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# The Impact of Business Intelligence on the Relationship Between Big Data Analytics and Financial Performance: An Empirical Study in Egypt\*

Mostafa Zaki HUSSEIN<sup>1</sup>, Samhi Abdelaty DIFALLA<sup>2</sup>, Hussein Abdelaal SALEM<sup>3</sup>

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## Abstract

The purpose of this research is to investigate the impact of Business Intelligence (BI) on the relation between Big Data Analytics (BDA) and Financial Performance (FP), at the beginning we reviewed the academic accounting and finance literature to develop the theoretical framework of business intelligence, big data and financial performance in terms of definition, motivations and theories, then we conduct an empirical analysis based on questionnaire-base survey data collected. The researchers identified the study population in the joint-stock companies listed on the Egyptian Stock Exchange and operating in the sectors and activities related to modern technologies in information systems, big data analytics, and business intelligence, in addition to the auditing offices that review the financial reports of these companies, and The sector closest to the research objective is the communications, media, and information technology sector, where the survey list was distributed among the sample companies with (15) lists for each company, and (15) lists for each audit office, so that the total sample becomes (120) individuals (with a response rate 83.3%), The results show, First, Big data analytics significantly affect organizations' financial performance, second, Business intelligence mediates (partial) the relationship between big data analytics and financial performance.

**Keywords:** Business Intelligence, Big Data Analytics, Financial Performance

**JEL Classification Code:** M10, M15, M19, O31, O33

## 1. Introduction

Digital technology (DT) has provided remarkable business developments and generated innovation possibilities for improving clients' experience, optimizing business operations, and generating several new business methods and models as a result of business enterprises' digitalization (Phornlaphatrachakorn & Jannopat, 2021), Nowadays, the trend moves towards digitalization and digital transformation which changes the current value chains of businesses and organizations. With the progress of digitalization, organizations have to develop their decision-making process and switch away from the traditional way of thinking to data-driven decisions to gain a competitive advantage.

Hence, big data technologies transform the way businesses operate, reshape the decisions making process and improve the organization's competitiveness (Li et al., 2022). Therefore, organizations must consider using big data and its analytics. According to (Hariri et al., 2019), the

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<sup>1</sup>First Author. Lecturer of Accounting and Auditing, Faculty of Commerce, Suez Canal University, Egypt. ORCID ID: 0000-0002-5207-017X. Email: dr.mostafazaki@yahoo.com

<sup>2</sup>Corresponding Author. [1] Assistant Professor, Department of Accounting, College of Business Administration Hotat Bani Tamim, Prince Sattam Bin Abdulaziz University, Saudi Arabia. ORCID ID: 0000-0002-2176-7548. [Postal Address: Al-Kharj 16278, Kingdom of Saudi Arabia] [2] Lecturer, Department of Accounting, Faculty of Commerce and Business Administration, Helwan University, Egypt. Email: s.difalla@psau.edu.sa

<sup>3</sup>Lecturer of Accounting and Auditing, Higher Institute of Marketing, Commerce and Information Systems, Egypt. ORCID ID: 0000-0003-1877-3768. Email: dr.husseinabdelaal@gmail.com

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definition of big data is: “data sets that are characterized by the huge volume of data, velocity, veracity, value, and variety with significant developments in the technologies for data storage”.

Within the era of big data, the worth of “DATA” is viewed as gold. Big data move through four phases: generation, acquisition, storage, and analytics (Al-Badi et al., 2018). Big data analytics enable organizations to extract helpful financial information from the huge, diverse, and complex data generated by big data. On the one hand, big data represent an opportunity for organizations to provide decision-makers with knowledge from a wide range of data. On the other hand, its analytics face challenges such as uncertainty, inappropriate information technology infrastructure, the requirement of high information security, highlighted privacy issues, more complicated than normal-sized data analytics, and lack of skilled personnel, especially in developing countries (Gandomi & Haider, 2015; Ferraris et al., 2018; Hariri et al., 2019).

Generally, big data emphasizes data collection and storage, while business intelligence (BI) focuses on analysis, visualization, and its adoption for decision. Business intelligence converts raw business data into meaningful information that helps in making efficient decisions. Business intelligence is composed of four phases: data analysis, insight, action, and performance measurement (Liang & Liu, 2018).

The organization’s performance is an important indicator of the management’s quality and denotes the proper use of information. Organizational performance is classified into nonfinancial performance and financial performance. Nonfinancial performance is indicated by the quality levels such as employee efficiency or customer satisfaction. The financial performance of an organization is indicated by terms expressed in monetary units, such as turnover, growth of sales, and earnings. More particularly, financial performance measures what has been achieved by organizations for a given time measured by financial structure, operating ability, profitability capability, solvency, and cash flow (Bag & Omrane, 2022).

