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Impact of Supply Chain Integration on the Success of Projects in Engineering Companies Specialized in Project Management

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Abstract*: This study aimed at identifying supply chain integration and its impact on the success of projects in engineering companies specializing in project management in Jordan. The researcher used a descriptive-analytical approach to analyze the collected data and classification to describe the phenomenon and the researched population and used the analytical part to reach the results of the study. a questionnaire has been developed to collect data. The sample of the study consisted of 118 project managers in these companies. The researcher used the statistical package for social sciences (SPSS) program to analyze the data and test the hypotheses of the study. The researcher concluded that there is a significant statistical effect at the level of (α≤ 0.05) for the integration of the supply chain in its dimensions (relations with suppliers, supply chain structure, supply integration, storage) on the success of projects in its dimensions (Just in time, quality of the project, and cost of the project) in engineering companies specialized in project management. Based on the results of the study, the researcher recommended several recommendations, the most important of which is the need to continue the partnership, coordination, and cooperation between the company and its suppliers in the areas of decision-making, such as product design decisions, decisions to develop materials specifications, and decisions to improve production methods.*

Keywords: Supply Chain Integration, Success of Project, Engineering Companies, Jordan.

Introduction

In light of the challenges faced by modern businesses, such as globalization and the pursuit of international operations, which result in increased competition, companies have been keen on achieving efficiency and effectiveness in their performance. They strive to maximize their creative and innovative capabilities to ensure their survival, growth, and profitability. This is accomplished through improving their operations management with distributors, suppliers, and internal and external customers. These efforts include supplier relationship management and customer relationship management to provide products or services that meet their needs and requirements (Eckstein, Goellner, Blome, & Henke, 2015).

Amidst global competition, companies have adjusted their strategies and started focusing on customer satisfaction as the key to their sustainability, continuity, and development. This requires improving the level of product delivery and service to customers and achieving the desired performance (Ali, Abualrejal, Mohamed Udin, Shtawi, & Alqudah, 2021). One of the methods that can be used to achieve the desired performance is supply chain integration. In recent years, the integration and responsiveness of the supply chain have gained significant importance in both theoretical and practical realms. Numerous literature and studies have highlighted the role of supply chain integration in improving company performance by integrating internal and external functions and effectively connecting them with suppliers, customers, and other supply chain partners (Uhl-Bien & Arena, 2018).

The importance of supply chain integration lies in creating integration among the core activities of the company, starting from project planning and control related to materials, supplies, and services, as well as the flow and exchange of information from suppliers to producers, ultimately reaching the final service delivered to the end consumer (Hussein Mohammed Abualrejal, Alqudah, Ali, Saoula, & AlOrmuza, 2022).

The study problem was inferred through interviews conducted by the researcher with project managers in each of the Jordanian engineering companies operating in the city of Amman. During which it was found that many Jordanian

engineering companies adopt different patterns in managing their engineering projects(Obaid et al., 2022). It needs to focus and pay attention to the integration of the supply chain represented by managing these projects from how to obtain work-related resources in addition to how to deal with both suppliers and customers by sharing information, materials and activities and committing to implementing them efficiently to meet customer needs(Alrifai et al., 2023).

Engineering companies specializing in project management in Jordan are responsible for managing and executing engineering and construction projects. They strive to keep up with advancements in their field, particularly in general management and project management. This is crucial for achieving a competitive advantage(Ali et al., 2021). Keeping up with developments in project management involves the companies' ability to possess the necessary knowledge, understanding, and skills to manage a project with minimal cost and high-quality operations, thereby surpassing competitors and positioning themselves in an advanced competitive position(Nuseir & Elrefae, 2022).

Therefore, this study aims to investigate the impact of supply chain integration on project success in engineering companies specializing in project management. It seeks to examine the extent to which these companies implement such strategies and provide recommendations that may assist engineering companies specializing in project management in Jordan in the future.

The existing gaps in knowledge give rise to the following research inquiries:

How does supply chain integration contribute to the success of engineering projects in specialized project management companies?

To what extent do engineering companies in Jordan implement supply chain integration strategies in their project management practices?

What are the key factors or barriers that affect the implementation of supply chain integration in engineering project management in Jordan?

LITERATURE REVIEW

Relationship with Suppliers

The degree of coordination between suppliers and manufacturers in decisions pertaining to inventory management, cooperative planning and supply represents the nature of this relationship. The author posits that effective communication plays a pivotal role in attaining supplier integration, fostering cooperation, and cultivating a durable relationship grounded in mutual trust. This, in turn, manifests in the efficacy of problem-solving and decision-making processes. The integration of suppliers is associated with various advantages for the company, such as the provision of resources and capabilities that contribute to market entry timing, cost reduction in production, and improvement in product quality. Additionally, the speaker emphasized that organizations actively pursue enduring partnerships with suppliers that are founded on principles of transparency and commitment. These relationships manifest in various ways, which are outlined below: Negotiations play a crucial role in the functioning of business operations, as they facilitate interactions with suppliers. These negotiations are typically driven by intense competition among suppliers, wherein the first party seeks to maximize its gains while the second party faces potential losses(Hult, Ketchen, & Chabowski, 2007). The outcome of these negotiations is contingent upon the relative negotiating power held by each party. Companies often strive to secure lower prices from suppliers, while suppliers may exert pressure to maintain higher prices based on the quality standards they establish and deliver(Abu Al-Rejal, Udin, & Yusoff, 2018).

