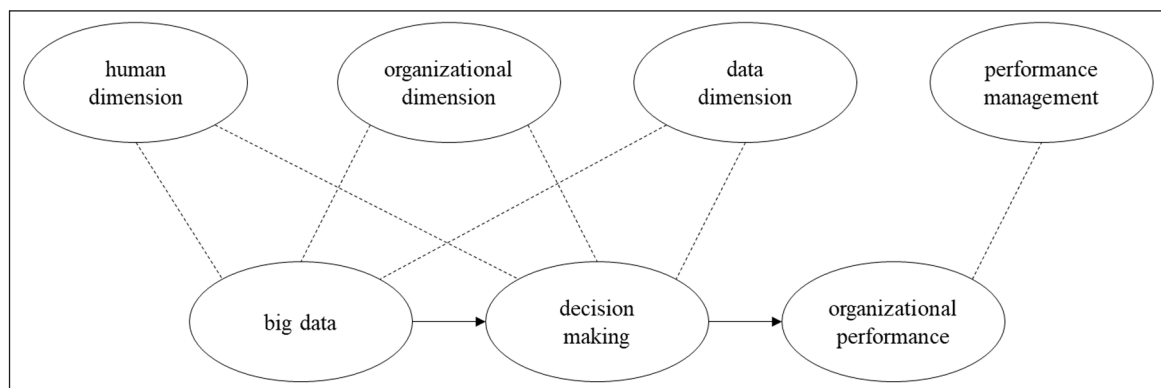


Figure 2: Suggested framework based on the literature examined.

To answer the final part of the research question – the application in the public field – each of the steps in the suggested model (see **Figure 2**) is briefly considered. First, a clarification of the term big data in a public context is important, which is not an easy task as there is not one single definition to this (Klievink, Romijn, Cunningham, & de Bruijn, 2017). As Desouza & Jacob (2017) explain, public organizations often already possess large datasets but fail to make use of all the data they collect. One application relevant to the public sector would be to engage citizens more in decision making processes (Desouza & Jacob, 2017). Another could be to improve policymaking (Janssen & Kuk, 2016). Klievink, Romijn, Cunningham, & de Bruijn (2017, p. 268) found three uncertainties concerning the use of big data in public organizations: “Uncertainty about what kinds of big data uses were suitable for the organization; [...] about whether the organization was sufficiently mature for big data use; [...] about the capabilities of and within the organization for big data use”. This underlines the findings of this study that capabilities – part of what was identified to be the human dimension – as well as the organizational and the data dimension are of great importance and are indeed existing issues in public organizations. These aspects need to be understood better in order to understand the application of big data in the public field.

Second, it is important to understand how decisions are being made in public organizations – an aspect that has not been clarified in this literature review and needs further attention from research. Van der Voort et al. (2019, p. 36) deduce “four theses of the impact of big data on public decision making” that differ substantially regarding their implications on public organizations. While big data could impact decision making by providing better information, it is also possible that big data may provide decision makers or data analysts with legitimization to pursue their own interests. Managers face different challenges that keep them from using big data more extensively – one of them being “using analytics for improved decision making, and [...] creating a big data and business analytics strategy” (Vidgen, Shaw, & Grant, 2017, p. 634). As these differences exist, the decision making process in public organizations is another aspect that needs further attention in research.

Third, as previously stated, performance can mean various things and has a different meaning in a public environment than in a private one. In the public sector, examples for big data to improve outcomes are through “public policies, programs and democratic processes” (Desouza & Jacob, 2017, p. 2). Performance in the public sector is more about creating value than about financial performance (Zheng et al., 2019). Due to this underlying complexity, performance management in the public field is more challenging than in private organizations (Arnaboldi, Lapsley, & Steccolini, 2015). Performance measurement systems often fail to take

this complexity into account (Zheng et al., 2019). In order to assess the impact of big data on organizational performance, 'performance' as well as how to measure it has to be properly defined.