With today’s fast-moving technology, Information System has become the backbone of most organizations. In consequence, organizations have to follow up the technological development, gain competitive advantage and find strategies to survive in the market. Businesses move toward using a large volume of data in the form of big data that is used to raise the quality of information gained.

However, big data are worthless and meaningless in a vacuum. Therefore, organizations need efficient analysis of big data to turn high volumes and diverse data into meaningful information. Analytics is used to analyze, earn intelligence and gain insights from big data. Big data analytics became a key component of decision-making processes because it

is a forward-looking approach (Ferraris et al., 2018). While business Intelligence uses current and historical data to extract insights into businesses and increase productivity (Niu et al., 2021). Therefore, the trend calls for using big data analytics in optimizing the business intelligence (BI) process to provide resources and support the data-driven decision-making process (Liang & Liu, 2018).

Big data analytics and business intelligence are considered a double-edged sword. Hence, they can increase the efficiency and effectiveness of the organization through information gained that help in setting appropriate strategies, which in turn can improve organizations’ performance (Maroufkhani et al., 2019). Despite their benefits, both big data analytics (BDA) and business intelligence (BI) are difficult to deal with them because of the massive data sources, the difficulty of the data nature itself, and the costs incurred in the data processing impact the performance of the organization. Therefore, this research focuses on the expected impact of big data analytics (BDA) and business intelligence (BI) on the organization’s financial performance. Therefore, the research questions can be summarized as follows:

RQ1: What are the consequences of big data analytics (BDA) on an organization’s financial performance?

RQ2: What is the influence of big data analytics (BDA) on business intelligence (BI)?

RQ3: How business intelligence (BI) contributes to achieving a high organization’s financial performance?

The research objectives are as follows:

1. Determine the impact of big data analytics (BDA) usage on financial performance.
2. Investigate the mediating role of business intelligence (BI) on the association between big data analytics (BDA) and organizations’ financial performance.

## 2. Literature Review and Hypotheses Development

### 2.1. Big Data Analytics and Financial Performance

Information systems (ISs) in organizations have improved over the years and moved from being a system in which financial transactions are recorded to a system that supports decisions made by businesses at several levels (Al-Alwan et al., 2022). In today’s complicated business world, the usefulness of big data to the organization’s performance has been subjected to arguments (Mikalef et al., 2019). The primary goals of a business are to maximize profit and growth, and highly efficient financial resource management has an impact on firm profitability and Financial Performance

(Matias & Bungato, 2021). Despite the rapid growth of the big data phenomenon as a necessary resource that provides organizations with a competitive advantage (Dahiya et al., 2021), big data does not necessarily bring growth in business value due to the complexity in the nature of big data, which can lead to inefficient and ineffective plans and strategic decisions (Su et al., 2021). As a result, there are two main points of contention: that understanding the vast amount of information will improve organizational performance, or that the challenges posed by the complicated nature of the data analytics process would reduce their use.

On the one hand, Ghasemaghaei et al. (2018) investigated the relationship between data analytics competency (analytical skills, data quality, knowledge's scope, big data, and tools sophistication) and organizational decision-making performance (efficiency and quality). The results show that big data analytics competency affects the quality of the decision. Additionally, all dimensions of big data analytics competency except for big data significantly increase decision efficiency. (Alrashidi et al., 2022) refer to the Big data comprises traditional nonfinancial and financial data sources, including phone conversation logs, email communication, and SMS from private and business media platforms; with the progress of technology, all types of data can be measured, saved, and recorded.

Moreover, Ghasemaghaei and Calic (2020) examined whether firm innovation performance (innovation efficiency and efficacy) can influence the relationship between big data characteristics (volume, variety, and velocity) and organization performance (customer viewpoint, financial benefits, and operational excellence). The findings ensure that data velocity and variety positively impact innovation efficiency and efficacy, but data quantity has no significant impact. The study also indicates that big data is not always better data because big data characteristics impact differentially on organizational performance. Therefore, organizations have to allocate their resources in a way that improves overall performance.

Additionally, Kibe et al. (2020) investigated whether the usage of big data analytics develops organizational performance (innovativeness, effectiveness, creativeness, productiveness, and efficiency) in Kenya. The results reveal that organizational performance is affected positively while conducting big data analytics. Furthermore, Vitari and Raguseo (2020) revealed that big data analytics add value to the business and lead to the promotion of organizational performance (financial, market performance, and customer satisfaction). While, Edwin Cheng et al. (2022), using a sample of 320 manufacturing organizations, found that the BDA does not have a direct effect on the sustainable performance of organizations. Consequently, the research hypothesis can be formulated as follows:

**HI:** *Big Data Analytics Significantly Affect Organizations' Financial Performance.*

## **2.2. Big Data Analytics, Business Intelligence, and Financial Performance**

Digital technology innovations (DTI) have progressively changed the phase of doing business and then influenced organizations' performance (Edu, 2022). The main aim of both big data analytics and business intelligence is to offer accurate and effective decisions. Thus, business intelligence has an impact on the success of organizations by improving productivity, gaining a market advantage, increasing organizational returns on investments, understanding the customers' behavior, and supporting the conversion of raw data into information (Wahua & Ahlijah, 2020).

