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Big Data Backed Business Intelligence to Upthrust Commercial Banks Decision-Making Processes

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ABSTRACT

Using business intelligence-backed big data leverages the decision-making processes in Jordanian commercial banks. The current study aimed to look into the consequence of using big data to upthrust the link between business intelligence and decision-making processes within Jordanian commercial banks. The study sample comprises 1600 employees from all levels in the 12 Commercial Banks in Jordan. Based on a random sampling of 371 questionnaires that were spread, (94.8%) of the total questionnaires were found fit for the analysis. This study utilized AMOS as a tool to examine the collected data. This study's results revealed that big data, business intelligence and decision-making processes are interrelated and significantly affect each other in Jordanian commercial banks. The current study results recommend banks in Jordan to devote more investment in big data infrastructure and also take measures to boost the abilities of personnel in analyzing and utilizing innovative data technology. Also, this study recommends researchers investigate other related factors that affect the relationship between the current study's concepts.

Keywords: Business Intelligence, Decision-Making Processes, Big Data, Data Quality and Integrity, Real-time Analysis, Flexibility and Scalability
JEL Classifications: G21, C53, O33

1. INTRODUCTION

In the big data era where a massive amount of data is available for financial institutions to handle, effective decision-making is what steers the wheel towards success. Business intelligence is a central piece in leveraging decision-making processes. Using business intelligence tools and techniques, bank managers can analyze and interpret vast data from innumerable sources such as client transactions, market-related trends, and risk-factors assessments. Hence, allows them to make informed decisions such as product offerings, pricing strategies, risk management, and customer retention. Furthermore, business intelligence enables bank managers to spot patterns and associations in customer behaviour, therefore allow them to personalize their services and offerings based on individual customer preferences. Ultimately, the use of business intelligence in banking helps drive profitability, mitigate risks, improve operational efficiency, and enhance overall customer satisfaction.

Big data analysis tool, within the banking industry, is at the center of decision-making processes.(Aliu, 2019; Soltani Delgosha et al., 2021). It enables banks to get the best out of vast amounts of information in real-time and leads to accurate predictions and assessments (Soltani Delgosha et al., 2021). Various alarming challenges are facing financial institutions such as process automation, heightened customer expectations, fierce competition, mergers and acquisitions, new developments, and market segmentation. Financial institutions hoard vast amounts of data daily, recording information for each customer individually, encompassing personal details, property and financial decisions, as well as their accounts, transactions per account, debit, and credit liabilities. Therefore, effective management that is built on

effective decision-making is at the heart of the survival of financial institutions. Consequently, poses a need for a cost-effective, data-driven, and reliable information decision-making process. This is the means for the banks to adopt robust analysis tools to enhance their performance, primarily aligned with the attainment of their objectives (Alshehadeh et al., 2023).

The integration of BI into the systems of organizations has evolved into a crucial scientific and organizational innovation for contemporary firms, endorsing information dissemination and forming the foundation of business decision-making processes (Borissova et al., 2020). Therefore, business intelligence empowers a company to comprehend its characteristics, and operational efficiency, and aids in designing a framework suitable for its organizational environment. It ensures that the implementation facilitates accurate decision-making, thereby enhancing overall firm performance (Olszak, 2022).

The Jordan Banking System is on a steady upward trend as it evolves to adapt to the challenges and changes of the global market, in the framework of implementing the best banking practices. It has always fulfilled its mission in economic productivity, monetary and financial stability, and supported development projects, and has begun to take innovative initiatives driven by new technologies, such as big data (Al-Khatib, 2022; Al-Okaily et al., 2023). In dealing with vast and complex datasets, adopting a business intelligence framework proves advantageous for any modern business entity (Borissova et al., 2020). This approach aligns employees' intellectual resources with the efficiency of computer-supported support systems, enhancing the quality of decision-making (Gołębiowska et al., 2021). Banks can use business intelligence, considering factors such as data quality, analytical capabilities, and usage levels, to enhance the transparency and intelligent visibility of their data and core operations (Nithya and Kiruthika, 2020), improving decision-making processes Awan et al.,(2021), integrates data across the value chain allowing for even more informed decision making (Singu, 2021). It equips managers with tools to report and analyze business information enabling them to comprehensively understand both internal and external organizational environments (Kašparová, 2023). As a result, managers have access, to data that significantly influences their decision-making and guides their endeavors (Maaitah, 2023).

