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Big Data and Business Future: A Great Bonding to Take Decisions

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ABSTRACT :

The purpose of this study is to analyse the relationship between Big Data and business decision making in the context of future business environment. The technological trend, Big Data, has been shaping business functions and transforming its operation through creating opportunity of data driven decision making capacity. A thorough discussion on the relationship between Big Data and business decision making has been prepared in this very study. The analysis includes influence of big data analytics in decision making, strategy development, strategic planning, functional data empowerment, business operation, etc. In addition, a discussion on empirical evidence with the discussion and analysis of case studies discussing successful implementation of Big Data in business operation. In line with this, the researcher has also prepared a discussion on challenges regarding the implementation of Big Data in business operation, required considerations for data governance, privacy, and ethical concern for a business perspective.

Keywords: Big Data, Edge computing, AI, Machine learning, data-driven decision, V framework.

1. Introduction

Big data has created its significance in today's business platform where it has been applied for adapting with the changes in rapidly changing business environment. Wamba et al. (2015) stated that an organisation's efficiency, nowadays, can be defined with the capability of using big data in business operation. The big data is defined in terms of its volume, velocity, veracity, value and variety where it is applied for shaping business performance, operation and efficiency (Gandomi & Haider, 2015). The business world encompassed with digital tools has established a requirement of big data to create unique value for its customers. Warren & Marz (2015) reported that data has become a crucial element of business performance where the efficiency of an organisation in managing and utilising data from various sources defines its success and business growth. The strategic change in business performance can be invited through the application of big data which is a set of complex data utilised for shaping business operation and productivity.

Businesses have been using big data for making effective strategic, operational, and tactical business decision to compete with competitors for the same market share. According to Ajah & Nweke (2019), the success and performance of today's business can be defined in the lens of the organisation's capacity of applying big data that supports in collecting and analysing big data to oversee market trends, offer personalised offering to customers, to energise internal process for acquiring desired market share. As it is predicted that the global data size will become 175 zettabytes by 2025, it is recommended to implement big data for adopting evidence-based decision by analysing this large volume of data (Statista, 2025). In this context, the application of big data capability can guide the organisation in developing an effective data management strategy and facilitating performance toward sustainable business growth and performance. However, the research has intended to develop a connecting between big data and business operation where this relationship can shape future of business based on big data analysis and evidence-based decision making for business operation.

2. Understanding Big Data: Definitions and Dimensions

Santoro et al. (2019) stated that big data is a complex and large dataset used for extracting and analysing data from large data volume to achieve purpose. On the other hand, Alwan & Ku-Mahamud (2020) defined that big data is a diverse data set of structured, unstructured, and semi-structured data for analysis where the growth of data is exponential. Traditional data processes fail in analysing complex data or large dataset which is termed as big data. According to Abbasi (2016) big data is a set of processes, mind-set and tools which are organised together to analysing and extract data from a large and complex data source. From the analysis of Zomaya & Sakr (2017), big data is a set of V framework that includes volume, variety, veracity, value and velocity which develop foundation of big data. In this context, the big data analytics is applied for collecting and analysing big data or massive data volume to achieve desired objective and to make business insight for an organisation. Furht & Villanustre (2016) marked a difference line between big data and traditional data whereas tradition data works with relationship dataset and big data works with structured, unstructured and semi-structured dataset for analysis and decision making.

Data volume has changed its shape from kilobyte to petabyte where businesses are even using zettabyte data volume, petabyte etc. where this data volume comes from social media, IoT devices, business market, other sources, etc. Now data analytics requires velocity of processing and analysing the data volume where the data volume carries velocity with eligibility of speeding data analysis. Sakr & Zomaya (2019) reported that big data can analyse data from structured, unstructured and semi-structured where the traditional data analytics works with only relational dataset. In addition, big data has achieved

trustworthiness and data quality where this is defined as veracity. Zomaya & Sakr (2017) cited that big data works well on developing insight by analysing large volume of raw data for a business.

