“Artificial intelligence applications for enhancing organizational excellence: Modifying role of supply chain agility”

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ARTIFICIAL INTELLIGENCE APPLICATIONS FOR ENHANCING ORGANIZATIONAL EXCELLENCE: MODIFYING ROLE OF SUPPLY CHAIN AGILITY

Abstract

The study's goal was to demonstrate the modifying role of supply chain agility in the impact of artificial intelligence applications on organizational excellence in Jordanian e-commerce companies. The analytical and descriptive approach was adopted. The study population consisted of 160 companies operating in the e-commerce sector in Jordan. The sample comprised 400 respondents working in senior and middle management positions. The questionnaire was utilized to collect the data. The results showed an impact of artificial intelligence applications in all dimensions (expert systems and neural networks) on the organizational excellence of e-commerce companies in Jordan. The value of the adjusted coefficient of determination (Adj. R2) was .265%. Based on the model's F value (4.1190) and its level of significance (P; 0.00), the impact of these techniques on organizational excellence is statistically significant. Additionally, the results displayed an impact of supply chain agility on improving the impact of artificial intelligence applications on organizational excellence. The value of the degree of influence ß after introducing the modified variable supply chain agility and the value of R Square increased by .11 at the significance level (Sig). = 0.000. This study recommended training workers to stay up to date with developments in artificial intelligence, expert systems, and neural networks in their operations, control of searching for this evidence within databases, and knowledge representation.

Keywords supply chain agility, artificial intelligence, organizational excellence, e-commerce, Jordan

JEL Classification L81, O33, Q55

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INTRODUCTION

The global crises have created pressure on companies to operate efficiently and respond to changes with excellence. The presence of new technology, such as artificial intelligence, has given companies opportunities to advance and thrive in multiple areas, such as supply chains and organizational excellence. However, artificial intelligence involves exploring ways to guide computers in performing tasks humans excel at, utilizing general-purpose applications like perception and logical reasoning (Hunt, 2014). Barnes and Zvarikova (2021) stressed that artificial intelligence science seeks sophisticated and advanced ways to program it and perform actions and conclusions similar to how human intelligence works. It also identifies the forms of intelligence and then simulates its various properties. Artificial intelligence science aims to resemble those processes in which the human mind works (Weng, 2012). Moreover, artificial intelligence enhances the computer's problem-solving and decision-making capabilities, mirroring the logical and organized thinking of the human mind. It aims to represent accounting programs and enhance the fundamental relationships among its elements (Dear, 2019).

Cobb (2018) indicates that the organizational excellence approach has become a vital paradigm for business growth and sustainability. This approach focuses on continuous learning, value creation, and improvement. Organizational excellence has become one of the fundamental pillars in improving the overall performance of business organizations (Bement, 2014). It plays an essential role in enhancing employees' values, beliefs, and behaviors (Al-Hashem, 2023). However, supply chain agility has become an important phenomenon, as it is characterized by the swift and effective response to operational disruptions and market dynamics (Craig & Easton, 2011). Furthermore, supply chain agility focuses on the resources exchanged between the organization and its customers, the organization, and suppliers through the supply chain (Gligor et al., 2019). Supply chain agility is the ability of organizations to overlook the flow of information, materials, services, and funds across any activity to maximize the effectiveness and efficiencies of operations (Swafford et al., 2008). This can be done by responding quickly to disturbances in operational processes through flexible planning and forecasting for emergencies that start from sourcing materials to the final delivery of products (Boubaker et al., 2019).

E-commerce companies in Jordan are experiencing an escalation in the variety and intricacy of administrative processes due to significant expansion in their activities. This has led to businesses being under heightened pressure to embrace modern administrative methods and tools, such as AI. Moreover, supply chain agility plays a critical role in optimizing resource utilization and enhancing operational efficiencies. However, there is a gap in understanding how supply chain agility mediates the impact of AI applications on organizational excellence within e-commerce companies in Jordan.

1. LITERATURE REVIEW AND HYPOTHESES

Intelligence is considered one of the complex processes capable of enabling a living organism to adapt continuously, in which thought and action correspond to means and ends. Artificial is a word related to the creation and has become widespread and used in various fields as a result of an action that happens when something is manufactured as unique and exists naturally (Nilsson, 2009). Al-Sukkar et al. (2013, p. 5) indicate that "the origin of the science of artificial intelligence is centered on research that studies methods for representing models in computer memory and searching and matching between its various elements in a way that summarizes its goals." It is also based on conducting various conclusions, such as deducing through reason and logic, comparison, or induction (Pantic et al., 2005). Artificial intelligence is concerned with automating human behavior and creating intelligent computer systems that exhibit human intelligence in their behavior (Hildmann, 2018).