In recent years, big data and business intelligence have revolutionized numerous industries, yet the banking sector still faces significant research gaps in effectively utilizing these technologies to support decision-making (Nithya and Kiruthika, 2020; Ranjan and Foropon, 2021). Despite the strides of interpreting and analyzing the dimensions of business intelligence, many banks still lag in the proper utilization of this valuable tools in the decision-making process. However, there is still an incomplete understanding of how business intelligence can be best used to enhance the effectiveness of banking operations, which is especially important in light of the intense competition within the sector. Therefore, this study aims to pave the way to a holistic approach of using intelligent systems to boost decision-making in the Jordanian banking sector by investigating the mediating role of big data in decision-making processes based on business intelligence in Jordanian commercial banks.

2. THEORETICAL FRAMEWORK

2.1. Fact-Based Decision-Making Culture

Factual-driven decision-making is critical in banking, especially in business intelligence. Within the banks' context, this philosophy is ingrained in smart tools in order to analyze vast financial data (Bany Mohammad et al., 2022). Therefore, decision-making based on factual data in banking uses Big Data, enabling banks to organize massive data from different sources, such as financial transactions, customer records and sometimes even economic predictions (Li et al., 2022). Working on this data assists in understanding trends and forecasts, which have a beneficial effect while making decisions, for they are based on true facts and figures. The relationship of FBDM culture to business intelligence lies in the use of advanced analytics and smart technologies to make the most of data. Business intelligence helps transform this data into valuable information and strategic insights (Gad-Elrab, 2021). Bharadiya, (2023) indicated that business intelligence systems can predict market trends, identify potential opportunities and risks, and provide guidance for improving the decision-making process. According to (Othman, 2021), the culture of decision-making based on facts and business intelligence contributes to enhancing banks' efficiency and improving their risk management.

2.2. Business Intelligence and Decision-making Process

The term "Business intelligence" highlights the use of technologies and strategic techniques to support management decisions (Shao et al., 2022). Business Intelligence and analytics has established literature in supporting the business in general and specifically strategic intelligence (Awamleh and Bustami, 2022), entrepreneurship (Awamleh et al., 2024), and business model innovation (Božič and Dimovski, 2019). Through business intelligence (BI), insightful perspectives must be gained, and without the analysis of intelligence, decisions regarding any part of the information cannot be made (Niño et al., 2020). The goal is to uncover the underlying processes or patterns that lead to a specific perspective or desired outcomes (Nithya and Kiruthika, 2020). Business Intelligence (BI) encompasses the gathering, integrating, analysing, and presenting business-related information, technology, applications, and practices. Its primary purpose is to facilitate informed and effective decision-making within a business context (Bharadiya, 2023). BI strives to enhance organizational efficiency in internal matters and promote transparency in crucial process trends (Ramakrishnan et al., 2020).

Niu et al., (2021) indicates that the core aim of BI is to transform data into knowledge, thereby contributing to the improvement of decision-making processes. Business Intelligence (BI) presents a solution that can collect and process data efficiently. Currently, BI stands out as a rapidly advancing domain within information technology (Skyrius, 2021). It encompasses a range of capabilities, technologies, tools, and methodologies aimed at assisting managers in comprehending business conditions (Olaniyi et al., 2023). BI comprises tools and processes to transform data into actionable knowledge, facilitating informed decision-making. Furthermore,

professionals and analysts can enhance their workflows by leveraging straightforward functionalities, leading to improved outcomes (Skyrius, 2021). For information to genuinely benefit the business, it is imperative to deliver precise data promptly, exactly when required. Furthermore, this information must prove vital for decision-making, strategic planning, and ultimately, the triumph of the business. The primary advantage of employing BI systems lies in the significant enhancement of decision-making effectiveness (Skyrius, 2021). Chatzistefanou, (2023) indicates that key tools within the BI-integrated framework encompass data storage, extraction, transmission, loading (ETL), online analytical processing, data mining (DM), and reporting.

