TELKOMNIKA, Vol.17, No.6, December 2019, pp.2790~2802
ISSN: 1693-6930, accredited First Grade by Kemenristekdikti, Decree No: 21/E/KPT/2018
DOI: 10.12928/TELKOMNIKA.v17i6.11962

Value creation with big data analytics for enterprises: a survey

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Abstract

The emergence of Big Data applications has paved the way for enterprises to use Big Data as a value-creation strategy for their business; however, the majority of enterprises fail to know how to generate value from their massive volumes of data. Big Data Analytics results can help the enterprises in better decision-making and provide them with additional profits. Studying different researches dedicated to value creation through Big Data Analytics. This paper (a) highlights the current state of the art proposed for creating value from Big Data Analytics, (b) identifies the essential factors and discusses their effects upon value creation, and (c) provides a classification of the cutting-edge technologies in this field.

Keywords*: big data, big data analytics, decision-making*, *enterprise, value creation*

1. Introduction

In the world of business, enormous operational and financial data are stored at millions of diverse datasets. Gantz and Reinsel [1] explain Big Data (BD) as an emergent generation of technologies and architectures for economical extraction of value from the huge amounts of diverse data through high-speed data exploration, collection, and analysis. Nowadays, enterprises are discovering large volumes of extremely detailed data to find out facts they failed to know previously [2]. The value-creation has turned into the determinant prerequisite of sustainability for enterprises. Besides it may provide them with profit maximization, customers' retention, business objectives fulfillment, and considerable income generation. Creating value is a difficult procedure, particularly if it involves internal and external parameters for organizations. If this procedure is used for BD scenarios, the formation of value should be found and recognized through a rather complex process. With creating further data, customary architectures and infrastructures have faced with a great challenge for processing large volumes of data as a timely and efficient manner. Progressively, companies are discovering how BD can be utilized for creating and capturing value [3]. For effective value creation at issue, organizations must discover modern special approaches to process large datasets.

Big Data Analytics (BDA), which is also called big data mining, is the procedure of detecting feasible knowledge models from large datasets [4]. Contemporary enterprises considerably take advantage of BD as a tool provides them with a comprehensive understanding of data associated with both customers and enterprises. BDA can help attain business objectives, leading to customers' retention and yield maximization. BDA helps in attaining V2C and V2F goals as it permits companies to carry out knowledge discovery processes and develop models of external and internal business procedures corresponding to operations, marketing strategies, source and personnel management, just to name a few. The BDA procedure allows companies to discover the non-stop alteration of knowledge models and consequently improve their business procedure patterns. BDA not only enhances transparency for the enterprises but also makes it simpler for them to continuously collect and study operational and economic data [3, 5-7]. BDA provides beneficial information allowing managers to make considerably effective decisions according to the conditions of the market [8]. Nowadays, BDA has been used in diverse areas of business such as customer analysis [9-13], product and service invention [14-17], market prediction [18-20], supply chain and performance management [21-24], risk management, and fraud detection [14, 15].

Received March 1, 2019; Revised March 12, 2019; Accepted April 2, 2019

The creation of value in BD-based organizations has been commonly referred to as three situations, namely [25], decreased uncertainty in the decision-making process, developments in products and services, and costs reduction. Scientists have traditionally explored particular activities and assets pertinent to the present investigation by focusing examinations on subjects like data gathering (e.g., [26]), data analysis (e.g., [27]), and IT-mediated information delivery (e.g., [28]), considerably demonstrating the way of generating value from a huge amount of datasets. Notwithstanding, there is still inadequate information about this very issue that, for instance, how unique activities and properties are concomitantly employed to generate value [29-32]. Implementing BDA can generate value for an organization? What further value does BDA provide compared to its other counterparts? Why should enterprises choose BDA to generate value when there are several techniques available to this end? And how enterprises can create value from BDA?

In the present study, the attempt is made to provide a comprehensive investigation of the role of BDA in value creation and how it generates value through the business analytics function. This study is distinct from [33-35] with respect to (a) mere focus on the value creation through BDA, (b) in-depth investigation of the extant BDA methods, and (c) precise identification of the integral factors and full-fledged discussion of their effects on value creation. The rest of the paper is organized as follows. Section 2 presents the factors employed to assess Big Data Analytics-based (BDA-based) value creation techniques. Section 3 deals with an actual survey of different BDA-based value creation techniques having been offered and published so far. The pros and cons of BDA-based value creation techniques are illustrated in section 4. Finally, section 5 concludes our survey.

2. The Evaluation Criteria of BDA-Based Value Creation

Evaluation criteria associated with the BDA-based value creation techniques will be described in this section. The most common criteria discussed in articles and studies by considering all aspects of the BDA-based value creation are listed as follows.

2.1. Basic Idea

The basic idea parameter specifies the fundamental theory of the discussed BDA-based value generation techniques which is applied to determine the prerequisites of the presented methods. The basic idea may be theoretical, conceptual, or empirical.

2.2. Insight Type

The idea of value creation in BD-based environments and situations is identified as insight for organizational improvements. The insight type may be associated with customer analysis, product and service innovation, market forecast, supply chain and performance management, risk management, and fraud detection.

