The role of big data in improving the balanced scorecard in Jordanian commercial banks: A field study

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A B S T R A C T

The study aimed to explore The Role of Big Data in Improving the Balanced Scorecard in Jordanian Commercial Banks. The descriptive approach was employed, and the quantitative method was adopted to achieve the study's objectives and test its hypotheses. A questionnaire tool was developed, consisting of four sections for big data and four sections for the balanced scorecard, comprising a total of 48 items. The validity and reliability of the tool were verified. The questionnaire was allocated to a sample of 400 employees of the study community which is the Jordanian commercial banks. The study's findings revealed that big data has a statistically significant impact on enhancing the balanced scorecard in Jordanian commercial banks. Dimensions of big data, such as "variety" and "veracity," had a positive and direct effect on improving all aspects of the balanced scorecard, including financial performance, customer service, learning, and growth. On the other hand, the impact of "volume" and "velocity" was limited or statistically insignificant in some aspects. According to multiple regression analyses, big data contributes to explaining 82% of the improvements observed in the balanced scorecard, highlighting the importance of investing in big data to enhance operational and financial performance.

1. Introduction

Dynamic transformations in many facets of life have been facilitated by the last century's tremendous advancements in globalization and information technology (Alzghoul & Al-kasasbeh, 2024; Hasan & Rahman, 2024). The direct interaction between individuals has significantly impacted their lifestyle, opening new horizons for global communication. Many countries have recognized the importance of positive engagement with this openness, which has led them to adopt information technology and knowledge more extensively (Ahmadi, 2024). In light of these changes, the focus on knowledge societies has become a necessity, as information societies rely on knowledge and consider it a fundamental factor in achieving economic growth and increasing productivity (Alzghoul et al., 2023; Eni et al., 2023). Relying on knowledge and technology has become a fundamental pillar for the economies of modern nations (Al-Dmour et al., 2023). This trend has made it essential for institutions to develop the capability to manage modern technologies to enhance their performance and ensure their sustainability amid rapid changes, as well as to improve banking strategies (Andronie et al., 2023). Big data is one of the modern concepts that emerged with the tremendous technological advancements, describing the massive flow of data (Al-Okaily et al., 2023). Data now flows from numerous sources, including the internet and various digital devices, which has led to new challenges in processing and analyzing it (Abousweilem et al., 2023; Reddy & Reddy, 2023). Today, big data is used in many fields to provide insights and analyses that support effective decision-making and enhance efficiency in business management (Olabanji et al., 2024). To keep pace with these technological advancements, it has become necessary to introduce significant changes in the field of management that align with the new global landscape (Alassuli, 2024; Karaki et al., 2023; Oladele & Stilinski, 2024). One of the most prominent aspects of these developments is the growing trend toward the concept of comprehensive management and the emergence of various management styles and forms that respond to the

demands of this progress (Yang, 2024). Among the modern forms of management are strategic management and long-term strategic planning, which rely on precise strategic analysis, where strategies are developed to achieve long-term goals and ensure continuous progress (Egon, 2024). Strategic goals focus on the short, medium, and long term, and since measuring the performance of these goals cannot wait until the completion of the implementation phase, it is essential to conduct continuous review and evaluation during the implementation process, taking corrective actions whenever necessary (Oladele, 2024). Thus, financial metrics alone are no longer sufficient to measure performance in relation to strategic goals; other criteria must be considered that align with each stage of the implementation process (Hutagalung & Reniati, 2024). As a result, the Balanced Scorecard was developed, which measures organizational performance thoroughly and correctly in four dimensions: financial, internal processes, customers, and development and learning. (Shrestha & Prajapati, 2024**).**

The novelty of this research lies in understanding the role of big data in improving the Balanced Scorecard in Jordanian commercial banks - A field study.

