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The effects of big data, artificial intelligence, and business intelligence on e-learning and business performance: Evidence from Jordanian telecommunication firms

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A B S T R A C T

This study sought to investigate the impacts of big data, artificial intelligence (AI), and business intelligence (BI) on Firms' e-learning and business performance at Jordanian telecommunications industry. After the samples were checked, a total of 269 were collected. All of the information gathered throughout the investigation was analyzed using the PLS software. The results show a network of interconnections can improve both e-learning and corporate effectiveness. This research concluded that the integration of big data, AI, and BI has a positive impact on e-learning infrastructure development and organizational efficiency. The findings indicate that big data has a positive and direct impact on business performance, including Big Data External and Internal, Innovative Usage, Indexing, and Sources Accuracy. In addition, Artificial intelligence positively affects business performance, including Data Accuracy, Data Transparency, Data Speed, and Creative Thinking and Learning. Moreover, business intelligence has a direct and positive impact on business performance, including Data Warehouse, Data Mining, Business Process Management, and Competitive Intelligence. In addition, the findings indicate that e-learning which represents system quality, information quality, and self-efficacy has a positive relationship on enhancing business performance. Interestingly, the present findings are inconsistent with those of previous studies showing the variables of interest which have no effect on e-learning and business performance. Taken together, the findings of this study suggest that firms should begin to apply processes related with applying e-learning and developing business performance. The novelty of the present study lies in highlighting the key dimensions of big data, artificial intelligence, and business intelligence when it comes to enhancing e-learning and business performance at Jordanian telecommunications industry.

1. Introduction

A recent trend in strategic information systems studies is the incorporation of the idea of business performance (Agarwal et al., 2010). According to their findings, digital technology's far-reaching effects on society and industry can be defined as "business performance" (Fosso et al., 2015; Fonseka et al., 2022). Many businesses today are looking to digital technology for cutting-edge answers to the age-old problem of how to boost operational performance in a sustainable way (Francheska, 2021; Hammouri et al., 2021a). New studies are needed to define the features and qualities of business performance that

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enable firms to increase productivity and compete in the digital market while providing the best value to their customers (Frank et al., 2019; Hammouri et al., 2022b). To improve the efficiency and effectiveness of an organization's performance, business performance the process by which the characteristics of an organization are changed, improved, and developed through the application of systems, tools, and technological methods of communication that lead to the discovery of new ideas and products, the development of novel solutions, the management of operations by technological means, and the general improvement of business performance (Gefen et al., 2011, Fonseka et al., 2022). Our inductive framework illustrates how advances in big data, AI, and business intelligence have helped boost e-learning and organizational effectiveness, and it is based on a thorough examination of the relevant literature. To better understand the phenomena of business performance and to discover the elements that aid or hinder the business performance process, businesses need to study the influence of the aforementioned variables and their impact on the business performance process. By assisting businesses in gauging the impact of big data, AI, and BI on e-learning variables like system quality, information quality, and self-efficacy, this study examines the effects of managing these systems as a means of enhancing e-learning and business performance. The rate of return orders, the rate at which new customers are acquired, and the level of customer satisfaction are all indicators of corporate success. In the following parts, we'll talk about how to conduct a review, analyze the results of previous studies, and offer some suggestions for where to go from here.

2. Literature review

2.1 Big data (BD)

The term “big data” refers to a broad category of data characterized by its size and complexity. Data mining, AI, LMSs, and social media sites are all examples of the kind of technologies that contribute to the massive amounts of data known as “big data” (Gray & Rumpe, 2017). Understanding consumer behavior, lowering operational expenses, product costs, and running fees are just a few of the ways in which businesses have benefited from using big data (Lu et al., 2015). With the use of big data technologies, businesses may better understand their consumers' preferences by reading between the lines of the messages and comments they get on social networking sites like Facebook (Hanelt et al., 2015; He et al., 2019; Yaqoob et al., 2016).

2.2 Artificial Intelligence (AI)

Computer scientists often make comparisons between the study of human intelligence and the field of artificial intelligence, which is defined as the branch of applied computing science that employs computational methods to aid businesses in carrying out their operations (Agustina et al., 2022; Hammouti et al, 2022c). Having the target market actively participate in the development and specification of a product has been shown to be very beneficial (Toole et al., 2015). As a result, the utilization of digital technology is crucial to the creative and innovative process since it provides a powerful medium for linking consumers with businesses (Krulicky & Horak, 2021; Hammouri et al., 2021b; Nusairat et al., 2021). Researchers generally agreed that integrating technological resources and systems into administrative, operational, and industrial settings was crucial to their respective sectors' growth. This was accomplished through the creation of long-term strategies that could lay the groundwork for the creation of detailed product development roadmaps (Lamba & Singh, 2017). The usage of artificial intelligence is one example of a technical tool that helps managers and decision-makers swiftly and effectively read, understand, and use the vast amounts of information available in online repositories and databases (Liang & Liu, 2018). This enables businesses to adopt and implement new models of operation, which can improve their current situations by, for example, creating innovative products with the potential to increase customer loyalty, bolstering their capacity for transformation and development, and gaining market share and competitive advantages (Majchrzak et al., 2016; Hammouri & Altaher, 2020; Wamba et al., 2015).