2.3. Value Creation Perspective

Value creation should be the ultimate objective of every BD strategy. However, it is still one of those terms easily used by the majority of so-called scholars lacking an adequate understanding of the data-to-value process. We consider value from two perspectives: (a) value to the Customer (V2C) and (b) value to the Firm (V2F) that are sometimes also referred to as "value delivery and value extraction".

2.4. Analytics Type

Organizations tending to promote their performance by applying a competitive landscape may undoubtedly require skills to not only analyze the historical data but also prognosticate the future. Thus, the analytics that can be used by organizations to acquire an in-depth understanding as a very prerequisite to promote their business can be classified into three descriptive, predictive, and prescriptive groups.

2.5. Big Data Analytics Strategy

Before starting up an analytical exercise, being aware of the benefits and disadvantages of the given analysis strategy is a matter of great importance. The BDA strategy may be Problem Solving, Data Modeling, Collateral Catch, and Data mining. When data are structured, and the problem is specific, BDA strategy is defined as a problem-solving strategy. If data are unstructured but the problem is framed, the BDA strategy is defined as data

modeling. The difference is that, in problem-solving, the focus is more on data, particularly on the use of new data sources. The data mining approach is a substantially explorative analytical strategy. Typically, data are not structured, and there is no defined problem to guide the analysis. When data are defined but the problem is undefined, analysts may discover new relationships when BDA strategy is a collateral catch.

2.6. Privacy and Data Protection

Big Data creates serious security challenges because consumers are entirely unaware of those who use their data and for what reasons. Various security issues, including privacy and confidentiality, are current and future fundamental issues in the value creation from BDA.

2.7. Data Integrity

Although the biggest challenges in the BD era seem to be associated with data collection and storage, we believe that the real problem is the integration of various data sources to realize successful BD value creation. This is because many of data sources are not built up as a way to be integrated with other data sources, and also the data sources often contain data variations that need further processing to create useful information. The data integrity parameter verifies the completeness, accuracy, and consistency of data in discussed BDA-based value generation techniques.

3. Value Creation from Big Data Analytics Solutions

In the present section, the solutions proposed in the scientific journals, books, essays, and conferences about value creation through BDA are presented. Comparative analysis and critical discussion of these solutions will be presented in detail in the following section. Lim et al. [36] recognized nine main parameters (namely dataset, data gathering, data, data analysis, information associated with the dataset, information distribution, users, information-derived value, and supplier network as shown in Figure 1) portraying data-driven value generation in information-intensive services (IISs). The aforementioned parameters were extracted from 149 service cases and six action studies, e.g., health (physical and mental), healthcare provision, auto manufacturing, information technology, telecom, and transportation). Moreover, a framework was presented for data usage and management to improve value creation in these services. These studies included the analysis of data derived from the real condition in the areas under study as well as the interviews with related IT and management scientists and specialists. Given their differences, these projects provided a valuable understanding of the data-to-value process.

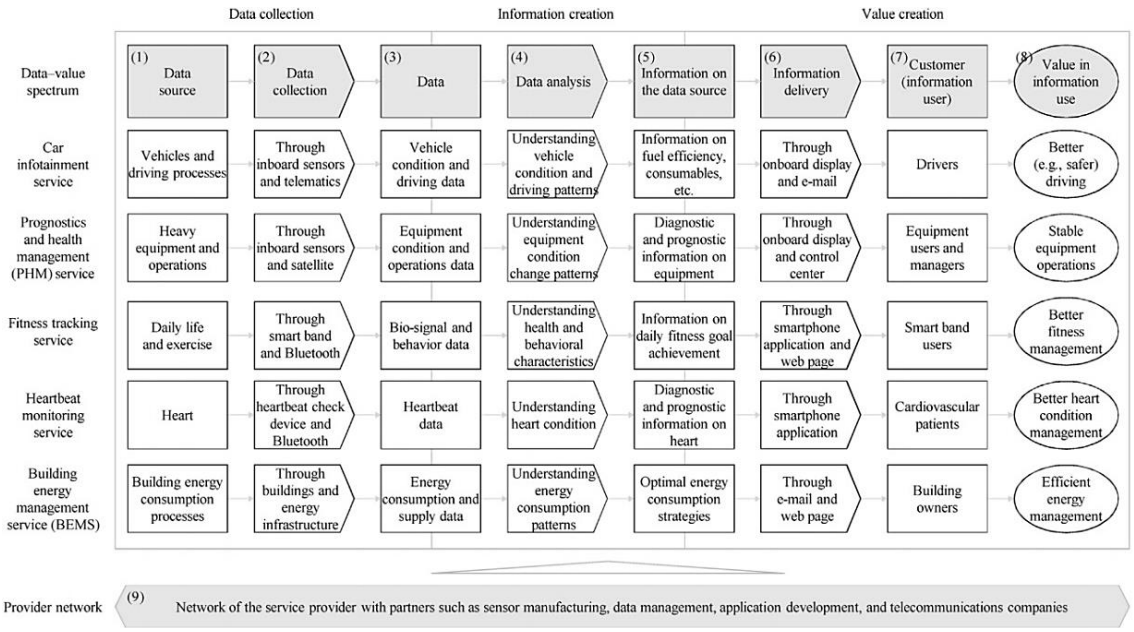

Figure 1. Nine parameters for the data-to-value process in IISs [36]

