Pak. j. life soc. Sci. (2025), 23(2): 357-371 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences

www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2025-23.2.00173

RESEARCH ARTICLE

The Impact of Business Intelligence on Organizational Innovation at Jordanian Commercial Banks: The Moderating Role of Artificial Intelligence

Dr. Wael Abdelfattah Alsariera*

The Word Islamic Science and Education University

ARTICLE INFO

Received: Jun 27, 2025

Accepted: Aug 19, 2025

Keywords

Business Intelligence
Organizational Innovation
Artificial Intelligence
Product Innovation
Process Innovation
Jordanian Commercial Banks

***Corresponding Author:**

Wael.alsariera@wise.edu.jo

ABSTRACT

This study aimed to recognize the impact of business intelligence (BI) by their dimensions (data collection and analysis (DCA), real- time data processing (RDP), business performance management (BPM), competitive intelligence(CI)) on organizational innovation (OI) by their dimensions (product innovation (PDI), process innovation (PRI)) through the moderating role of artificial intelligence (AI) at Jordanian commercial banks. The population of the study consisted of all the employees in the top and middle management in Jordanian commercial banks. The study used the analytical descriptive approach, and A proportional stratified random sample was used for data collection. A questionnaire was developed for collecting data from the sample individuals, where (300) questionnaires were distributed, only (285) questionnaires were valid for analysis. The results revealed that there is an impact of business intelligence (BI) on organizational innovation (OI) at Jordanian commercial banks. In addition, the results discovered that there is an impact of business intelligence on product innovation and process innovation as dimensions of organizational innovation. Moreover, the results showed that there is a role of artificial intelligence (AI) in improving the impact of business intelligence on organizational innovation at Jordanian commercial banks. Based on the results, the study recommended the necessity of hiring employees with high competencies of analytical skills in order to perform constant improvements in business intelligence systems and achieve new innovations at the level of the product and process, paying more attention to performing predictive analyses to understand customers' behaviors and make the right decisions at Jordanian commercial banks, in addition to the necessity of making an integration between artificial intelligence systems to come up with a clear vision to commercial banks, as well as finding proactive solutions to the needs of customers after reviewing previous data and investigating customers' behaviors.

INTRODUCTION

Recently, organizations' environments have witnessed rapid changes that led to several changes in the nature of their work, where it has become necessary to make radical changes in their work nature in order to cope with those changes. Indeed, the technological advancement witnessed by the whole world has changed the view of business organizations towards the administrative methods that should be followed in order to be able to compete, given the strong competitive circumstances between business organizations, including the banks system. Accordingly, the concept of business intelligence has been introduced as one of the most important modern administrative methods that should be adopted by business organizations, where such methods contribute to enhancing the competitive power of these organizations at the local and the global levels.

Therefore, data have become an important source for the success of business organizations that contribute to achieving sustainable performance. Hence, it has been necessary to consider data, particularly big data by innovating software to find out data, store them and process them accurately (Jalil, et al., 2019). This context is referred to as business intelligence, which refers to a set of tools

and techniques which are used to collect data from various resources, store them, and analyze them in order to help users make the suitable decisions (Eidizadih, et al., 2017). Business intelligence also refers to a set of practices that enable organizations to make the suitable decisions by making a logical effort to find out creative ideas that help business organizations grow based on technological methods and some mathematical models- this context contributes to making high-quality decisions (Miqnani and Shabila, 2019).

Therefore, innovation and creativity have become amongst the requirements of successive developments in business organizations, given the rapid changes in the surrounding environment. Indeed, innovation contributes to the continuity of organizations, especially with the accelerating global changes (Al-Silwadi and Ghonaim, 2022). Since innovation is considered as one of the main characteristics that contribute to enhancing the competitive power of business organizations (Chen et al., 2018), researchers still look for new methods to improve the innovative side of organizations (Ode and Ayaroo, 2019). In this vein, artificial intelligence is considered amongst the methods that support business intelligence, where it contributes to developing information systems, so that they can be employed in a way similar to that used by people while performing tasks, in terms of storing data and using them in making the right decisions (Mohammad, 2020). Therefore, the study problem has been mainly concerned with organizational innovation, considering it as one of the solutions adopted by commercial banks to maintain their continuity and competitiveness, either through innovation in the provided products or innovation in process. Accordingly, the author attempted to show the role of business intelligence in achieving organizational innovation based on artificial intelligence which contributes to increasing this effect. Hence, the study attempted to identify the role of artificial intelligence in improving the impact of business intelligence in organizational innovation at Jordanian commercial banks.

