The impact of the big data analytics on the Asian firms in Digital technology industry: The moderating role of Knowledge management

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Abstract

This study aims to evaluate the impact of big data analytics on the performance of companies in Asia's digital technology industry, as well as the role that knowledge management plays in influencing that impact. The study adopts a quantitative research methodology and collects data from a number of regional firms. According to the findings, big data analytics have a favorable effect on corporate performance in the digital technology industry, and the adoption of efficient knowledge management systems strengthens this connection. In addition, the study found that knowledge management functions as a moderator between big data analytics and business performance. This highlights how important it is to effectively manage knowledge in order to use big data analytics to enhance company performance. The findings have significance for regional managers and policymakers, underlining the need to invest in big data analytics and knowledge management to increase business performance in the digital technology industry. This study contributes to our comprehension of the role that big data analytics and knowledge management play in enhancing the performance of Asian companies in the digital technology sector. In conclusion, the findings show that regional companies may benefit from a strategic approach to knowledge management in order to optimize the positive impact of big data analytics on their overall performance.

Keywords: Big data analytics, Asian firms, Digital technology

BACKGROUND

By managing big data, businesses can achieve several advantages. Digital, technological, and online businesses can apply these advantages. Big data is being used by digitally born organizations, i.e., Amazon and Google. Fewer difficulties were found by these companies in leading themselves in utilizing big data. However, the ability to achieve a competitive advantage can be higher for some companies. Managers are supported in the process of decision-making based on evidence (Wang, et al.,2020). The decline in costs for every aspect, including storage, processing, memory, bandwidth, etc. is reduced. Thus, companies that are not born digital can cost-effectively approach big data analysis. Traditional businesses can be transformed through big data with effective utilization of required technology. The required technology can help in gathering a huge amount of data at a cheaper cost. The reliance on big data along with its effective utilization is being done by different industries. The use of big data is growing in commercial contexts as well from health care, finance to supply chain management

(Usmanova et al.,2020). It was found by Shamimet al. (2020) that data-driven companies are able to achieve improved performance in terms of operational efficiency and financial gains. Companies, which use data for making decisions, are able to experience more productivity in contrast to their competitors.

The process required for comprehending the management of data for driving useful knowledge and information is referred to as Big data analytics (BDA) (Saleem et al., 2020). This knowledge and information can help businesses with ineffective management and decision-making (Liao et al., 2020). The data is collected and analyzed for developing new knowledge and actionable insights to gain a competitive advantage. Therefore, high-performance and low-performance companies can be differentiated BDA. Big data analysis helps organizations in the formulation of long-term vision, reduce acquisition costs for customers and increase revenue (Ferraris,et al.,2020). Therefore, big data can be used by managers to acquire more knowledge and transform it for effective decision-making. The decisions are intended to improve the performance of business organizations (Lei et al.,2020). An integrated and structured approach is required for managing information and knowledge generated from big data analytics. One of the important challenges for the management is to manage relevant information lying inside or outside the traditional boundaries of a firm. Managers need to face this challenge by effective utilization of their skills and experience (Nisar et al.,2020). Managing different types of information enables an organization to become innovative and utilize internal capabilities efficiently (Chatterjee et al.,2020).

CONCEPTUAL FRAMEWORK

It was highlighted by Narayanamurthy and Tortorella (2020) that improved decision-making based on data and innovative methods for learning and organization is supported by BDA. Thus, BDA results in an improved level of performance. Different aspects of the business including production efficiency, operational risks, and CRM can be managed properly through BDA, which ultimately leads to superior performance. It has been shown by previous research studies based on RBV (resource-based view) and IS (information system) that there is a positive influence created on firm performance by organizational ability to process information, i.e., higher profits or return on investment (Kache & Seuring,2017). Routines and skills in the transformation of knowledge into output are included in organizational capabilities (Zhu et al., 2018). Therefore, the organizational ability to collect, organize and analyze big data can create a difference. Such capabilities are difficult to imitate because of path dependency effects (Grover et al., 2018). For achieving competitive advantage, several capabilities and resources at the firm level are required to be combined. BDA capabilities cannot be created just through big data (Gupta and George, 2016; Wamba et al., 2017). Creating abilities, which are difficult to imitate require a combination of different physical, human, financial, and organizational resources. These capabilities can result in improved performance such as return on investment, improved level of customer satisfaction, increase in profitability, and organizational growth (Sivarajah et al., 2017). Therefore, the following hypothesis has been proposed:

H1. BDAN has positive impact on NFP.