2. Literature review

2.1 First: Big Data

Big data has garnered significant attention from researchers and specialists in the accounting field in recent years, with various definitions addressing this concept. Olabanji et al. (2024) defined it as "large-scale informational assets characterized by their volume, velocity, and variety, requiring innovative and effective processing to support operational development and decision-making." The International Organization for Standardization (2017) also noted that "big data is a set of data that exhibits characteristics such as large volume, velocity, variety, and veracity." Meanwhile, Ochuba et al. (2020) highlighted that big data stands out for its clear comparison between its vast size, high speed, and variety when compared to traditional types of data**.** Big data is of great importance as it provides organizations, especially banks, with a strong competitive advantage if analyzed and utilized correctly (Adewusi et al., 2024). It helps increase organizational efficiency by extracting accurate information from customer databases, thereby enhancing efficiency, increasing profits, and reducing risks and losses (Ogundipe, 2024). A study by Pamucar et al. (2024) showed that big data has evolved into a vital instrument utilized by a variety of companies, including banks and other institutions, for research, strategy development, and evaluation. Big data apps help these businesses operate more efficiently and enable wise decision-making for precise and successful outcomes. This is achieved by providing a thorough and accurate explanation of big data's features and how to use it to create best practices and guarantee the accuracy of organizational data (Alzghoul et al., 2024; Gopal et al., 2024).

Dimensions of Big Data

Laney introduced the notion of big data in 2001 and listed the following essential characteristics that describe large data:

Volume: It refers to the increase in the volume of data and its rapid growth with the emergence of new sources of it, which determines the value and potential of data that is classified as big data. Therefore, it needs processors and devices capable of dealing with that data (Arshad et al., 2024).

Velocity: The speed at which data is generated and retrieved to meet demand is important since speed plays a major role in decision-making based on data. The duration of time it takes for data to go from the point of production to a point of use, like analysis or storage, is referred to as "speed". The organization must be able to examine the data and benefit from it as soon as possible given the speed at which it travels (Ji et al., 2024).

Variety: Over 80% of data in use today is said to be unstructured or disorganized, necessitating processing methods distinct from those used for traditional data. Because of this diversity, efficient analysis solutions that can manage data retrieved from social networks or smart apps are needed (Kasowaki & Kooper, 2024).

Veracity: It speaks to the degree of data reliability since recipients give the caliber of the information they get a lot of weight. Since not all data is necessarily helpful to the organization or aids in decision-making, false or untrustworthy data needs to be removed. (Babu et al., 2024).

Value: Value is related to the contribution of data in making the right decisions at the right time for organizations. Big data helps the organization better understand the market's needs and demands, as well as prioritize production. This aids in improving the ability to make effective strategic decisions based on comprehensive and accurate data analysis, thereby enhancing the corporation's performance and achieving its goals (Tambuskar et al., 2024).

2.2 Second: The Balanced Scorecard

Oladele (2024) explained that an organization's vision and strategy can be transformed into a collection of correlated strategic objectives and metrics with the use of the balanced scorecard, a management tool. According to Shrestha & Prajapati (2024),

the balanced scorecard is a model that offers a number of strategies to help the business make strategic decisions based on impact analyses from a variety of angles, including the financial, customer, internal processes, growth, and learning dimensions. This allows the business to achieve sustainable returns. Furthermore, using both financial and non-financial indicators to measure performance in support of both short- and long-term objectives is possible with the Balanced Scorecard. By contrasting planned and executed performance indicators, the Balanced Scorecard is actually regarded as a strategic instrument that improves the actual performance efficiency of the business (Hutagalung & Reniati, 2024). Hristov et al. (2024) the organization's vision and strategy are translated into goals and measurements targeted at attaining the highest possible performance, and this is how the Balanced Scorecard is defined: it is a comprehensive and integrated method for monitoring financial and non-financial performance (Martín-Gómez et al., 2024). This system enhances the organization's interactions, draws in customers and investors, and satisfies shareholders. It also helps employees achieve goals that are in line with the organization's broader objectives (Saraiva et al., 2024).

Objectives of Balanced Scorecard Using

The balanced scorecard is one of the modern management tools widely used in evaluating the performance of institutions and organizations on various levels. This tool aims to achieve a comprehensive balance between financial and non-financial objectives, which helps provide an accurate and holistic view of the organization's performance. Among the most important objectives of using the Balanced Scorecard, as mentioned in the study by Dağıdır and Özkan (2024), are**:**

- Strengthening relationships with existing customers, maintaining their satisfaction, and striving to acquire new customers and enter new target markets.
- Developing innovative products that meet changing customer needs, while ensuring the satisfaction of new customers and gaining additional market share.
- Ensuring customer satisfaction and achieving high levels of loyalty and commitment from them.
- Providing high-quality products and services at competitive costs compared to rivals.
- Enhancing employees' skills and expertise, thereby improving their ability to enhance operational performance and deliver high-quality service, with quick responsiveness to meet customer expectations without delay.
- Improving the efficiency of internal processes by eliminating activities that do not add tangible value to the customer, thereby enhancing the value of the service provided.
- Developing information technology, databases, and their systems.

