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Original Article

Obstacles of Applying Supply Chain Management Concepts (SCM) in the Jordanian Construction Sector.

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The use of supply chain management in industry has been quite successful, particularly in the industrial sector. In today's marketplace, Jordanian construction firms must compete not only with local but also with international companies; therefore, the use of supply chain management is critical to improving efficiency and increasing competitive advantage. A survey was conducted in this study to investigate the main obstacles for adopting supply chain management to the Jordanian construction sector. The survey questionnaire was created by summarizing and incorporating prior findings, as well as consulting with specialists. Participants in the poll were those who have worked with main contractors and participated in construction projects. The findings revealed several major factors that obstruct the use of supply chain management in the construction industry.

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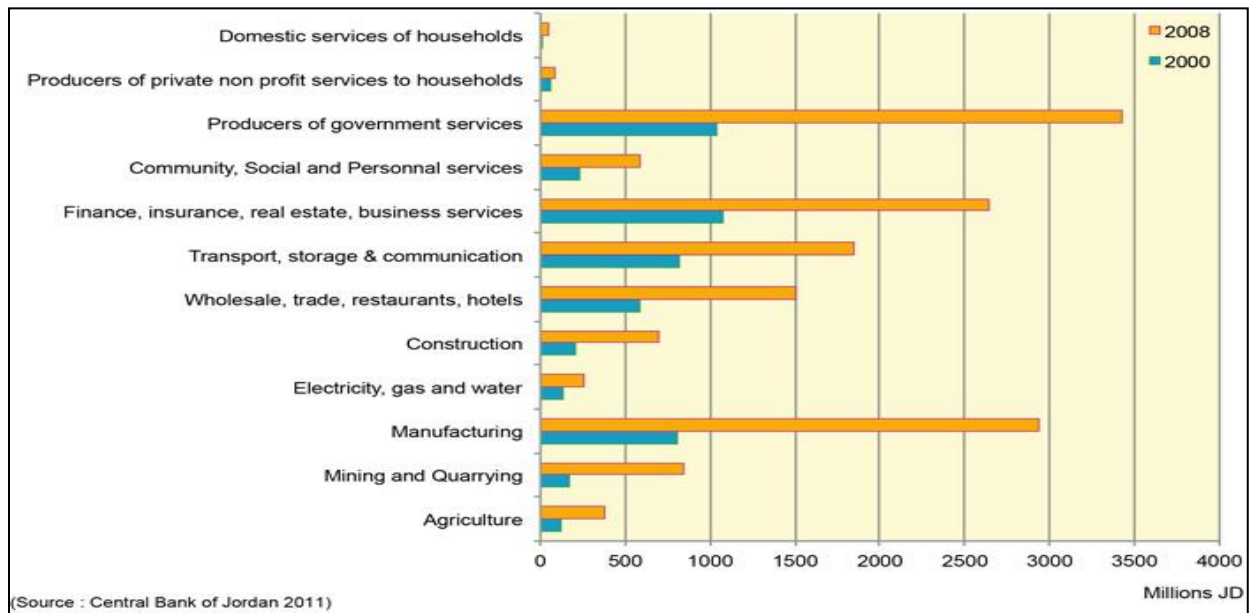
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INTRODUCTION