Role of KM as a Moderator

A set of beliefs, which can be arranged to improve the performance of an organization through actions, is referred to as Knowledge (Janssen et al.,2017). Three key processes of KM have been acknowledged in literature (Günther et al., 2017). The acquisition of

knowledge is the process that is used for creating new knowledge from information and data. The conversion of knowledge is related to making it useful for the benefit of an organization (Brayne,2017). The knowledge is structured and transformed into explicit knowledge. The application of knowledge is linked with the utilization of knowledge for performing different activities (Dashet al.,2019). The processes of acquisition of new knowledge are included in KM by converting knowledge for making it accessible and usable Mohammadi,et al.,2018). Thus, this knowledge is effectively utilized for improving the performance of a firm. Companies are allowed to acquire, store, process, and transfer knowledge in an efficient manner through knowledge management processes (Borgman,2017). This knowledge is used for increasing market share, customer satisfaction, and financial performance.

It has been found by previous research studies that the value of business derived from IS investments have resulted in mixed outcomes. This is referred to as the IT Productive paradox (Ferraris et al.,2020). It has been argued by some scholars that KM and IS investments may not result in improved effectiveness and efficiency of operations (Zhang et al.,2018). However, a positive relationship between firm performance and investments has been found by some researchers (McIver et al., 2017). It has been suggested by the findings that lack a positive association between KM and IS investment with firm performance can be explained by various factors such as lack of suitable data, time lags between the investments, and unavailability of IT benefits (Li et al., 2020).

The key concerns about the development of knowledge and its processing are reframed by BDA (Ali et al.,2018). It involves questions about the engagement with information, nature, and its classification. Challenges are experienced by firms in the management of relevant knowledge gained from BDA, such as complexities of data integration, privacy and security issues, lack of skilled employees, and suitable IT infrastructure (Cai et al.,2019). In this context, a structured approach for Knowledge Management is crucial. Changes in personal knowledge management can be made by BDA, which can widen and increase the role of individual knowledge as well as make changes in workers' roles (Zhenget al.,2017). The significant interrelation between KM and BDA was highlighted by Papaet al. (2020) for sharing common business intelligence knowledge along with extending human knowledge. This results in various types of improvements in the performance of a firm. Therefore, the following research hypothesis has been proposed.

H2: BDAN has positive impact on KM.

H3:KM mediates between BDAN and NFP.

H4: BDAN has positive impact on FP.

H5: KM mediates between BDAN and FP.
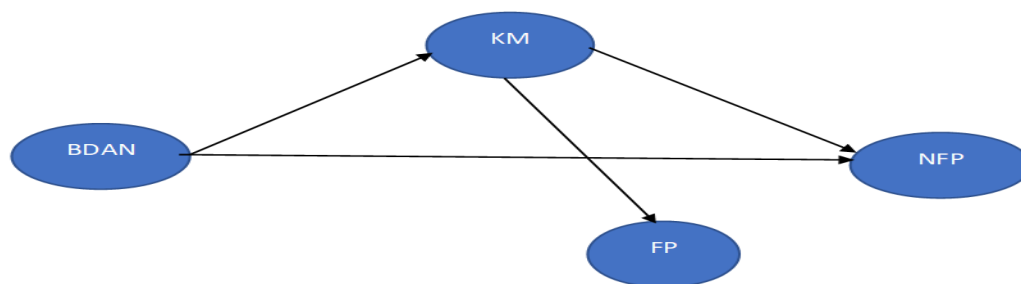
Figure 1.
Conceptual Framework