The foundation of artificial intelligence lies in crafting sophisticated systems that store millions of data in computers, forming a fundamental database akin to how information is kept in the human mind through learning and acquired experience (Al-Sayed, 2020). Subsequently, tailored programs are created, enabling computers to engage with this data logically when confronted with decision-making challenges (Mahmoud & Attiyat, 2016). Illustrations of AI encompass personal computers and robots capable of engaging in discussions with humans and executing vocal instructions (De Choudhury & Kiciman, 2018). This science also examines advanced methods and techniques for programming accounting systems used in developing systems that simulate human intelligence and allow the possibility of deducing laws and facts represented in the computer's memory (Pannu, 2015). These systems are represented by expert systems and neural networks, which were adopted as independent variables in this study.

The first is an expert system. It is a domain where knowledge is structured, and research is managed within knowledge bases. These systems were devised to extract expertise and incorporate it into an expert system, acting as a substitute for humans and facilitating the transfer of these experiences to others. Moreover, they excel in solving problems at a swifter pace than human experts (De Choudhury & Kiciman, 2018). Expert systems are dedicated computer systems constructed upon information bases within an exact domain of expertise. Their applications encompass designing

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diverse schemes, arranging customer orders, assigning resources to activities, and managing operations (Najdawi et al., 2008).

The second is a neural network. It is an extensive processor system distributed in parallel designed to simulate the human mind. This system consists of basic processing items that constitute computational units referred to as "nodes or neurons." It is also characterized by a neuronal characteristic that stores experimental information and practical knowledge to make it available to its users (Fagerholm et al., 2018). These networks compromise several nodes that commit certain calculations as a group; each node is seen as a tiny, conventional computer unit that operates in parallel based on the existence of interactions between them. Networks are mathematical models displayed as diagrams or basic algorithm entities. They simulate features observed in computer systems processing information, offering solutions to intricate problems in parallel. These networks are comprised of relatively simple elements referred to as neurons (Al-Bakri & Al-Sayed, 2010).

The definition of organizational excellence stems from the focus of modern administrative schools on defining this concept to illustrate that scientific management has defined efficiency as a criterion for organizational excellence. However, the human relations movement focused on the workers' social needs. Simultaneously, modern administrative approaches have added concepts, such as quality of life, teamwork, organizational culture, organizational environment, organizational effectiveness, and other concepts that focus on achieving the organization's overall goals (Jawad, 2010). Kanji and Moura E Sá (2001) indicates that organizational excellence represents an advanced stage of proficiency in superior work in managing the organization, achieving goals, and reaching the best results with high professionalism and excellence. Soon and Zainol (2011), on the one hand, defined organizational excellence as the organization's effectiveness from an organizational standpoint and the continuation and sustainability of that effectiveness through achieving harmony and compatibility between working individuals. On the other hand, they defined organizational excellence as the work systems and activities specified in the organization's strategy.

Organizational excellence is viewed as the organization's ability to solve the problems it faces and achieve and reach unprecedented results in which the organization outperforms other organizations that work with it in the same field (Aldalimy et al., 2019). Organizational excellence drives the organization to seize appropriate opportunities to implement business strategies, makes it qualified to strengthen alliance relationships between supplier and customer, and works to enhance its capabilities to achieve a sustainable competitive position (Al-Najjar & Al-Hayali, 2013). Ringrose (2013) indicates that the importance of organizational excellence comes from organizations' need to collect information to make crucial decisions. They also need to continuously improve the work of their members so that they can help the organization and make it more distinguished in performance compared to competitors (Zayed, 2018). Thus, organizational excellence is the organization's overall superiority over its counterparts through providing the best products and services and interacting with customers and public who deal with it through interactive relationships, so organizational excellence in management has become one of the tools for achieving competitiveness (Pozega et al., 2014).