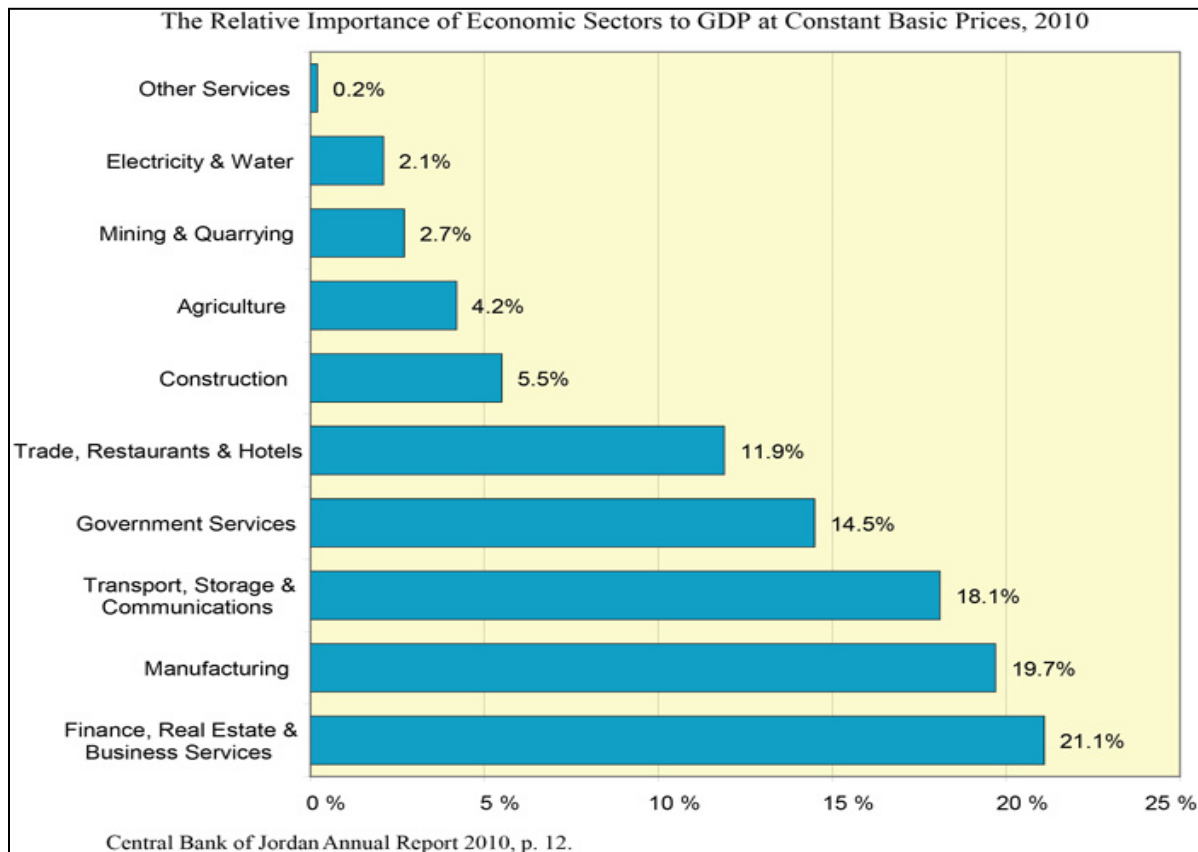
The construction industry is one of Jordan's most important economic sectors, contributing significantly to the country's growth (Alkilani, Jupp, & Sawhney, 2013). It experienced numerous

challenges as a result of the effects of the economic crisis. However, in recent years, the Jordanian construction industry has showed indications of resurgence. The entire value of the construction sector is reached 249 million Jordanian dinars in 2021 (Trading Economics. 2022).

Figure 1: Gross Domestic Product by Economic Activity at current basic prices in million JD (2002-2008)



Source: (Ababsa, 2013)

Figure 2: The Relative Importance of Economic Sectors to GDP at constant Basic Prices in 2010

Source: (Ababsa & Kohlmayer, 2013)

Jordanian construction firms must compete not only with local but also with international firms. As a result, the current demand for innovations to improve the efficiency of the construction sector and raise its companies' competitive edge is extremely pressing.

The supply chain management technique has been widely used in a variety of professions, particularly in the industrial business. Its efficiency aided numerous industries in increasing productivity and competitive capacity in today's global market. Successful supply chain management applications include Starbucks, Colgate-Palmolive, Intel, Unilever, and McDonald's. As a result, they have risen to the top of their respective markets. In Jordan, the GLFS company has also had significant success by incorporating supply chain management into their business operations. As a result, supply chain management is seen as an appropriate strategy

for meeting the pressing needs of Jordan's construction sector (Bani Ismail, 2012). Despite the current acknowledgement of supply chain management's significance, its use in the construction industry in general, and Jordan in particular, is minimal. As a result, determining the sources of such carelessness of its concepts is critical.