The precise and trustworthy data leads to long-term success (Duggineni, 2023). BI tools are useful for organizing and transforming data into valuable insights, contributing to more reliable decision-making (Khong et al., 2023). The concentration on data quality and precision enhances the credibility of organizational decisions making (Singu, 2021). In addition to providing integrated, high-quality data, business intelligence contributes to real-time data analysis.

The BI's reporting and analyzing capabilities reduce the waiting time for decision-makers. This shift enables organizations to make structured decisions promptly, enhancing their ability to respond quickly to changes and align with industry trends (Ranjan and Foropon, 2021). Also, (El Ghalbzouri and El Bouhdidi, 2022) highlight the capability of BI tools to handle large-scale data requirements efficiently (Nambiar and Mundra, 2022). Furthermore, BI tools allow organizations to scale up their infrastructure without compromising efficiency, ensuring they can meet the growing data-demand. Ultimately, Borissova et al., (2020) indicated that business intelligence systems essentially serve as decision support systems based on the analyzed data. Therefore, the researcher believes that:

H_1: Business intelligence significantly impacts Decision-Making Processes in Jordanian commercial banks.

2.3. Business Intelligence and Big Data

Business Intelligence (BI) systems enable the consolidation of data from diverse environments, locations, operating systems, and databases rapidly (Kašparová, 2023). Frequently, this voluminous data is either unstructured or stored in databases with distinct schemas, necessitating specialized handling before integration (Negro and Mesia, 2020). Gad-Elrab, (2021) pointed out that Big data has changed the way enterprises handle and profit from enormous amounts of data through BI. Companies get useful information from big datasets analytics which are easily interactive with BI tools for the decision-making process. Through structure, analyses, and graphs of large sizes of data, BI tools have the power to allow companies to follow patterns trends, and relationships that may not have been followed otherwise (Al-Okaily et al., 2023). The blend of business intelligence and big data empowers organizations to improve strategic planning, optimize operations, and get a competitive advantage in the data-driven world of today. They can therefore view how business intelligence affects big data in defining a new era where ideas of innovation and success are accessible in all sectors. Hence, the researcher believes that:

H_2: Business intelligence Significantly Impacts Big Data in Jordanian commercial banks.

2.4. Big Data and Decision-Making Process

Weerasinghe et al. (2022) indicated that the employment of big data has allowed organizations to rethink how they make decisions and refine decision-making processes. Upper-ton Big Data refers to the huge amount of the same, new, and different types of data that swamps a business. One of the great things about big data is that it provides a lot of information, which results in great decision-making (Pattnaik and Shah, 2023). Big data plays an important role in making the right decisions based on data rather than a hunch using different shared analytical tools, managers effectively sort/filter the data and then process it, thus drawing out valuable insights in a much shorter time (Jabbar et al., 2020). This results in organizations having autonomy and can make the most informed decisions because the data is current, and the decision is made instantly (Kauffmann et al., 2020). By using big data the banks can efficiently predict future outcomes and can make sound decisions on current occurring issues. Predictive analysis techniques help organizations identify potential future challenges and upcoming opportunities. It helps them to manipulate their data and plan accordingly (Balbin et al., 2020). Seyedan and Mafakheri, (2020) believe that through predictive analysis using big data, more reliable forecasting can be done, leading to better decisions in different areas. In the opinion of Kahila, (2023), large-scale data is going to be inevitable, thus companies need to find a strategy through it now or later. Therefore, the researcher believes that:

H_3: Big Data has a Significant Impact on Decision-Making Processes in Jordanian commercial banks.

2.5. Business Intelligence, Big Data, and Decision-Making Process

Business intelligence with the help of big data, enables banks to get valuable insights and to make decisions such as how to perform, modify strategies, and cut off any extra costs that can be a barrier to achieving goals, without violating any compliance standard (Al-Okaily et al., 2023). Business intelligence is a strategic focus, in today's world, to have an edge for informed decision-making. Through business intelligence, the whole data can be analyzed and then key decisions can be made efficiently (Duggineni, 2023). One of the most important features of business intelligence tools is to gather data from various sources throughout the organization. The data, after being structured into a repository, can be retrieved faster by the relevant department (Skyrius, 2021). However, (Olszak, 2022) found a direct link between Big Data and Business Intelligence and organizational success. This is by stressing the importance of decision making optimization. Big data is an important tool to understand the business context and monitor changes. With the assistance of big data, firms can have a system that will provide in-depth insights into this data, making decision-making easier. Big data is a comprehensive tool to gather data, from multiple sources such as social media platforms, and different technologies, to derive insights from this data (Shahid and Sheikh, 2021). Diversity in data sources ultimately helps understand deep relations and all possible perspectives relevant to a business (Li et al., 2022). Therefore, the researcher believes that:

H_4: Big Data mediates the relationship between Business

intelligence and Decision-Making Processes in Jordanian commercial banks.

Consequently. The theoretical model outlined in (Figure 1) shows interrelationships among the study's aspects.

3. RESEARCH METHODOLOGY

The methodology section prescribes the methodology to achieve the study's objectives. Besides, details of the selected sample and its characteristics. Furthermore, it explicates the preparation and development of the data collection instrument. Then, the required statistical methods utilized to process the collected data.

The researchers followed a descriptive-analytical approach to answer this study's question; identify the big data meditating effect in the interaction of business intelligence capabilities and decision-making processes. This method is based on an exhaustive explanation of the subject problem. In other words, detecting the research model variables and unfolding the interrelated links within them (Sekaran and Bougie, 2016).

3.1. Population and Study Sample

This study addresses the Commercial Banks in Jordan as the study population. Specifically, it consists of 12 Banks that hold administrative positions. In total, it targets (1600) employees. The sampling method is a random sample of 371 questionnaires which is suitable for the study (Sekaran and Bougie, 2016). Out of all the distributed questionnaires, 359 were retrieved and (7) questionnaires were excluded. Hence, (352) questionnaires (94.8%) of the questionnaires were found fit for the analysis.

3.2. Study Tool

The researchers designed the study instrument based on a thorough investigation of related previous studies. The questionnaire highlighted (39) items organized as the following sections: Firstly, (21) questions related to the independent variable which is Business intelligence (Data Quality and Integration (7) items, Real-time Analysis (7) items, Flexibility, and Scalability (7) items). Secondly, (11) questions related to the dependent variable which is Decision-Making Processes. Thirdly, (7) questions about the intermediary variable which is Big Data. The questions formulated as a five-point Likert scale. Namely, 1 as strongly agree to 5 strongly disagree. This is to give respondents greater flexibility in selecting the right response (Sekaran and Bougie, 2016).

3.3. Reliability Test

To test the reliability of the study's instrument, the Cronbach Alpha coefficient values were calculated for all items. The overall reliability test result is 86.4% shown in Table 1. The Cronbach Alpha score ranged from 87.5% to 91.2% which is higher than the acceptable percentage of 70%. This agrees with the acceptable scores within the field (Sekaran and Bougie, 2016).

4. RESULTS

According to Table 2, the descriptive statistics show that 62.8% of the total sample were males, leaving 37.2% for females. In terms of education, 65.1% of the total sample held a bachelor's degree. The highest percentage for years of experience was 6-10 years constituting 32.7% of the total sample. Finally, 27% of the sample were Managers and unit heads whereas the remaining were employees.

In order to check that the data is normally distributed, the result of the normal distribution test is shown in Table 3. As the response number is large, one sample Kolmogorov-Smirnov (K-S) was used. The result indicates that K-S value is < 5 at a Sig value > 0.05, and the skewness values < 1, collectively indicating a normal distribution (Hair, et al., 2011).

The multicollinearity test and the VIF and tolerance scores were recorded in Table 4. The results show the VIF values < 3, while the tolerance values > 0.10. This confirms the absence of multicollinearity amid the independent variables.