The Dimensions of the Balanced Scorecard

The Financial Dimension

Farahbakhsh et al. (2024) explained that the financial dimension of the balanced scorecard includes metrics related to the return on shareholders' investments, as well as profitability, sales growth, and risk measures (Abdelraheem & Hussien, 2022). These financial metrics are not limited to setting the card's objectives but also include building added value for the unit. Financial performance indicators are part of traditional metrics, which alone cannot determine performance levels without considering external factors such as market and environmental changes. Although they focus on current performance, they also emphasize the importance of future planning, making them a crucial component of the Balanced Scorecard, reflecting efforts to achieve overall goals and their integration with other activities within the organization (Areiqat et al., 2020). Siam and Hussein (2022) indicate that the financial performance indicators in the Balanced Scorecard aim to achieve two main objectives. Financial performance metrics, such as liquidity, are linked to achieving long-term goals, including the organization's ability to repay its debts and future obligations (Alassuli, 2023; Gazi et al., 2022). Financial performance metrics provide a comprehensive view of the organization's performance outcomes, serving as an indicator of how successful the organization is in implementing its strategies. This is not only in terms of profitability but also in terms of added value and generating stable cash flows (Turshan et al., 2020).

The Customer Dimension

Through the customer dimension, it is evident that the Balanced Scorecard requires managers to direct their efforts and messages towards serving customers via a set of metrics that reflect the factors important to customers (Shrestha & Prajapati, 2024). These factors focus on four main aspects: time, quality, cost, and service. To ensure balanced performance and execution within organizations, objectives related to these aspects must be clear (Rahayu et al., 2023), in addition to translating them into specific metrics. The customer dimension also includes metrics aimed at enhancing customer satisfaction and retention, as well as acquiring new customers and increasing market share in targeted sectors (Tawse & Tabesh, 2023). Hristov et al. (2024) indicate that the strategic objectives in the customer dimension primarily depend on analyzing customer profitability, as the profits achieved are linked to the organization's ability to satisfy customers (Kumar et al., 2023). Achieving an appropriate market share requires balancing customer satisfaction with targeted profits. An organization cannot ensure strategic success if it focuses solely on customer satisfaction without considering profitability (Agag et al., 2023). While customer satisfaction may depend on offering goods and services at low prices and high quality, this can lead to reduced

profits in the long run. Therefore, the organization must balance quality and profitability by aligning prices with costs to achieve its objectives within the framework of the Balanced Scorecard (Stavropoulou et al., 2023).

Internal Processes Dimension

Internal processes encompass all activities and actions carried out by the organization with the aim of achieving customer satisfaction and meeting strategic objectives (Areiqat et al., 2023). Internal processes are classified into three main principles (Gazi et al., 2023).

- **Innovation:** refers to the search for new ideas in response to changing customer needs, working to meet those needs through innovative approaches, with a focus on the long term and exploring new markets .
- **Operations:** this includes all operational processes related to order delivery to customers, with an emphasis on efficiency and speed of execution, contributing to added value and reducing costs to achieve the financial goals related to operations .
- **After-Sales Services**: these services cover everything related to the transportation and settlement of purchased goods, as well as following up on sales and providing quick and convenient responses to customer requests. These services enhance the organization's reputation in the markets, attract new customers, and ensure the loyalty of existing customers .
- The internal processes metrics focus on the organization's value chain, with objectives to improve efficiency and financial productivity, enhance overall quality in inventory management, and reduce operational costs. These metrics rely on modern managerial accounting principles that support the evaluation of the organization's internal performance. They include various standards such as production volume, delivery time, and costs associated with operations (Rosita et al., 2023).

Learning and Growth Dimension

The learning and growth dimension focuses on applied learning and continuous growth, aiming to identify and diagnose the infrastructure needed by the organization to achieve sustainable development and improve long-term performance. This learning and growth are achieved through the organization's three main resources (Areiqat et al., 2020):

1. Employee capabilities.
2. Information systems capabilities .
3. Organizational processes that enhance motivation, empowerment, creativity, and engagement.