Research Background

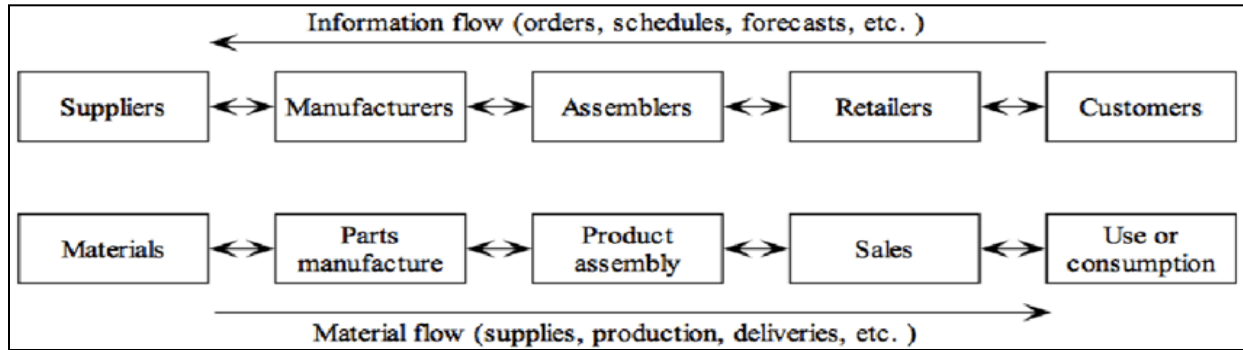
This section starts with supply chain management in the manufacturing and construction industries. The characteristics of the construction supply chain are then presented. Finally, the applicability of supply chain management to the construction industry is addressed.

Manufacturing Supply Chain and Supply Chain Management

firm's related to the activities from raw material to finished product and delivery to customers.

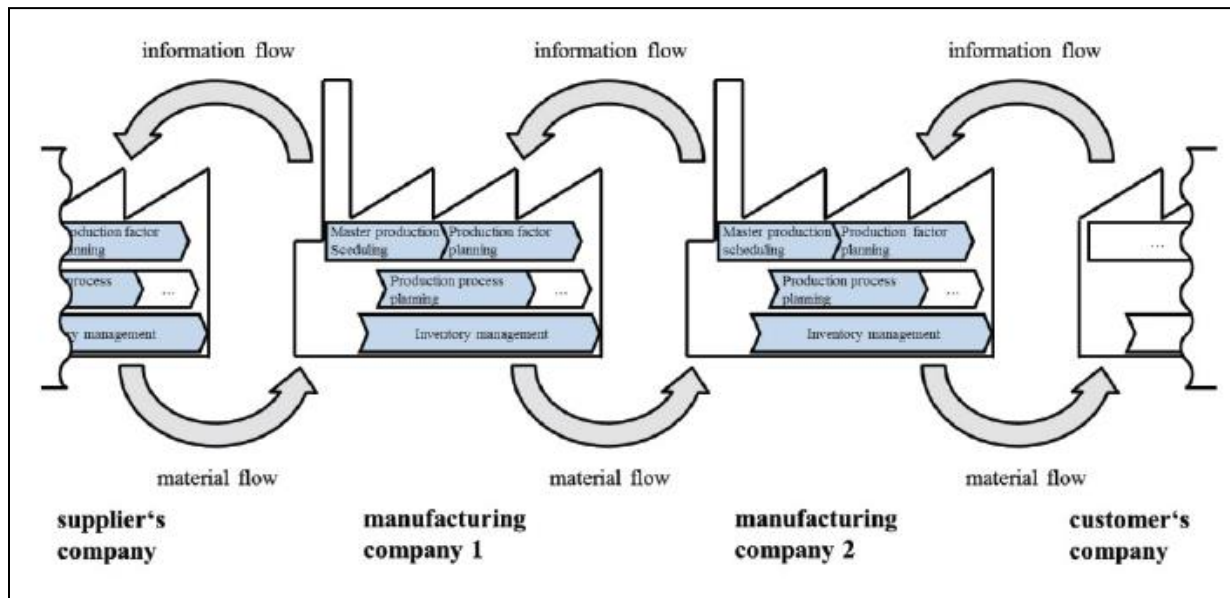
From the *Figure 3*, we can find that the supply chain in manufacturing can be defined as the network of