Table 1: The study instruments stability coefficients

Variable	Alpha value	Number of statements
Independent variable		
Business intelligence	0.887	21
Independent variable	0.875	7
Real-time analysis	0.902	7
Flexibility and scalability	0.887	7
Mediation variable		
Big data	0.912	7
Dependent variable		
Decision-Making Processes	0.877	11
All	0.85	39

Table 2: Descriptive statistics

Variable	Frequency	Percentage
Gender		
Female	131	37.2
Male	221	62.8
Academic qualification		
Diploma	61	17.3
Bachelor's degree	229	65.1
Postgraduate studies	62	17.6
Years of experience		
5 years or less	96	27.3
6-10 years	115	32.7
11-15 years	104	29.5
16 years and above	37	10.5
Job vacancy		
Employee	257	73
Unit manager	36	10.2
Department head	59	16.8
Total	352	100

Table 3: The normal distribution test of data

Variable	Mean	SD	Skewness	k-s	Sig
Business intelligence	3.73	0.64	–0.43	0.84	0.51
Data quality and integration	3.83	0.42	–0.43	1.03	0.374
Real-time analysis	3.45	0.62	–0.33	1.12	0.087
Flexibility and scalability	3.92	0.53	–0.42	1.25	0.261
Big data	3.64	0.60	–0.09	1.09	0.174
Decision-making processes	3.84	0.57	–0.35	1.245	0.085

As shown in Table 5, the details of the inter-correlation which is represented by the Pearson Correlation test to validate the relationship between the current study variables. The value of the correlations between the variables ranged from (0.417 to 0.783). Hence, indicates the occurrence of a positively significant relationship amongst the study variables at P = 0.000.

The researchers used multiple regression to examine the study's hypotheses. H1 test the link between business intelligence and the decision-making process. Table 6 shows the testing results of H_1.

The results in Table 6 indicate a statistically significant effect at the significance level of 0.00. Furthermore, the coefficient of determination is ($R^2 = 0.766$) hence, business intelligence explained (76.6%) of the variance in Decision-Making Processes. According to the results, all variables contributed to the impact of business intelligence on decision-making processes. Therefore, this leads to alternative hypothesis acceptance "Business intelligence has a significant impact on Decision-Making Processes in Jordanian commercial banks."

Table 7 specifies the results of the multiple linear regression test for H_2. The coefficient ($R^2 = 0.562$), indicates that the (business intelligence) explained (56.2%) of the variance in (big data), at a significance level of 0.00. Consequently, business intelligence significantly impacts Big Data with moderate variance explanation. Therefore, this indicates the acceptance of the alternative hypothesis "Business intelligence has a significant impact on Big Data in Jordanian commercial banks." is accepted.

Table 8 displays the result of the coefficient ($R^2 = 0.579$), indicates that the Big Data explained (57.9%) of the variance in Decision-Making Processes at (Sig = 0.000), the value of (F) reached (176.111), which confirms the significance of the model at ($\alpha \leq 0.05$). the coefficient value (B = 0.498) equivalent to Decision-Making Processes at (Sig = 0.000). Collectively, the alternative hypothesis is accepted "There is a positive relationship between Big Data and the Decision-Making Processes in Jordanian commercial banks".

The fit model data analysis appears in Table 9, showing that (χ^2/df =4.01) is significant at (Sig = 0.000), (GFI = 0.976) is above the recommended minimum. The (CFI = 0.982) exceeds the recommended minimum limit (RAMSEA = 0.082) and meets the recommended limit. Accordingly, all the mentioned results indicate that the proposed model fits the collected data.

Table 10 illustrates the values of the direct and indirect impact of the relationship of the intermediate variable (Big Data) in the bridge between business intelligence and decision-making Processes. The direct effect of business intelligence BI-decision-making Processes is (0.539), which indicates that business

Table 4: Tolerance and VIF

Variables	Tolerance	VIF
Data quality and integration	0.579	1.725
Real-time analysis	0.453	2.208
Flexibility and scalability	0.463	2.19

Table 5: Pearson correlation

Variable	Business intelligence	Data quality and integration	Real-time analysis	Flexibility and scalability	Decision-making processes	Big data
Business intelligence	1					
Data quality and integration	0.523**	1				
Real-time analysis	0.427**	0.783**	1			
Flexibility and scalability	0.418**	0.783**	0.765**	1		
Decision-making processes	0.748**	0.663**	0.658**	0.752**	1	
Big data	0.559**	0.506**	0.453**	0.594**	0.579**	1