As authors show, capturing data from related databases, generating beneficial information associated with such databases through detailed analyses, and providing the acquired insights to the customers are considered to be the very prerequisites that IISs may need in this regard. In fact, the parameters mentioned above explain how customers and providers can both benefit from information delivery and make clear distinctions among IISs. The IISs improvement in this highly competitive world where economic prosperous strongly depends on data access may require a full-fledged framework like what presented in this study. Zeng and Glaister [37] suggested a theoretical framework through which managers can manage data and create value by decentralizing, contextualizing, experimenting, and conveniently implementing insights acquired from data. The framework at issue is demonstrated in Figure 2.

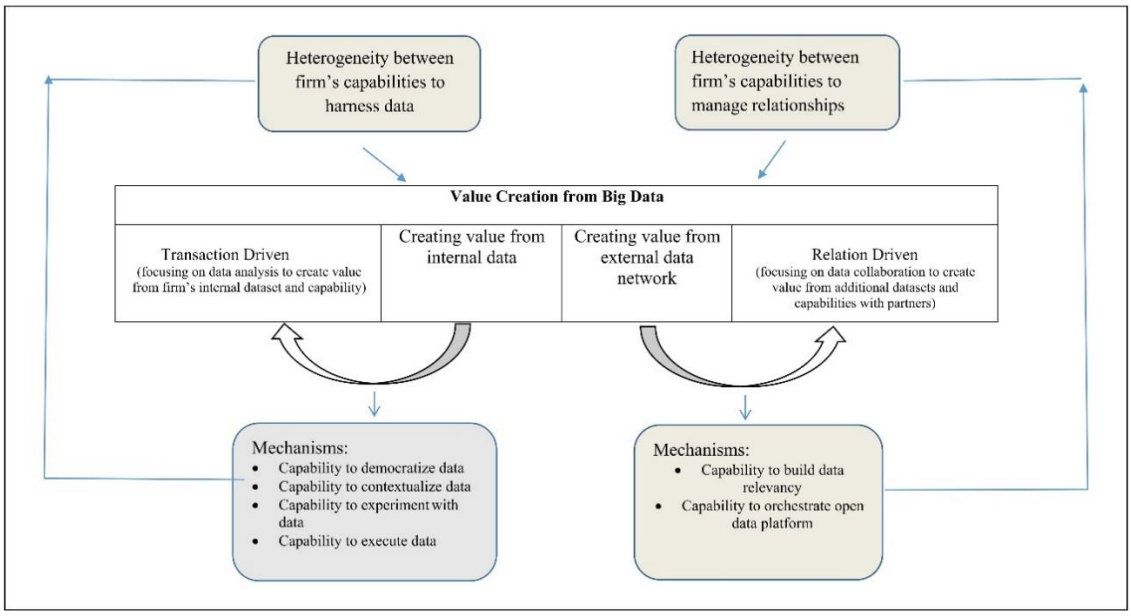

Figure 2. The proposed framework for data-based value generation [37]

In this research, a key contribution was made by responding to the call to study how managers create value utilizing big data. To trace the causation chain, this research has recognized two modes of data-to-value process. Value generation with the aid of organizational data is largely transaction-driven, that is to say, firms tend to emphasize data analysis to create a more considerable economic rent. Value generation through open-access data network firms is substantially relation-driven, that is to say, the firms mostly focus on isolated datasets to gain a combined insight so as to create a larger economic rent also benefiting their business partners. Presenting an inductive model portraying data-driven value generation, the study provides insights on mechanisms describing why some firms outperform their counterparts in data-driven value generation. Analysis of the authors indicated that firms are different with respect to their abilities to create value, whether internally or externally, from big data.

The authors suggested that scattered data fail to be sufficient for maximizing data-based value generation. As they argued, value generation is closely related to the process of transferring relevant information through the internal firm-wide boundaries. In addition to concentrating on generating value directly from the firm-wide data network, enterprises take advantage of an open-access data network that provides a wide range of expanded and dynamic information dataset serving as a heterogeneous and complex source which is virtually impossible to be reproduced by individual firms. Accordingly, the competition arena is wider than the organization level. Under this condition, there is interdependence between the connecting parts to generate models, strategies, trends, and creative solutions from a combination of databases rather than a limited firm-level source.

Results of this research also confirm that enterprises concomitantly taking advantage of management and structured guidelines are more flexible and can effectively respond to the market changes. This research showed that firms tending to generate decentralized databases, follow 'trial and error' strategy, encourage collaboration between units, and have a curious outlook towards data-related issues are deemed to be more prone to generate value from data. Such decentralized and flexible organizations can extemporaneously respond to data. Leaders in such organizations also consider data as a public tool that should be available and agreed upon by all personnel. The results generally shed light on the fact that organizational patterns encompassing diverse data-to-value processes, particularly managerial capabilities, can help firms to outperform their counterparts because their managers are equipped with insights and connections that allow comprehensive and precise evaluations.