RESEARCH METHODOLOGY

The purpose of this study was to evaluate the influence of big data analytics on the performance of Asian firms in the digital technology industry, with a particular emphasis on the moderating effect of knowledge management. A survey-based technique was utilized to obtain data from the investigated population. 375 individuals were selected as survey respondents in order to determine their level of knowledge and experience in the field of digital technology. The constructs of the study were evaluated using a standardized questionnaire. Two sections were included in the questionnaire. The first phase was collecting demographic information on the respondents, such as their ages, genders, degrees of education, and years of professional experience. The second half of the questionnaire had the measuring items for the components of the study, which were, in order, big data analytics, knowledge management, and business performance. The survey was circulated digitally via a variety of social media platforms and email lists, with respondents receiving 485 questions. To validate the hypotheses, the gathered data were subjected to the Partial Least Squares-Structural Equation Modeling technique (PLS-SEM). Internal consistency, convergent validity, and discriminant validity were utilized to evaluate the reliability and validity of the measurement model. According to the findings of the inquiry, the measurement model was both valid and reliable.
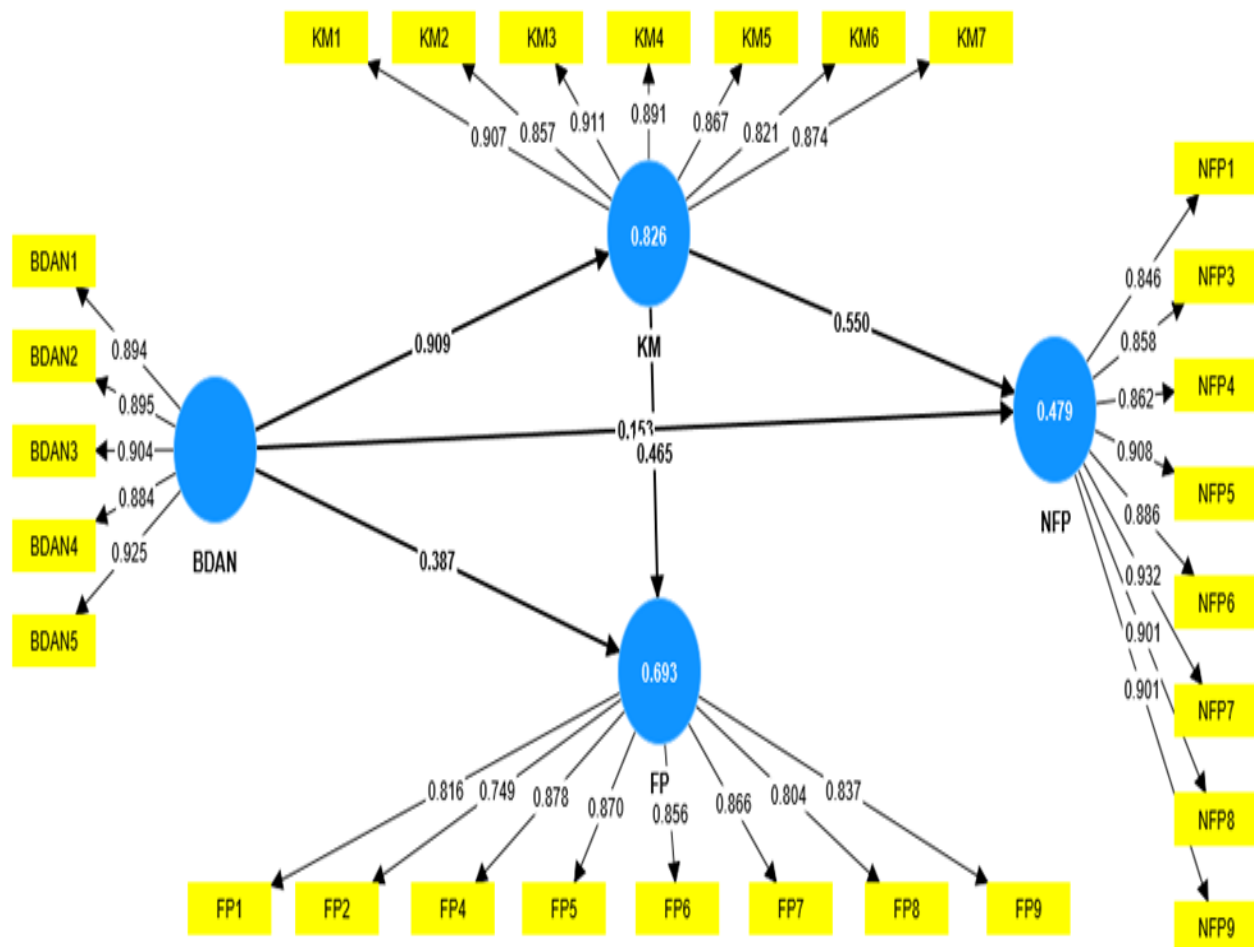
In addition, the structural model was utilized to evaluate hypotheses on the influence of big data analytics on company performance and the moderating role of knowledge management in this relationship. The findings of the study indicated the existence of a significant and favorable association between big data analytics and business performance. In addition, the results indicated that knowledge management moderated the association between big data analytics and firm performance. The survey-based research methodology adopted in this study yielded useful insights on the impact of big data analytics on the performance of Asian firms operating in the digital technology industry, as well as the moderating effect of knowledge management. Conclusions of this study have significant implications for managers and policymakers in the digital technology industry. These individuals are looking for ways to boost the performance of their companies by utilizing big data analytics and knowledge management effectively.