3. Technological Infrastructure Supporting Big Data

Big data analytics require technologies which are associated with big data for data analysis, processing and decision making. Furht & Villanustre (2016) cited that big data needs to the supported with possible technologies which guided in the way of collecting, analysing, storing and decision making for an organisation. The technological infrastructure sets up way of collecting, processing, analysing and storing data where the usable technological tools for data analytics include:

- **Data storage:** In the application of big data, an organisation requires a scalable storage that can store massive volume of data for further use. In this context, Hadoop Distributed File System (HDFS) technology supports big data analytics in storing large data volume (Abbasi, 2016). On the other hand, Sakr & Zomaya (2019) cited that there are found various cloud services supportive to data storage of big data analytics. The cloud services for big data analytics include Google cloud, AWS, Azure etc. have been found effective and scalable for the big data storage.
- **Data processing:** Another important work for data analytics is data processing that is applied for preparing output of collected data. Zomaya & Sakr (2017) stated that the data processing in big data analytics is performed using framework which is established through some tools like Apache etc. The tools for data processing include Apache Spark, MapReduce, Apache Kafka, etc. where these support in real-time data processing benefit (Zomaya & Sakr, 2017). On the other hand, batch data processing tool is another solution found for the data processing in big data analytics.
- **Data warehousing and integration:** Other than data storing, there is found a necessity of warehousing data that is the process of developing central repository of structured data collected from various sources. Sakr & Zomaya (2019) reported that data warehousing in data analytics is performed for data extraction, transformation and loading along with data modelling and cleansing. With this process, an organisation can experience facilities of trend analysis, historical data analysis and decision making. On the other hand, Alwan & Ku-Mahamud (2020) data integration in big data analytics is performed with the purpose of setting up consistent view for multiple users where the integration is happened following data warehousing. The sourcing of data from various sources is combined into a single platform to develop a format of unified and consisted view of scattered large data volume.
- **Machine learning and AI:** The main function of big data analytics takes place through machine learning and AI where various technologies are applied for this purpose. Sakr & Zomaya (2019) cited that Artificial intelligence is a process of simulating human intelligence within machines where machine learning is a sub-set of AI to make machines perform based on programmed data to enhance performance. The tools such as deep learning, clustering, predictive modelling, generative AI, etc. that support in predicting future market, informed decision and strategic development.
- **Visualisation tools:** The processed data or result output from data analytics need to be presented in a visualised format for understanding and decision making. In this aspect, technologies such as Power BI, Qlik, Tableau, D3.js, google graphs, etc. which assist in presenting complex and large data in understandable format through visuals such as charts, graphs, bars,maps, infographics, for better decision making and efficiency (Zomaya & Sakr, 2017).

4. Strategic Role of Big Data in Business Decision-Making

Big data analytics support in making informed decision where this develops insight of markets and future trends. The following functional decisions are made using big data analytics:

- **Strategic planning:** Sivarajah et al. (2024) stated that an organisation must make strategic decision for business operation where this creates much impact on performance and operation. A strategic planning is developed with the vision of long-term business orientation where business leaders adopt effective planning for attaining business vision and market competitiveness. In this context, the big data analytics is highly applied for predicting future business and market trends along with the estimation of business resource allocation. Huang et al. (2016) cited that business leaders are found using predictive analytics of big data while developing strategic planning for business and performance.
- **Customer relationship management:** This has been found another effective function of a business where value found in return from customers develops business profitability. Santoro et al. (2019) stated that the performance of business depends largely on customer relationship management. In this context, the big data tool assists in understanding customer behaviour for designing personalised offering where the technology uses customer review, feedback and past data etc. for the data analysis and decision making (Fosso Wamba & Mishra, 2017). The output of data analysis is evidence based that creates input for designing competitive customer service to maximise customer satisfaction.
- **Operational efficiency:** According to Brynjolfsson, Hitt & Kim (2011), big data in business performance creates large impact where an organisation can attain operational efficiency with this technology. Since the business operation is largely defined by the performance of supply chain, inventory, production, distribution, maintenance, etc. which all can be regulated using output of big data analytics.
- **Financial performance:** Big data is also applied in the process of risk assessment and fraud detection which are found effective for reducing business risks and enhancing business performance. On the other hand, the financial forecasting happened through big data creates huge impact on business performance where the forecasting provides necessary insight on financial decision making (Chen, Chiang & Storey, 2012).
- **Innovation and R&D:** Chen et al. (2014) stated that continuous innovation is a competitive capability of an organisation that innovates new product or services or process through effective R&D. In this aspect, big data has changed the way of research and development along with

innovation where employees can collect and analyse information efficiently using big data tools for trend analysis, predictive future trends, market feature and customer behaviour for business performance (Malek et al., 2017).