This part of the Balanced Scorecard criteria is linked to the continuous improvement of products and the ability to deliver new, innovative products, reflecting the organization's capacity for creativity, development, and learning. It also indicates the potential to provide added value to customers and increase operational efficiency (Areiqat et al., 2020). Krylov (2023) points out that this section of the Balanced Scorecard demonstrates to managers how to manage their intangible resources (human, informational, organizational) to enhance the internal improvements necessary for implementing the institutional strategy (Al-Mawali, 2023). The core capabilities included in the learning and growth dimension are the key to the organization's success, as business success relies on individuals rising to the highest levels of performance through continuous learning and the acquisition of knowledge and experience (Govindan et al., 2023). This dimension emphasizes the importance of developing employees and improving their performance by enhancing their intellectual and organizational skills, as well as providing a supportive work environment, which, in turn, contributes to achieving the organization's strategic goals (Abrokwah-Larbi & Awuku-Larbi, 2024).

Hypotheses

H_0: *There is no effect of big data in enhancing the balanced scorecard in Jordanian commercial banks.*

H_{01}: *There is no effect of big data with its dimensions (Volume, Velocity, Variety, Veracity) in enhancing the financial dimension in commercial banks in Jordan.*
H_{02}: *There is no effect of big data with its dimensions (Volume, Velocity, Variety, Veracity) in enhancing the Customer Dimension in commercial banks in Jordan.*
H_{03}: *There is no effect of big data with its dimensions (Volume, Velocity, Variety, Veracity) in enhancing the Internal operations Dimension in commercial banks in Jordan.*
H_{04}: *There is no effect of big data with its dimensions (Volume, Velocity, Variety, Veracity) in enhancing the learning and growth dimension in commercial banks in Jordan.*
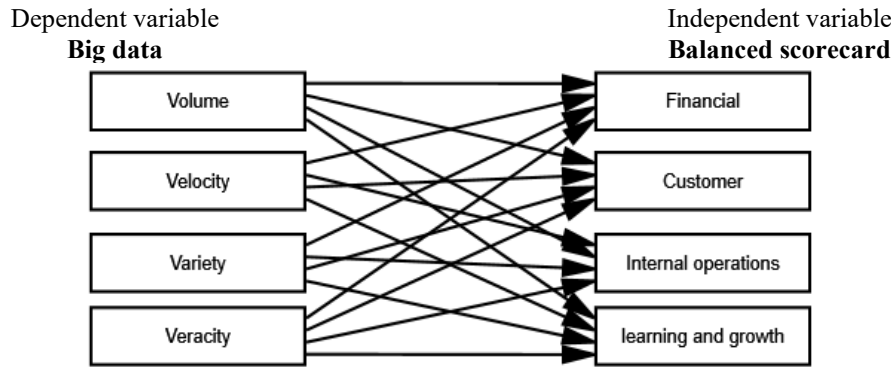
Dependent variable
Big data

Independent variable
Balanced scorecard

Volume	Financial
Velocity	Customer
Variety	Internal operations
Veracity	learning and growth

Fig. 1. Study Model

3. Research Methodology

The current study focuses on evaluating the role of big data in enhancing the effectiveness of the balanced scorecard within commercial banks. This was applied to a random sample of employees in Jordanian commercial banks, which number 14 commercial banks, with a total of 13,921 employees. In this context, the researcher analyzed how banks use big data to achieve multiple competitive advantages. The descriptive approach was used to evaluate the impact of these technologies. The research tools included a questionnaire distributed to samples of employees in banks. These questionnaires included two sections: the first section requested demographic data, while the second section included the big data axes, which amounted to 4 axes, and the balanced scorecard axes, which amounted to 4 axes. Each statement was based on a five-point Likert scale. All of this was analyzed using descriptive statistics methods to ensure the accuracy and comprehensiveness of the results obtained. The necessary sample size was determined, where 400 employees were the ideal sample size. Using the approach developed by Craigie and Morgan (1970) to represent the percentage of employees in each bank, a sample of 400 employees was selected. The questionnaire was distributed to 450 employees and 400 valid questionnaires were retrieved for analysis. Regarding data analysis, quantitative analysis techniques were used to extract accurate results from the collected data and determine the extent of the impact of big data in improving the balanced scorecard in these banks. Advanced statistical models, such as linear regression analysis, were used to verify the relationships between the use of big data and improving bank performance. SPSS programs were used to accurately implement these analytical processes.