Supply Network Structure

The establishment of a strong partnership relationship and closer ties between a company and its supplier can be facilitated by a range of factors, such as emerging trends, shared success, mutual trust, and collaborative learning. Additionally, the company's adherence to certain practices plays a crucial role in attaining the desired level of partnership with its suppliers. Cooperation is exemplified in the interplay between a company and its supplier, wherein both entities collaborate closely to mutually support and enhance each other's capacities and capabilities. The structure of the supply network is an essential aspect to consider in the field of supply chain management. The supply chain

structure pertains to a system of interconnected individuals or organizations that are bound together by adaptable connections due to the mutual reliance of their respective objectives and interests(Dumitrascu, Dumitrascu, & Dobrotă, 2020) .The advent of globalization and the dynamics of international competition have contributed to the intricate nature of supply chain structures over the past decade. This has been accompanied by the involvement and engagement of numerous entities, including companies and stakeholders(Ali, Udin, & Abualrejal, 2023b). Consequently, a phenomenon known as the expanding supply chain has emerged, encompassing the following parties: The primary providers of raw materials. Producers refer to the entities that bear the responsibility of manufacturing various products, encompassing both raw materials and finished goods(Ali, Abualrejal, Mohamed Udin, Shtawi, & Alqudah, 2022). Distributors refer to the entities that engage in the trading of inventory across the supply chain, encompassing both raw materials and finished products. Retailers are entities that engage with the general public, specifically the end consumers, and occupy a position in close proximity to the market. As a result, they play a crucial role in determining and assessing the demand requirements. Customers refer to the entities, whether they be organizations or individuals that engage in the purchase and utilization of products within the supply chain. Service providers encompass a range of companies that offer their services to various stakeholders involved in the supply chain, including producers, distributors, retailers, and consumers. The structure of the supply chain entails establishing collaborative partnerships or joint relationships among multiple parties. This necessitates cultivating mutual trust, ensuring a high level of dependability, and fostering effective communication within the chain. Ultimately, the goal is to foster cooperative relationships and strategic alliances among the supply chain members. In order to guarantee the efficacy of the established framework for this series(Ali, Udin, & Abualrejal, 2023c).

Supply Integration

The supply function in the supply chain is represented as the activity responsible for providing the material needs or resources necessary for the smooth functioning and regularity of the company's operations, including production and sale, such as raw materials, supplies, equipment, means of transportation, and commodity and service requirements, with economic quantity, appropriate quality, appropriate price, and appropriate supply and supply conditions(Ali et al., 2023c). The best sources.

The supply integration process is represented by the sub-processes related to shipping, transporting, receiving and checking materials to ensure that they conform to the standards in terms of types, items, quantities and specifications(Wilden, Gudergan, Nielsen, & Lings, 2013). As it is considered and the supply function in the supply chain is more than just a one-time process, and perhaps for several limited times, it includes as a continuous function the planning of supply operations, organizing the supply department or department and defining supply procedures and policies, in addition to conducting the necessary research to determine the desired characteristics and specifications before Carrying out any supply process and those related to the selection of appropriate sources of supply, how to negotiate with them, shipping and transportation conditions, insurance for the goods, and inspection and examination procedures necessary for receipt(Hult et al., 2007).

Storage

Warehousing is one of the widespread elements that exist throughout the supply chain, whether it is the storage of raw materials, in operation, or finished goods. Singh, et. al. 2010 pointed out the importance of providing a storage system by the company. This is because the warehousing process consumes resources, time, and money greatly(Hussein M. Abualrejal, Abu Doleh, & Mohtar, 2017). Therefore, these operations must be planned and managed accurately through quality standards in managing and monitoring the warehousing activity, and following it up to maintain the integrity of the inventory and maintain the quality of the product, as warehousing aims to obtain the required goods in quantities. And the right situation, in the right place, at the right time, in an inexpensive manner, and compatible with the customer's requirements(Brockner et al., 2006).

As the initial benefits of the supply chain for customers are achieved through the reduction in the storage process by transporting the products directly to the place of purchase or the place to be delivered to, and then after that they are stored, and whoever does that is the primary responsible for them(Zhou & Benton, 2007).

Project Success Dimensions

There are a set of recognized dimensions for the success of projects, as they are considered among the components of project success management and must be available in order to reach the success of projects, the most prominent of which are:

Quality of Project Operations

Which is represented by all the works and operations related to the completion of the project and defining the tasks related to the project, as the success of the project depends on its containing the processes that contribute to its success and ensuring its quality, in other words, that it contains all the processes necessary to determine all the works, operations and needs of the project, Identifying all parts that are not related to the project, as one of the reasons for the failure of projects is the failure to define the processes, tasks and needs necessary for its completion; In order for companies or institutions to ensure the success of their projects, it is necessary to ensure accurate and good identification of needs through continuous communication with the beneficiaries of the project.

Project quality processes are defined as the processes in which quality is ensured and monitored in all activities and project production inputs, through the use of technical methods in monitoring and quality assurance. The project quality process is the process of applying all quality management systems through policies and procedures with activities that contribute to improving Continuous operations that are implemented during the implementation period of the project, in order to ensure obtaining high-quality outputs that achieve the common goals of all parties of common interest.

Project Cost

Which is represented in the process of planning the costs established for the implementation of the project with the availability of the proposed study for the establishment of the project, which is called the initial study in the feasibility study of the project, and the project management team prepares full estimates about the costs of the project (Roh, Lin, & Jang, 2022).

Project cost is defined as a set of operations necessary for planning and estimating the costs allocated for project implementation, making the budget and financing the project, in addition to how to provide and manage financial resources and work on controlling costs related to the project to ensure its completion according to the plans set for it and achieve the desired goals(Scott-Young & Samson, 2008).

Whereas (Hussein M. Abualrejal et al., 2017) defined the project cost as all the important operations to guarantee the completion of the implementation of the project work in accordance with the financial budget approved by the project management, and also includes resource planning, budget cost planning, and cost control(Ali et al., 2021).

Just In Time

The time-bound production process is the process through which the project work plan is transformed into a schedule or schedule for operation, i.e. to ensure a specific time for the implementation and completion of the project.(Bartezzaghi & Turco, 1989) defined it as how to manage time effectively and efficiently by the project management in order to complete the project. Project activities (products or services it provides) and deliver them at the agreed time and date(Alrifai et al., 2023).