Supply chains have become a vital phenomenon due to the cost restriction through which the company desires can be achieved and the potential gained from outside opportunities due to the interactions between the business and its suppliers as well as with customers (Martel & Klibi, 2016). Supply chains describe all the interrelated elements and processes necessary to ensure the adequate amount of product at the right time and place at the lowest possible cost (Green et al., 2014). Arzu Akyuz and Erman Erkan (2010) demonstrated that the supply chain affects performance development, is the most interactive with its internal and external environment, and is dependent on its success or failure. Given that the survival and existence of the firm depend on its interaction with the environment, company management must respond to and adapt to environmental changes by acting in a manner that is appropriate for these changes (Nelson et al., 2007). Thus, the flexibility of the supply chain is represented by the ability of the company's control systems to monitor the changes that take place in the remote work

environment and adapt to its variables. This starts from the process of preparing and processing products from their origin as raw materials until they become ready for consumption by the end customer (Salgueiro et al., 2010) as well as for food supplements, novel foods and as a source of essential oils and aromatic extracts. The non-availability or inadequacy of standards for checking and assuring the quality of aromatic plants and spices is one of the main problems that arise for industry when using such raw materials. As many aromatic plants are harvested from the wild, standardization to assure their quality is important for their safe and effective utilization in food and beverage industries. On the other hand, there are numerous parameters that influence the chemical composition of plants, which play an important role in the final quality of the product and possibly in any risk arising to the consumer. Also, from a safety point of view, aromatic plants and spices should be free of undeclared contaminants and adulterants, such as toxic botanicals, pathogenic microorganisms and excessive levels of microbial toxins, pesticides or fumigation agents. People focus on these aspects and examine ways to assure their appropriate utilization from the quality and safety standpoint. The regulatory situation of medicinal and aromatic plants are called MAPs.

Fayezi et al. (2017) indicate that supply chain agility refers to the company's capacity to change or ability to respond to risks with little return in time, effort, cost, or performance. This helps coordinate materials and finished products, facilitate production and inventory processes, allocate facilities, and transport between the chain's parties, achieving efficiency and rapid response to the final customer (Tse et al., 2016). This current viewpoint regarding supply chain agility offers strategic advantages and practical benefits; thus, a competitive advantage can be achieved for all supply chain partners (Chen, 2019). Based on continuous change and responding to changes in customers' needs, desires, and tastes, supply chain agility is a rapidly growing concept that includes developing and adapting relationships between the chain parties to provide value to the final customer (Wahyuni, 2012). That is, it focuses on delivering the product to the customer at the minimum cost, highest quality, and in the shortest time (Arif-Uz-Zamane et al., 2018).

Drohomeretski et al. (2018) find supply chain agility vital to involving companies from suppliers and buyers to respond and adapt in an organized manner to create the best possible flow of information and resources, improve relationships between chain participants, and keep everyone's attention on adding value for the end user. Al-Muqaiti (2021) noted a statistical correlation between the extent of artificial intelligence utilization and the overall performance quality of universities in Jordan. Zarrouqi and Falta (2020) displayed theoretical programs incorporating AI to enhance opportunities for self-training and contribute to students' effectiveness in the educational process. Al-Bashtawi and Al-Baqmi (2015) decided that preserving the assets and files that hold information and business data is one of the prerequisites for putting expert systems into banks. Helmy (2012) determined that applying artificial neural networks is crucial for identifying fundamental errors during the audit of financial statements.

Al-Ajeeb and Al-Najjar (2022) showed that the significance of organizational excellence variables was notably high and that strategic thinking impacted organizational excellence. Moreover, Al-Buhaira (2021) concluded that the expansion and interest of companies in compensation strategies contribute to achieving excellence in their organizational performance. Al-Jedaiah and Albdareen (2020) found a positive correlation between the human resources management strategy and the degree of organizational excellence. Fok-Yew and Hamid (2021) showed a correlation and influence between lean manufacturing and organizational excellence. Alkharabsheh and Al-Sarayreh (2022) found that leaders' strategic intelligence impacts organizational excellence. Al-Omari (2017) concluded that organizational change has an impact on organizational excellence. Boulter (2005) showed that organizational excellence strategies improve organizational excellence.