REVIEWING LITERATURE AND FORMULATING THE STUDY HYPOTHESES:

Business intelligence is considered as a type of the techniques that contribute to customizing data to serve business organizations, where business intelligence classifies data and compares them in order to make the suitable decisions. Currently, organizations use business intelligence to make the right strategic decisions that enhance the progress of organizations. However, the considerable changes that took place to organizations during the previous years entailed changes in those organizations' view concerning the employed administrative methods, where organizations have become more inclined towards simulating knowledge and data in order to generate suitable information that contributes to the process of decision making- this can be performed by collecting data, processing them, storing them, and analyzing them to come up with a comprehensive vision. Therefore, business intelligence helps business organizations make strategic decisions and achieve the competitive advantage (Jakhar and Krishna, 2020). In this vein, the previous studies revealed that business intelligence with its dimensions (data integration and analytical abilities, data quality, quality of data collection, using information in business, culture of making analytical decisions) had an effect on the exchange between knowledge and innovation in mini and medium companies, and the behavior of innovative work (Alderie and Fam, 2022). The results revealed that innovation in mini and medium companies had an effect on the behavior of innovative work. The results also showed that there was an effect for using business intelligence system (data stores, data mining, data show instruments, analytical processing, data processes) on institutional excellence, through the mediating role of managerial innovation (Al-Tahir, 2022). The results revealed that there was an effect for business intelligence on the practices of electronic human resources management. The results also showed that business intelligence dimensions (data management, data analysis, business performance management, data linking) had a significant effect on providing the best practices of electronic human-resources management (Awad and Mahmoud, 2023). Furthermore, there was an effect for business intelligence with its dimensions (strategic capabilities of business intelligence, business intelligence team, business intelligence infrastructure) on organizational innovation with its dimensions (process innovation, manufacturing innovation, managerial innovation), and that business intelligence could be used to identify opportunities, threats, and information derived from business intelligence systems that contribute to formulating the organizational strategies and help managers make decisions (Al-Ghareeb, 2022). The results revealed that there was a positive effect for knowledge information processes (knowledge identification, knowledge planning, knowledge dissemination, knowledge generation, knowledge

storing and organization, knowledge application) on organizational innovation, either individually or as a whole (Abusharar, 2019). The results revealed that artificial intelligence contributed to improving the economic situation by inventing new methods that enhance the process of creativity and development; therefore, transparency and knowledge-sharing by all the concerned parties had a critical role in enhancing productivity and promoting the competitive status towards more future innovation (Cockburn et al., 2018). Compatibility between open innovative processes was more evident through adopting the concept of artificial intelligence, given its role in innovation management- artificial intelligence promoted cooperation related to achieving open creativity, where the sequencing of the open innovative processes facilitated innovation management through implementing artificial intelligence (Kuzior, et al., 2023). The results showed an integrative relationship between artificial intelligence and innovation based on the Japanese experiment that mimic artificial intelligence and its relationship with innovation (Hathli and Al-Sheikh, 2022).

Based on the above-mentioned, the following hypotheses were formulated:

The hypotheses:

Ho1: there is no significant impact at (α≤ 0.05) for business intelligence (data collection and analysis, real- time data processing, business performance management, competitive intelligence) on organizational innovation (product innovation, process innovation) at Jordanian commercial banks.

The sub-hypotheses were consequent from this hypothesis as follow:

Ho1.1: there is no significant impact at (α≤ 0.05) for business intelligence (data collection and analysis, real-time data processing, business performance management, competitive intelligence) on product innovation at Jordanian commercial banks.

Ho1.2: there is no significant impact at (α≤ 0.05) for business intelligence (data collection and analysis, real-time data processing, business performance management, competitive intelligence) on process innovation at Jordanian commercial banks.

Ho2: there is no significant impact at (α≤ 0.05) for business intelligence (data collection and analysis, real-time data processing, business performance management, competitive intelligence) on organizational innovation (product innovation, process innovation) through the moderating role of artificial intelligence at Jordanian commercial banks.