Hence, we note that timely production management is related to project time management by organizing all efforts from planning schedule management, defining activities and their series, then estimating their resources and estimating their duration, and then adjusting the schedule and monitoring any change to the schedule to avoid delays in delivery Project on time(Hussein Mohammed Abualrejal et al., 2022).

Supply Chain Integration and Enterprise Success

By talking about the success of projects, it was noted that the success of projects depends primarily on the project management processes, which, as I mentioned above, are represented in the coordination and organization of all the processes of project requirements. The advanced modern systems lead to the ineffectiveness of the supply systems,

the delay in the production requirements of materials, and this negatively affects the satisfaction of customers. Therefore, it was necessary to follow good strategies to manage the operations of their projects, especially the engineering companies specialized in project management. These strategies are related to the supply chain strategy (Ali et al., 2023c).

As engineering companies follow the supply chain in their projects, it contributes to reorganizing their project management processes in terms of improving and organizing supply tasks and activities and improving their performance, thus raising the efficiency and effectiveness of performance, which contributes to achieving the success of the project's objectives(Ali et al., 2022).

Whereas, the relationship may be positive between the use of integration in the supply chain, represented by integration in the operations of departments and even end users, whether products or services, in addition to the formation of customer satisfaction, which indicates one of the indicators of the success of applying the supply chain in engineering projects(Hilhorst, Desportes, & de Milliano, 2019).

Conceptual Model

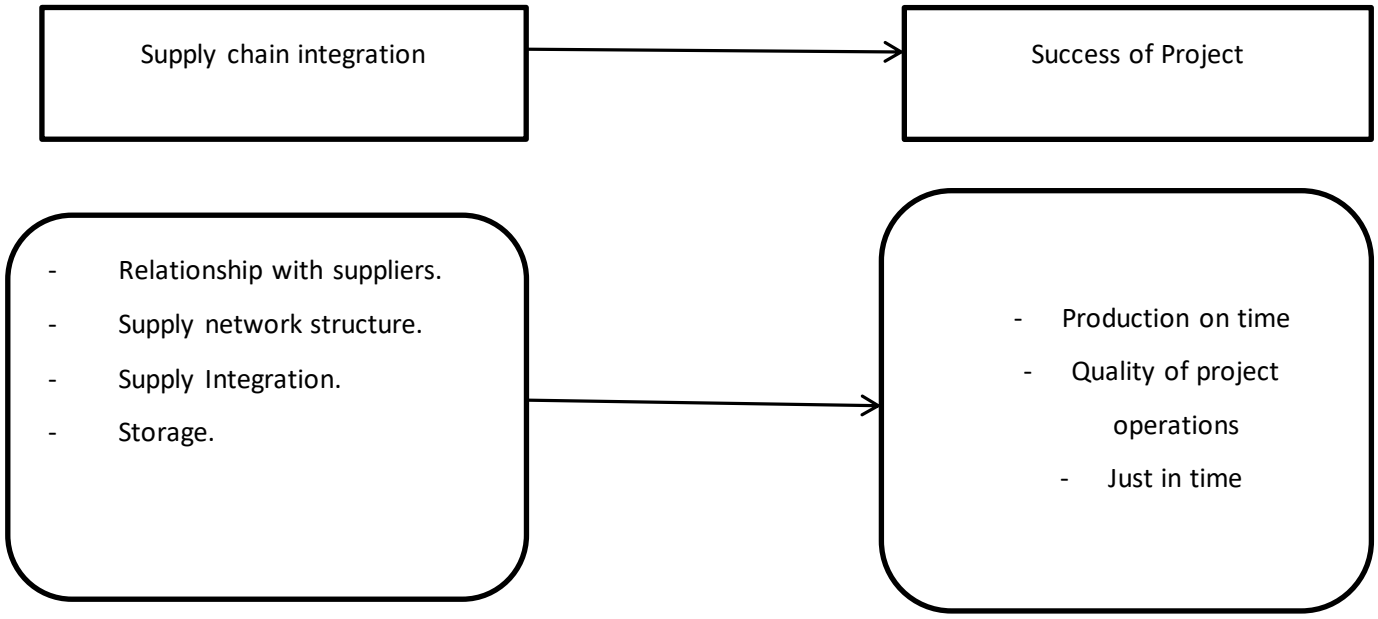

FIGURE 1: The study's model

Research Model

This study relied on the analytical descriptive approach, to deal with the collected data and classify it, in order to describe the phenomenon and the researched community, and the analytical part of it to obtain the results of testing the hypotheses of the study and to know the impact of supply chain integration on the success of projects in engineering companies specialized in project management.

The study population consisted of all (211) engineering consulting companies specialized in project management, as mentioned in the records of the Offices Authority of the Jordanian Engineers Association (2022).

(140) consulting engineering companies specialized in project management were selected depending on the size of the projects completed or to be completed. The questionnaires were retrieved (124) of them and after checking them, (6) questionnaires were excluded because they were not valid for analysis in terms of incomplete answers. Thus, the number of valid questionnaires for statistical analysis was (118), which constituted (84.3%) of the number of questionnaires. Distributed questionnaires, and the following table shows the distribution of the study sample according to demographic and functional variables.

Data analysis

Questionnaires due to their lack of validity of the analysis in terms of the incompleteness of the answer in it, and thus the number of valid questionnaires for conducting statistical analysis on them was (118) questionnaires, which constituted (84.3%) of the number of distributed questionnaires, and the following table shows the distribution of the study sample individuals according to demographic and functional variables.