5. Industry Applications: Case Studies

There are found several successful industry and organisation application of big data in business operation and functions. Some the successful stories have been described below:

Amazon: This is one of the largest e-commerce retailers and it has initiated the application of big data in its business operation. The purpose of implementing this machine learning tool "recommendation engine" was to offer a highly attractive personalised customer service experience. This platform offers recommendation for purchase of products based on customers' past behaviour or purchase history. Hewage et al. (2018) cited that the management of Amazon developed a remarkable technology for its customers using big data that assists customers in making desirable purchase decision. From the analysis of McKinsey (2018**)**, it is found that the tool led Amazon to acquire a revenue of 35% more from the implementation of recommendation engine. Chen (2017) stated that Amazon created an opportunity for its customers to experience a personalised service and shopping experience where an AI is there for assisting purchase decision. In this context, the technology predicts customers' preference from the past data analysis or categorising similar customer group. In addition, this technology collects data from customers' browsing patterns, reviews, product view, etc. for recommending a service. Cheedella, Fathimabi & Chinamuttevi (2024) cited that amazon recommendation engine is also useful for inventory management by forecasting demand, stock management and price adjustment through market and customer analysis. According to Dwivedi et al. (2020), the recommendation engine of Amazon has been found a successful big data application technology for business operation and performance where this offers extensive personalised shopping experience and customer service to exceed customer satisfaction. This tool has been blended with personalised marketing where customers feel valued and recognised while visiting amazon online stores and finding reason for revising Amazon.

- **Netflix:** Another great example of successful big data application is Netflix that has implemented this technology in various areas of business functions. Van Es, (2023) cited that big data of Netflix supports in understanding customer preference, content optimization and reduction of customer switching. The management of Netflix identified big data as an effective tool of understanding customers' need and preference where this has created an opportunity of increasing customer satisfaction. In this context, the platform offers personalised services and suggestion to its customers who were analysed using their past usage history and patterns. It has also been identified that this platform uses predictive modelling of big data for data analysis and tracking customers' preferences and changing in needs. On the other hand, Maddodi (2019) cited that Netflix has achieved a great success in using big data for guiding its customers and instigating their demand and predicting their behaviour to enhance business performance. In another context, the big data analytics has offered Netflix to innovate service from the data analysis of technology where the "house of Cards" is the result of such process (Van Es, 2023). This series was produced by analysing data of customer where this data-driven decision marked its success in the industry. Walker (2017) reported that Netflix has established an example of applying big data analytics in developing marketing strategies, content production and offering personalised customer service to increase satisfaction and customer retention rate. However, the "user behaviour analytic" tool of Netflix is a successful application of big data analytics in entertainment industry for guiding business performance.
- **Walmart:** The success of retail business depends largely on inventory tracking, forecasting, customer service, pricing etc. where Walmart has been one of the leading retailers in competing with its competitive strategies. Harsoor, Patil & Tech (2015) stated that efficiency of a retailer derives from its inventory management capacity where a retailer has to maintain stock to satisfy customers. In this context, Walmart introduced real-time inventory tracking through the application of big data where this energised performance of inventory management (Singh et al., (2017). With this technology, the retailer created support of restocking and overstocking for its performance in the retail customer and logistics management. The real time inventory tracking technology of Walmart offers benefits of stock management and inventory controlling to satisfy customers' demand. On the other hand, the management of Walmart also introduced demand forecasting along with inventory management where this activity is closely related with each other (Harsoor, Patil & Tech, 2015). With this technology, the retailer can predict demand of customers where this helps management in making decision of business operation. There is found another effective practice of big data in Walmart retail business where this is defined as pricing strategy. The dynamic pricing strategy works in real-time basis where big data analytics tool offer changes in pricing based on competitive and market analysis (Cao, 2021). From the analysis, it is also found that the effective inventory management leads the retailer in minimising waste along with the support of meeting customers' demand where the data analysis makes management in waste management and stock decision for business (Cao, 2021). However, the big data analytics in Walmart has created positive impact in predictive analysis for demand management and adaptation with customers' preference change along with customer behaviour analysis for maximising satisfaction and retention.
- **Airbnb:** Big data application in Airbnb starts with dynamic pricing strategy which has been practised for meeting customers' changing preference and offering a unique value (Amat-Lefort, Barravecchia & Mastrogiacomo, 2023). In this context, the tool collects information from market trends, competitor pricing and demand forecasting which were analysed for offering a unique pricing to attract customers and to meet satisfaction (Amat-Lefort, Barravecchia & Mastrogiacomo, 2023). This pricing strategy has been found impactful on business operation where this has created a competitive value in the market for Airbnb. In another context, the management of this organisation uses big data for fraud detection and risk management that was applied to increase customer service quality. This organisation collects data on customers' behavioural patterns and complaints which created base for fraud detection and risk management (Lee et al., 2020). In addition, the predictive modelling helps in defining risks and tools of risks management of effective and optimum business operation of Airbnb. On the other hand, the organisation has been found with the application of customer personalisation which is a result of big data analytics (Wang, 2023). Customers are identified with their reviews, preferences, previous history, experience, past purchase, etc. for categorising their behaviour and demand where the analysis output is used for personalised offering to customers (Lee et al., 2020). Big data in Airbnb has also been applied