The conceptual Framework:

Business Intelligence (BI):

Business intelligence is considered amongst the modern managerial methods adopted by organizations currently, where business intelligence refers to the set of techniques used by organizations to collect, store and analyze data in order to make the suitable decision in the suitable time (Bozic and Dimovski, 2019, 39). Business intelligence is an inclusive term for all the required activities to (collecting data, storing and analyzing) in order to create the right decisions (Nuno and Arnold, 2018). It refers to one of the domains related to business applications that depend on computer to advocate decisions, manage data correctly and analyze smart data (Dogan, 2021). Business intelligence also refers to the high-quality information in the data stores that are designed accurately, the tools provided to users in the suitable time, in addition to the correct data-analysis that contribute to making the right decisions (Popovic, et al., 2019). Also, it refers to the set of tools, applications and practices which help organizations classify, analyze and store data based on the technological infrastructure practices of those organizations (Chen and Len, 2021). The dimensions of business intelligence can be outlined as follows:

Data Collection and Analysis (DCA): It refers to the set of techniques and tools that are used to collect data from several resources, and then analyze and show those data by employing specialized tools to improve the process of decision making (Hussein and Al-Shammari, 2017). This dimension also refers to the first step of business intelligence systems, where the needed data are collected based on scientific techniques and methods (Sweis and Abdeen, 2018). Furthermore, data are collected from the internal and external sources according to the previously-set objectives which, in turn, contributes to making the right decisions (Laudon, 2014).

Real-Time Data Processing (RDP): during this stage, the previously-collected data are classified into categories, where the links and connections between data are evacuated in order to generate accurate and high-quality data (Stair and Reynolds, 2018). In this stage, data are processed according to the organization's changing activities, and the nature of data is changed constantly to become more effective. Then, data are stored, retrieved temporarily, and a set of analytical activities are performed simultaneously (Qishta and Abudan, 2020). During this stage, the previously collected and classified data are converted into valid information, where the relationships and validity of such information are verified in order to conclude valuable data. The processing stage includes several steps, including verifying the validity of data, distributing them according to certain characteristics, and classifying them based on the nature of usage (Al-Omoush, 2020).

Business-Performance Management (BPM): it is considered as the basic structure for organizing and analyzing work methodologies. It also refers to the systems relating to directing the performance of organizations which, in turn, converts the organization's objectives into applicable plans (Abbas, 2018). This stage also refers to the organizational tools that are used in analyzing and managing organizational performance in order to achieve the targeted objectives and provide solutions to the possible barriers (Van Decker, et al., 2017). It refers to the set of scales used by organizations to monitor their performance, where the various departments of organizations can utilize the tools and techniques to determine the strategic objectives that include operational elements, such as financial planning (Sharda and Dublin, 2020).

Competitive Intelligence (CI): it refers to the processes with correct methodologies that include a set of activities through which business organization's needs of business intelligence are determined. Then, the data are collected, analyzed, classified, and published in the external surroundings to help decision makers achieve the organization's objectives (Al-Dudlaimi & Khader, 2019). Competitive intelligence is also considered as a method used by organizations to uncover the competitive environments, with their threats and opportunities, by collecting data about competitors and their strategies, in addition to information about customers and products, so as to use them to develop competitive strategies (Sameera and Khalifa, 2017). Competitive intelligence is a mechanism that gives an early warning that helps business organizations investigate the threats and opportunities in the competitive environment, where organizations analyze data and perform effective practices that are based on right decisions (Elwan, 2020).

Organizational Innovation (OI):

It refers to the extent of employing the new ideas in the markets relating to making changes in the processes of business (Tiqawi, et al., 2019). This step precedes organizational creativity, and includes implementing innovative ideas, and is viewed as a basic element for organizational change, which is considered as a guidance that increases the organization's ability to compete within business environment (Hilal et al., 2020). It is a process which includes a number of tasks consisting of digital techniques as well as advanced practical strategies and applications, in addition to more innovative production processes (Niu, et al., 2023). It is also defined as developing new products, where it adds an additional value for stakeholders. Therefore, innovation has a critical role in making an accelerating change for developing products (Chatterjee, et al., 2019). Others defined it as overseeing the future by finding suitable ideas that contribute to adding more profits and value to organizations in order to achieve the competitive advantage (Salem, 2024). The dimensions of organizational innovation can be outlined as follows:

Product Innovation (PDI): it refers to introducing new products or developing the current ones by developing the adopted product methods, where the process of improvement includes the characteristics and usage of products. Changes can be performed in the nature and content of products as well as the functions for which such products are designed. Also, change can be comprehensive and radical, where the new products are different from the current ones, or the change can be gradual by modifying the current products and improving them to be compatible with the requirements of customers (Abdulaziz, 2016). Product innovation also refers to finding modern and innovative methods that contribute to making new products, where the organization can be pioneer with regard to providing innovative services by customizing financial resources to the domains of research and development- in this vein, new products and services are provided after training individuals in organizations to develop products for new and distinctive customers (Obialor

and Obialor, 2022). Product innovation also represents a number of changes that take place to products, either as goods or services, where such changes cannot be imitated by other organizations. Therefore, the concept of innovation goes hand in hand with the concept of modernization (Karim et al., 2017).