Finally, chances and risks of big data application in public organizations have to be considered. Gamage (2016, p. 389) sees great potential in using big data in public organizations to "reduce costs, improve service delivery, increase transparency and improve decision making." He suggests organizations to promote research, create incentives for data sharing and encourage public and private partnerships to build and maintain sufficient technical infrastructure (Gamage, 2016). Lavertu (2016) focuses on the potential risks of external evaluation of public data and performance information due to misunderstandings and misinterpretations of such external actors. It is argued that wrong handling of data can lead to flawed decision making (Klievink et al., 2017). Public organizations should therefore put more effort into making performance measures understandable (Lavertu, 2016). Potential further risks are privacy or data security breaches (Klievink et al., 2017). The use of big data in public organizations is highly relevant and needs further investigation as it holds chances as well as risks. Bearing this in mind, this study identified potential implications both for practice as well as research which will be explained in the concluding section.

6 Conclusion

To sum up, the systematic literature review of this study suggests that big data can help enhance a public organizations' performance by improving its decision making processes. However, a clear definition of all the aspects in question – big data, decision making and performance – is crucial. Thereby, it is important to keep three dimensions in mind that have been identified by literature to potentially play a role in the relationship: the human dimension (e.g. skills), the organizational dimension (e.g. organizational agility) and the data dimension (e.g. data quality).

It is suggested that public organizations need to work on the issues in the three identified dimensions (the human, organizational and data dimension) in order to better harness value from big data. Namely, human capabilities like data interpretation skills need to be developed. It further seems to be of importance that the organization as a whole is ready for big data (e.g. through organizational agility). If a public organization decides to deploy big data, the quality of the underlying data needs to be verified and ensured. While it seems undisputable that big data holds a big potential for better decision making and eventually for better performance, given the potential risks, public organizations need to be careful when trying to pursue this tempting approach. Only when public organizations are ready to assess the potential risks of big data, they should start to apply it in a greater manner.

There is a big potential for research to better understand the complex processes behind big data and value creation. Especially, it is important to better understand decision making processes in public organizations. This paper proposes a model that helps conceptualizing big data and organizational performance and that can be further tested. It offers insights on three dimensions that seem to be particularly promising: the human dimension, the organizational dimension and the data dimension. To assess this topic holistically, this paper advocates for further research to include the three perspectives together.

Competing Interests

The authors have no competing interests to declare.

References

- Acharya, A., Singh, S. K., Pereira, V., & Singh, P.** (2018). Big data, knowledge co-creation and decision making in fashion industry. *International Journal of Information Management*, 42, 90–101. DOI: <https://doi.org/10.1016/j.ijinfomgt.2018.06.008>
- Agarwal, P. K.** (2018). Public Administration Challenges in the World of AI and Bots. *Public Administration Review*, 78(6), 917–921. DOI: <https://doi.org/10.1111/puar.12979>
- Akhtar, P., Frynas, J. G., Mellahi, K., & Ullah, S.** (2019). Big Data-Savvy Teams' Skills, Big Data-Driven Actions and Business Performance. *British Journal of Management*, 30(2), 252–271. DOI: <https://doi.org/10.1111/1467-8551.12333>
- Amankwah-Amoah, J., & Adomako, S.** (2019). Big data analytics and business failures in data-Rich environments: An organizing framework. *Computers in Industry*, 105, 204–212. DOI: <https://doi.org/10.1016/j.compind.2018.12.015>
- Arnaboldi, M., Lapsley, I., & Steccolini, I.** (2015). Performance Management in the Public Sector: The Ultimate Challenge. *Financial Accountability & Management*, 31(1), 1–22. DOI: <https://doi.org/10.1111/faam.12049>