RESULTS

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Figure 2.
 Measurement Model

Table 1.
Outer Loadings

	BDAN	FP	KM	NFP
BDAN1	0.894			
BDAN2	0.895			
BDAN3	0.904			
BDAN4	0.884			
BDAN5	0.925			
FP1		0.816		
FP2		0.749		
FP4		0.878		
FP5		0.870		
FP6		0.856		
FP7		0.866		
FP8		0.804		
FP9		0.837		
KM1			0.907	
KM2			0.857	
KM3			0.911	
KM4			0.891	
KM5			0.867	
KM6			0.821	
KM7			0.874	
NFP1				0.846
NFP3				0.858
NFP4				0.862
NFP5				0.908
NFP6				0.886
NFP7				0.932
NFP8				0.901
NFP9				0.901

One of the most crucial tasks when using Partial Least Squares for Structural Equation Modeling (SEM) is to conduct a reliability study to establish whether or not the measurement model is consistent and stable (PLS). The measurement model represents the connections between latent and observable variables in PLS-SEM. As a result, the overall quality and accuracy of the model's predictions are significantly enhanced. Typically, either the Composite Reliability (CR) or the Average Variance Extracted methods are used to assess the PLS-SEM dependability (AVE) (Mohd Dzin et al.,2020:). The correlation ratio (CR), which is the average of the squared factor loadings, can be used to evaluate the dependability of a latent variable. AVE can also be used to measure the consistency with which latent components in observable variables contribute to total variance. These trustworthiness characteristics are essential for maintaining the validity of the PLS-SEM model and getting the correct findings from the research. Table 3 displays the coefficient of reliability (CR) and average variance explained (AVE) for the latent components utilized in this investigation. These scores suggest dependability that is adequate.

Table 2.
Reliability Analysis

	ach's alpha	liability (rho_a)	reliability (rho_c)	racted (AVE)
BDAN	0.942	0.942	0.955	0.811
FP	0.938	0.945	0.949	0.698
KM	0.949	0.950	0.958	0.767
NFP	0.961	0.966	0.967	0.787

The discriminant validity of the current study is demonstrated in Table 3.

To ensure that the two variables in question are unrelated, you must conduct a test for discriminant validity. This part of the topic was analyzed using the method developed by Fornell and Larker. Table 3 provides a summary of the research findings; it demonstrates that the loadings given in bold for each construct have a bigger absolute value than the other values, showing that all variables possess a high level of discriminant validity. On the basis of the results of the tables examining convergent validity, reliability, and discriminant validity, we can therefore infer that the data is legitimate and trustworthy.

Table 3.
Discriminant validity

	BDAN	FP	KM	NFP
BDAN	0.901			
FP	0.810	0.836		
KM	0.909	0.817	0.876	
NFP	0.653	0.724	0.689	0.887

We utilized the structural model to verify the calculated hypothesis. Each variable is a latent construct.
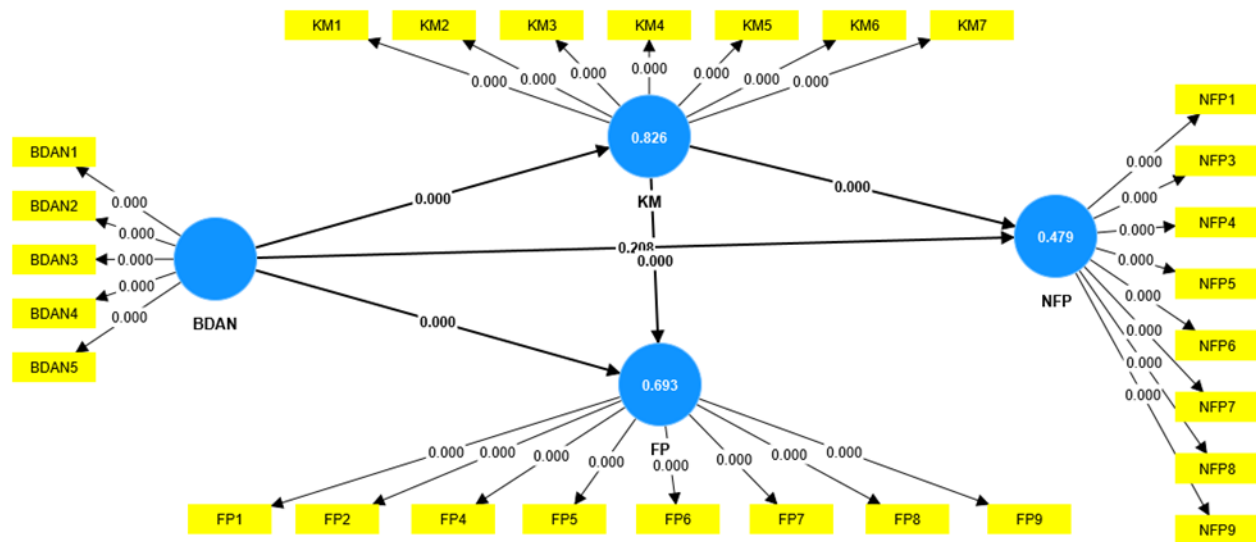
Figure 3.
Structural Model