Al-Rawashdeh (2023) suggested that risk management affects the agility of supply chains in the Arab Potash Company. Al-Hassan (2022) concluded that electronic supply chain agility has an impact on the operational performance of chemical industry companies. Brandenburg et al. (2019) showed the importance of sustainable sup-

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ply chain management: theoretical development, performance measurement, and quantitative and qualitative support. Yu et al. (2018) revealed that integrating external information and supply chain agility, reactive and proactive, and its response to uncertain conditions improve operational performance. Errassafi et al. (2019) found that the mediating role of supply chain responsiveness does not influence the impact of supply chain integration on operational performance.

Therefore, the organizational excellence of business organizations is achieved by relying on artificial intelligence, as it is a global field in modern business practice that is suitable for all orientations and studies on directing computers to emulate tasks performed more proficiently by humans. This requires companies to find a new mechanism related to how they can reduce chain risks and improve them through supporting their agility to meet their requirements, with the need to determine the prospects for dealing with the data. Hence, this study explores how artificial intelligence can influence organizational excellence. It also focuses on how the supply chain affects this relationship. This paper seeks to address problems of the effective integration of AI technologies and the enhancement of supply chain agility, all of which help organizations achieve organizational excellence in the dynamic and competitive world of e-commerce. In light of the literature review, the following hypotheses were formulated:

Ho1: The combined dimensions of AI applications do not affect organizational excellence in Jordanian e-commerce companies.

Ho1-1: Expert systems do not affect organizational excellence in Jordanian e-commerce companies.

Ho1-2: Neural networks do not affect organizational excellence in Jordanian e-commerce companies.

Ho2: Supply chain agility does not improve the impact of artificial intelligence applications in all their dimensions (expert systems and neural networks) on organizational excellence in Jordanian e-commerce companies.

2. METHODOLOGY

The descriptive and analytical methods were relied upon to evaluate the modifying role of supply chain agility in the impact of AI applications on organizational excellence in Jordanian e-commerce enterprises. The study sample consists of companies operating in Jordanian e-commerce sector that have registered with the Ministry of Industry and Trade, amounting to 160 companies (Amman Chamber of Commerce, 2022).

The study sample is random, as approximately 480 questionnaires were sent via the Internet; 403 questionnaires were retrieved, representing 83.9% of the total number of questionnaires distributed. After sorting them, three were excluded due to incomplete filling out. Thus, the sample consisted of 400 respondents working in middle and senior management positions within the companies included in this study, which were subjected to statistical analysis, with a percentage of 83.3% of the final sample.

The questionnaire was presented to a panel of arbitrators from Jordanian university professors in management and statistics to judge its suitability as a data collection tool. Internal consistency was tested to determine how reliable the data collection tool was using Cronbach's alpha coefficient, totaling 92.7%, which is an accepted percentage that has high reliability for the result of the current study (Sekaran, 2016). As for the data collection method, the study relied on a questionnaire as a primary source, while books, periodicals, and scientific dissertations were used as secondary sources. The paper used the statistical program (SPSS) to extract the field study results such as frequencies, averages, proportions, the multiple and simple regression test, and the hierarchical multiple linear regression test.

3. RESULTS AND DISCUSSION

This study examines the impact of applications in all their dimensions (expert systems and neural networks) on organizational excellence in Jordanian e-commerce companies. It also explains how supply chain agility enhances the impact of artificial intelligence applications on organizational excellence in Jordanian e-commerce companies.

Table 1. Means and standard deviations for expert systems

S	Statements	Mean (M)	Standard deviation (SD)	Importance level	Rank
1	Software applications are utilized in e-commerce based on databases within a certain field of expertise.	3.775	0.7299	High	4
2	Electronic commerce utilizes expert systems by translating them into computer programs.	3.565	0.6804	Med	8
3	Expert systems play a role in extracting knowledge to address problems within the context of e-commerce.	3.905	.6835	High	2
4	Enhancing e-commerce processes involves the utilization of advanced programming languages.	3.670671	0.8221	Med	7
5	Expert systems are utilized because they can provide advice and make correct decisions in relation to electronic commerce.	3.9170	0.6212	High	1
6	Control and knowledge over e-commerce processes are displayed within databases.	3.695	0.6731	High	6
7	The expert system serves as a hierarchical framework expressing the body of accounting data pertinent to electronic commerce operations.	3.859	0.6006	High	3
8	In the expert system, e-commerce processes are encoded and saved in the knowledge base system after being entered into a program.	3.753	0.7384	High	5
Expert systems		3.767	High		

Table 1 alludes that the averages for expert systems reached an elevated level (3.767), and their averages were between 3.9170 and 3.565. The statement "Expert systems are utilized because they can provide advice and make correct decisions in relation to electronic commerce" came with a mean of 3.9170, while the statement "Electronic commerce utilizes expert systems by translating them into computer programs" came in last position with 3.565. The SD reveals the degree to which values deviate from the mean of all elements. Notably low, these deviations suggest that responses from the research sample are closely aligned and largely comparable.