Considering the relationship between big data analytics and business intelligence, Jin and Kim (2018) found that organizations can attain management efficiency without investing in additional infrastructure from the usage of big data through efficient business intelligence. However, Chu and Yong (2021) investigated how auditors and accountants deal with data analytics, machine learning applications, and data visualization software. The results reveal that machine learning software tools help auditors in analyzing journal entries and in fraud detection. Also, big data analytics enhance business intelligence. In addition, Allam (2021) examined the importance of big data analytics (BDA) in business intelligence (BI) for maximizing the value-generation process. The results show that big data analytics support the release of information from the huge amounts of data generated where it helps in providing accurate insights into the businesses, facilitates business operations, and creates growth opportunities, and as a result, it improves business intelligence.

Thus, Suša et al. (2020) examined whether business intelligence increases organizational performance. The findings reveal that implementing business intelligence has an indirect positive impact on organizational performance through business intelligence and business process management initiatives. In addition to the study of Lateef and Keikhosrokiani (2022), the findings assist that the construction of a business intelligence system (BIS) can develop overall organizational efficiency in an ever-changing business environment. Hence, the adoption of successful business intelligence will aid in better decision-making, promote economic improvement for organizations, and improve innovation, performance, and productivity. Further, Huang et al. (2022) tested the influence of Business Intelligence on the financial performance of start-ups. The result shows that the relationship between business intelligence and financial performance is indirect but

mediated by Innovativeness as well as network learning in start-ups. However, Yang et al. (2022) revealed that business intelligence has a positive impact on financial efficacy, which in turn improves financial performance.

Both big data analytics and business intelligence help organizations in value creation. Therefore, a question arose about whether they have an impact on organizational performance. For that reason, Ilmudeen (2021) tested the impact of big data capability on business intelligence infrastructure and the impact of that influence on the achievement of better organizational performance (whether operational or marketing performance). The findings show that the BDA capability has a significant influence on business intelligence infrastructure, and as a result of this relation both operational and marketing performance are affected positively. Also, business intelligence infrastructure has a partial mediation effect on the relation between BDA capability and operational performance and a full mediation effect on the relation between BDA capability and marketing performance.

Although Tong-on et al. (2021) examined the use of BDA on business intelligence activities and the impact of their usage on business performance in the hotel industry in Thailand, the results reveal that BDA and business intelligence improve financial performance positively. Furthermore, Qaffas et al. (2022) revealed that big data analytics has a positive impact on business intelligence which in turn affects an organization's financial and marketing performance.

However, the study of Paulino (2022) showed that business analytics have a significant positive effect on the level of business intelligence. While business intelligence has a significant positive effect on organizational performance. Consequently, the research hypothesis can be formulated as follows:

**H2:** *Business Intelligence Significantly Mediates the Association Between Big Data Analytics and Financial Performance.*

From the above-mentioned, it is concluded that there is an emerging stream of literature to identify the value of using big data analytics and business intelligence to optimize the organization's performance.

### 3. Research Methodology

This empirical study is conducted to support the theoretical part of the current research, and for the empirical study to achieve its goal, a set of constructs and limitations must be identified, these constructs and limitations are discussed and analyzed in the following sections.

#### 3.1. Research Design

This research is an empirical analysis based on questionnaire-based survey data collected. This research depends upon cross-sectional. Hence, the data is gathered just once by answering the research questions (Sekaran & Bougie, 2016). According to the foregoing, the researcher relies on testing the direct and indirect effects between the variables on the statistical methods that fit with these variables and the size of the sample. Therefore, the researcher used the Statistical Package for Social Science (SPSS V.25).

#### 3.2. Research Approach

To meet the purpose of this research, the research is based basically on an *inductive approach* through observing the phenomenon as it is in practice by depending on quantitative scientific observation through determining the dimensions and components of the phenomenon and reviewing previous relevant studies regarding the research topic. The research also depends on a *deductive approach* through the empirical study by using a questionnaire to collect data about the phenomenon to capture financial statements preparers' opinions and auditors' descriptions of specific engagement experiences involving the direct relation between big data analytics (BDA) and financial performance, the indirect relation between big data analytics (BDA) and financial performance through business intelligence and to test the integrity of hypotheses.