Process Innovation (PCI): it includes the innovations related to developing new production methods in order to reduce cost and increase customer satisfaction. This can be done by using new tools and methods to enhance production and promote the efficiency of production activities, where the change could be radical and related to work methods, or gradual and related to improving the ingredients of the product. Process innovation also includes the marketing processes related to design, packaging, distribution, and transportation (Al-Qudah, et al., 2020). Process innovation refers to the process of performing work tasks effectively by making modification to products in order to improve the production methods, the used procedures and the methods of delivering products. It represents initiatives that are invisible to customers, but take place inside the organization (Simo, et al., 2023). Process innovation demonstrates the changes relating to developing or implementing new methods for production and marketing, through which the organization can reduce costs, improve quality and gain customer satisfaction (Tang, 2015).

Artificial Intelligence (AI):

It refers to the processes that are performed by computers in order to simulate the human intelligence, imitate his behavior and thinking style as well as the mechanisms of decision making. This process is performed by investigating the human behavior and monitoring the actions and reactions performed by people. Then, there is assimilation concerning the way through which people think and make decisions by using too complex computer systems (Mohammad, 2020). Artificial intelligence has a critical role in promoting innovations by accelerating the processes of discovery, where it helps environmental systems by exploiting the power of data provided through hybrid cloud to create applicable insights (Marshall et al., 2021).

Artificial intelligence has high capabilities that advocate innovation in the future, where it supports open innovation, since it is implemented by using educational logarithms in order to accelerate the discovery process, and enhance collective intelligence (Kuzior, et al, 2023). It is defined as the computer's ability to act and think just like human beings, where the computer systems mimic the human behavior and thinking (Gocen and Ayedmire, 2020). Artificial intelligence is considered as an advanced domain in computer sciences, where it is significantly used to implement a number of tasks that require human intelligence, such as finding solutions to major problems, thinking logically, and analyzing the educational process by using a large set of data (Li et al., 2024).

METHOD:

The researcher depended on the quantitative descriptive approach, where the study is considered as a quantitative one in terms of the used methods, and an applied study in terms of its nature as it was applied to the Jordanian commercial banks. So, this study addressed the causal relationships between the study variables and dimensions (Al-Najjar, et al., 2020: 53-55).

Participants:

The participants are all the employees in the top and middle management at Jordanian commercial banks, with a total of (898) employees. A proportional stratified random sample was used, and the appropriate study sample size was (270) employees according to the sampling table (Sekeran and Bougie, 2016, 263). Therefore, the researcher distributed (300) questionnaires to ensure obtaining the required percentage of responses, and only (285) questionnaires were analyzable.

The Analysis Unit:

The analysis unit included all the employees in the senior and middle management at Jordanian commercial banks.

Validity and Reliability

Validity test:

This test confirmed the validity of the study questionnaire, in terms of the connection between the variables items, where the results revealed that the items of the questionnaire were clear and accurate. In addition to introduced it to a number of academics and experts, where their notices were taken into attentions.

The Reliability Test:

The reliability test was performed in order to verify the internal consistency between the items of each dimension and the study variables. Cronbach alpha coefficients were calculated for the independent variable, where the values of Cronbach alpha are shown in table (1).

First, the reliability for the items of the independent variable (BI).

Table 1: Cronbach alpha coefficients for the independent variable (BI) and its dimensions

Dimensions	Items Number	Cronbach Alpha Coefficients
DCA	4	0.898
RDP	4	0.895
BPM	4	0.894
CI	4	0.889
BI	16	0.942

Table (1) shows the reliability values for the dimensions of (BI) by using Cronbach alpha, where all the dimensions have high reliability values, as the overall reliability of the independent variable is (0.942). The results also reveal that each individual dimension in the independent variable has a high degree of reliability.

Second, the reliability for the items of the dependent variable (OI**):**

Table 2: Cronbach alpha coefficients for the dependent variable (OI) and its dimensions

Dimensions	Items Number	Cronbach Alpha Coefficients
PDI	4	0.866
PCI	4	0.913
OI	8	0.927

The previous table shows the Cronbach's alpha for the (OI) dimensions, where all the dimensions have high reliability values, as the overall reliability of the dependent variable is (0.927). The results also reveal that each individual dimension in the dependent variable has a high degree of reliability.