Table (1): Distribution of respondents according to demographic and employment variables

Variables	Category	Repetition	percentage
Type	Mention	104	88.1
	female	14	11.9
	Total	**118**	**100**
Age group	Less than 30 years old	2	1.7
	From 30 to 40 years old	16	13.6
	From 41-50 years old	73	61.9
	51 years and over	27	22.9
	Total	**118**	**100**
Educational level	Intermediate diploma or less	3	2.5
	BA	74	62.7
	Higher Diploma	1	.8
	M.A.	31	26.3
	Ph.D.	9	7.6
	Total	**118**	**100**
Years of experience in current location	Less than 5 years	39	33.0
	5-10 years	44	37.3
	From 11 to 15 years old	16	13.6
The number of years of experience in the company	Over 15 years old	19	16.1
	Total	**118**	**100**

Hypotheses Test

The main hypothesis: There is no statistically significant effect at the significance level ($0.05 \geq \alpha$) of supply chain integration with its dimensions (relations with suppliers, supply network structure, supply integration, storage) on project success (on-time production, quality of project operations, project cost) In engineering companies specialized in project management.

To test the hypothesis, the researcher conducted a multiple regression test to detect the presence of an impact in order to integrate the supply chain with its dimensions (relations with suppliers, supply network structure, supply integration, storage) on the success of projects (production on time, quality

Project operations, project cost) in engineering firms specializing in project management at the significance level ($0.05 \geq \alpha$), and the following are results presented:

Table (2): Multiple Regression Analysis of the main hypothesis

Independent variable	Transactions			Summary Form			ANOVA	
	Beta	t	Statistical significance t	R Correlation coefficient	R2 The coefficient of determination	R2 the average	f	Statistical significance "f"
Independent variable	.157	2.027	.045	.660[a]	.436	.416	21.807	.000[a]
Relationship with suppliers	-.120	-1.684	.095					
The structure of the supply network	.461	6.513	.000					
Supply integration	.368	4.759	.000					

Table 2 presents the dimensions of the supply chain integration dimension model, namely relationships with suppliers, supply network structure, supply integration, and storage. The impact of these dimensions on project success, specifically on-time production, project process quality, and project cost, is examined in the context of engineering firms specializing in project management. The findings of this study indicate that the identified dimensions of supply chain integration have a significant influence on project success in these firms. The statistical significance level of the test was found to be less than 0.05, indicating a significant result. Additionally, the relationship coefficient (R) between the independent and dependent variables was calculated to be 0.660, suggesting a strong and satisfactory relationship.

The R2 value represents the coefficient of determination in the regression model, indicating the proportion of variance in the dependent variable that can be explained by the independent variable. A higher R2 value indicates a stronger relationship between the variables. Therefore, the highest attainable R2 value is considered the most accurate. The numerical representation of the value of this model is expressed as a percentage, specifically 43.6%. Furthermore, the adjusted coefficient of determination represents the proportion of variance that can be accounted for by conducting the analysis on the dataset of the representative population under investigation. In this particular study, the adjusted coefficient of determination was found to be 41.6%. It is worth noting that the disparity between this value and the coefficient of determination (R2) is minimal, with a difference of only 2%. This suggests that the variables included in the model possess a strong predictive capability for the values of the dependent variable.

Upon examining the impact of each dimension of the independent variable, it becomes evident that the dimensions, namely relationship with suppliers, structure of the supply network, and storage, exhibit a statistically significant influence on the success of projects. This significance is observed at a significance level of 0.05 ($\alpha \geq 0.05$). Specifically, the value of the relationship variable with suppliers (4.759) surpasses its critical value (1.96) at a

significance level of 0.000. Similarly, the supply network structure variable (2.027) reaches significance at a level of 0.045, and the storage variable (6.513) achieves significance at a level of 0.000. However, it is worth noting that the dimension of "supply integration" does not demonstrate any significant impact. Based on statistical analysis at a significance level of 0.05 ($\alpha \geq 0.05$), the observed value of t (-1.684) is smaller than the critical value (1.96) at a significance level of 0.095, which exceeds the predetermined significance level of 0.05.

The impact of integrating the dimensions of the supply chain on project success was assessed using an ANOVA test. The results, shown in Table 15, indicate that the F value was 21.807, with a significance level of 0.000, which is less than the threshold of 0.05. Consequently, the null hypothesis is rejected, and the alternative hypothesis is accepted. The alternative hypothesis posits that there exists a statistically significant impact, at a significance level of $\alpha \leq 0.05$, of supply chain integration across various dimensions (namely, relations with suppliers, supply network structure, supply integration, and storage) on the success of projects, as measured by on-time production, quality of project operations, and project cost. Engineering companies that specialize in project management.

The first sub-hypothesis: There is statistically significant effect at the significance level ($0.05 \geq \alpha$) of supply chain integration in its dimensions (relations with suppliers, supply network structure, supply integration, storage) on production at the specified time in engineering companies specialized in project management.

To test the hypothesis, the researcher conducted a multiple regression test to detect the presence of an impact in order to integrate the supply chain with its dimensions (relations with suppliers, supply network structure, supply integration, storage) on production on time in engineering companies specialized in project management at the level of significance ($0.05 \geq \alpha$) the following is the results display:

Table (3): Multiple Regression Analysis of the first sub-hypothesis

Independent variable	Transactions			Summary Form			ANOVA	
	Beta	t	Statistical significance t	R Correlation coefficient	R2 The coefficient of determination	R2 the average	f	Statistical significance "f"
Relationship with suppliers	.355	4.084	.000	.537[a]	.288	.263	11.434	.000[a]
The structure of the supply network	.236	2.707	.008					
Supply integration	-.106	-1.322	.189					
Storage	.163	2.057	.042					

It is evident from Table 3 that the correlation coefficient (R) between the independent variables and the dependent variable is 0.537. Additionally, the determination coefficient (R2) has attained a value of 0.288, indicating that approximately 26.3% of the variations in production during the specified time period can be accounted for by the independent variables. The observed phenomenon can be attributed to alterations in the integrity of the supply chain, while the remaining factors contributing to this phenomenon are ascribed to other variables. The statistical significance of the effect was demonstrated by the value of F (11.434) at a significance level of 0.000, which is below the conventional threshold of 0.05.