Verhoef, Kooge, and Walk [38] in a book entitled "Creating Value with Big Data Analytics" indicated that in the CRM days, advisors inform that a lot of organizations are not successful to derive value from their Big Data tasks due to the lack of a data strategy. Therefore, the authors promised that the readers would be offered with an answer for addressing and overcoming the challenges faced in the extraction of value from a wide range of information available, finally leading to better decisions and improved competitive benefit. Moreover, the subtitle 'making smarter marketing decisions' is believed to have a considerable attachment to the main title.

The book mainly serves as a model or framework for data-based value generation as shown in Figure 3. The critical steps in this model cover suites of metrics, data assets, Big Data abilities, Big Data Analytics, and Big Data value. At first, a brief review is presented, and then the stages are fully described one-by-one in the following chapters. The key themes for each stage are addressed in the opening chapters, and then their main associated problems are dealt with in the following sub-chapters. The seminal part of the book is dedicated to the description of various data analysis techniques which are mostly known by a majority of readers (e.g., decision tree models, cluster analysis, time-series, and RFM). The book explicitly explains that the era of Big Data by no means labels traditional analytical techniques as primitive methods, it instead implies that the applications are currently more nuanced due to the vast majority of databases.

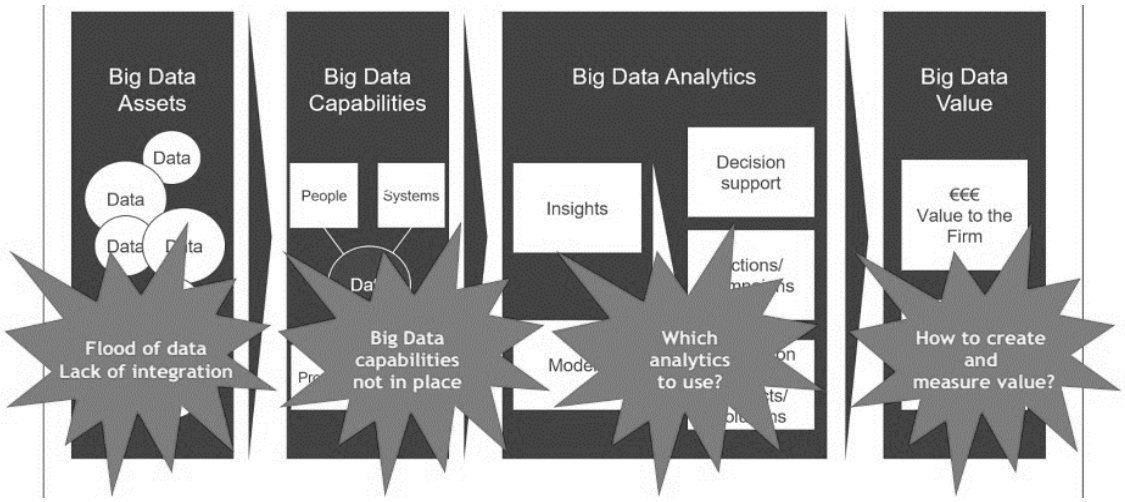

Figure 3. The model for value creation with big data [38]

Moreover, the authors argued the progressively vital problem of efficiently expressing outcomes derived from complex analyses and presented visualization and storytelling as helpful tools for message transferring. The authors presented a wide range of case studies with considerably useful instances of the way five organizations have generated value from BD in different sectors. According to the authors, procedures, employees, systems, and firms are the crucial players in successfully developing BD. Therefore, improving skills, creating a team of

experienced and well-informed members, developing well-structured systems and procedures, and revising the organization for providing highest influence on decision making seem to be the matters of significant importance. Improvement of tactics, such as illustrative case study, is suggested for attracting talented individuals into marketing analytics. The authors also provided a useful framework at the heart of it to operate Big Data within the company. A considerable portion of the content emphasizes on the description of the analytic approaches, but with slightly less focus on how this should be managed within an organization for delivering the value and deriving smarter decision making from data.

Rehman et al. [29] reported a new concept of BD reduction to fulfill the V2C goals, including (1) minimizing the costs for users, (2) increasing the trust between users and organization, (3) preserving customers privacy, (4) allowing secure data sharing, and (5) assigning control of data sharing to the users. The authors presented a brief review of the BDA process and related tools for value creation. The article also suggested a business pattern for end-to-end data reduction. Additionally, the business model blueprint is presented to reduce big-sized data, and then the crucial factors of a limited number of areas in which they can be applied are mapped onto the business canvas model (BMC). The study then addressed the difficulties faced by the implementation of this technology. The suggested model mainly aims at replacing raw data sharing with knowledge-driven one in BD systems as shown in Figure 4. Taking into account the case study of IoT-based BD systems, the authors aimed at depicting the context in which the proposed model works.