#### 3.3. Research Model

Based on the literature review, research aim, and objectives, the research hypotheses were formulated as follows (Figure 1):

#### 3.4. Sample Selection

The researchers identified the study population in the joint-stock companies listed on the Egyptian Stock Exchange and operating in the sectors and activities related to modern technologies in information systems, big data analytics, and business intelligence, in addition to the auditing offices that review the financial reports of these companies, and after the Capital Market Authority restructured the sectors of the Egyptian Stock Exchange. The sector closest to the research objective is the communications, media, and information technology sector, which numbered (5) companies, and companies that deal in dollars were excluded for the possibility of comparison.

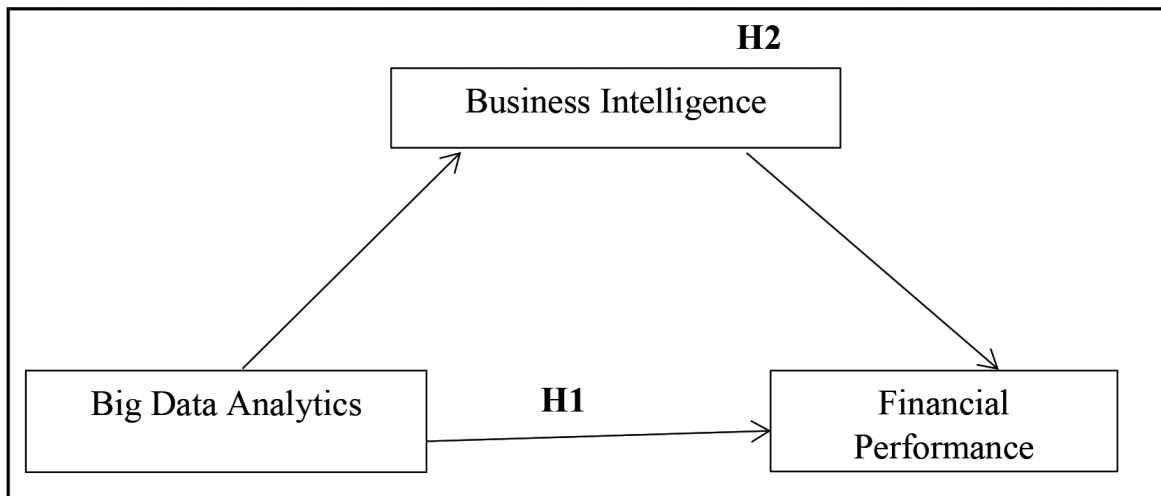


Figure 1: Research Model

The researchers chose the joint-stock companies registered in the Egyptian Stock Exchange as a study population for the following reasons:

- Choosing companies listed on the stock exchange ensures that they deal with modern technologies such as big data analytics and business intelligence.
- Selecting companies listed on the stock exchange guarantee the competence of those preparing the financial statements therein, in addition to the experience of financial managers in these companies in analyzing the relationship between big data analytics, business intelligence, and financial performance.

The categories of the study sample whose opinions were surveyed are the compilers of the financial statements and financial managers, in addition to the auditors of the audit offices associated with these companies, which numbered (3) audit offices, and since the vocabulary of these categories is difficult to limit the actual number accurately, the researcher selected the study sample from each A class randomly (judgmental method in selecting samples), where the survey list was distributed among the sample companies with (15) lists for each company, and (15) lists for each audit office, so that the total sample becomes (120) individuals, taking into account the selection of experiences and competencies and those who have the understanding and ability to Accommodate the inquiries of the survey list by selecting those with experience and holders of professional certificates.

After determining the initial sample for all categories of the study, the researcher distributed the survey lists (120 lists) through a personal interview and hand delivery or sending

and receiving them via e-mail, in addition to resorting to preparing a form for the survey list through Google forms through the following link: ([https://www.google.com/intl/ar\\_eg/forms/about](https://www.google.com/intl/ar_eg/forms/about))

The researchers distributed (45) to the study category of financial statement preparers, through whom a response was given to (38) a list with a response rate (of 84.4%), in contrast to (30) a list distributed to the study category of the financial managers of the sample companies, the response to (21) a list with a response rate (70%), in addition to distributing (45) to external reviewers through whom a response was given to (41) a list with a response rate (91.1%), Thus, the final study sample that was statistically analyzed became (38) a list from financial statement preparers, (20) list from financial managers, (41) a list from external auditors, by (38%), (21%), (41%), respectively, out of the total sample size, the percentage of questionnaires retrieved (response rate) from the study sample is 83.3%, which is a good percentage indicating the response and interest of the study sample in the subject of the research.

### 3.5. Statistical Methods Used

The researcher relied on the questionnaire as a tool for applied study, and to achieve its goal, it was divided into two parts:

- The first section includes personal data about the participant in the questionnaire, to clarify the experience and qualification, and to determine the degree of reliance on his answer.
- The second section: Questions of the questionnaire.



