Big Data Analytics based governance and Decision performance

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ABSTRACT

Digitalization of businesses has resulted in globalization, which in turn has led to collection of massive data related to different stakeholders by the businesses. This data, often called Big Data is a valuable resource for the firms. The objective of this paper is to understand if the inclusion of Big Data analytics has resulted in better strategic decision making by the governing bodies of the businesses. In addition, the mediation effect of big data analytics is tested on big data-based governance and decision performance through Baron and Kelly mediation test. Data is collected from the real estate industry through a questionnaire. The results indicate that there is a positive relationship between big data-based governance and decision performance. Big data Analytics directly affects the decision performance while the relationship between big data-based governance and big data capabilities is insignificant. In addition, big data capabilities have mediating impact on the big data driven governance and decision performance relation.

Keywords: Big data capabilities, Resource based theory, Knowledge based view, Mediation, Decision quality.

1. Introduction

Globalization through digitalization has provided many opportunities to businesses all over the world for value creation. The incorporation of technologies in businesses, such as cloud computing, internet of things etc. along with mobile devices together with the internet has resulted in large data volumes which is known as Big Data [1]. This availability of large data volume to the businesses has given the decision makers the opportunity to decide based on real evidence [2]. Traditionally the decisions were based on the data generated by the ERPs implemented by the organizations [3]. The data extracted from these systems has to be structured according to the need of the decision makers, thus, facilitating speed of decision making along with the accuracy of decisions [4]. Few examples of such decisions are inventory planning, sales optimization, and receivables aging etc.

In today's world, the businesses that are taking decisions based on big data analytics are more likely to be successful [5]. However, due to complex data sets which may be structured or unstructured, it is not easy to reach a decision. Additional effort by the decision makers is required coupled with the specialized capabilities to understand the data is required to extract information from

large and complex data volumes [6]. This leads to the desired management practices together with the big data capabilities being crucial for better decision-making practices in the organization [7]. The process of decision making based on big data requires preparing the data for the analysis first and then carrying out the analysis. The outcome of the analysis will lead to decision making. Each of the activities, i.e., collection of big data, preparation of data and then the analysis require different managerial capabilities along with resources [8].

The quality of governance directly affects the quality of decision making [9]. With big data the need to reform the decision-making process within the corporate board cannot be ignored [9]. The rapid change in technology along with access to more data related to the business requires capable personnel at the decision-making levels, both at board level or within the management [10]. The decisions taken by the board of directors' impact on the performance of the firm. Along with other factors, the board's performance has been related to the poor performance of the companies. This is due to the fact that the decisions taken at the board level are strategic decisions and impact on the whole firm. As the board has a crucial role in the success of the firm, therefore, a capable and improved board will lead to better performance of the organization. Prior to big data, the strategic decisions were taken by the board based on information extracted from internal data sources, which was structured according to the needs of the board and management [11]. With big data, as the data is unstructured and is continuously being collected, the information which could be extracted can be vast. To extract the information and to interpret it specialized capabilities are required both at the board level as well as the management level.

The resource-based theory and Knowledge based view of firms are at the core of this study. Resource based view emphasizes the identification of valuable resources and their efficient use to enhance the performance of the business, while Knowledge based view considers knowledge as a valuable resource to the firm, thus the implication of big data on the strategic decision making by the governing bodies of firms is being explored in this study.

2. Literature Review

2.1 Governance

Corporate governance is the way an entity is governed and directed [12]. Traditional corporate governance follows the agency theory [13], while according to the stakeholders theory, the businesses should be governed in a way that all stakeholders objectives are taken care of [14]. Thus, the governance model, whether it is agency theory based or stakeholder theory based, undertakes decisions in the best interest of the business with respect to the shareholders or the stakeholders. There are many studies focusing on firm performance and corporate governance [15-19]. Two types of governance structures are mentioned by academicians one is contractual, and the other one is relational. Contractual Governance is stated to be the one in which there is a legal agreement to govern a firm, while relational governance is based on commitment and mutual trust. The transfer of knowledge as well as learning is facilitated by mutual trust. Thus, a competent governance system consists of not just contractual but relational as well.

Resource based theory highlights that the effective utilization of the internal resources of an organization leads to better performance and competitive advantage and Knowledge based theory identifies the knowledge is one the key resource available to the organization which can contribute to better performance through enhanced decision-making. Thus, in this perspective, the Business data analytics knowledge of the governance bodies within the organization leads to better organizational performance.

Knowledge-based view (KBV) also plays a key role in enhancing decision-making quality. The KBV suggests that among the top strategic resources of firm, knowledge is the most important one and it can be stated that the objective of a business is to convert the available knowledge into outcomes leading to commercial success of the business. In this context, businesses must enhance their knowledge, on the board level as well as on a managerial level, to have competitive edge and to face and react accordingly to any market challenges.