2.3 Business intelligence (BI)

The amount, quality, accuracy, and validity of the data summed up the challenges that organizations faced in owning and managing big data (Raffoni et al., 2018). As a result, the business intelligence strategy has developed as an efficient and original means of gaining the competitive edge through the extraction of new values (Nambisan et al., 2017; Bharadwaj & Noble, 2017). An organization's ability to store, manages, analyze, and weave its data in order to get insights and create novel goods and services is greatly aided by business intelligence systems (BIS) (Nenonen & Storbacka, 2018; Al-Gasawneh et al., 2022; Rabaai et al., 2022). Due to the current difficulty of work without the extensive use of technological systems, the ability of organizations to deal with and analyze big data and try to extract new values, and the complexity of the process required to achieve business performance, organizations have been compelled to use analytical business intelligence tools (Hammouri & Abu-Shanab, 2018; Prasetyo et al., 2018; Nuseir et al., 2021). Organizations can gain the ability to extract new ideas, support the decision-making process, solve complex and intractable problems, and finally provide new services and products to customers by storing data in data warehouses, classifying it, ensuring its accuracy, and searching for new relationships between data (Biswas & Sen, 2016; Setiawan et al., 2021; Bordeleau et al., 2020; Hua-Pu et al., 2015; Tong-On et al., 2021).

2.4 E-learning and business performance

For most businesses right now, the advent of the digital economy is seen as both a threat and an opportunity. As a result of inadequate resources (such as computers and talented employees), some businesses found navigating the digital economy to be a formidable undertaking. Organizations, on the other hand, have viewed the rise of the digital economy as a chance to strengthen their internal resources and gain an edge in the marketplace (Tong-On et al., 2021; Sousa et al., 2020; Tautz et al., 2021; Almajali et al., 2021; Hammouri et al., 2022a). When it comes to reaching customers and providing distinctive and

innovative products ahead of competitors at a reasonable price, organizations that are looking for stability and maintaining a stable position in front of competitors understand the difficulty and the need to possess diverse capabilities (Urbinati et al., 2018; Hammouri & Abu-Shanab, 2020; Tortorella et al., 2020). With the rising costs of commercial, operational, and transportation costs, as well as the increasing reliance on technological systems to deal with big data and customers' demands, most businesses have turned to increasing their technological capabilities as one solution to reach full business performance (Vial, 2019). Furthermore, numerous studies on the assessment of e-learning users have been conducted, and much study has been done on the efficacy of distant learning systems. Digital technologies like lecture recordings, question tools, classroom response systems, and virtual reality have been studied by (Warner & Wager, 2019) to see how they affect active learning, repetition, and feedback in the classroom. Some of the factors that researchers consider when gauging the success of information system acceptance are the quality, system utilization, perceived benefits, and students' perspectives (2021). The COVID-19 pandemic online learning platform's UI, PEU, PU, IQ, SQ, BI, and ACTUAL USAGE were analyzed using the Extended Technology Acceptance Model (ETAM) and (Wieland et al., 2017) IS Success Model, respectively. Based on previous studies and reviews, the following research hypotheses are proposed:

H1: *Big data has a positive effect on e-learning.*
H2: *Big data has a positive effect on Business performance.*
H3: *Artificial Intelligence has a positive effect on e-learning.*
H4: *Artificial Intelligence has a positive effect on Business performance.*
H5: *Business Intelligence has a positive effect on e-learning.*
H6: *Business Intelligence has a positive effect on Business performance.*
H7: *e-learning has a positive effect on Business performance*.