It is worth mentioning that the dimensions pertaining to the relationship with suppliers, the structure of the supply network, and storage exhibit a significant influence on timely production. This is evident from the values of (t), which are notably higher (4.084, 2.707, 2.057) compared to the tabular value (1.96). The statistical significance of the variables (0.000, 0.008, 0.042) is found to be lower than the predetermined significance level ($\alpha \leq 0.05$). Additionally, it is observed that there is no significant effect of the supply dimension on timely production, as the calculated t-value

(-1.322) falls below the critical t-value (1.96) at a significance level of 0.189, which is greater than the specified value of 0.05.

Regarding the impact of supply chain integration dimensions on production timeliness, an ANOVA test was utilized. The results, presented in Table 16, indicate that the calculated F value of 11.434 surpasses the significance level of 0.05, with a p-value of 0.000. The null hypothesis is rejected in favor of the alternative hypothesis, which states that there is a statistically significant effect, at a significance level of α (0.05≥α), of supply chain integration in its various dimensions (relationships with suppliers, supply network structure, supply integration, storage) on the timely production in engineering firms specializing in project management.

The second sub-hypothesis: There is statistically significant effect at the significance level (0.05≥α) of supply chain integration in its dimensions (relations with suppliers, supply network structure, supply integration, storage) on the quality of project operations in engineering companies specialized in project management.

In order to examine the hypothesis, the researcher performed a multiple regression analysis to determine whether there is a significant relationship between the integration of the supply chain and its various dimensions (such as supplier relationships, supply network structure, supply integration, and storage) and the quality of project operations in engineering companies specializing in project management. The level of significance chosen for this analysis was α = 0.05. The results of the analysis are presented below.

Table (4): Multiple Regression Analysis of the second sub-hypothesis

Independent variable	Transactions			Summary Form			ANOVA	
	Beta	t	Statistical significance t	R Correlation coefficient	R2 The coefficient of determination	R2 the average	f	Statistical significance "f"
Relationship with suppliers	.378	4.383	.000	.546[a]	.298	.274	12.018	.000[a]
The structure of the supply network	.234	2.708	.008					
Supply integration	-.119	-1.497	.137					
Storage	.120	1.518	.132					

The analysis of Table 4 reveals that the correlation coefficient (R) between the independent variables and the dependent variable is 0.546. Additionally, the coefficient of determination (R2) is found to be 0.298, indicating that approximately 29.8% of the variations in the quality of project operations can be accounted for by changes in the integrity of the supply chain. The remaining variations are attributable to other factors. The statistical significance of the effect was indicated by the value of F (12.018) at a significance level of 0.000, which is lower than the predetermined threshold of 0.05.

It is worth noting from the table that the dimensions pertaining to the relationship with suppliers and the structure of the supply network have a distinct impact on the quality of project operations. Specifically, the values of (t) for these dimensions are 4.383 and 2.708, respectively, which are higher than the tabular value of 1.96. Additionally, the corresponding statistical functions for these dimensions are 0.000 and 0.008, respectively, which are lower than the significance level of 0.05 (α). On the other hand, the dimensions of supply integration and storage do not have a significant effect on the quality of project operations, as the values of t (-1.497 and 1.518, respectively) are lower than

the tabular value of 1.96. The observed significance level (0.137, 0.132) is greater than the predetermined threshold value of 0.05.

The impact of supply chain integration dimensions on the quality of project operations was assessed using an ANOVA test. Table 17 shows that the calculated F value of 12.018 reached statistical significance at a level of 0.000, which is less than the predetermined significance level of 0.05. Consequently, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates that there is a statistically significant effect of supply chain integration, including its dimensions of relations with suppliers, supply network structure, supply integration, and storage, on the quality of project operations in engineering companies specializing in project management, at a significance level of 0.05 or higher.

The third sub-hypothesis: There is statistically significant effect at the significance level ($0.05 \geq \alpha$) of supply chain integration in its dimensions (relations with suppliers, supply network structure, supply integration, storage) on the project cost in engineering companies specialized in project management.

In order to examine the hypothesis, the researcher performed a multiple regression analysis to determine whether there is a significant impact of integrating the supply chain with its various dimensions (including relations with suppliers, supply network structure, supply integration, and storage) on project costs in engineering companies specializing in project management. The level of significance chosen for this analysis was set at $\alpha = 0.05$. The obtained results are presented below.

Table (5): Multiple Regression Analysis of the third sub-hypothesis

Independent variable	Transactions			Summary Form			ANOVA	
	Beta	t	Statistical significance t	R Correlation coefficient	R2 The coefficient of determination	R2 the average	f	Statistical significance "f"
Relationship with suppliers	.103	1.520	.131	.752[a]	.565	.550	36.693	.000[a]
The structure of the supply network	-.108	-1.588	.115					
Supply integration	-.047	-.759	.449					
Storage	.741	11.934	.000					

The analysis of Table 5 reveals that the correlation coefficient (R) between the independent variables and the dependent variable is 0.752. Additionally, the determination coefficient (R2) is calculated to be 0.565, indicating that approximately 56.5% of the variations in the project cost can be accounted for by the changes in the aforementioned variables. The remaining factors contributing to the integrity of the supply chain can be attributed to various other variables. The calculated value of the F statistic was found to be 36.693 at a significance level of 0.000, which is lower than the conventional threshold of 0.05. This result suggests a statistically significant effect.

It is worth mentioning that the table indicates a significant relationship between the dimension (storage) and the cost of the project. Specifically, the value of (t) for this dimension is 11.934, which is considerably higher than the tabular value of 1.96. Moreover, the level of significance for this relationship is 0.000, which is lower than the predetermined level of significance (α) of 0.05. The variables under investigation, namely the relationship with suppliers, supply network structure, and supply integration, do not have a significant effect on the project cost. This is evident from the t-values (1.520, -1.588, -0.759) associated with these variables, which are lower than the critical value (1.96) at a

significance level of 0.05. However, it should be noted that the p-values (0.131, 0.115, 0.449) corresponding to these variables are greater than the specified significance level of 0.05.