The second section of the questionnaire includes two axes as follows:

- The first axis: Items related to big data analysis and their relationship with financial performance, and it consists of (7) phrases for big data, and (6) phrases for financial performance.
- The second axis: items related to business intelligence, and it consists of (8) phrases.

## 4. Results

### 4.1. Data validity for Statistical Analysis

To determine the validity of the data for statistical analysis, the researcher does the following:

#### *The diversity and adequacy of the professional practices and academic qualifications of the participants in the questionnaire*

By counting the retrieved lists and analyzing the basic data of the participants, the categories of the study sample can be divided according to academic qualifications into (19) holders of Ph.D. degrees (19%), (23) holders of a master's degree (23%), and (27) holders of Postgraduate Diplomas and Professional Certificates in the rate of (27%). and (31) holders of Bachelor (31%). With regard to practical experience, the number of participants whose experience ranges from 5 years to less than 10 years is (14), the number of participants whose experience ranges from 5 years to less than 10 years is (31), and the number of participants whose experience ranges from 10 years to less than 15 years (26) participant, in exchange for (29) participants with more than 15 years of experience. That the study sample is characterized by the diversity and adequacy of the professional practices and the scientific qualifications of the participants, with the availability of the experience factor sufficiently in the sample. Where the percentage of participants among them who have more than ten years of experience has reached 55%, which is a good percentage, which contributes to the reassurance of the results of the study.

#### *Testing the validity and reliability of the study tool (Cronbach's alpha)*

To determine the degree of validity and stability of the elements used in measuring the study variables, the researcher used Cronbach's alpha coefficient and the internal consistency coefficient, Cronbach's alpha coefficient for big data analytics variable (0.729), and financial performance variable (0.794), and Business Intelligence variable (0.773).

Cronbach's alpha coefficient for the whole questionnaire (0.897). The validity coefficient, which is calculated through the square root of the Cronbach's alpha coefficient, is (0.854), (0.891), and (0.879), for the three variables of the study, respectively, In light of the previous results, the researcher finds that the reliability and validity coefficients are high, which indicates a high degree of homogeneity and consistency between the variables of the study.

### 4.2. Descriptive Analysis

The researcher presents the results of characterizing the opinions of the study sample about the statements related to the study variables through statistical measures (the arithmetic mean, standard deviation, and relative weight) as follows (Table 1):

From Table 1, the researcher concludes the following results:

The arithmetic mean values of all respondents' responses to all items (greater than 3) indicate that opinions tend to favor agreement about big data analytics; This is confirmed by the relative weight ratios of all the elements, which exceed 60%, representing the choice of "neutral".

All the arithmetic means of all the expressions were statistically significant at a significant level (0.05). This indicates that there are differences (significant differences) in the opinions of the participants between the observed values and the value of (3) The representative of the neutral selection.

The order of the degree of agreement (relative importance) indicates the most important and highest approval statements from the participants as follows:

- Big data technologies transform the way businesses operate, reshape the decisions making process and improve the organization's competitiveness
- The collection of data from various sections of the organizations, combining, validating, and tracking the development together constitute a time-consuming activity.

From Table 2, the researcher concludes the following results:

All the arithmetic means of all the expressions were statistically significant at a significant level (0.05). This indicates that there are differences (significant differences) in the opinions of the participants between the observed values and the value of (3) The representative of the neutral selection.

The order of the degree of agreement (relative importance) indicates the most important and highest approval statements from the participants as follows:

**Table 1:** The Descriptive Analysis of the Big Data Analytics Variable

Descriptive Analysis of Big Data Analytics Variable	Statistical Measures			
	Mean	Standard Deviation	Relative Weight	Sig.
Big data technologies transform the way businesses operate, reshape the decisions making process and improve the organization's competitiveness	4.19	0.918	83.80%	0.000
Big data analytics enable organizations to extract valuable information from the huge, diverse, and complex data generated by big data	4.07	1.027	81.40%	0.000
Big data represent an opportunity for organizations through providing decision-makers with knowledge from a wide range of data	4.12	0.902	82.40%	0.000
Data quality is a big barrier to the activities of analytics	4.03	1.193	80.60%	0.000
There is a lack of ability to use many different Big Data analysis tools and techniques	4.14	0.817	82.80%	0.000
There is difficulty in gathering information about customers and competitors	4.1	0.893	82.00%	0.000
The collection of data from various sections of the organizations, combining, validating, and tracking the development together constitute a time-consuming activity	4.15	0.833	83.00%	0.000
The degree of overall approval of big data analytics variable	4.1143	0.58498	82.29%	Agreement

\*\*The arithmetic mean is statistically significant at a significant level of 0.05.