Third, the reliability for the items of the modified variable (AI**):**

Table 3: Cronbach alpha coefficients for the modified variable(AI)

Variable	Items Number	Cronbach Alpha Coefficients
AI	10	0.918

Table (3) shows the reliability value for the variable of (AI) by using Cronbach alpha, where it has a high reliability value of (0.918), indicating that the Moderating variable has a high reliability value.

Since all the values in the previous tables are more than (0.70), we may conclude that there is an internal consistency between the scale items. Therefore, the study instrument has an acceptable reliability degree, and it is valid for usage (Al-Najjar et al., 2016).

Hypotheses Testing:

The researcher used the regression analysis to test the first main hypothesis, stating" there is no significant impact at ($\alpha \leq 0.05$) for business intelligence (data collection and analysis, real- time data processing, business performance management, competitive intelligence) on organizational innovation (product innovation, process innovation) at Jordanian commercial banks".

where various inflation factor and tolerance were used to calculate the values of correlation between (DCA, RDP, BPM, CI). The results showed that the values of variance inflation factor for the

independent variable (BI) were less than (10) and range between (2.688 - 4.145). Also, the value of tolerance for all the dimensions of the independent variable ranged between (0.2039-0.308), where all the values were more than (0.05), indicating the validity of performing regression analysis test to the first study hypothesis (Sekeran and Bougie, 2016).

In order to verify the lack of autocorrelation for the regression model of testing the hypotheses, (Durbin-Watson) coefficient was calculated- the values ranging between (0-4) confirm the lack of this problem in the study data (Montgomery, Peck and Vening, 2001).

Accordingly, the results confirmed the possibility of applying multi regression analysis to test the main study hypothesis, as illustrated in table (4).

Table 4: Analysis of variance to test (Ho1)

Model	**Total square**	**Degree of freedom**	**Mean square**	**f-value**	**Sig.**
Regression	125.01	4	31.252	*247.82	0.00
Differences	35.44	281	0.126	-	-
Total	160.45	285	-	-	-
Correlation coefficient (R)	0.883				
Determination coefficient (R^2)	0.779				
Adjusted determination coefficient (R^2)	0.776				

* Sig. at (α≤ 0.05)

Table (4) reveals the calculated (f-value) was (247.82) at a degree of freedom (281 and 4), where these values are Sig. at (α≤ 0.05). Also, it shows that (BI) account for (77.90%) of variance in (OI) at Jordanian commercial banks.

This finding confirms the impact of (BI) on achieving (OI) at Jordanian commercial banks. The results also show a decline in the differences between the value of determination coefficient and the adjusted determination coefficient, indicating independency of the (BI) concerning its impact on the (OI). Table (5) shows the results of regression coefficients analysis in order to test the statistical significance for the dimensions of (BI).

Table 5 :**Multi regression test to determine the impact of (BI) on (OI) at Jordanian commercial banks**

	Non-standardized coefficients	**Standardized coefficients**		**(t)**	**Sig.**
Dimensions	B	Std. error	Beta		
DCA	0.393	0.053	0.349	*7.424	0.000
RDP	0.390	0.054	0.333	*7.174	0.000
BPM	0.189	0.055	0.165	*3.412	0.001
CI	0.185	0.047	0.155	*3.947	0.000

*Sig. at (α≤ 0.05)

Table (5) shows that there is a significant impact at (α≤ 0.05) for all the dimensions of BI (DCA, RDP, BPM, CI) on (OI) at Jordanian commercial banks, the calculated (t-values) of the dimensions are (7.424), (7.174), (3.412) and (3.947), respectively, where all these values are significant at (α≤ 0.05).

Based on tables (4) and (5), we rejected the (Ho1), and accept the (H1), stating "there is a significant impact for (α≤ 0.05) for (BI) with its dimensions (DCA, RDP, BPM, CI) on (OI) with its dimensions ((PDI), (PCI)) at Jordanian commercial banks".

In order to test (Ho1.1), stating" there is no significant impact at (α≤ 0.05) for business intelligence (data collection and analysis, real-time data processing, business performance management, competitive intelligence) on product innovation at Jordanian commercial banks". analysis of variance was performed, as illustrated in table (6).

Table 6: Analysis of variance to test (Ho1.1)

Model	Total square	Degree of freedom	Mean square	f-value	Sig.
Regression	134.76	4	33.692	*181.56	0.00
Differences	52.14	281	0.186	-	-
Total	186.90	285	-	-	-
Correlation coefficient (R)	0.849				
Determination coefficient (R^2)	0.721				
Adjusted determination coefficient (R^2)	0.717				

*Sig. at (α≤ 0.05)

Table 6 shows the calculated (f-value) was 181.56 at degrees of freedom of (4, 281) ,where these values are significant at (α≤ 0.05). Also it shows the (BI) with its dimensions (DCA, RDP, BPM, CI) accounted for (72.10%) of variance in (PDI) at Jordanian commercial banks.