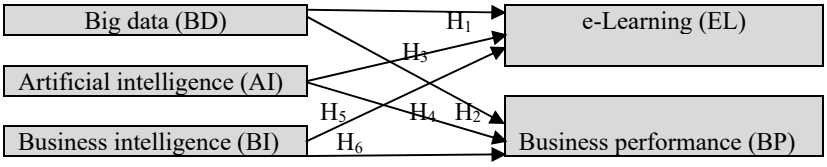

Fig. 1. The proposed study

3. Research methodology

The research survey was built in Google Drive and distributed to participants using a five-point Likert scale (1 = Strongly Disagree; 2 = Disagree; 3 = neutral; 4 = Agree; and 5 = Strongly Agree) to evaluate the study's primary constructs through quantitative methods. The researcher also uses the PLS method to statistically discuss the research hypotheses. After verifying and filtering all the data obtained, 269 respondents' answers were accepted to be used in the analysis process and for discussing the study hypotheses. Finally, the total number of samples obtained was ten times bigger than the number of predictors.

4. Research results

Results of a reliability analysis were tabulated below; it was conducted with the composite reliability values, the average of the retrieved variables, and a Cronbach alpha of 0.50 or higher. Furthermore, the table below demonstrates that the evaluation-based research model is solid enough to proceed with a discussion of the research hypotheses.

Table 1
The summary of the results for the reliability and validity

Construct	Codes	FL	AVE	CR	Cronbach α	VIF
Big Data	BD1	0.724	0.632	0.688	0.709	1.878
	BD2	0.561				1.599
	BD3	0.660				1.984
	BD4	0.892				1.535
Artificial Intelligence	AI1	0.758	0.732	0.783	0.748	1.581
	AI2	0.761				1.633
	AI3	0.726				1.916
	AI4	0.749				1.630
Business Intelligence	BI1	0.664	0.597	0.775	0.671	1.399
	BI2	0.559				1.469
	BI3	0.613				1.579
	BI4	0.811				1.532
E-Learning	EL1	0.886	0.743	0.766	0.866	1.327
	EL2	0.834				1.322
	EL3	0.878				1.532
Business Performance	BP1	0.829	0.757	0.669	0.825	1.656
	BP2	0.807				1.520
	BP3	0.841				1.685

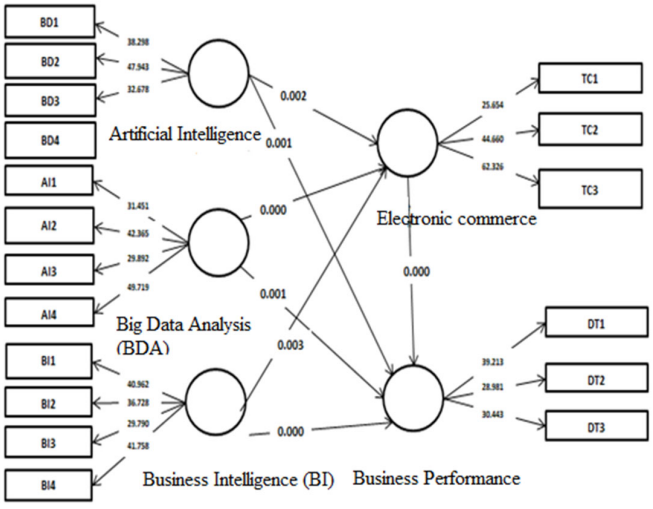

Fig. 2. The results of bootstrapping

All the search hypotheses have been fully accepted, and their immediate effects and interrelationships are shown in the table below.

Table 2
The results of path coefficient test

Hypotheses	P-value	Significance
H1: Big Data → E-Learning	0.002	Supported
H2: Big Data → Business Performance	0.001	Supported
H3: Artificial Intelligence → E-Learning	0.000	Supported
H4: Artificial Intelligence → Business Performance	0.001	Supported
H5: Business Intelligence → E-Learning	0.003	Supported
H6: Business Intelligence → Business Performance	0.000	Supported
H7: E-Learning → Business Performance	0.000	Supported

5. Conclusion

The findings have shown that big data, both outside and internally, novel usage indexing, source correctness, and deep learning all have good direct effects on business performance. The finding is consistent with those of prior research (Ahmad & Mustafa, 2022). This study has also demonstrated how AI improves corporate outcomes including data precision, data transparency, innovative problem solving, and quick data learning. This finding agrees with those of prior research (Bordeleau et al., 2020). Corporate intelligence, which encompasses data warehouse, data mining, BPM, and competitive intelligence, has been shown to have a direct and positive effect on business performance. This finding agrees with those of prior investigations (Raffoni et al., 2018). Finally, there is a discrepancy between the research findings and those of other studies that found no link between e-learning and financial success. In conclusion, this study's findings indicate that organizations, firms, and companies need to prioritize the use of big data through artificial intelligence and business intelligence systems to keep up with the pace of development and competition, gain a competitive edge, acquire new knowledge, strengthen their decision-making processes, and competent of boosting existing customers' happiness.

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