**Table 2:** The Descriptive Analysis of the Role of Big Data Analytics on Financial Performance

Descriptive Analysis of the Role of Big Data Analytics on Financial Performance	Statistical Measures			
	Mean	Standard Deviation	Relative Weight	Sig.
Using big data analytics increases the quality of the work output through the integration of external data with internal to facilitate high-value analysis of the business environment.	4.12	0.946	82.40%	0.000
The Provision of up-to-date information to consumers leads to an improvement in organizations' market share.	3.99	0.893	79.80%	0.000
Big data analytics usage will cause sales growth.	4.18	0.968	83.60%	0.000
Big data analytics have an impact on the return on investment.	3.91	1.19	78.20%	0.000
There is a link between big data analytics and earnings growth.	4.04	1.1	80.80%	0.000
The usage of big data resources can improve market-directed capabilities and thereby firm performance.	4.11	0.952	82.20%	0.000
The degree of overall approval of the role of big data analytics on financial performance.	4.0583	0.71161	81.17%	Agreement

\*\*The arithmetic mean is statistically significant at a significant level of 0.05.

- Big data analytics usage will cause sales growth.
- The usage of big data resources can improve market-directed capabilities and thereby firm performance.

From Table 3, the researcher concludes the following results:

The arithmetic mean values of all items (greater than 3) indicate that opinions tend to favor agreement about Business Intelligence; This is confirmed by the relative weight ratios of all the elements, which exceed 60%, representing the choice of “neutral”.

All the arithmetic means of all the expressions were statistically significant at a significant level (0.05). This indicates that there are differences (significant differences) in the opinions of the participants between the observed values and the value of (3) The representative of the neutral selection.

The order of the degree of agreement (relative importance) indicates the most important and highest approval statements from the participants as follows:

- Business intelligence can improve the organizations’ market share.
- Business intelligence is a tool that adds value, improves organizations’ insights in competitive markets, and increases productivity.

### 4.3. Analysis of Variance Between the Sample Groups

The researcher analyzes the variance (the extent of agreement and disagreement) in the opinions of the sample groups about the statements related to the variables of the study, through the Kruskal-Wallis test, as follows (Table 4):

Table 4 shows the following results:

The values of the average ranks indicate that the highest categories agreeing to big data analytics and business intelligence are the category of financial managers of the sample companies with an average rank of (61.38), (57.45) while the study category of financial statements preparer came to the highest category agreeing to the role of big data analytics on the financial performance of companies with an average rank reach (of 56.04). The study category of the external auditors of the sample companies was the least approved of the data of the study variables.

The values of the significant level of (the Kruskal-Wallis test) for the data related to the variables of the study were (0.427), (0.074), and (0.168), respectively, which is greater than 5%. This indicates that there are no significant differences between the sample groups and that there is agreement among them on the role of BDA on financial performance and the impact of BI on this relationship.

**Table 3:** The Descriptive Analysis of the Business Intelligence Variable

Descriptive Analysis of Business Intelligence Variable	Statistical Measures			
	Mean	Standard Deviation	Relative Weight	Sig.
There is a need for big data analytics staff to have the right skills, training, and suitable education to accomplish their jobs.	4.09	0.842	81.80%	0.000
Business intelligence is a tool that adds value, improves organizations’ insights in competitive markets, and increases productivity.	4.1	0.882	82.00%	0.000
Business intelligence can improve the organizations’ market share.	4.12	0.956	82.40%	0.000
Business intelligence has an impact on sales growth.	3.83	1.129	76.60%	0.000
Business intelligence affects the return on investment in a positive manner.	3.96	1.044	79.20%	0.000
There is a link between big data analytics and earnings growth.	3.97	0.989	79.40%	0.000
Big data analytics affects the process of gathering essential information that allows firms to make informed decisions and improve business efficiency and productivity.	4.01	1.02	80.20%	0.000
Business intelligence can improve the relationship between big data analytics and organizations’ financial performance.	3.98	0.853	79.60%	0.000
The degree of overall approval of the Business Intelligence variable	4.0075	0.60219	80.15%	Agreement

\*\*The arithmetic mean is statistically significant at a significant level of 0.05.



**Table 4:** Analysis of Variance Between the Sample Groups on the Study Variables

Study Variables	Participants	N	Mean Rank	Order	Kruskal-Wallis Sig.
Big data analytics	Financial statements preparer	38	52.99	2	0.427
	Financial Manager	21	61.38	1	
	External auditor	41	42.62	3	
	Total	100			
Financial performance	Financial statements preparer	38	56.04	1	0.074
	Financial Manager	21	55.88	2	
	External auditor	41	42.61	3	
	Total	100			
Business Intelligence	Financial statements preparer	38	53.47	2	0.168
	Financial Manager.	21	57.45	1	
	External auditor	41	44.18	3	
	Total	100			

**Table 5:** Correlation Between the Hypothesis Variables

Independent Variable	Correlation	Financial Performance (Y)
Big Data Analytics (X)	Pearson Correlation	0.697**
	Sig.	0.000

\*\*Indicates the significance of the correlation coefficient at the level of 0.01 significance.