The impact of integrating the dimensions of the supply chain on project costs was assessed using an ANOVA test. The results, as shown in Table (5), indicate that the calculated F value of 36.693 is significant at a level of significance of 0.000, which is less than the predetermined threshold of 0.05. Consequently, the null hypothesis is rejected, and the alternative hypothesis is accepted. This implies that there is a statistically significant effect, at a significance level of 0.05 or greater, of integrating the supply chain with its dimensions (relations with suppliers, supply network structure, supply integration, storage) on project costs in engineering companies specializing in project management.

Conclusion

In conclusion, supply chain integration plays a vital role in the success of engineering projects in specialized project management companies(Ali et al., 2023c). The findings of this study suggest that integrating the supply chain within project management practices can lead to improved project performance, cost reduction, and increased customer satisfaction(Ali et al., 2021). By effectively managing the flow of information, materials, and activities between suppliers, customers, and other supply chain partners, engineering companies can enhance their operational efficiency and achieve project success. However, the study also identified some key factors and barriers that affect the implementation of supply chain integration in engineering project management in Jordan. These factors include organizational culture, lack of awareness and knowledge, resistance to change, limited collaboration among stakeholders, and inadequate technology infrastructure. Addressing these challenges is crucial for successful implementation of supply chain integration strategies. Recommendations: Based on the findings of this study, the following recommendations are proposed to assist engineering companies specializing in project management in Jordan: Develop a culture of collaboration and shared goals: Encourage collaboration and open communication among project teams, suppliers, and customers. Foster a culture that values integration and encourages knowledge sharing and cooperation. Invest in training and development: Provide training programs to enhance employees' knowledge and skills in supply chain management and project integration(Bartezzaghi & Turco, 1989). This will help them understand the benefits and importance of supply chain integration and equip them with the necessary tools to implement it effectively. Embrace technology: Invest in advanced technology infrastructure that supports supply chain integration, such as integrated project management software, communication platforms, and data analytics tools. This will facilitate real-time information sharing, streamline processes, and improve decision-making. Foster strategic partnerships: Develop strong relationships with suppliers, customers, and other supply chain partners. Foster long-term partnerships based on trust, mutual understanding, and shared goals. Collaborate closely with partners to streamline processes, reduce costs, and enhance project outcomes(Ali, Udin, & Abualrejal, 2023a). Overcome resistance to change: Address resistance to change by involving employees in the implementation process, providing clear communication about the benefits of supply chain integration, and addressing concerns and uncertainties. Create a supportive environment that encourages employees to embrace change and actively participate in the integration efforts. Continuous improvement and monitoring: Regularly assess the effectiveness of supply chain integration strategies and monitor key performance indicators. Identify areas for improvement and implement necessary changes to optimize project management practices. By implementing these recommendations, engineering companies specializing in project management in Jordan can enhance their project success rates and gain a competitive edge in the market. Supply chain integration should be seen as an ongoing process that requires continuous improvement and adaptation to changing market dynamics and customer demands.

References:

Abu Al-Rejal, H. M., Udin, Z. M., & Yusoff, R. Z. B. (2018). The role of supply chain management toward performance of manufacturing companies in Yemen. International Journal of Supply Chain Management, 7(6), 92–99.

Abualrejal, Hussein M., Abu Doleh, J. D., & Mohtar, S. (2017). Supply-chain management capabilities practices in industrial organization in republic of Yemen. International Journal of Supply Chain Management, 6(4), 98–109.

Abualrejal, Hussein Mohammed, Alqudah, A. Z., Ali, A. A. A., Saoula, O., & AlOrmuza, T. K. (2022). University Parcel Centre Services Quality and Users' Satisfaction in Higher Education Institutions: A Case of Universiti Utara Malaysia BT - Proceedings of International Conference on Emerging Technologies and Intelligent Systems (M. Al-Emran, M. A. Al-Sharafi, M. N. Al-Kabi, & K. Shaalan, eds.). Cham: Springer International Publishing.

Ali, A. A. A., Abualrejal, H. M. E., Mohamed Udin, Z. B., Shtawi, H. O., & Alqudah, A. Z. (2021). The Role of Supply Chain Integration on Project Management Success in Jordanian Engineering Companies. International Conference on Emerging Technologies and Intelligent Systems, 646–657. Springer.

Ali, A. A. A., Abualrejal, H. M. E., Mohamed Udin, Z. B., Shtawi, H. O., & Alqudah, A. Z. (2022). The Role of Supply Chain Integration on Project Management Success in Jordanian Engineering Companies BT - Proceedings of International Conference on Emerging Technologies and Intelligent Systems (M. Al-Emran, M. A. Al-Sharafi, M. N. Al-Kabi, & K. Shaalan, eds.). Cham: Springer International Publishing.

Ali, A. A. A., Udin, Z. B. M., & Abualrejal, H. M. E. (2023a). The Impact of Artificial Intelligence and Supply Chain Resilience on the Companies Supply Chains Performance: The Moderating Role of Supply Chain Dynamism. Lecture Notes in Networks and Systems, 550 LNNS(2023), 17–28. https://doi.org/10.1007/978-3-031-16865-9_2

Ali, A. A. A., Udin, Z. B. M., & Abualrejal, H. M. E. (2023b). The Impact of Artificial Intelligence and Supply Chain Resilience on the Companies Supply Chains Performance: The Moderating Role of Supply Chain Dynamism BT - International Conference on Information Systems and Intelligent Applications (M. Al-Emran, M. A. Al-Sharafi, & K. Shaalan, eds.). Cham: Springer International Publishing.