This finding confirms the impact of (BI) on achieving (PDI) as one of (OI) dimensions at Jordanian commercial banks. The results also show a decline in the differences between the determination coefficient and the adjusted determination coefficient, indicating the independency of (BI) concerning its impact on (OI). Table (7) shows the results of regression analysis to test the statistical significance to the dimensions of (BI).

Table 7: Multi-regression analysis to determine the impact of (BI) on (PDI) at Jordanian commercial banks

	Non-standardized coefficients	Standardized coefficients		(t)	Sig.
Dimensions	B	Std. error	Beta		
DCA	0.447	0.064	0.368	*6.965	0.000
RDP	0.531	0.066	0.419	*8.047	0.000
BPM	0.141	0.067	0.114	*2.100	0.037
CI	0.047	0.057	0.036	*0.825	0.410

* Sig. at (α≤ 0.05)

Table (7) shows that there is a significant impact at (α≤ 0.05) for all the dimensions of BI (DCA, RDP, BPM, CI) on (PDI) at Jordanian commercial banks, the calculated (t-values) of the dimensions are (6.965), (8.047), (2.100) and (0.825), respectively, where all these values are significant at (α≤ 0.05).

Based on the tables (6) and (7), we reject the (Ho1.1), and accept the (H1.1), stating "there is a statistically significant impact at (α≤ 0.05) for BI with its dimensions (DCA, RDP, BPM, CI) on (PDI) at Jordanian commercial banks".

In order to test (Ho1.2), "there is no significant impact at (α≤ 0.05) for business intelligence (data collection and analysis, real-time data processing, business performance management, competitive intelligence) on process innovation at Jordanian commercial banks". analysis of variance was performed, as illustrated in table (8).

Table 8: Analysis of variance to test (Ho1.2)

Model	Total square	Degree of freedom	Mean square	f-value	Sig.
Regression	118.84	4	29.711	*157.369	0.00
Differences	53.05	281	0.189	-	-
Total	171.89	285	-	-	-
Correlation coefficient (R)	0.831				
Determination coefficient (R^2)	0.691				
Adjusted determination coefficient (R^2)	0.687				

*Sig. at (α≤ 0.05)

Table (8) shows that the calculated (f-value) is 157.369 at degrees of freedom of (4, 281), where these values are significant at (α≤ 0.05). Also, it reveals that (BI) with its dimensions (DCA, RDP, BPM, CI) account for (69.10%) of variance in (PRI) at Jordanian commercial banks.

This finding confirms the impact of (BI) on achieving (PRI) as one of (OI) dimensions at Jordanian commercial banks. In addition, the results show a decline in the differences between the determination coefficient and the adjusted determination coefficient, indicating the independency of the independent variable (BI) concerning its impact on the dependent variable. Table (9) shows the results of regression analysis to test the statistical significance for the dimensions of (BI).

Table 9: Multi-regression analysis to determine the impact of (BI) on (PRI) at Jordanian commercial banks.

	Non-standardized coefficients	**Standardized coefficients**		**(t)**	**Sig.**
Dimensions	B	Std. error	Beta		
DCA	0.338	0.065	0.291	*5.229	0.000
RDP	0.250	0.067	0.206	*3.749	0.000
BPM	0.237	0.068	0.200	*3.495	0.000
CI	0.323	0.057	0.261	*5.633	0.000

*Sig. at (α≤ 0.05)

Table (9) shows that there is a significant impact at (α≤ 0.05) for all the dimensions of BI (DCA, RDP, BPM, CI) on (PRI) at Jordanian commercial banks, the calculated (t-values) of the dimensions are (5.229), (3.749), (3.495) and (5.633), respectively, where all these values are significant at (α≤ 0.05).

Based on tables (8) and (9), we reject the (Ho1.2), and accept the (H1.2), stating "there is a significant impact at (α≤ 0.05) for BI with its dimensions (DCA, RDP, BPM, CI) on process innovation at Jordanian commercial banks".

Hierarchical regression was used to test (Ho2), stating" there is no significant impact at (α≤ 0.05) for business intelligence (data collection and analysis, real-time data processing, business performance management, competitive intelligence) on organizational innovation (product innovation, process innovation) through the moderating role of artificial intelligence at Jordanian commercial banks". The results are shown in table (10).