#### 4.4. Testing the Research Hypothesis

##### 4.4.1. First Hypothesis Test

The first hypothesis of the study is tested by analyzing the correlation between BDA and corporate financial performance, in addition to analyzing the results of regression analysis to measure big data analytics (independent variable) on financial performance (dependent variable), as follows:

To test the unilateral relationship between BDA and corporate financial performance, a Correlation Analysis for the variables was performed. The following table shows the correlations between the hypothesis variables (Table 5).

The positive correlation coefficient sign indicates the existence of a direct correlation (positive), and the correlation coefficient value indicates the strength of the correlation relationship; thus, There is a positive correlation with a significant relationship between big data analytics and corporate financial performance, with as the correlation coefficient is positive and is almost equal to (1), and the level of significance (sig) is less than (0.01), Which supports the validity of the First hypothesis of the research.

To measure the aggregate impact of BDA on corporate financial performance, the following table shows the results of the regression analysis (Table 6):

Table 6 shows the regression results for the research model related to the effect of big data analytics on corporate financial performance. From the output obtained, the results of the coefficient of determination test are tests conducted to determine the extent of the independent variable in describing the dependent variable. Based on the results of the regression that has been done and summarized in the table show that the resulting  $R^2$  value is (0.485): 48.5%. These results indicate that the independent (big data analytics) have the ability of 48.5% to explain the dependent variable, the remaining is explained by other factors outside the independent variables used in the study.

##### 4.4.2. Second Hypothesis Test

The second hypothesis of the study examines the mediation of the business intelligence variable on the relationship between big data analysis and financial performance, which was proven in the first hypothesis of the study. To achieve this, the variables must be defined as follows: Independent Variable (X): Big Data Analytics. Dependent variable (Y): financial performance. (M) mediator variable: business intelligence.

In light of the foregoing, the researcher takes the following steps, as follows:

The first step: verifying the first condition, which is the presence of an effect of the independent variable (big data analytics) on the mediating variable (business intelligence), and this is shown in the following table (Table 7), in which is clear that there is a significant effect of BDA on BI, as

**Table 6:** Regression Analysis for the First Hypothesis Variables

The Dependent Variable		Financial Performance (Y)				
The Independent Variables		Regression Coefficient (B)	Beta Value	T value	Significance Level	Significance At 0.01
(Constant)	( $B_0$ )	0.571		1.559	0.122	
Big data analytics		0.848	0.697	9.616	0.000	Statistically significant
Model explanatory value		$R^2 = 0.485$				
Model overall significance Prob (F-statistic)		ANOVA = 0.000				

**Table 7:** First Step for the Second Hypothesis Variables

The First Step: An Effect of the Independent Variable (Big Data Analytics) on the Mediating Variable (Business Intelligence)						
Details		Regression Coefficient (B)	Beta Value	T value	Significance Level	Significance At 0.01
(Constant)	( $B_0$ )	1.411		4.134	0.000	
Big data analytics		0.631	0.613	7.681	0.000	Statistically significant
Model explanatory value		$R^2 = 0.376$				

Test Result: The first condition has been fulfilled with a significant effect of big data analytics on business intelligence.

**Table 8:** Second Step for the Second Hypothesis Variables

The Second Step: An Effect of the Independent Variable (Big Data Analytics) on the Dependent Variable (Financial Performance)						
Details		Regression Coefficient (B)	Beta Value	T value	Significance Level	Significance At 0.01
(Constant)	( $B_0$ )	0.571		1.559	0.122	
Big data analytics		0.848	0.697	9.616	0.000	Statistically significant
Model explanatory value		$R^2 = 0.485$				

Test Result: The second condition has been fulfilled with a significant effect of big data analytics on financial performance.

the regression coefficient reached (0.631), And the level of significance is less than (0.01) (Table 7).

The second step: verifying the second condition, which is the presence of an effect of the independent variable (big data analytics) on the dependent variable (financial performance)., and this is shown in the following table, the regression coefficient reached (0.848), The level of

significance is less than (0.01), which represents the total effect (Table 8).

The third step: verifying the third condition, which is the presence of an effect of the mediating variable (business intelligence) on the dependent variable (financial performance) in light of the presence of the independent variable (big data analytics) as a control variable in the

multiple regression equation, and this is shown through the following table, in which it is clear that there is A significant impact of BI on financial performance in the presence of BDA as a controlling factor, as the regression coefficient was (0.584), and the level of significance was less than (0.01) (Table 9).