Ali, A. A. A., Udin, Z. M., & Abualrejal, H. M. E. (2023c). The Impact of Humanitarian Supply Chain on Non-Government Organizations Performance Moderated by Organisation Culture. International Journal of Sustainable Development and Planning, 18(3), 763–772. https://doi.org/10.18280/ijsdp.180312

Alrifai, K., Obaid, T., Ali, A. A. A., Abulehia, A. F. S., Abualrejal, H. M. E., & Nassoura, M. B. A. R. (2023). The Role of Artificial Intelligence in Project Performance in Construction Companies in Palestine BT - International Conference on Information Systems and Intelligent Applications (M. Al-Emran, M. A. Al-Sharafi, & K. Shaalan, eds.). Cham: Springer International Publishing.

Obaid, T., Eneizan, B., Naser, S. S. A., Alsheikh, G., Ali, A. A. A., Abualrejal, H. M. E., & Gazem, N. A. (2022). Factors Contributing to an Effective E- Government Adoption in Palestine BT - Advances on Intelligent Informatics and Computing (F. Saeed, F. Mohammed, & F. Ghaleb, eds.). Cham: Springer International Publishing.

Aldammagh, Z., Abdeljawad, R., & Obaid, T. (2021). Predicting mobile banking adoption: An integration of TAM and TPB with trust and perceived risk. Financial Internet Quarterly, 17(3), 35-46.

Almasri, A., Obaid, T., Abumandil, M. S., Eneizan, B., Mahmoud, A. Y., & Abu-Naser, S. S. (2022, October). Mining Educational Data to Improve Teachers' Performance. In International Conference on Information Systems and Intelligent Applications: ICISIA 2022 (pp. 243-255). Cham: Springer International Publishing.

Eneizan, B., Obaid, T., Abumandil, M. S., Mahmoud, A. Y., Abu-Naser, S. S., Arif, K., & Abulehia, A. F. (2022, October). Acceptance of Mobile Banking in the Era of COVID-19. In International Conference on Information Systems and Intelligent Applications: ICISIA 2022 (pp. 29-42). Cham: Springer International Publishing.

Obaid, T., Eneizan, B., Naser, S. S. A., Alsheikh, G., Ali, A. A. A., Abualrejal, H. M. E., & Gazem, N. A. (2022). Factors contributing to an effective e-government adoption in Palestine. In Advances on Intelligent Informatics and Computing: Health Informatics, Intelligent Systems, Data Science and Smart Computing (pp. 663-676). Cham: Springer International Publishing.

Jouda, H., Abu Jarad, A., Obaid, T., Abu Mdallalah, S., & Awaja, A. (2020). Mobile Banking Adoption: Decomposed Theory of Planned Behavior with Perceived Trust. Available at SSRN 3660403.

Obaid, T., Abdaljawad, R., & Mdallalahc, S. A. (2020). Factors Driving E-Learning Adoption In Palestine: An Integration of Technology Acceptance Model And IS Success Model. Available at SSRN 3686490.

Obaid, T. F., & Eneizan, B. M. (2016). Transfer of training and post-training on job performance in Middle Eastern countries. Review of Public Administration and Management, 400(3786), 1-11.

Obaid, T. (2018). Determine process training key factors and job performance in higher education sector. International Journal of Engineering & Technology, 7(4.15), 477–480.

Obaid, T. *et al*. (2022). Factors Contributing to an Effective E- Government Adoption in Palestine. In: Saeed, F., Mohammed, F., Ghaleb, F. (eds) Advances on Intelligent Informatics and Computing. IRICT 2021. Lecture Notes on Data Engineering and Communications Technologies, vol 127. Springer, Cham. https://doi.org/10.1007/978-3-030-98741-1_55

Obaid, T., Eneizan, B., Abumandil, M.S.S., Mahmoud, A.Y., Abu-Naser, S.S., Ali, A.A.A. (2023). Factors Affecting Students' Adoption of E-Learning Systems During COVID-19 Pandemic: A Structural Equation Modeling Approach. In: Al-Emran, M., Al-Sharafi, M.A., Shaalan, K. (eds) International Conference on Information Systems and Intelligent Applications. ICISIA 2022. Lecture Notes in Networks and Systems, vol 550. Springer, Cham. https://doi.org/10.1007/978-3-031-16865-9_19

Abu Amuna, Y. M., et al. (2017). "Strategic Environmental Scanning: an Approach for Crises Management." International Journal of Information Technology and Electrical Engineering 6(3): 28-34.

Elsharif, A. A. and S. S. Abu-Naser (2019). "An Expert System for Diagnosing Sugarcane Diseases." International Journal of Academic Engineering Research (IJAER) 3(3): 19-27.

Abu Naser, S. S., et al. (2016). "Measuring knowledge management maturity at HEI to enhance performance-an empirical study at Al-Azhar University in Palestine." International Journal of Commerce and Management Research 2(5): 55-62.

Abu-Saqer, M. M. and S. S. Abu-Naser (2019). "Developing an Expert System for Papaya Plant Disease Diagnosis." International Journal of Academic Engineering Research (IJAER) 3(4): 14-21.

Alajrami, M. A. and S. S. Abu-Naser (2018). "Onion Rule Based System for Disorders Diagnosis and Treatment." International Journal of Academic Pedagogical Research (IJAPR) 2(8): 1-9.

Almurshidi, S. H. and S. S. Abu Naser (2017). "Design and Development of Diabetes Intelligent Tutoring System." EUROPEAN ACADEMIC RESEARCH 6(9): 8117-8128.

Nasser, I. M., et al. (2019). "Artificial Neural Network for Diagnose Autism Spectrum Disorder." International Journal of Academic Information Systems Research (IJAISR) 3(2): 27-32.

Masri, N., et al. (2019). "Survey of Rule-Based Systems." International Journal of Academic Information Systems Research (IJAISR) 3(7): 1-23.

Al Shobaki, M. J., et al. (2016). "The impact of top management support for strategic planning on crisis management: Case study on UNRWA-Gaza Strip." International Journal of Academic Research and Development 1(10): 20-25.

Hilles, M. M. and S. S. Abu Naser (2017). "Knowledge-based Intelligent Tutoring System for Teaching Mongo Database." EUROPEAN ACADEMIC RESEARCH 6(10): 8783-8794.