3.1 Study sample

Table 1
The sample distribution

		Frequency	Percent
Age	Less than 25	84	21.0
	From 25 until less than 35	172	43.0
	From 25 until less than 35	58	14.5
	Less than 55	61	15.3
	55 and more	25	6.3
Educational qualification	Bachelor's	182	45.5
	Higher Diploma	52	13.0
	Master's	115	28.8
	Ph.D	43	10.8
	Any other educational qualification	8	2.0
Years of experience	Less than 5	73	18.3
	5 and more – less than 10	127	31.8
	10 and more– less than 15	102	25.5
	15 and more – less than 20	19	4.8
	20 and more – less than 25	79	19.8
	Total	400	100.0

3.2 Reliability

Cronbach's alpha was employed to evaluate the survey appliance internal consistency and reliability, which has a range of 0.78 to 0.92. This shows that the items have a high degree of internal consistency, indicating the instrument's reliability in evaluating the target construct. The scale has sufficient reliability if the alpha value is more than 0.70, which is considered a commonly recognized criterion (Sekaran, 2016). As shown in Table (2).

Table 2
The results of the Cronbach's alpha

N	Domain	Cronbach alpha
1	Volume	0.78
2	Velocity	0.81
3	Variety	0.84
4	Veracity	0.80
Big data		0.90
1	Financial	0.84
2	Customer	0.86
3	Internal operations	0.83
4	learning and growth	0.82
	Balanced scorecard	0.92

3.3 Findings

Means and standard deviations of big data and balanced scorecard in Jordanian commercial banks were calculated as shown in Table 3.

H₀: *There is no effect of big data in enhancing the balanced scorecard in Jordanian commercial banks.*

Table 3
The big data means and standard deviations, arranged in decreasing order

Class	N	Domain	Mean	Std. Deviation	Level
1	1	Volume	4.03	.597	high
2	3	Variety	3.92	.656	high
3	2	Velocity	3.91	.632	high
4	4	Veracity	3.82	.685	high
		big data	3.92	.537	high

The independent variable: Big data

As can be seen in Table 3, "Volume" has the greatest mean (4.03), while "Veracity" came in last with a mean of 3.82. Additionally, the total mean of this table, which is 3.92, indicates a high degree of agreement.

Table 4
The balanced scorecard means and standard deviations, arranged in decreasing order

Rank	N	Domain	Mean	Std. Deviation	Level
1	1	Financial	3.87	.541	high
2	4	learning and growth	3.73	.703	high
3	2	Customer	3.68	.552	high
4	3	Internal operations	3.57	.652	moderate
		Balanced scorecard	3.71	.548	high

The dependent variable: Balanced scorecard

Table 4 displays a high degree of agreement, with "Financial" receiving the highest mean (3.87) and "Internal operations" ranking lowest with mean (3.57). Additionally, the data demonstrates a high degree of agreement with an overall mean of 3.71.

H₀: *There is no effect of big data in enhancing the balanced scorecard in Jordanian commercial banks.*

Table 5 shows the coefficient table for the multiple regression analysis for H0. The study model explained 82% of the improvement in the balanced scorecard in Jordanian commercial banks, according to the results of the multiple regression test (Coefficient of determination $R^2 = 0.821$).

Table 5
The results of multiple regression interpretations for the impact of big data (Volume, Velocity, Variety, Veracity) in enhancing the balanced scorecard in Jordanian commercial banks

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.534	.090		5.937	.000
	Volume	.000	.023	.000	-.010	.992
	Velocity	.127	.026	.147	4.896	.000
	Variety	.396	.033	.474	12.161	.000
	Veracity	.296	.029	.370	10.359	.000
	R=0.906	R^2=0.821		F=454.088	P=0.000	

Table 5 shows that:

- Volume has no statistical impact in **enhancing the balanced scorecard in Jordanian commercial banks** (B=0.000, t=-.010, p=0.992 > 0.05).
- Velocity has a statistically positive impact in **enhancing the balanced scorecard in Jordanian commercial banks** (B= 0.127, t= 4.896, p= 0.000 <0.05).
- Variety has a statistically positive impact in **enhancing the balanced scorecard in Jordanian commercial banks** (B= 0.396, t= 12.161, p= 0.000 < 0.05).
- Veracity has a statistically positive impact in **enhancing the balanced scorecard in Jordanian commercial banks** (B= 0.296, t= 10.359, p= 0.000 < 0.05).