Table 10: Hierarchical regression analysis to determine the role of artificial intelligence(AI) to improving the impact of business intelligence (BI) on organizational innovation(OI).

Dependent variable	**Independent variables**	**First model**			**Second model**			**Third model**		
		B	(t)	Sig.	B	(t)	Sig.	B	(t)	Sig.
	BI	1.16	30.77	0.00						
	AI				0.49	22.589	0.00			
	BI * AI							0.31	5.78	0.00
	(R)		0.81			0.85			0.89	
	(R^2)		0.66			0.72			0.79	
OI	(ΔR^2)		0.66			0.06			0.11	

*Sig. at (α≤ 0.05)

Table (10) reveals that inserting the Moderating variable (AI) has improved the impact of (BI) with its dimensions (DCA, RDP, BPM, CI) on (PI) with its dimensions (PDI, PRI) at Jordanian commercial banks. Also the results show that the increase in the determination coefficient was (11%), which is statistically significant at (α≤ 0.05). Accordingly, we can conclude that the moderating variable (artificial intelligence) has promoted the impact of business intelligence on organizational innovation at Jordanian commercial banks.

Hence, we reject the (Ho2), and accept the (H2), stating "there is a statistically significant impact at (α≤ 0.05) for business intelligence (data collection and analysis, real-time data processing, business performance management, competitive intelligence) on organizational innovation (product

innovation, process innovation) through the moderating role of artificial intelligence at Jordanian commercial banks".

DISCUSSION:

In this study, the author investigated the impact of business intelligence (BI) on organizational innovation (OI) through the moderating role of artificial intelligence. The study concluded that the Jordanian commercial banks use a set of business intelligence techniques, including (data collection and analysis, real-time data processing, business performance management, competitive intelligence) in order to achieve organizational innovation at the level of product and process, where artificial intelligence improved the relationship between them. Variance analysis, multi-regression analysis and hierarchical regression analysis were used to verify the assumption.

The results revealed that business intelligence with its dimensions had an impact on organizational innovation with its dimensions at Jordanian commercial banks. The effect percentage in the first model was (0.66), which improved to become (0.72) in the second model, and after inserting the adjusted variable (artificial intelligence), the percentage increased to become (0.79). The results showed that the highest influential dimension on organizational innovation with its two dimensions was data collection and analysis, while the highest influential dimension on product innovation was real-time data processing, and the highest influential dimension on product innovation was data collection and analysis.

Therefore, the (Ho1) was rejected, and the (H1) was accepted, as it stated that there was an impact for business intelligence with its dimensions on organizational innovation with its dimensions at Jordanian commercial banks. However, competitive intelligence was excluded from the model, since there was no statistical significance concerning product innovation. This finding agreed with (Al-Ghareeb, 2022) which confirmed the impact of business intelligence with its dimensions on organizational innovation, and suggested that the information derived from business intelligence systems contributed to formulating organizational strategies and helped managers make decisions. This finding also agreed with (Al-Tahir, 2022) which suggested that business intelligence had an effect on the behaviors of innovative activities. The results showed that innovation in mini and medium companies had a positive effect, and that using (BI) (data stores, data mining, data show, analytical processing, data processes) positively affected institutional excellence with managerial innovation as a mediating variable.

The results showed that artificial intelligence had a prominent role in improving the relationship between business intelligence and organizational innovation, where the determination coefficient achieved an increase of (11%). Therefore, (Ho2) was rejected, and the (H2) was accepted, as it stated that there was an impact of business intelligence with its dimensions on organizational innovation with its dimensions at Jordanian commercial banks through the moderating role of artificial intelligence. This finding also agreed with Kuzior, et al., (2023) which suggested that there was an agreement between open innovation processes based on adopting the concept of artificial intelligence due to its contribution to innovation management. The results showed that artificial intelligence had an important role in enhancing corporation that was closely related to achieving open innovation, where the sequencing of open Innovation processes contributed to innovation management by implementing artificial intelligence. The findings also agreed with Hathali and Al-Sheikh (2022) that confirmed a relationship between artificial intelligence and innovation.