2.2 Big Data based governance and Decision making

Firms using big data analytics differentiate them from the ones using traditional decision making and give them an edge due to access to more insight. The process of big data analytics starts with the collection of data from their own business departments such as production, sales, supply chain etc, as well as from industry and relevant stakeholders such as customers, suppliers etc. [20]. A thorough and detailed data can give the business valuable insight into hidden information which they can use to improve their decision-making. To analyse the data, different analytics tools have been helping the decision makers to enhance the effectiveness of their decisions. These big data analytics tools are being used to mine different types of data such as from the customers their interest, behaviour and demand, giving valuable information to the businesses to adapt to the customer needs. Similarly, these analytics tools also provide the scenario-based simulations options which also proves to be helpful in decision making. Therefore, a governance system based on utilizing big data analytics leads to improved decision-making process.

2.3 Big Data based governance and big data capabilities

Digital transformation and globalization since early this century have led to the digitalization of the businesses. REF This has further brought innovation and promoted the product development as well as improvement in the services [20]. Along with this, big data has brought in certain challenges for the businesses. The big data may be structures and unstructured. greater the complexity level of the data higher capabilities is required related to data storage as well as the system requirements [21]. Big Data analytics competences assist the businesses to gather any type of data and quickly analyse it. This results in enhancing the business significance. Businesses must allocate reasonable resources such as human resource, infrastructure and analytic tools etc to enhance their big data analysis capabilities to extract maximum benefit from the data while relational governance is related to social capital and value creation through knowledge sharing resulting from support and trust within the organization [22].

2.4 Big Data analytics capabilities and decision performance

In order to utilise the huge data sets extracted from different business areas such as marketing, production, demand and logistics etc, data analytics capabilities become vital for the firm. Efficient analysis will result in finding hidden data patterns which might lead to better decision performance [23]. In supply chain production scheduling, inventory along with transportation are vital. With big data analytics capabilities, the firm can mitigate its risks in supply chain through reduced reaction time, better inventory planning and more accurate prediction of customer demand [24]. Hence, businesses can improve their market strategies and resource allocation planning by analysing raw data to identify the hidden patterns and forecast demand [25]. Therefore, the firms with higher big data analytical capabilities have a competitive edge as they can incorporate the information resulting from the analysis to take more efficient decisions.

3. Research Design

The study is based on primary data collected from China's real estate industry and a quantitative deductive approach is being followed. China is selected as it is regarded as the highest digitalized economy [26]. Data is collected using structured questionnaires.

Most of the firms in China are actively utilizing big data analytics capabilities in their operation. There were 244 usable responses from the respondents. Certain constructs of the questionnaire were adapted, and some were self-developed. There were four constructs for the decision performance variable. Big Data capabilities had six constructs which were adapted [27]. Big data-based governance had five constructs. A five-point Likert scale ranging from strongly agree to strongly disagree was used to measure all constructs. The collected data is analyzed using SPSS-AMOS to test the hypothesis.

3.1 Hypothesis development

Based on the above stated literature following hypothesis are formed.

H1: Use of Big data is positively associated with decision performance.

H2: Use of Big data is positively associated with data analytics capabilities.

H3: Big Data analytics capabilities are positively associated with decision performance.

H4: Big Data analytics capabilities mediate the use of Big data association with decision performance.

Figure 1 below shows the research model for this study based on literature review.

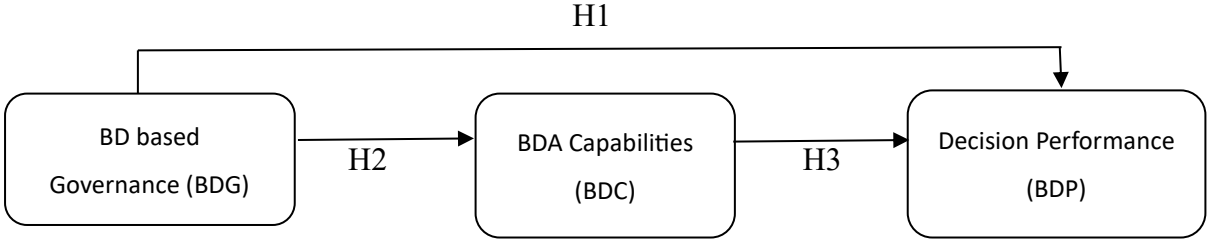

Figure 1. Research Model

Source: By Authors

4. Results and Discussion

Summary statistics of the collected data is given in Table 1 below. There were 138 male respondents and 106 female respondents, most of them held bachelor's degree. In the age group highest respondents were from 20 to 30 age.

Table 1. Descriptive Statistics

	Gender		Education			Age			
	Male	Female	College	Bachelor's degree	Master and above	20–30	31–40	41–50	>50
Frequency	138	106	43	187	14	144	71	18	11
Percentage	57%	43%	17%	77%	6%	59%	29%	7%	5%

4.1 Model fitness test

Prior to applying the Confirmatory factor analysis (CFA), it is important to test if the model and the data set are consistent. Certain model fit criteria are applied by researchers for CFA [28]. Goodness of fit indices and their results are presented below in Table 2.