H$_1$: *There is no effect of big data with its dimensions (volume, velocity, variety, veracity) in enhancing the financial dimension in commercial banks in Jordan.*

Table 6 shows the coefficient table for the multiple regression analysis for H1. The big data explained 56% of the improvement in the **financial dimension** in Jordanian commercial banks, according to the results of the multiple regression test. (Coefficient of determination R^2 = 0.560).

Table 6
The results of multiple regression interpretations for the impact of big data (volume, velocity, variety, veracity) in enhancing the financial dimension in Jordanian commercial banks

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.019	.139		7.312	.000
	Volume	.146	.036	.161	4.027	.000
	Velocity	.104	.040	.122	2.587	.010
	Variety	.286	.050	.347	5.674	.000
	Veracity	.191	.044	.242	4.327	.000
R=0.748	R^2=0.560			F=125.557	P=0.000	

Table 6 shows that:

- Volume has statistical positive impact in **enhancing the financial dimension in Jordanian commercial banks** (B=0.146, t=4.027, p=0.000<0.05).
- Velocity has statistically positive impact in **enhancing the financial dimension in Jordanian commercial banks** (B=0.104, t=2.587, p=0.010 <0.05).
- Variety has statistically positive impact **in enhancing the financial dimension in Jordanian commercial banks** (B=0.286, t=5.674, p=0.000 < 0.05).
- Veracity has statistically positive impact in **enhancing the financial dimension in Jordanian commercial banks** (B=0.191, t=4.327, p=0.000 < 0.05).

H$_2$: *There is no effect of big data with its dimensions (Volume, Velocity, Variety, Veracity) in enhancing the customer dimension in commercial banks in Jordan.*

Table 7 shows the coefficient table for the multiple regression analysis for H2. The big data explained 69.1% of the improvement in the **customer dimension** in Jordanian commercial banks, according to the results of the multiple regression test. (Coefficient of determination R^2 = 0.691).

Table 7
The results of multiple regression interpretations results for the impact of big data (volume, velocity, variety, veracity) in enhancing the customer in Jordanian commercial banks

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.683	.119		5.732	.000
	Volume	-.026	.031	-.028	-.824	.410
	Velocity	.267	.034	.306	7.773	.000
	Variety	.340	.043	.404	7.871	.000
	Veracity	.189	.038	.234	4.984	.000
R=0.831	R^2=0.691			F=	P=0.000	

Table 7 shows that:

- Volume has no statistical impact in **enhancing the Customer in Jordanian commercial banks** (B=0.026, t=-0.824, p=0.410 > 0.05).
- Velocity has statistically positive impact in **enhancing the Customer in Jordanian commercial banks** (B=0.267, t=7.773, p=0.000 <0.05).
- Variety has statistically positive impact in **enhancing the Customer in Jordanian commercial banks** (B=0.340, t=7.871, p=0.000 < 0.05).
- Veracity has statistically positive impact in **enhancing the Customer in Jordanian commercial banks** (B=0.189, t=4.984, p=0.000 < 0.05).

H3: *There is no effect of big data with its dimensions (Volume, Velocity, Variety, Veracity) in enhancing the Internal operations dimension in commercial banks in Jordan.*

Table 8 shows the coefficient table for the multiple regression analysis for H3. The big data explained 67.7% of the improvement in **the internal operations dimension** in Jordanian commercial banks, according to the results of the multiple regression test (Coefficient of determination $R^2 = 0.677$).

Table 8

The results of multiple regression interpretations for the impact of big data (Volume, Velocity, Variety, Veracity) in enhancing the internal operations in Jordanian commercial banks

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.303	.144		2.108	.036
	Volume	-.048	.037	-.044	-1.280	.201
	Velocity	.075	.042	.073	1.807	.071
	Variety	.449	.052	.452	8.626	.000
	Veracity	.367	.046	.386	8.035	.000
R=0.823	R^2=0.677			F=207.145	P=0.000	

Table 8 above shows that:

- Volume has no statistical impact in **enhancing the internal operations in Jordanian commercial banks** (B=0.048, t=-1.280, p= 0.201 > 0.05).
- Velocity has no statistical impact in **enhancing the internal operations in Jordanian commercial banks** (B=0.075, t=1.807, p= 0.071 > 0.05).
- Variety has a statistically positive impact in **enhancing the internal operations in Jordanian commercial banks** (B=0.449, t=8.626, p=0.000 < 0.05).
- Veracity has a statistically positive impact in **enhancing the Internal operations in Jordanian commercial banks** (B=0.367, t=8.035, p= 0.000 < 0.05).