for increasing trust among customers and opportunity of customer engagement where this is offered from the market and customer data analysis within big data analytics.

6. Benefits of Big Data Integration

Warren & Marz (2015) stated that big data integration offers various benefits to users where the several benefits of big data enhance business operation and performance. The benefits of big data integration are discussed below:

- **Enhanced decision accuracy:** Wamba et al., (2015) cited that the precision and accuracy of decision is highly required for a business where success of business depends on decision accuracy. So, the management has to make decision based on data, experience and future profitability where the failure in decision can cost money, effort and investment. In this context, big data has come up with solution where the management can reduce the risk of decision making failure. Sivarajah et al. (2024) reported that the accuracy of decision has been enhanced with the integration of big data analytics in decision making process. The application of big data is useful and impactful as this tool uses empirical and real-time data for enhancing validity and reliability.
- **Customer insight and loyalty:** Technologies of big data provides improved understanding of customers and their preferences. Fosso Wamba & Mishra, (2017) cited that customer insight is essential for business in expediting business performance and profitability. The customer insight is used for strategy development and decision making where organisations use insight of predicting future market and demand. Organisations apply big data analytics for creating a good understanding of customers' preferences, experience, demand, trend etc. which are applied for designing and developing personalised service and product to exceed customer satisfaction and to enhance loyalty (Côrte-Real, Oliveira & Ruivo, 2017).
- **Risk reduction:** The big data analytics for an organisation creates pathway of reducing business risks since it collects and analyses data for decision making. The real-time data in use for analytics guide management in predicting future changes in market, potential risks for the business (Smeda, 2015). On the other hand, the data analysis for customer complaint, business failure, market changes create functionality of risks reduction and management for increasing performance.
- **Operational excellence:** With the integration of big data analytics in business operation, organisations have attained opportunity of operational excellence. In this context, technologies such as automation, process optimisation, lead time reduction, real-time decision making, etc. offer huge benefit in attaining operational excellence (Santoro et al., 2019). For example, the real-time data management of inventory management and stock management has enhanced efficiency of retailers in meeting customers' demand, reduction of waste and fulfilling seasonal pick demands along with reduction of overstocking. The data output from big data analytics creates functionality of strategy planning and strategy development which increase operational excellence as a result.
- **Market responsiveness:** Organisations that are using big data analytics can predict market changes effectively. As a result, the management can respond to market rapidly being informed of the change where the responsiveness enhances competitiveness.