Table 2. Model Fitness Test

Criteria	**Measurements**	**Acceptable Range**
X^2/Df	1.71	01-03
X^2	1.11	-
PCLOSE	0.11	>0.05
AGFI	0.91	>0.80
GFI	0.98	>0.90
RMSEA	0.04	<0.08
CFI	0.99	>0.95
NFI	0.91	>0.90
TLI	0.92	>0.90
RMR	0.03	<0.09

Further, KMO and Bartletts test was also found to be significant which further confirmed the model fitness as shown below in Table 3.

Table 3. KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.74
Bartlett's Test of Sphericity	Approx. Chi-Square	187.63
	df	243
	Sig.	.000

4.2 Confirmatory factor Analysis

Confirmatory factor analysis was performed on the collected data as shown in Table 4 below. Factor loading results showed one construct from each variable was below the accepted value of 0.60 reducing the overall validity and reliability. These were removed and the remaining constructs were qualified. Table 4 below shows the construct loading ranging from 0.647 to 0.796 depicting convergent validity. Average Variance extracted (AVE) values are for the constructs are all above 0.50 and Composite reliability (CR) values are above 0.70, further confirming the convergent validity [29]. There was no multicollinearity issue in the data as shown by VIF values ranging from 1.271 to 1.954 which are all below 10. Further Cronbach's alpha values range from 0.749 to 0.836 above the accepted value of 0.70

Table 4. Confirmatory Factor Analysis

Variables	Constructs	Loading	VIF	AVE	CR	α
BDG	BDG1	0.732	1.352	0.528	0.817	0.781
	BDG2	0.761	1.445			
	BDG3	0.731	1.769			
	BDG4	0.679	1.444			
BDC	BDC1	0.647	1.547	0.511	0.838	0.752
	BDC2	0.721	1.481			
	BDC3	0.655	1.271			
	BDC4	0.743	1.481			
	BDC5	0.796	1.371			
BDP	BDP1	0.733	1.954	0.553	0.787	0.749
	BDP2	0.815	1.552			
	BDP3	0.677	1.635			

4.3 Hypothesis testing

In the first step the first three hypothesis are tested as shown in Table 5 below.

Table 5. Regression Results

			Regression Weight (Standardized)	SE	p-Value	Remarks
BDG	→	BDP	0.169	0.067	0.006	Supported
BDG	→	BDC	0.075	0.050	0.178	Not supported
BDC	→	BDP	0.10	0.050	0.041	Supported

The results show that there is a significant positive relationship at 10% significance level between Big Data based governance and decision performance with regression coefficient of 0.169, hence our H1 is accepted. The relationship between Big Data governance and Bid Data capabilities is insignificant, rejecting our H2 while significant relationship is proved between Big Data Capabilities and decision performance.

In the next step, a mediation test was conducted using Baron and Kenny Mediation test as shown in Table 6 below.

Table 6. Baron and Kenny Mediation test

Path			Direct Path		Indirect Path		Remarks
			Coefficient	Sig.	Coefficient	Sig.	
BDG	→	BDP	0.169	0.04	0.199	0.01	Full mediation

The results show that in the significance level has increased, therefore according to the Baron and Kenny [30] criteria, mediation is proved.

5. Conclusions, Limitations and Future Research

The main objective of this study was to check the impact of big data-based governance mechanisms on the decision making performance of the firms The capabilities of the firms to work with big data was also tested for its impact on the decision making performance along with the relationship of big data based governance with big data capabilities. The results of our study indicate that big data based governance systems have positive impact on the decision making performance of the firms as which follows the findings of Janssen, et al. [7]. It was also revealed that there is no relation of big data based governance structure of the firms with the big data capabilities which goes against the findings of Janssen, et al. [7] and Shamim, et al. [31], while the big data capabilities has direct relationship with the decision performance which supports prior studies [7, 10, 24, 25]. The summary of empirical results is shown in Table 5. In the first step we found that our H1 is supported as Big Data based governance significantly impacts the decision performance ($\beta = 0.169$, $p < 0.05$). This may be due to the fact that the incorporation of big data provides confidence to the firms that they can improve their decision performance through improving the data findings and transition from traditional decision making [32]. H2 was rejected as the results were insignificant (p: $0.178 > 0.05$). H3 was accepted and big data capabilities significantly affect the decision performance ($\beta = 0.100$, $p < 0.05$). In the next step Baron and Kenny mediation test proved mediation of big data capabilities on big data governance and decision performance. This means that a high big data focused governance leads to better decisions. Thus, shifting to big data driven decision instead of traditional experiential decision making by the firms leads to more accurate and timely decisions. This study has several limitations. First, the data was collected from people working in the real estate industry in China. In addition, limited variables were tested in this study and further factors such as organization culture, employee training and development may also be included in the future studies. As this study is based on cross sectional data, it is also suggested that a longitudinal study may be undertaken as enhancing the decision performance and quality is a long-term objective of the firms.

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