- Bøe-Lillegraven, T.** (2014). Untangling the Ambidexterity Dilemma through Big Data Analytics. *Journal of Organization Design*, 3(3). DOI: <https://doi.org/10.7146/jod.18173>
- Braganza, A., Brooks, L., Nepelski, D., Ali, M., & Moro, R.** (2017). Resource management in big data initiatives: Processes and dynamic capabilities. *Journal of Business Research*, 70, 328–337. DOI: <https://doi.org/10.1016/j.jbusres.2016.08.006>
- Campos, J., Sharma, P., Jantunen, E., Baglee, D., & Fumagalli, L.** (2017). Business Performance Measurements in Asset Management with the Support of Big Data Technologies. *Management Systems in Production Engineering*, 25(3), 143–149. DOI: <https://doi.org/10.1515/mspe-2017-0021>
- Cao, G., & Duan, Y.** (2017). How do top- and bottom-performing companies differ in using business analytics? *Journal of Enterprise Information Management*, 30(6), 874–892. DOI: <https://doi.org/10.1108/JEIM-04-2016-0080>
- Cavanillas, J.** (2015). *New horizons for a data-driven economy: A roadmap for usage and exploitation of big data in Europe*. New York, NY: Springer Berlin Heidelberg.
- Chen, Chiang, & Storey.** (2012). Business Intelligence and Analytics: From Big Data to Big Impact. *MIS Quarterly*, 36(4), 1165. DOI: <https://doi.org/10.2307/41703503>
- Chen, D. Q., Preston, D. S., & Swink, M.** (2015). How the Use of Big Data Analytics Affects Value Creation in Supply Chain Management. *Journal of Management Information Systems*, 32(4), 4–39. DOI: <https://doi.org/10.1080/07421222.2015.1138364>
- Côrte-Real, N., Oliveira, T., & Ruivo, P.** (2017). Assessing business value of Big Data Analytics in European firms. *Journal of Business Research*, 70, 379–390. DOI: <https://doi.org/10.1016/j.jbusres.2016.08.011>
- de Camargo Fiorini, P., Pais Seles, B. M. R., Chiappetta Jabbour, C. J., Barbiero Mariano, E., & Lopes de Sousa Jabbour, A. B.** (2018). Management theory and big data literature_ From a review to a research agenda|Elsevier Enhanced Reader. DOI: <https://doi.org/10.1016/j.ijinfomgt.2018.07.005>
- Desouza, K. C., & Jacob, B.** (2017). Big Data in the Public Sector: Lessons for Practitioners and Scholars. *Administration & Society*, 49(7), 1043–1064. DOI: <https://doi.org/10.1177/0095399714555751>
- Dooren, W., van Bouckaert, G., & Halligan, J.** (2015). *Performance management in the public sector* (Second edition). London; New York: Routledge. DOI: <https://doi.org/10.4324/9781315817590>
- Dubey, R., Gunasekaran, A., Childe, S. J., Blome, C., & Papadopoulos, T.** (2019). Big Data and Predictive Analytics and Manufacturing Performance: Integrating Institutional Theory, Resource-Based View and Big Data Culture. *British Journal of Management*, 30(2), 341–361. DOI: <https://doi.org/10.1111/1467-8551.12355>
- Eisenhardt, K. M., & Martin, J. A.** (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10–11), 1105–1121. DOI: [https://doi.org/10.1002/1097-0266\(200010/11\)21:10/11<1105::AID-SMJ133>3.0.CO;2-E](https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E)
- Fisch, C., & Block, J.** (2018). Six tips for your (systematic) literature review in business and management research. *Management Review Quarterly*, 68(2), 103–106. DOI: <https://doi.org/10.1007/s11301-018-0142-x>
- Fosso Wamba, S., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D.** (2015). How ‘big data’ can make big impact: Findings from a systematic review and a longitudinal case study. *International Journal of Production Economics*, 165, 234–246. DOI: <https://doi.org/10.1016/j.ijpe.2014.12.031>
- Fryer, K., Antony, J., & Ogden, S.** (2009). Performance management in the public sector. *International Journal of Public Sector Management*, 22(6), 478–498. DOI: <https://doi.org/10.1108/09513550910982850>
- Gamage, P.** (2016). New development: Leveraging ‘big data’ analytics in the public sector. *Public Money & Management*, 36(5), 385–390. DOI: <https://doi.org/10.1080/09540962.2016.1194087>
- Ghasemaghaei, M.** (2018). Improving Organizational Performance Through the Use of Big Data. *Journal of Computer Information Systems*, 1–14. DOI: <https://doi.org/10.1080/08874417.2018.1496805>
- Giest, S.** (2017). Big data for policymaking: Fad or fasttrack? *Policy Sciences*, 50(3), 367–382. DOI: <https://doi.org/10.1007/s11077-017-9293-1>
- Gnizy, I.** (2019). Big data and its strategic path to value in international firms. *International Marketing Review*, 36(3), 318–341. DOI: <https://doi.org/10.1108/IMR-09-2018-0249>
- Grable, J. E., & Lyons, A. C.** (2018). An Introduction to Big Data. *INVESTMENT MANAGEMENT*, 5.
- Grover, P., & Kar, A. K.** (2017). Big Data Analytics: A Review on Theoretical Contributions and Tools Used in Literature. *Global Journal of Flexible Systems Management*, 18(3), 203–229. DOI: <https://doi.org/10.1007/s40171-017-0159-3>

- Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S. F., Childe, S. J., Hazen, B., & Akter, S.** (2017). Big data and predictive analytics for supply chain and organizational performance. *Journal of Business Research*, 70, 308–317. DOI: <https://doi.org/10.1016/j.jbusres.2016.08.004>
- Hazen, B. T., Boone, C. A., Ezell, J. D., & Jones-Farmer, L. A.** (2014). Data quality for data science, predictive analytics, and big data in supply chain management: An introduction to the problem and suggestions for research and applications. *International Journal of Production Economics*, 154, 72–80. DOI: <https://doi.org/10.1016/j.ijpe.2014.04.018>
- Heymann, M.** (2018). How the service industry can corral big data into a business-building tool. *Global Business and Organizational Excellence*, 37(5), 39–46. DOI: <https://doi.org/10.1002/joe.21875>
- Ingrams, A.** (2018). Transparency for Results: Testing a Model of Performance Management in Open Government Initiatives. *International Journal of Public Administration*, 41(13), 1033–1046. DOI: <https://doi.org/10.1080/01900692.2017.1318400>
- Janssen, M., & Kuk, G.** (2016). Big and Open Linked Data (BOLD) in research, policy, and practice. *Journal of Organizational Computing and Electronic Commerce*, 26(1–2), 3–13. DOI: <https://doi.org/10.1080/10919392.2015.1124005>
- Janssen, M., & van den Hoven, J.** (2015). Big and Open Linked Data (BOLD) in government: A challenge to transparency and privacy? *Government Information Quarterly*, 32(4), 363–368. DOI: <https://doi.org/10.1016/j.giq.2015.11.007>
- Janssen, M., van der Voort, H., & Wahyudi, A.** (2017). Factors influencing big data decision-making quality. *Journal of Business Research*, 70, 338–345. DOI: <https://doi.org/10.1016/j.jbusres.2016.08.007>
- Ji-fan Ren, S., Fosso Wamba, S., Akter, S., Dubey, R., & Childe, S. J.** (2017). Modelling quality dynamics, business value and firm performance in a big data analytics environment. *International Journal of Production Research*, 55(17), 5011–5026. DOI: <https://doi.org/10.1080/00207543.2016.1154209>
- Kim, G.-H., Trimi, S., & Chung, J.-H.** (2014). Big-data applications in the government sector. *Communications of the ACM*, 57(3), 78–85. DOI: <https://doi.org/10.1145/2500873>
- Klievink, B., Romijn, B.-J., Cunningham, S., & de Bruijn, H.** (2017). Big data in the public sector: Uncertainties and readiness. *Information Systems Frontiers*, 19(2), 267–283. DOI: <https://doi.org/10.1007/s10796-016-9686-2>
- Kościelniak, H., & Puto, A.** (2015). BIG DATA in Decision Making Processes of Enterprises. *Procedia Computer Science*, 65, 1052–1058. DOI: <https://doi.org/10.1016/j.procs.2015.09.053>
- Lavertu, S.** (2016). We All Need Help: “Big Data” and the Mismeasure of Public Administration. *Public Administration Review*, 76(6), 864–872. DOI: <https://doi.org/10.1111/puar.12436>
- McAfee, A., & Brynjolfsson, E.** (2012). *Big Data: The Management Revolution*, 9.
- Merendino, A., Dibb, S., Meadows, M., Quinn, L., Wilson, D., Simkin, L., & Canhoto, A.** (2018). Big data, big decisions: The impact of big data on board level decision-making. *Journal of Business Research*, 93, 67–78. DOI: <https://doi.org/10.1016/j.jbusres.2018.08.029>
- Mikalef, P., Boura, M., Lekakos, G., & Krogstie, J.** (2019). Big data analytics and firm performance: Findings from a mixed-method approach. *Journal of Business Research*, 98, 261–276. DOI: <https://doi.org/10.1016/j.jbusres.2019.01.044>
- Raffoni, A., Visani, F., Bartolini, M., & Silvi, R.** (2018). Business Performance Analytics: Exploring the potential for Performance Management Systems. *Production Planning & Control*, 29(1), 51–67. DOI: <https://doi.org/10.1080/09537287.2017.1381887>
- Sena, V., Bhaumik, S., Sengupta, A., & Demirbag, M.** (2019). Big Data and Performance: What Can Management Research Tell us? *British Journal of Management*, 30(2), 219–228. DOI: <https://doi.org/10.1111/1467-8551.12362>
- Şerban, R.-A.** (2017). The Impact of Big Data, Sustainability, and Digitalization on Company Performance. *Studies in Business and Economics*, 12(3), 181–189. DOI: <https://doi.org/10.1515/sbe-2017-0045>
- Singh, S. K., & El-Kassar, A.-N.** (2019). Role of big data analytics in developing sustainable capabilities. *Journal of Cleaner Production*, 213, 1264–1273. DOI: <https://doi.org/10.1016/j.jclepro.2018.12.199>
- Sivarajah, U., Kamal, M. M., Irani, Z., & Weerakkody, V.** (2017). Critical analysis of Big Data challenges and analytical methods. *Journal of Business Research*, 70, 263–286. DOI: <https://doi.org/10.1016/j.jbusres.2016.08.001>
- Teece, D. J., Pisano, G., & Shuen, A.** (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. DOI: [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)