AlFerjany, A. A. M., et al. (2018). "The Relationship between Correcting Deviations in Measuring Performance and Achieving the Objectives of Control-The Islamic University as a Model." International Journal of Engineering and Information Systems (IJEAIS) 2(1): 74-89.

Alshawwa, I. A., et al. (2020). "Analyzing Types of Cherry Using Deep Learning." International Journal of Academic Engineering Research (IJAER) 4(1): 1-5.

El Talla, S. A., et al. (2018). "Organizational Structure and its Relation to the Prevailing Pattern of Communication in Palestinian Universities." International Journal of Engineering and Information Systems (IJEAIS) 2(5): 22-43.

Abu Amuna, Y. M., et al. (2017). "Understanding Critical Variables for Customer Relationship Management in Higher Education Institution from Employees Perspective." International Journal of Information Technology and Electrical Engineering 6(1): 10-16.

Al Shobaki, M. J. and S. S. Abu Naser (2016). "Decision support systems and its role in developing the universities strategic management: Islamic university in Gaza as a case study." International Journal of Advanced Research and Development 1(10): 33-47.

Barhoom, A. M. and S. S. Abu-Naser (2018). "Black Pepper Expert System." International Journal of Academic Information Systems Research (IJAISR) 2(8): 9-16.

Sultan, Y. S. A., et al. (2018). "The Style of Leadership and Its Role in Determining the Pattern of Administrative Communication in Universities-Islamic University of Gaza as a Model." International Journal of Academic Management Science Research (IJAMSR) 2(6): 26-42.

Abu Naser, S. S. and M. J. Al Shobaki (2016). The Impact of Management Requirements and Operations of Computerized Management Information Systems to Improve Performance (Practical Study on the employees of the company of Gaza Electricity Distribution). First Scientific Conference for Community Development.

Abu Naser, S. S. (2006). "Intelligent tutoring system for teaching database to sophomore students in Gaza and its effect on their performance." Information Technology Journal 5(5): 916-922.

Mettleq, A. S. A. and S. S. Abu-Naser (2019). "A Rule Based System for the Diagnosis of Coffee Diseases." International Journal of Academic Information Systems Research (IJAISR) 3(3): 1-8.

Al Shobaki, M., et al. (2018). "Performance Reality of Administrative Staff in Palestinian Universities." International Journal of Academic Information Systems Research (IJAISR) 2(4): 1-17.

Salama, A. A., et al. (2018). "The Role of Administrative Procedures and Regulations in Enhancing the Performance of The Educational Institutions-The Islamic University in Gaza is A Model." International Journal of Academic Multidisciplinary Research (IJAMR) 2(2): 14-27.

Taha, A. M., et al. (2022). "Gender Prediction from Retinal Fundus Using Deep Learning." International Journal of Academic Information Systems Research (IJAISR) 6(5): 57-63.

Bartezzaghi, E., & Turco, F. (1989). The Impact of Just-in-time on Production System Performance: An Analytical Framework. International Journal of Operations & Production Management, 9(8), 40–62. https://doi.org/10.1108/EUM0000000001257

Brockner, J., Flynn, F. J., Dolan, R. J., Ostfield, A., Pace, D., & Ziskin, I. V. (2006). Commentary on "radical HRM innovation and competitive advantage: The Moneyball story." Human Resource Management, 45(1), 127–145. https://doi.org/10.1002/hrm

Dumitrascu, O., Dumitrascu, M., & Dobrotă, D. (2020). Performance evaluation for a sustainable supply chain management system in the automotive industry using artificial intelligence. Processes, 8(11), 1–20. https://doi.org/10.3390/pr8111384

Eckstein, D., Goellner, M., Blome, C., & Henke, M. (2015). The performance impact of supply chain agility and supply chain adaptability: The moderating effect of product complexity. International Journal of Production Research, 53(10), 3028–3046. https://doi.org/10.1080/00207543.2014.970707

Hilhorst, D., Desportes, I., & de Milliano, C. W. J. (2019). Humanitarian governance and resilience building: Ethiopia in comparative perspective. Disasters, 43(S2), S109–S131. https://doi.org/10.1111/disa.12332

Hult, G. T. M., Ketchen, D. J., & Chabowski, B. R. (2007). Leadership, the buying center, and supply chain performance: A study of linked users, buyers, and suppliers. Industrial Marketing Management, 36(3), 393–403. https://doi.org/10.1016/j.indmarman.2005.12.002

Nuseir, M. T., & Elrefae, G. (2022). The effect of social media marketing, compatibility and perceived ease of use on marketing performance: Evidence from hotel industry. International Journal of Data and Network Science, 6(3), 885–894. https://doi.org/10.5267/j.ijdns.2022.2.008

Roh, S., Lin, H. H., & Jang, H. (2022). Performance indicators for humanitarian relief logistics in Taiwan. Asian Journal of Shipping and Logistics, 38(3), 173–180. https://doi.org/10.1016/j.ajsl.2022.06.002

Scott-Young, C., & Samson, D. (2008). Project success and project team management: Evidence from capital projects in the process industries. Journal of Operations Management, 26(6), 749–766. https://doi.org/10.1016/j.jom.2007.10.006

Uhl-Bien, M., & Arena, M. (2018). Leadership for organizational adaptability: A theoretical synthesis and integrative framework. Leadership Quarterly, 29(1), 89–104. https://doi.org/10.1016/j.leaqua.2017.12.009

Wilden, R., Gudergan, S. P., Nielsen, B. B., & Lings, I. (2013). Dynamic Capabilities and Performance: Strategy, Structure and Environment. Long Range Planning, 46(1–2), 72–96. https://doi.org/10.1016/j.lrp.2012.12.001

Zhou, H., & Benton, W. C. (2007). Supply chain practice and information sharing. Journal of Operations Management, 25(6), 1348–1365. https://doi.org/https://doi.org/10.1016/j.jom.2007.01.009