**Correlation is significant at the 0.01 level (2-tailed).

Figure 1: Theoretical model

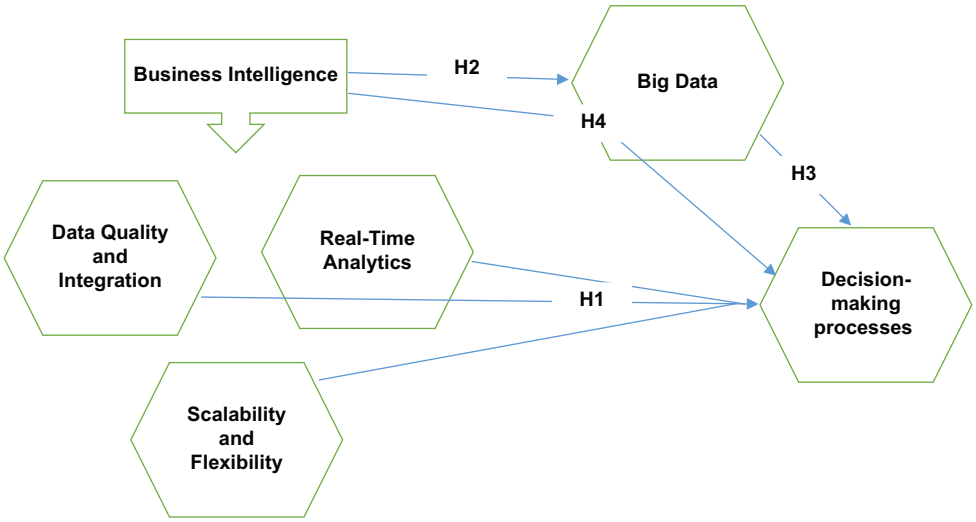

Figure 2: Test results of the model

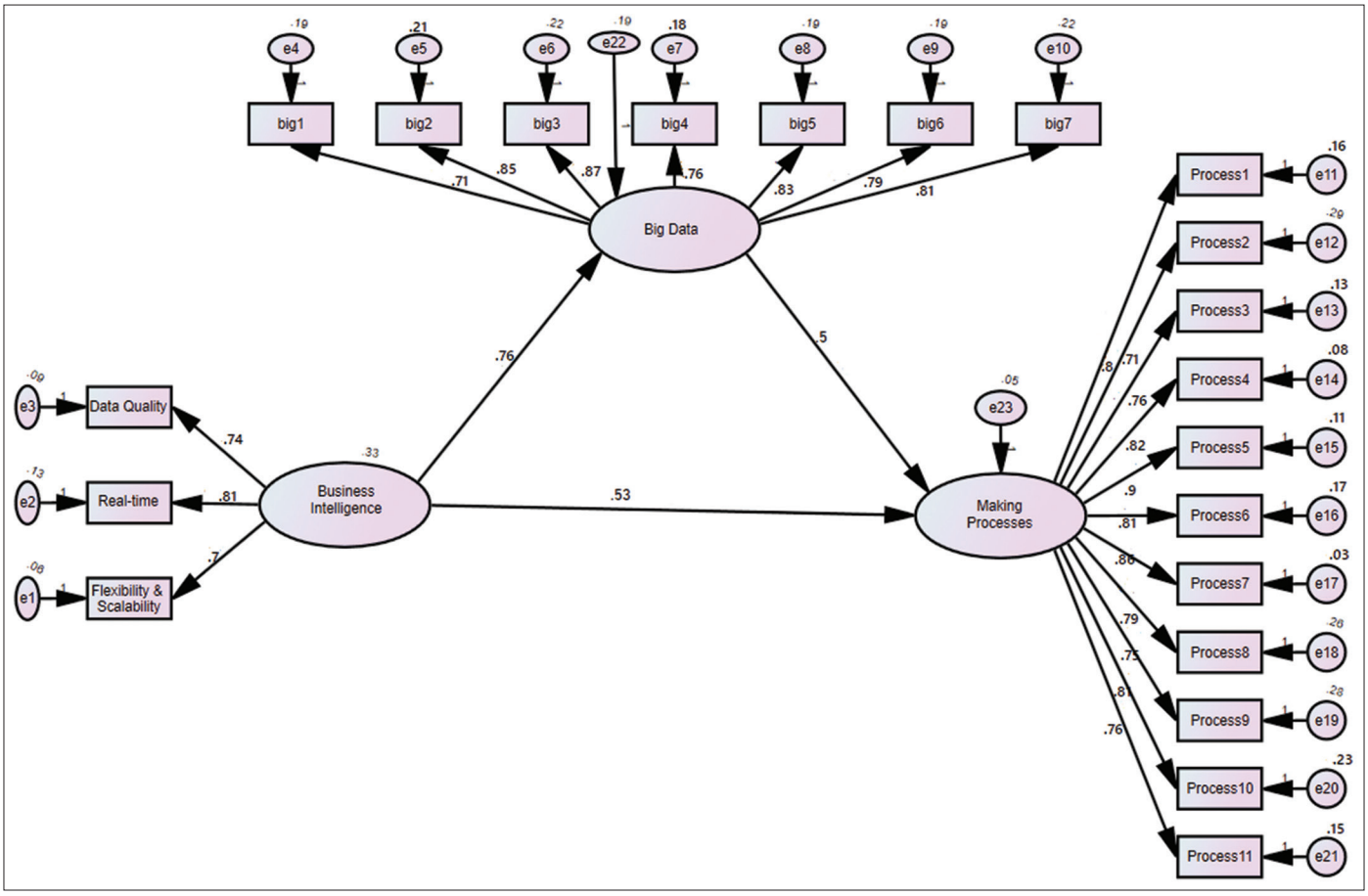

Table 6: The multiple regression test of H_1

Variable	B	Standard error	T	Sig T*
Constant	1.01	0.133	7.597	0.00
Data quality and integration	0.313	0.057	5.491	0.049
Real-time analysis	0.217	0.049	4.428	0.017
Flexibility and scalability	0.492	0.054	9.11	0.00

R=0.766, R^2=0.587, R^2 Adj.=0.583, F=164.68, Sig.=0.00

Table 7: The multiple regression test of the H_2

Variable	B	Standard error	T	Sig T*
Constant	0.943	0.283	3.33	0.001
Data quality and integration	0.229	0.069	3.318	0.001
Real-time analysis	0.249	0.075	3.324	0.001
Flexibility and scalability	0.21	0.07	3.001	0.003

R=0.562, R^2=0.316, R^2 Adj.=0.306, F=32.514, Sig.=0.00

Table 8: Testing the impact of big data on decision-making processes

Variable	B	Standard error	T	Sig T*
Constant	1.78	0.157	11.353	0.00
Big data	0.498	0.037	13.271	0.00

R=0.579, R^2=0.335, R^2 Adj.=0.333, F=176.111, Sig.=0.00

intelligence affects Decision-Making Processes. As for the direct impact of big data on the DMP is (0.5). This indicates that big data moderately impacts the decision-making processes and thus increased attention to big data will generate an impact on the decision-making processes.

Business intelligence' direct impact on big data equals (0.76) at ($P < 0.05$), hence there is an indirect effect of the mediating variable statistically accounting for (0.38). As for the business intelligence's total impact on the decision-making processes equals (0.91) with big data presence. The effect of the mediating variable was statistically significant, the mediation is partial due to the presence of business intelligence in both direct (Business intelligence – Decision-Making Processes) and indirect (Business intelligence – Big Data – Decision-Making Processes) effects. However, business intelligence and big data substantially and significantly enhance the decision-making process in commercial banks.

Based on (Figure 2), this study concluded that integrating business intelligence and big data improves the decision-making processes. This conclusion relates to another study's findings that using big data analytics alongside business intelligence tools aids leaders in making fast, data-driven, precise decisions for the most optimized outcomes (Olaniyi et al., 2023). However, the dimensions of the variables were different in both studies. Specifically, the utilization of internal benchmarks, banks can identify what is working well and what needs improvement. This, in turn, ensures that the bank can improve its efficiency and productivity across different channels.