7. Challenges in Implementing Big Data

McAfee & Brynjolfsson (2012) argued that leaders of various organisations have to confront challenges while using big data where the challenges need to be overcome for attaining desired outcome from the analysis. The challenges of big data are discussed below:

- **Data quality:** Reinsel, Gantz & Rydning (2018) reported that data quality is key requirement for big data analytics to produce desired result or outcome. Users of this technology have to ensure that they provide accurate data for the analysis of big data analytics. On the other hand, Smeda (2015) cited that inaccurate data leads to inaccurate analysis and result for an organisation. In another context, it is required that complete data is shared with analytics that produce result based on the data received as input. However, the decision making of an organisation can greatly be influenced with the analytics output where the quality data is a necessity to be maintained in the process of analysis.
- **Integration complexity:** The data which are collected for big data analytics are from various sources. In addition, the data are in structured, semi-structured and unstructured format which create challenge of integration. Medeiros, Hoppen & Maçada, (2020) cited that an organisation faces challenges of integration complexity due to data volume and diverse sources.
- **Security and privacy:** Zomaya & Sakr (2017) reported that users of big data have to ensure ethical consideration and compliance of rules while utilising analytics for attaining transparency and acceptance of result output. There is found high challenge of complying with legal and ethical concern which are ensured through regulations. In this context, an organisation has to follow through GDPR and CCPA regulations for data analytics to ensure security and privacy of data collection and analysis.
- **Shortage of skilled employees:** Since big data technology is new in the business world following industry 2.0 revolution, this sector lack of required skilled employees. Sivarajah et al. (2024) described that the opportunity of big data can only be leveraged with skilled employees where there is found a large gap of developing talents for this technology. So, organisations may face challenges of talented employees who are skilled in big data technology.
- **Cost and Return on Investment:** The implementation of big data requires a large amount of initial investment which guides the way of facilitating technologies for big data capacity development. In addition, the establishment of technological infrastructure is another section of cost and investment where small organisations may face difficulty of arranging such volume of initial investment (Reinsel, Gantz & Rydning, 2018). Moreover, organisations are unware of collecting desired return of investment which is still underway for visibility and quantity.

8. Ethical and Legal Considerations

Organisations and others have to consider ethical and legal considerations while using big data to increase trustworthiness and transparency. The following areas are upheld with ethical and legal considerations of big data technology:

- **Privacy:** Data privacy is a crucial ethical element for everyone where the personal data should be protected legally. While using data for analytics users have to maintain transparency and legal considerations for collecting and analysing personal data (Blessing, 2024). In this context, respective legal requirements and confidentiality have to be applied during the application of big data analytics.
- **Bias:** This creates high ethical complexity for the big data users where data biasness can reduce transparency. In addition, discrimination can be found in practice for the implementation of big data analytics (Abbasi, 2016). The algorithms developed with program of using biased data may lead to improper and biased result for organisation.
- **Transparency:** It is necessary that the management of an organisation need to be transparent in using data and making decision. The process of maintaining transparency in decision making through big data ensures ethical compliance and transparency in decision making. In this context, the application of laws like GDPR ensure that organisations have maintained proper process of data collection, informed consent, confidentiality and government polices while implementing big data analytics (Blessing, 2024).

9. The Future of Big Data in Business

Ajah & Nweke (2019) described that Big Data has great potential of creating enormous impact on business operation and performance. This technology facilitates business operation in various ways that improves business process, quality decision making, competitiveness and operations. The areas which are to be get influenced by the Big Data technology have been discussed below:

- **Decision making:** Côrte-Real, Oliveira & Ruivo (2017) stated that the business competitiveness of an organisation in recent days is defined with its capacity of decision making. The capability of decision making is enhanced when an organisation has the resources of making data driven decision. In this context, big data plays vital role in providing data based insight to decision makers or leaders of an organisation that can make effective and impactful business decision (Malek et al., 2017). In addition, the real-time decision making capability is also enhanced with this technology where an organisation can receive insight on real-time basis based on the data analysis from big data tools. In turn, the improved decision making assists in capturing value from customers and market promptly where this evidence based decision create great impact on business operation and efficiency.
- **Business automation:** Organisations, nowadays, are competitive over establishing technological infrastructure to transform traditional business into automation. Murri et al. (2024) reported that business automation has generated a key opportunity for an organisation in enhancing business operation and creating an intelligent business process. The business automation can be ensured with the integration of various business function with Artificial Intelligence. With the integration of AI in business process, an organisation can creates a unit of automated business process that can apply intelligence to make instant decision and to offer improved performance (McKinsey & Company 2018).
- **Edge computing:** This has been considered an evolving technology and facility for businesses in near future. With this opportunity, an organisation can collect and analyse data at hand where it allows business leaders in reducing latency. Zomaya & Sakr (2017) reported that the facility of collecting and analysing data closer to data source is defined as edge computing where this reduces requirement of maintaining central database. In this facility, organisations won't require to send data to machine or tools for analysis and result, rather machines can collect required data for purpose by its own capability.
- **Data democratisation:** According to Wamba et al., (2015), data democratisation can be defined as data empowerment where every business function will have access to data and data analytics. This process of data democratisation will create facility of businesses in making instant and effective decision where a business function will enjoy empowerment of using and analysing data for its functional activities independently (Sakr & Zomaya, 2019). This facility needs to the availed for all business functions in a controlled manner to make self-service data analytics for independent functional insight.
- **Internet of Things:** In near future, an organisation will emphasise on integrating big data with IoT devices for better performance where the devices can support in enhancing customer service and business performance.
- **Sustainable analytics:** There is found a benefit of sustainability in business operations where the sustainability feature can be integrated with data analytics. In this context, an organisation has to ensure environmental, social and governance metrics while implementing and using big data analytics for its functional operation (Santoro et al., 2019). The big data will support in measuring business performance and impact in the context of sustainability or ESG.
- **Block chain technology:** Businesses can utilise Blockchain technology in big data for improved benefits and performance where it may generate high value for an organisation. In this context, functions like supply chain management, data sharing, inventory management will be benefitted with the integration of Blockchain technology with big data (Acheampong, 2018).

10. Recommendations

The author has devised some recommendations for businesses after the analysis of big data in future business where those are reported below:

At the outset of making big data decision for integration with business functions and operations, the management of an organisation should develop a clear vision. The development of clear business for Big Data technology in business operation will guide in developing business strategy and strategic planning. The vision will encompass current business vision, market status, financial health, strategic pathways, management, human resource, etc.

The management of an organisation should conduct an internal resource for assessing requirement of investment amount along with the infrastructure of technology. With this assessment, the organisation can make decision on big data integration. In addition, it can finds out ways of developing technological infrastructure and skilled human resource for performing the big data technology.

While initiating big data technology implantation, an organisation has to consider data governance and security. The management of large data volume should be regulated by structured policies and regulations where these will guide in maintaining data quality, confidentiality, security and governance of data management.

Data democratisation should be ensured for all business functions where this ensures data empowerment. With this facility, functions of an organisation can develop their own functional data management and big data analytics to make insight and data driven decision for increasing performance.

Following the implement of Big Data in a workplace, the management should develop a culture of data driven business operation and application of this till. In this context, it needs to arrange required training for employees to increase their capacity and usability of the technology. With the development data driven culture, the organisation can increase encouragement of evidence-based decision making practice and attaining competitiveness with Big Data technology.

A continuous learning and monitoring process is highly required for an organisation to enhance the capability of using the technology. Moreover, the continuous monitoring process will dictate ROI of the investment along with the performance of Big Data technology. In another context, this approach will facilitate the business adaptability following the market trends, technology trends and changes in customer preferences.

11. Conclusion

In the present business environment and market competitiveness, Big Data has been found growing its significance and contribution for an organisation. From a technological trend, it has become a crucial element or technology for business operation. Thus, the management of an organisation has to exert capacity of leveraging Big Data functionality and technology in various business functions and operations to accelerate organisational performance. Big Data technology can be an effective tool or technology that can guide organisation in achieving desired market competitiveness and capturing value over competitors. In such a condition, the management of an organisation has to develop a synergy between big data and business functions to enhance functional performance. In this context, a strong relationship between big data analytics and decision making can foster capability of market performance where this creates opportunity of data driven decision making. In addition, the transformation of business in terms of Big Data technology will create great impact on business operations and performance where the management of an organisation can make smart, evidence based decision to adapt with changing market and customers' preferences.

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