CONCLUSION:

This study contributed to enhancing a cognitive basis by using the theoretical and practical evidence about the variables and relationships addressed by the study. The study investigated the way of enhancing the capabilities of the Jordanian commercial banks through the role of (BI) in achieving (OI) based on the moderating role of (AI). Therefore, the study investigated the relationships that provided a valuable basis for identifying the relationship between (OI) and the dimensions of (BI) at Jordanian commercial banks as follow:

First, the impact of data collection and analysis on organizational innovation:

The results showed more interest among the Jordanian commercial banks with regard to collecting accurate data relevant to the targeted objectives, where these banks stored data in professional way

that facilitates access to them when needed. Also, data analyzed by using modern methods in order to help managers take the suitable decisions related to providing new services. Furthermore, the stored data were used to convert generous ideas from those data into services, where the methods of providing services to customers were improved.

Second, the Impact of Online and Electrical Processing on Organizational Innovation:

The Jordanian commercial banks used the newest programs and systems in order to process data after analysis, where the produced information was provided to the concerned parties. These banks have always attempted to make the outcomes of the proceeding processes accurate and clear in order to facilitate the process of inserting new customers as compared to other competitors. The services provided to customers resulted in considerable changes in the sector of banks, where all the activities that didn't add value to the bank's processes are excluded.

Third, the Impact of Business-Performance Management on Organizational Innovation:

The results showed that the management of the Jordanian commercial banks sought to monitor performance in order to achieve an obvious strategic vision that is based on involving employees in the managerial process, in terms of setting goals and making decisions. The management staff also used tools and technology in order to analyze and manage performance to achieve the targeted objectives which, in turn, contributed to enhancing efforts of research and development of new services.

Fourth, the Impact of Competitive Intelligence on Organizational Innovation:

The Jordanian commercial banks sought to set effective strategies by using business intelligence systems. These banks also used competitive intelligence to investigate the changing environmental conditions in order to determine the threats and opportunities to which the Jordanian commercial banks were exposed, and innovate new methods and procedures to improve services- these banks did efforts to make changes in designing services to monitor the new developments and satisfy customers.

Fifth, the Role of Artificial Intelligence in Improving the Impact of Business Intelligence on Organizational Innovation:

The Jordanian commercial banks sought to adapt with the surrounding environment and the accelerating technological developments by using artificial intelligence systems, where those systems contributed to achieving tasks, solving problems and making decisions. Therefore, artificial intelligence had a prominent role in improving the impact of business intelligence on innovation, in terms of providing new services, improving the current services, or developing methods for providing services by using new innovative techniques, particularly when organizational innovation had become amongst the most important organizational innovations adopted by the commercial banks to cope with the strong competition.

Recommendations:

The necessity of urging the commercial banks to possess protection systems in order to prevent any violation to the systems and databases by enhancing their interest in business intelligence systems to improve the services provided to customers and cope with the developments provided by the other sectors.

The necessity of hiring employees who are qualified in the analytical skills in order to make regular improvement to business intelligence systems and achieve more innovations at the level of products or process.

The necessity of developing technical capabilities of the employees in charge of business intelligence at the technical level by holding training courses, and at the operational level based on work teams in order to enhance their ability to solve the operational problems and develop technical solutions.

Paying more attention to predictive future analysis in order to understand the behavior of customers which, in turn, contributes to making qualitative decisions, where this can be done by being more concerned with business intelligent systems that help commercial banks to provide the best services to customers.

The necessity of urging the Jordanian commercial banks to adopt clear strategies for applying artificial intelligence in order to develop new products or insert improvement to current products and processes.

The necessity of integrating business intelligence systems and artificial intelligence systems in order to achieve clear visions about the future of commercial banks find proactive solutions to customers' needs, and investigate the behavior of customers.

Designing smart platforms that integrate business intelligence systems and artificial intelligence systems in order to monitor the performance of banks and enhance the innovative domains by analyzing data and converting them into strategic insights about the innovative improvements in products and processes.

The Study Limitations and Suggestions for Future Research:

This study included a number of limitations and suggestions for future research, as follows:

The current study only focused on the impact of business intelligence on organizational innovation through the adjusted role of artificial intelligence, where the future research can address other variables, such as organizational success, and entrepreneurship, or use a mediating variable between business intelligence and organizational innovation, such as organizational creativity or knowledge-sharing.

This study was limited to the Jordanian commercial banks, where the future studies can choose broader population, such as Islamic Banks or industrial companies.

The study focused on the dimensions of business intelligence represented by (data collection and analysis, real-time data processing, business-performance management, competitive intelligence), where the future studies can focus on other dimensions of business intelligence, such as (data mining, data stores, and report show).

This study used the questionnaire as an instrument for collecting data, where this instrument cannot be free from bias for respondents. Therefore, the future studies can select other less biased instruments to collect data, such as interview and observation.

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