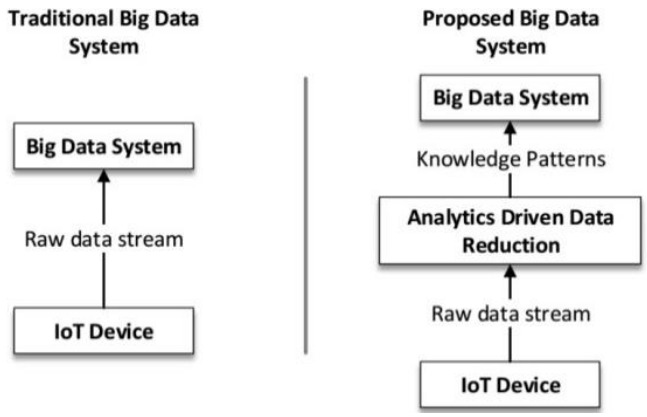

Figure 4. Analytics-driven big data reduction [29]

As shown in Figure 5, the authors considered a five-layer IoT architecture that provided model enables (i) local data decrease, (ii) collaborative data decrease, and (iii) remote data decrease. The first one is attained through analytic components in mobile devices with applications collecting, preprocessing, analyzing, and storing data patterns. The collaborative data decrease is attained through analytic components in edge servers implementing analytics on locally gathered knowledge-based patterns and subsequently generating collaborative data patterns. In relation to the remote data decrease, the patterns extracted from these servers are combined, and then new patterns are generated through analytics services. The resulting data patterns are connected to large data stores to enable value generation through analytics.

The distinction between the presented model and the traditional ones is that in the former the users are informed of the application and volume of the created information. This model may generally provide users with information accessibility; hence it not only enhances the users' trust in enterprises but also establishes a direct mutual relation between the firms and users. This model also removes the user concern about privacy as their main worry by letting them share and subscribe to several BD applications.

The primary data reduction in mobile edge CC systems decreases the computation-related costs and the price of information communication as well as data transmission in CC environments. Consequently, it simply facilities the financial burden of firms.

The small- and medium-sized enterprises (SMEs) usually face challenges in applying cloud-based BDA due to the financial costs of SLA. This model can also support cloud service suppliers to reduce the services' cost. As the model also facilitates BDA, thereby BIRT can provide users with considerably profound insights associated with data.

Andersson and Elf [39] reported that BDA is a moderately unfamiliar area and organizations are about to achieve more insights to apply it in their businesses. Indeed, they are not fully informed of the requirements of BDA implementation. Moreover, they mainly hesitate to tackle the ethical problems of penetrating personal data. The goal of this research is to discover the primary measures the firms have to take for big data-based value creation. As the authors suggested, having in mind their structure, organizations have to decide whether focus merely on Customer Analytics or Process Analytics or both of them, with following an ethics plan as shown in Figure 6. As they argued, this is the first step toward BDA-base value generation for organizations. According to their response to the above-mentioned question, organizations should determine the requirements and value creators. The components of the organizational structure, i.e., management support, cross-functional units, and capabilities, are considered as prerequisites, i.e., they are needed for BDA but inadequate for BDA-based value generation. Customer Analytics and Process Analytics, together with an ethics tactic, are considered to be the value generators as they can bring about either higher income or saving costs. Notably, as BDA plays a significant role in creating fundamental effective changes and achieving competitive advantage, it is likely to turn into a prerequisite for organizations in the near future.

Taking the first stage toward generating value from BD, the organization survival becomes more probable, and the opportunities are also likely to be considerably enhanced. Overall, the experimental results show that data-driven decision-making should be further encouraged in organizations and more individuals should dare to believe the outcomes of data analysis; however, the role of managers and their decision making should not be overlooked. Conclusion corresponding to the data derived from customer analytics and process analytics goes hand in hand with Business Model Canvas developed by Osterwalder and porter perspective on strategy. These models confirm the efficiency of BDA as a method for creating a competitive advantage or value. However, neither of the methods emphasizes the enablers required to this end. The study not only highlights the role of BDA as a crucial player in the value-generating process but also describes the requirements to meet this goal.