This result emphasizes the importance of expert systems that help departments and workers at various administrative levels to implement e-commerce operations, make decisions, and solve the problems they encounter. This result is consistent with Al-Bashtawi and Al-Baqmi (2015), whose findings indicated that one of the necessities for implementing expert systems is the need to preserve their files and assets containing data and info relevant to the business processes.

Table 2 alludes that the overall means for neural networks were at an increased level and reached 3.740,

Table 2. Means and standard deviations for neural networks

S	Statements	Mean (M)	Standard deviation (SD)	Importance level	Rank
9	Neural networks are employed to seamlessly execute e-commerce operations in an integrated electronic form, implementing them effectively.	3.836	0.6875	High	3
10	Neural networks are used to store information about electronic commerce operations in links and connections	3.728	0.6968	High	4
11	In the e-commerce process, electronic central processing units take the form of neurons, giving users information.	3.589	0.8352	Med	7
12	Neural networks are incorporated into math models of e-commerce operations, structured as diagrams that simulate features present in computer networks.	3.565	0.6805	Med	8
13	Neural networks play a role in processing information related to e-commerce operations and offering parallel solutions to complex problems.	3.906	0.6836	High	2
14	Neural networks play a role in presenting clear solutions and recommendations to the user within e-commerce operations.	3.670	0.8221	Med	6
15	Users can input instructions and information related to e-commerce operations into neural networks, facilitating the retrieval of relevant information.	3.917	0.6212	High	1
16	Neural networks allow the stages of e-commerce operation to be explained in order to reach a resolution.	3.706	0.6871	High	5
Neural network		4037.3	High		

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and their means were between 3.917 and 3.565. The statement "Users can input instructions and information related to e-commerce operations into neural networks, facilitating the retrieval of relevant information" was with a mean of 3.917. In contrast, the statement "Neural networks are incorporated into math models of e-commerce operations, structured as diagrams that simulate features present in computer networks" comes last with a mean of 3.565. The low SD indicates that the values are minimally dispersed from the means of all items. This suggests that the responses from the study participants are closely aligned and largely similar.

This result emphasizes the importance of neural networks as one of the excellent and suitable instruments for dealing with problems pertaining to identifying and categorizing patterns. Computer neurons include all aspects capable of completing e-commerce operations and practically implementing them by storing experimental information and practical knowledge in communications, links, and processing units that constitute computational elements. This result is consistent with Helmy (2012), who concluded that it is important to apply artificial neural networks to discover crucial mistakes when auditing financial statements.

Table 3 shows that for the dependent variable, organizational excellence, related means ranged between 3.822 and 3.487. The statement "The company is interested in excellence and achieving elevated levels of organizational performance and a good reputation" comes first with a mean of (3.822). The statement "The company seeks to achieve excellence in order to achieve high financial returns and commitment to social responsibility and volunteer initiatives" comes in last with a mean of 3.487.

The application of artificial intelligence enhances organizational excellence and achieves high levels of organizational performance and continuous improvement. In addition, this can express the individual's sense of connection to the company's goals and values and the role the individual plays in achieving company goals. This can illustrate the individual's commitment to functional values and cultivating team spirit for the company's sake and not for his own interests. In particular, the applications of artificial intelligence contribute to making employees more capable of achieving company goals. Since the vision for the work is transparent and integrated, this can lead to the prevalence of a kind of discipline and commitment in completing tasks. This finding aligns with Al-Ajeeb and Al-Najjar (2022), who demonstrated the relatively high importance of organizational excellence.