Using a Partial Least Squares (PLS) technique, structural equation modeling (SEM) adds a structural model that captures the causal structure of the data. With this approach, we can create correlations between factors that were previously unknown. The term "structural modeling" is used to describe the entire process, which comprises each of these techniques. To build the PLS-SEM structural model, a set of structural equations must be retrieved from the measurement model and then utilized to estimate the external loadings (Gao et al.2020; Abdulmuhsin et al.,2020; Asada et al.,2020; Basheer et al.,2020; Raoof et al.,2020; Nuseir et al.,2020; Yan et al.,2020). This approach must be repeated numerous times for the modeling technique. This model can be used to develop predictions and test hypotheses regarding the associations between latent variables using observed data. Table 4 summarizes the study's findings and illustrates that all hypotheses may be accepted with a high degree of confidence.

Table 4.
Direct Results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
BDPAN -> OP	0.764	0.766	0.046	16.771	0.000
BDPAN -> SEC	0.915	0.914	0.016	57.114	0.000
SEC -> OP	0.481	0.487	0.095	5.082	0.000

Table 5 below shows that the results of the mediation investigation show that the mediation path is statistically significant.

Table 5.
Mediation Analysis

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
BDPAN -> SEC -> OP	0.440	0.446	0.089	4.926	0.000

DISCUSSION AND CONCLUSION

The unification of large data sets with the latest analytics is the most significant aspect of the big data revolution for problem-solving. Two key sources of insight derived from big

data have resulted from the ability to solve problems and spotting patterns beyond the mental capabilities of a human. BDA can help in analyzing multidimensional and large data sets for determining correlations and hidden patterns. The positions traditionally supported by received wisdom, practical experience, and common sense can be validated. New insights can be delivered into the current dynamics of a market, population, or business by BDA. The realm of reliable predictive analytics has been expanded by big data. A new generation of models can be developed by analyzing hidden relationships in large data sets. These newly developed models can help in defining the way things will evolve in the future. Big data is sought by organizations for improving their performance measures (Wang et al., 2018). It has been found empirically in this research that a specific KM orientation level and BDA capabilities should be possessed by firms to get full advantages of big data. This can result in an effective process of decision-making by sourcing information and making decisions based on the information acquired. The creation and transfer of knowledge are done in this era of big data and expertise does not exist where it used to be. Thus, a skilled leader may create flexibility for increasing cross-functional cooperation and reduce the syndrome of 'not invented here (Guinan et al., 2019). It is understood by people that problems can be solved with collaboration and the right information. There is also a need for people who possess effective problem-solving skills using various techniques.

Big data utilization can help in better decision-making, which can in turn improve the performance of an organization. This advantage possessed by BDA should be understood by leaders that BDA-related capabilities should be developed. The combination of data science and domain expertise by companies in different sectors can show increased responsiveness. The performance of an organization can be improved through the acquisition of big data, sourcing relevant information and trends from it, transferring it into different organizational activities, and fact-based decision-making. All these factors result in reduced costs and improved returns for organizations through the use of big data and big data analytics.

LIMITATIONS

The research has given attention to two important capabilities of big data relevant to humans, i.e. KM capabilities and BDA. The focus of future studies can be made on other important resources, which can be effective in big data exploitation. For instance, the formation of a culture driven by data diverts the attention of managers for better decision making and equipping employees with technical skills in terms of training and education specific to big data. The competencies related to big data can be developed through training and education. There are some limitations of this research as well. The study is based on the SME sector of Pakistan. Future studies can work on different areas or samples to analyze the generalization of the current findings. For now, the study is limited to the specific area of BDA. By nature, BDA is context-specific because of variations in the analytics industry. Another limitation of the study is the use of cross-sectional data. Thus, future studies can work on panel data for analyzing the validity of findings across time and evaluate the effect of time lag of KM capabilities and BDA on future performances of a firm.

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