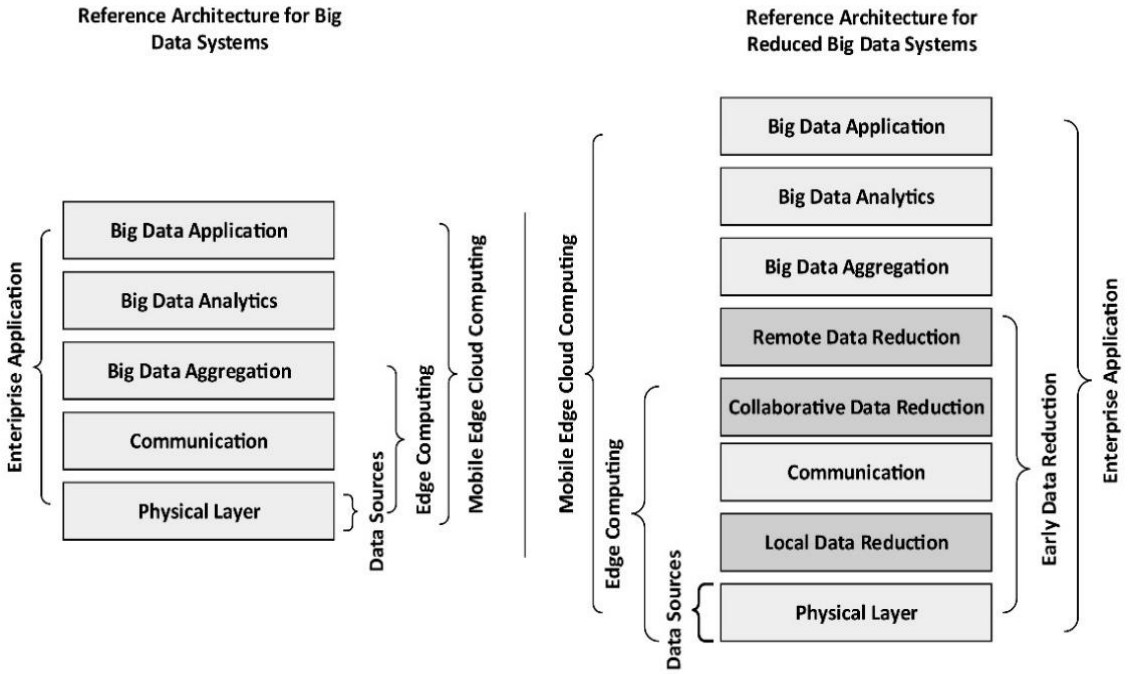

Figure 5. Reference Patterns for BD Systems [29]

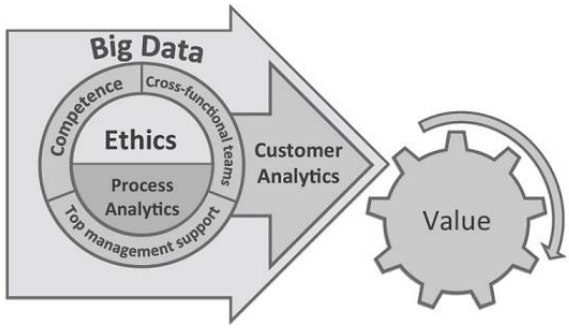

Figure 6. The components of a BD-to-value solution [39]

The author's interpretation of the experimental results on ethics is more mystifying. In spite of the great intention of the organization to gather data, users hesitate to reveal their data. Accordingly, organizations strongly take caution to apply the strategies derived from BD at full capacity to avoid making users worried. Therefore, if both parties agree upon BD implementation and the resulting consequences, the worries associated with data collection may disappear. If both parties acquire more knowledge on BDA, the recommendation of assigning data generation and application tasks to a third party as an organizer can work. When the parties succeed to come to an agreement on this matter, they would feel safe with BDA technology. The authors finally concluded that it is BD that sets the restrictions, but organizations can change it into an advantage by using BD efficiently.

Vidgen [40] discovered data-to-value process in organizations and the challenges they face in applying BDA. Vidgen used three case studies implemented on large organizations with a formal business analytics team and a large amount of data that can be considered "big data." The case studies were analyzed using business analytics –based framework facilitating both data collection and value generation in the organization. Organizations ability to use analytics technique was investigated over a sociotechnical lens of organization/management, process, individuals, and technology. The analyses led to twenty crucial results summarized as follows. Results associated with data-to-value process (namely, ensuring the quality of data, building trust between parties, providing adequate anonymization, sharing value with data providers, generating value over data partnerships, generating public and private value, and monitoring the variations need to be applied in regulations), results associated with the organization and management (namely, developing an organization-level analytics strategy, developing procedures to promote organization and its culture, acquiring deep domain expertise, building a well-informed analytics team, cooperating with academics, ensuring ethical observance, creating an agile analytics project, and exploiting the analytics projects), results associated with the tools (namely, utilizing story-telling for visualization, defining the vision before choosing the tools), and results associated with people (namely, employing the attitudes of cognizant data scientists, employing data scientists who are good bricoleurs, employing data scientists with ability to work in challenging working condition). To investigate the measures required to be taken by organizations for value creation, the authors improve the framework utilized by Nerur et al. [41], who examined the organizational shift from old-style software to agile software improvement. The model shows the effects of such an alteration via four parameters (namely, organization/management, people, process, and technology). The model is a notable attribution of Leavitt's diamond organization model and sociotechnical systems. The author utilized this model to investigate the effects of a shift to a data-driven organization. The business analytics ability can be supposed as a moderator between data collected and the value created (internally and externally) from that data over better decision-making by the organization as shown in Figure 7.

The model consists of the cycle of data attainment, value propositions exploration, approach, execution, and evaluation as shown in Figure 8. Phase 2a is planned for avoiding the pitfalls corresponding to the grand plan–small pilot projects using agile approaches are applied for gaining credibility, learning about analytics and techniques, identifying data-related problems, and providing evidence to confirm strategy. In step 6, the efficiency of the process is

assessed. At this level, the resulting performance of the organization is compared to that of the prominent competitors, and the maturity of the analytics is evaluated as well.