The equations for the relationships between the variables of the three paths can be explained as follows:

$$\text{Business Intelligence (M)} = 1.411 + 0.631 \text{ Big Data Analytics (X)} \quad (1)$$

$$\text{Financial Performance (Y)} = 0.571 + 0.848 \text{ Big Data Analytics (X)} \quad (2)$$

$$\text{Financial Performance (Y)} = -0.253 + 0.479 \text{ Big Data Analytics (X)} + 0.584 \text{ Business Intelligence (M)} \quad (3)$$

The mediation condition according to the Baron and Kenny (1986) method is the direct effect of the independent variable (BDA) on the dependent variable (financial performance), which is represented by the regression coefficient (0.479) in equation No. (3), is closer to zero than the total effect in equation No. (2), which is the value (0.848).

## 5. Conclusion

The research attempted to test the Impact of Business Intelligence (BI) on the Relationship Between Big Data Analytics (BDA) and Financial Performance (FP). And to achieve this objective and investigate the relations we developed two hypotheses and conducted an empirical study.

According to the first hypothesis, big data analytics has a significant effect (at the level of 1%) on financial performance, the regression coefficient indicates the positive impact of big data analytics on improving the financial performance of companies. The resulting direction for the relationship between big data analytics and financial performance is positive as predicted. This significant and positive result is consistent with the first hypothesis proposed by the author in this study. Hence, the regression model can be formulated as follows:

$$\text{Financial Performance (Y)} = 0.571 + 0.848 \text{ Big Data Analytics}$$

The results obtained from this test indicate big data analytics significantly affect organizations' financial performance. Which supports the validity of the first hypothesis of the study

According to the second hypothesis, we find that the condition is fulfilled and that business intelligence mediates the relationship between big data analytics and financial performance. The results also confirm that the mediation here is partial, as the regression coefficient of the direct impact of the independent variable (big data analytics) on the dependent variable (financial performance) in Equation No. (3) Statistically significant at a significant level (0.01). The above can be explained through the following figure (Figure 2).

In light of the previous analysis, it is possible to prove the second hypothesis of the study that business intelligence significantly mediates the association between big data analytics and financial performance.

**Table 9:** Third Step for the Second Hypothesis Variables

The Third Step: An Effect of the Mediating Variable (Business Intelligence) on the Dependent Variable (Financial Performance) in Light of the Presence of the Independent Variable (Big Data Analytics) as a Control Variable						
Details		Regression Coefficient (B)	Beta Value	T value	Significance Level	Significance At 0.01
(Constant)	(B <sub>0</sub> )	0.253		-0.756	0.452	
Big data analytics		0.479	0.394	5.093	0.000	Statistically significant
Business Intelligence		0.584	0.494	6.390	0.000	Statistically significant
Model explanatory value		R <sup>2</sup> = 0.638				

Test Result: The second condition has been fulfilled with a significant effect of business intelligence on financial performance in light of the presence of big data analytics as a control variable.

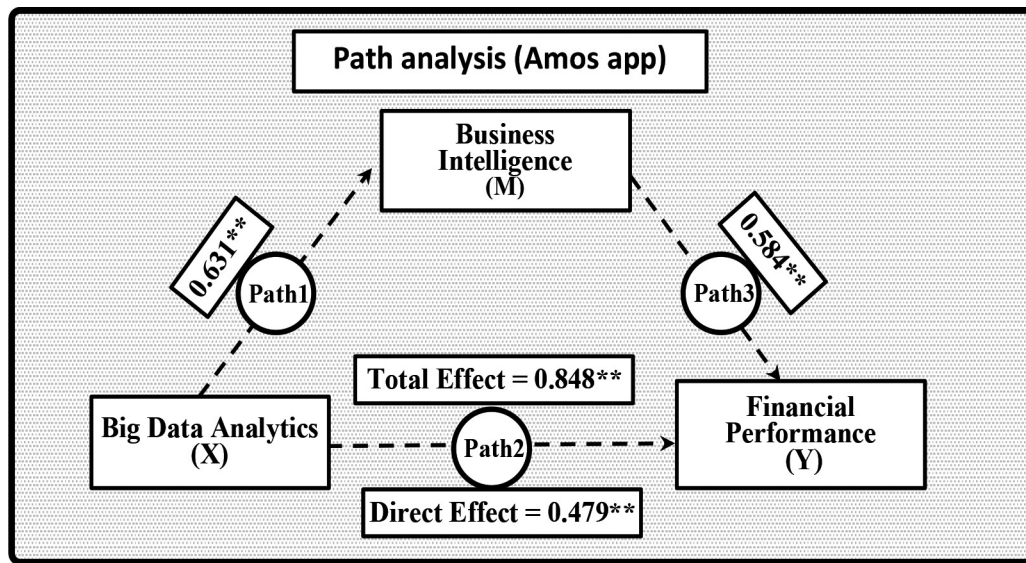


Figure 2: Path Analysis

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