- Trieu, V.-H.** (2017). Getting value from Business Intelligence systems: A review and research agenda. *Decision Support Systems*, 93, 111–124. DOI: <https://doi.org/10.1016/j.dss.2016.09.019>
- van der Voort, H. G., Klievink, A. J., Arnaboldi, M., & Meijer, A. J.** (2019). Rationality and politics of algorithms. Will the promise of big data survive the dynamics of public decision making? *Government Information Quarterly*, 36(1), 27–38. DOI: <https://doi.org/10.1016/j.giq.2018.10.011>
- Vidgen, R., Shaw, S., & Grant, D. B.** (2017). Management challenges in creating value from business analytics. *European Journal of Operational Research*, 261(2), 626–639. DOI: <https://doi.org/10.1016/j.ejor.2017.02.023>
- Wang, Y., Kung, L., Gupta, S., & Ozdemir, S.** (2019). Leveraging Big Data Analytics to Improve Quality of Care in Healthcare Organizations: A Configurational Perspective. *British Journal of Management*, 30(2), 362–388. DOI: <https://doi.org/10.1111/1467-8551.12332>
- Webster, J., & Watson, R. T.** (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, 26(2), xiii–xxiii. Abgerufen von JSTOR.
- Wigan, M. R., & Clarke, R.** (2013). Big Data's Big Unintended Consequences. *Computer*, 46(6), 46–53. DOI: <https://doi.org/10.1109/MC.2013.195>
- Zheng, Y., Wang, W., Liu, W., & Mingers, J.** (2019). A performance management framework for the public sector: The balanced stakeholder model. *Journal of the Operational Research Society*, 70(4), 568–580. DOI: <https://doi.org/10.1080/01605682.2018.1448247>

How to cite this article: Guirguis, K. (2020). From Big Data to Big Performance – Exploring the Potential of Big Data for Enhancing Public Organizations' Performance. A Systematic Literature Review. *Swiss Yearbook of Administrative Sciences*, 11(1), pp. 55–65. DOI: <https://doi.org/10.5334/ssas.140>

Submitted: 04 December 2019

Accepted: 11 February 2020

Published: 02 March 2020

Copyright: © 2020 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See <http://creativecommons.org/licenses/by/4.0/>.



Swiss Yearbook of Administrative Sciences is a peer-reviewed open access journal published by Ubiquity Press.

OPEN ACCESS The Open Access logo, featuring a stylized 'a' inside a circle.