Table 4 demonstrates that the overall means of the modifying variable, supply chain agility, were

Table 3. Means and deviations for the dependent variable: Organizational excellence

S	Statements	Mean (M)	Standard deviation (SD)	Importance level	Rank
17	The company is interested in excellence and achieving elevated levels of organizational performance and a good reputation.	3.822	0.7290	High	1
18	The company invests its available resources to improve organizational performance in accordance with standards and considerations related to its objectives.	3.775	0.7617	High	5
19	The company is keen to apply advanced concepts in quality systems and total quality management.	3.542	0.7446	Med	8
20	The company is keen to improve business results and organizational activities and achieve sustainable growth.	3.761	0.9232	High	6
21	The company analyzes deviations, if any, so that the necessary corrections can be made.	3.810	0.7251	High	2
22	The company examines its financial and economic position using financial analysis and administrative review.	3.790	0.8149	High	3
23	The company evaluates businesses and activities, which includes comparing results with pre-determined standards.	3.547	0.7901	Med	7
24	The company seeks to achieve excellence in order to achieve high financial returns and commitment to social responsibility and volunteer initiatives.	3.487	0.7446	Med	9
25	The company is keen to build team spirit among employees and form relationships between employees.	3.782	.7331	High	4
Organizational excellence		3.701		High	

Table 4. Means and deviations for the modifying variable: Supply chain agility

S	Statements	Mean (M)	Standard deviation (SD)	Importance level	Rank
26	The company has the ability to handle complex orders that carry different specifications to meet customer needs.	4.000	.7303	High	1
27	The company has capabilities to manufacture products that satisfy consumers at a lower cost and with a higher value.	3.960	.6416	High	3
28	The company is capable of rapid production and prompt response to partner relationships and process adoption for specific products.	3.981	.7831	High	2
29	The company takes into account the balance between its production capabilities and the volume of demand for products.	3.631	.8301	Medium	7
30	The company can adapt to the requirements of the surrounding environment, develop management capabilities, and address sudden changes.	3.565	.8380	Medium	8
31	The company is able to make and create changes in its internal operations to ensure it can confront the various changes and threats it faces.	3.552	.8229	Medium	9
32	The company handles circumstances that require adjustments to ensure delivery on time and associated plans with customers without errors.	3.684	.7157	Medium	6
33	The company has the ability to adapt methods for building information systems in a way that suits its information needs.	3.855	.7607	High	5
34	The company has capabilities to carry out several tasks and duties at the same time by focusing on exchanging the required information between its departments and suppliers.	3.881	.8321	High	4
Modifying variable: Supply chain agility		3.789		High	

at an elevated level (3.789), and the related means ranged between 4.000 and 3.552. The statement "The company has the ability to handle complex orders that carry different specifications to meet customer needs" had the mean of 4.00, and its relative rank was high. The findings also demonstrated that the statement "The company is able to make and create changes in its internal operations to ensure it can confront the various changes and threats it faces" got the lowest mean based on the participants' answers, with the mean of 3.5520, and the relative rank of this statement was medium. However, the SDs are low, indicating that the participants' answers are, to an extreme extent, close and similar.

Table 5 clearly indicates that the combined use of AI applications (expert systems and neural networks) as independent variables (R) accounts for 51.5% of the variations among e-commerce companies in Jordan regarding organizational excellence. The value of Adj. R2 was .265%. Based on the model's F value (4.1190) and its level of significance (P; 0.000), it becomes clear that the impact of these techniques on organizational excellence is statistically significant. Table 5 shows that expert systems had the greatest impact on organizational excellence, as the value of the standard coefficient (β) reached 0.697 and is statistically significant. In addition, the t-value was significant (Sig), less than the significance level (0.05).

Table 5. Multiple and simple linear regression test: Impact of AI on organizational excellence of e-commerce companies in Jordan

Correlation coefficient (R) = 0.515, coefficient of determination (R2) = 0.265, and adjusted coefficient of determination (Adj R2) = .177					
Analysis of variance (ANOVA)					
Model	**Sum of squares**	**Degrees of freedom**	**Square of means**	**F-value**	**Sig.**
Regression (LR)	9.5540	2.0	4.7770	4.1190	0.000*
Residual value (RV)	26.5040	397.0	0.066		
Total (T)	36.0580	399.0			
Transaction (Coefficients)					
Model		**Standard error (SE)**	**Standard coefficients (Beta)**	**T-value Test**	**Sig.**
Fixed limit (0.789)			4.8320	6.1210	0.000
Expert systems (ES)		0.305	0.697	.97330	0.000
Neural networks		0.365	0.505	3.9420	0.000

Note: *(Statistically significant) at the significance level (≥ α 0.05).