H4: *There is no effect of big data with its dimensions (Volume, Velocity, Variety, Veracity) in enhancing the learning and growth dimension in commercial banks in Jordan.*

Table 9 shows the coefficient table for the multiple regression analysis for H4. The big data explained 73.9% of the improvement in **the learning and growth dimension** in Jordanian commercial banks, according to the results of the multiple regression test (Coefficient of determination $R^2 = 0.739$).

Table 9

The results of multiple regression interpretations for the impact of big data (Volume, Velocity, Variety, Veracity) in enhancing the learning and growth in Jordanian commercial banks

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.130	.140		.928	.354
	Volume	.074	.036	-.062	2.024	.044
	Velocity	.062	.040	.055	1.531	.127
	Variety	.508	.051	.474	10.055	.000
	Veracity	.436	.044	.425	9.831	.000
R=0.859	R^2=0.739			F=278.942	P=0.000	

Table 9 shows that:

- Volume has a statistically positive impact in **enhancing the learning and growth in Jordanian commercial banks** (B=0.074, t=2.024, p=0.044 < 0.05).
- Velocity has no statistical impact in enhancing **learning and growth in Jordanian commercial banks** (B=0.062, t=1.531, p=0.127 <0.05).
- Variety has a statistically positive impact on **enhancing learning and growth in Jordanian commercial banks** (B=0.508, t=10.055, p= 0.000 < 0.05).
- Veracity has a statistically positive impact on **enhancing learning and growth in Jordanian commercial banks** (B=0.436, t=9.831, p= 0.000 < 0.05).

4. Conclusion

The results of this study indicate that big data has a significant impact on enhancing the balanced scorecard in Jordanian commercial banks. Multiple regression analyses revealed clear positive effects of factors such as velocity, variety, and veracity. These key elements of big data have greatly contributed to improving various dimensions of the balanced scorecard, including financial dimensions, learning and growth, internal processes, and customer service. The study shows that investing in modern technologies and training employees to use these technologies effectively can lead to tangible improvements in management and operations within banks. Therefore, it is recommended to continue investing in big data and advanced technology to enhance efficiency and effectiveness, ensuring the optimal application of financial accounting theories in practice. This is a necessary step to maintain competitiveness and achieve transparency in the digital age .Big data helps banks better understand customer needs and expectations, contributing to the improvement of the customer service dimension in the balanced scorecard. The ability to analyze large amounts of data quickly and accurately enables banks to provide customized services and enhance the customer experience. The results indicate that variety and veracity in big data have a significant positive impact on customer satisfaction, which enhances the service dimension of the bank and improves customer interactions.

Regarding the financial dimension, the results showed an improvement in the financial performance of banks due to the utilization of big data analytics. Enhancing the ability to predict financial challenges and understand patterns in market behavior allows banks to better manage their risks and improve financial decision-making. The high value demonstrated by the 'volume' aspect of data suggests that large amounts of data, when properly analyzed, provide valuable insights that can lead to a transformation in financial performance .The study highlights the importance of big data in improving internal processes. Data enables banks to monitor and evaluate internal performance more efficiently, enhancing operational efficiency. This includes improving financial, administrative, and logistical processes within the bank. The ability to use data to analyze operations, identify weaknesses, and uncover opportunities makes banks more adaptable and responsive to market changes.

The learning and growth dimension also benefits from big data, as it supports banks in developing their employees' skills and promoting continuous learning initiatives. Leveraging data to identify training needs and assess the effectiveness of educational programs helps build a more competent workforce equipped with the necessary tools to tackle new challenges . Therefore, the study clearly shows the urgent need for banks to continue investing in advanced technologies and big data, not only to enhance their performance according to the balanced scorecard criteria but also to ensure competitiveness and transparency in the contemporary global business environment. Investment in these technologies and improving data analytical capabilities will enable banks to navigate the changing economic climate more effectively and proactively capitalize on emerging opportunities.

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