This study confirms that linking business intelligence with big data is useful for commercial banks. Similarly, Shouman and

Table 9: Fit model

Indicator	AGFI	χ^2/df	GFI	RMSEA	CFI	NFI
Value recommended	>0.8	<5	>0.90	≤0.10	>0.9	>0.9
References	(Miles and Shevlin, 1998).	(Tabachnick and Fidell, 2007)	(Miles and Shevlin, 1998).	(MacCallum et al., 1996)	(Hu and Bentler, 1999).	(Hu and Bentler, 1999).
Value of model	0.9	4.01	0.976	0.082	0.982	0.979

Table 10: Direct and indirect effects H_4

Variable	Direct impact	Indirect impact	Total Impact	C.R	S.E	Sig.
Business intelligence – decision making processes	0.539	0.38	0.919	9.98	0.054	***
Business intelligence - big data	0.761		0.761	14.11	0.054	***
Big data – decision making processes	0.5		0.5	12.19	0.041	0.007

Chehade, (2020); Pillay and Van Der Merwe, (2021) mention that business intelligence enables the analysis of vast amounts of big data collected from multiple sources within a banking organization. This comprehensive analysis allows a deeper understanding of customer behaviour, market trends, and potential financial risks. Banks can utilize their business intelligence technologies to recognize where the investment opportunities lie. Therefore, it can provide better financial services (Yu and Song, 2020). On the other hand, integrated technologies offer a vital pathway through which the leaders and strategic managers make important operation decisions by analyzing essential insights that eventually lead to success in the volatile financial environment (Awamleh and Bustami, 2022; Al-Okaily et al., 2023). This supports the current study findings which indicate big data's significant role in elevating the bridge between business intelligence and the decision-making process.

5. CONCLUSIONS

The current study empirically proved that incorporating business intelligence with big data quips Jordanian commercial banks with the necessary tools to enhance the quality of data. This is via systematically collecting and analyzing vast amounts of information. In more depth, this rigid process leads to usable data and therefore more reliable information. Consequently, this contributes to increased accuracy in analysis and reduces the likelihood of errors. Moreover, business intelligence and big data facilitate comprehensive data integration within Jordanian commercial Banks which aids in forming a comprehensive understanding of the business investment. This holistic approach enables commercial banks to form cohesive knowledge of customer behaviors and market dynamics. Therefore, enabling more informed and efficient decision-making regarding resource utilization.

This study also found that real-time big data analysis contributes to enhancing decision-making processes in Jordanian commercial banks. The primary benefit is embedded in the availability of real-time data analysis, which leads to instant and immediate access to information. This function enables the banking sector to keep pace with ongoing developments, hence easing the process of making rapid decisions based on the latest data. Therefore, Jordanian commercial banks can cope with rapid fluctuations in financial markets and improve their responsiveness to customer needs.

Another conclusion of the current study is to highlight the big data transformative impact on the decision-making process. The vast volume, diversity, and speed of data generated in Jordanian commercial banks provide them with unprecedented insights and a better understanding of their business. Based on this study practical implications, big data analysis and business intelligence integration, benefit make a powerful tool that is able to re-engineering of data processing in organizations which in turn enhance the data generated by its daily activities and practices. Finally, the study has demonstrated the impact of business intelligence and big data analysis on decision-making processes, highlighting the importance of understanding the utilization and management of big data.

5.1. Practical Implications

The current study's highlight several practical implications for Jordanian commercial banks. Firstly, big data enables commercial banks to leverage business intelligence in improving the decision-making process efficiency. This involves utilizing business intelligence for informed decision-making regarding operations, personnel, processes, and customer relationships. Secondly, the study urges commercial banks to apply appropriate measures that ensure the robustness and quality of real-time big data analysis, by utilizing business intelligence. Thirdly, it encourages commercial banks to utilize advanced analytics tools such as predictive analysis and machine learning to maximize understanding of big data. Fourthly, the study underscores the need for commercial banks to employ a solid grasp of the relationship between business intelligence, big data, and the decision-making process. Finally, the study endorses commercial banks in Jordan to invest heavily in infrastructure development and human resource training to earn the full potential of this data-driven approach.

5.2. Limitations and Future Research

This study influences the current literature to take different approaches to explore further the connection between business intelligence and decision-making processes, the study recommends that researchers take other related factors into account. However, this current study was limited to the following:

- Jordanian commercial banks.
- The employees who hold administrative positions in the Jordanian commercial banks.
- Fiscal year 2024.

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