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Table 6. Hierarchical multiple linear regression test for the second hypothesis

Dependent variable	Independent variables	The first model			The second model		
		ß	T	Sig	ß	T	Sig
Organizational excellence	Artificial intelligence	.480	4.538	.000	.371	4.193	.000
	Supply chain agility				.462	11.501	.000
	R		.802			.869	
	R Square		.644			.754	
	R Square Change		.644			.111	
	F Change		106.167			132.266	
	Sig. F Change		.000			.000	

Subsequently, neural network showed a standard coefficient (β) reaching 0.505, signifying statistical significance, given that the significance value of t (Sig) was below the significance degree of 0.05.

Accordingly, the initial main null hypothesis is not accepted, and the alternative hypothesis is accepted: "There is an impact of artificial intelligence applications in all their combined dimensions (expert systems, neural networks) on organizational excellence in e-commerce companies in Jordan." In that, the sub-hypotheses emanate from it; the initial hypothesis and its corresponding sub-hypotheses, including the first one, are rejected, while the alternative hypotheses are affirmed. The alternative hypothesis is: "There is an impact of expert systems on organizational excellence in e-commerce Jordanian companies."

Moreover, the significant *t* value (Sig) was below the significance degree (0.05). The second hypothesis is not accepted, and the alternative hypothesis received support and was accepted: "There is an effect of neural networks on organizational excellence in e-commerce companies in Jordan." The significant *t*-value (Sig) was below the degree of significance (0.05). This result aligns with Al-Muqaiti (2021), who emphasized a statistically significant correlation between the level of artificial intelligence utilization, its overall score, and the quality of performance.

These results confirm the importance of cognitive developments in e-commerce companies, which led to the need to provide tools and means that aid them in improving their processes. Hence, AI techniques serve as a novel and advanced approach to minimizing errors. Artificial intelligence techniques also help companies reach a high level of precision and excellence when choosing the right decisions. These decisions depend on employing precise information to gather, store, and analyze data from applications, information management systems, and technology.

Table 6 shows the impact of supply chain agility on improving the impact of AI applications on organizational excellence. By analyzing the results of the hierarchical multiple regression analysis tests based on the two models in Table 6, the findings show the value of the impact degree ß reached .480 of the change occurring within organizational excellence at a significance level Sig = 0.000. Moreover, the second model, the modified variable, supply chain agility, was entered to become the values of the degree of influence ß (.371, .462). The results also showed that the value of *R* Square increased by .11 for this model at a significance level Sig = 0.000.

In light of this test's findings, the study rejects the second null hypothesis and embraces the alternative hypothesis, "There is an impact of supply chain agility in improving the impact of artificial intelligence applications in all their dimensions (expert systems, neural networks) on organizational excellence in Jordanian e-commerce companies."

CONCLUSION

This study aimed to demonstrate the modifying role of supply chain agility in the impact of AI applications on organizational excellence in Jordanian e-commerce companies. The results showed an impact of AI applications in all dimensions (expert systems and neural networks) on organizational excellence.

It also showed the impact of supply chain agility in improving the impact of AI applications on the organizational excellence of e-commerce companies in Jordan.

Moreover, this study confirms the importance of using artificial intelligence to control the work performed by e-commerce companies. It stands as a field within computer science that endeavors to discover modern and advanced methods for programming, aiming to replicate certain properties of human intelligence and gain a deeper understanding of its surrounding facets. In addition, it resembles the complex processes that take place in a person's mind when thinking about things around him and translating those mental processes into corresponding and related processes that work to elevate the computer's ability to deal with complex problems and work to solve them.

The study recommends training workers in e-commerce companies to catch up with the developments in artificial intelligence and its technologies represented by expert systems and neural networks in their operations, control of searching for this evidence within databases, and knowledge representation. Alongside the rising interest in expert systems among e-commerce companies for their role in organizational excellence, it is imperative to transform them into computer-embraced programs. Furthermore, it benefits from neural networks, especially in providing solutions, the reasons for providing these solutions, and clear and comprehensive recommendations to the user about e-commerce operations. The study also recommends that e-commerce companies match their production capabilities with customer demands and provide flexible production systems because they help improve work productivity and increase profits. Therefore, managers should consolidate the concept of supply chain agility in companies by holding courses for employees to learn about the significance of agility in the supply chain.

AUTHOR CONTRIBUTIONS

Conceptualization: Mohammad Alnadi.
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