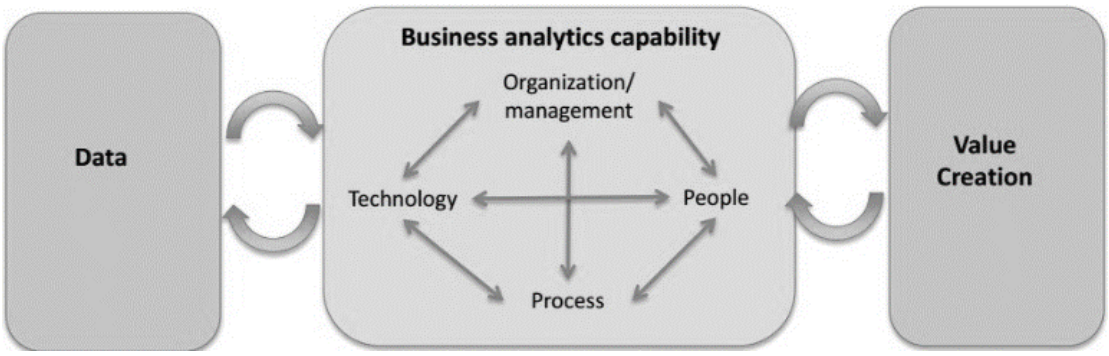

Figure 7. Research framework [40]

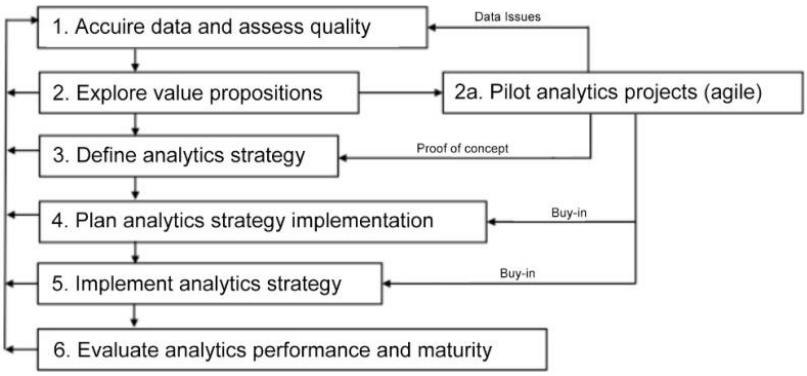

Figure 8. Business analytics implementation model [40]

4. Evaluation

All the solutions discussed under the category of 'Value Creation through Big Data Analytics' are presented chronologically in Table 1. Relying on six action research dedicated to industry and government, Lim and colleagues [36] recognized nine crucial indicators defining data-driven value generation. As they concluded, these factors play a significant role in portraying and analyzing the data-to-value process in IISs. Empirically tested, a simple yet comprehensive framework was presented for data usage and management to improve value creation in these services. Integrating the existing works, the presented framework is highly beneficial in data-to-value process analysis and designing. This study provides a comprehensive insight rather than sporadic points on data-based value generation. However, the study has some limitations expected to be tackled by future works. First, the nine factors were extracted from 149 service cases and six action studies, hence they fail to be sufficiently all-inclusive; moreover, some of the primary facets of the data-driven value creation have been undoubtedly dismissed. Second, the study failed to evaluate to what extent each factor may influence value creation in information-intensive services. Therefore, further experimental research works are necessary to identify the effects of such factors in various contexts. Third, even though the study put forward a new design strategy for IISs using the presented framework, it failed to determine whether the design approach efficiently works in this context or not. Thus, additional empirical studies on information-intensive services or information system design are required to investigate the design approach for such services.

In [37], Zeng and Glaister proposed a new process-oriented framework based on a qualitative approach to investigate how firms create value utilizing Big Data. The importance of this study is presenting an inductive process model that indicates BD-driven value-creation

and providing insights on mechanisms describing why some firms outperform their counterparts in generating value from BD. The findings demonstrate that value creation is the result of measures taken by firms rather than data. Analyses showed the ability of firms to create value, whether internally or externally, from Big Data. Theoretical framework development provided valuable insights mainly into the knowledge of firms for network orchestration and Big Data management as the key prerequisites of value creation. In the former, i.e., network orchestration ability, the value can be created using the extended-data network. In the latter, i.e., Big Data management, the managers can create value by democratizing, contextualizing, experimenting, and conveniently implementing insights acquired from data. This study has various limitations compared to other studies. In this research, limited cases from a specific industry and only Internet Platform Companies adopting an open platform strategy were analyzed. Accordingly, findings can rarely be generalized and they ought to be interpreted with caution. Furthermore, as this research is focused on China, the question is whether the results can be true about other countries or they are merely representative of the Chinese industry.

In [38], Verhoef, Kooge, and Walk proposed a practical approach with a comprehensive theoretical framework and a new perspective to generate value from BDA. Authors define BDA and indicate that it is an evolution of data analytics since the early 1990s. To solve the complexities, this study offered a robust model for value creation from BDA. It focuses on two directions of value creation (V2C and V2F) and the role that 'analytics' and the rapidly growing volume of data- structured and unstructured-from both internal and external sources may play in this regard. The authors then classified these two directions of value creation into three levels: market level, brand level, and customer level. For each of the aforementioned six areas, the authors offered a practical approach to use and analyze Big Data. All success factors have been listed for optimal use of BDA in organizations.

Table 1. Comparison of the Evaluated Big Data Analytics Solutions

Author(s)	Basic Theory	Insight Type	Value Creation Perspective	Analytics Type	Big Data Analytics Strategy	Privacy and Data Protection	Data Integrity
Lim et al. [36]	Nine data-based factors for value creation in information-intensive services	Product and service innovation and supply chain and performance management	V2C and V2F	Descriptive	Data modeling	No	No
Zeng and Glaister [37]	Value generation through decentralizing, contextualizing, experimenting, and conveniently implementing insights acquired from data	Supply chain and performance management	V2F	Prescriptive	Problem solving	No	No
Verhoef, Kooge, and Walk [38]	Lack of a data strategy to make smarter marketing decisions	Product and service innovation and supply chain and performance management	V2C and V2F	Descriptive	Problem solving	No	No
Rehman et al. [29]	Data reduction approach for value creation to fulfill the V2C and V2F goals	Supply chain and performance management, risk management, and fraud detection	V2C and V2F	Prescriptive	Data modeling	Yes	Yes
Andersson and Elf [39]	Value generation from Big Data Analytics through process analytics or customer analytics, together with an ethics strategy	Market and customer analysis and supply chain and performance management	V2F	Prescriptive	Problem solving	Yes	No
Vidgen [40]	Value generation through the business analytics model	Market and customer analysis and supply chain and performance management	V2F	Descriptive	Data modeling	Yes	Yes

In [29], Rehman et al. provided a data reduction approach for value generation to fulfill the V2C and V2F goals. Adopting BDA as a tool used by firms for creating value, the study aims

at uncovering the tacit knowledge in both operations-related and customer-related data. The study suggested a framework to decrease BD at the customer end, allowing firms to reduce the costs associated with cloud service to apply BDA. The proposed framework also paves the way for establishing trust between customers and businesses by providing local knowledge accessibility and privacy-preserving data sharing. Additionally, the business model blueprint is presented to reduce big-sized data, and then the crucial factors of a limited number of application areas are mapped onto BMC. The study then addressed the difficulties faced by technology implementation. A point deserves noting is that the efficiency of the suggested approach and the resulting V2C and V2F failed to be evaluated in the real world. More to the point, the authors provided no component-based architecture for the given framework.

In [39], Andersson and Elf provided a solution for BD-based value creation. This study is primarily focused on the first measures the firms have to take for BD-based value creation. The study follows an inductive approach for qualitative data analysis. Respondents were BD experts and firms using huge volumes of data. The empirically obtained results were compared to their academically acquired counterparts in light of strategy, organizational change, and ethical dilemmas the organizations may face in relation to customer data. To this end, E. ON Elnät was taken advantage to typify the difficulties and questions organizations may face in the very beginning of a BD implementation process. From a theoretical perspective, the study provides guidelines on BD by grouping it into various application areas and then elucidates their differences and value-creating potential for a business. The fact of the matter is that, when the advantages of Big Data for a company are revealed, its overview turns to be far easier. Theoretically, this study shed also some light on the mutual relationship among properties of the organizational structure.

Vidgen [40] proposed a model of analytics eco-system and a process model with a six-stage maturity to investigate the measures required to be taken by organizations for value creation. The analytics eco-system puts the business analytics in an organization-wide frame, and then the process model is provided for analytics implementation. The large companies with both a formal business analytics group and huge volumes of data were chosen as the case studies. The analyses led to twenty key factors. As suggested by the author, concomitant consideration and management of data and value is a crucial matter. Indeed, value creation requires data to be efficiently handled, and the resulting value has to be also fairly shared with data providers. Also, business analytics is assumed to be a business transformation plan requiring strategy, senior management support, and active and careful change management rather than a technical plan which has to be necessarily assigned to the IT department. It by no means undermines the crucial role of IT department in an organization because it is well known that IT is an underlying enabler of this process and it is purposefully embedded in the organizational processes and procedures. Furthermore, business analytics and its subset (i.e., data science) require a process model. To this end, Agile Software Development seems to be a useful commencing point. A further point is that implementing a business analytics plan in an organization may require a change model. Finally, in this journey, data experts may significantly require the spirit of inquiry and creative problem-solving ability as well as the capability to take advantage of all extant tools and techniques.

5. Conclusion

The survey critically investigated different Big Data Analytics solutions proposed for the value creation. To analyze the creation of value in BD-based organizations, we performed a systematic literature review of the seminal works dedicated to this issue. The identification of value creation in the respective papers was carried out by the authors in light of the way whereby value creation is considered in Big Data environments.

The Results of this study indicate that to create value from BDA, enterprises need to address issues pertaining to operational and financial data, market conditions, business domain, customer analysis, product and service innovation, supply chain and performance management, risk management, analytics type, Big Data Analytics strategy, privacy and data protection, data integrity, and various other factors. Most Big Data Analytics value creation solutions proposed can stimulate organizations to make better decisions, shift from traditional development to agile development, and turn into data-driven organizations.

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