Figure 3: Generic configuration of a supply chain in manufacturing



Source: (Mazzawi & Alawamleh, 2019)

Figure 4: Manufacturing supply chain and planning processes



Source: (Schuh, Schenk, & Servos, 2015)

From the *Figure 4*, supply chain management can be defined as the management of the interface relationships among key stakeholders and enterprise functions that occur in the maximization of value creation which is driven by customer needs satisfaction and facilitated by efficient logistics management (Stock & Boyer, 2009).

Construction Supply Chain and Supply Chain Management

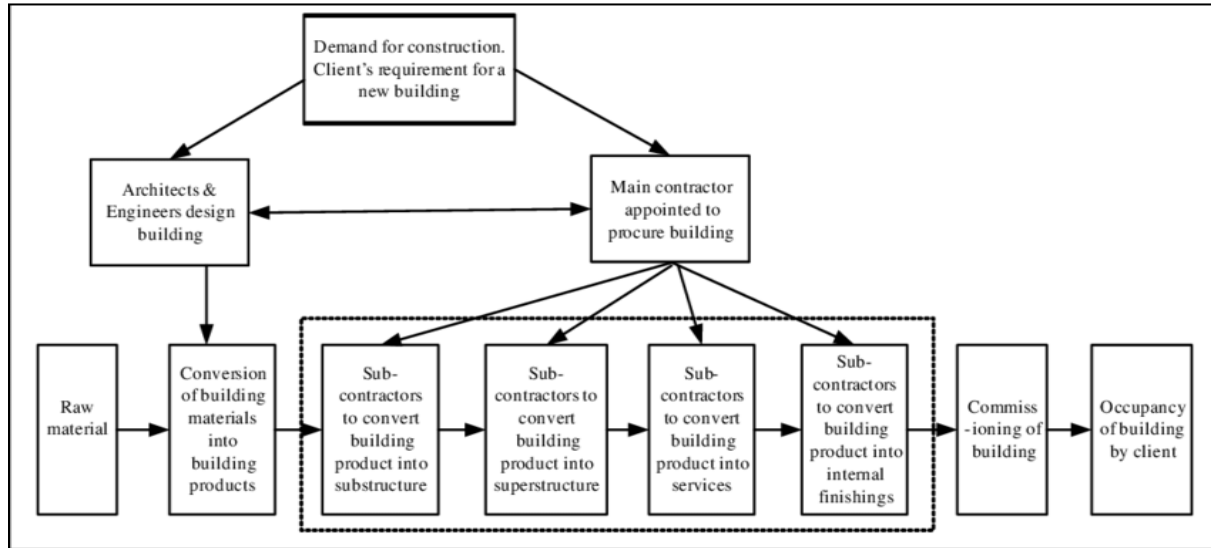
Despite the fact that the construction industry is far away than other sectors in implementing supply chain management, several concepts are available like the concepts mentioned in (Pryke, 2009). In this paper, however, the supply chain and supply chain management are defined as follows: The supply chain is a network of organizations engaged in the creation and use of a completed building (customer,

designer, consultant, prime contractor, subcontractor, and suppliers, etc).

In *Figure 3*, each supply chain segment is a link in one or more other chains, forming a complex network; supply chain management in construction

is the methods used by companies to increase cooperation among chain stakeholders and integrate important construction business operations. Its aim was to increase construction productivity, increase competitive advantage, and meet customer needs at the lowest possible cost (Li et al., 2006).

Figure 5: A typical construction supply chain



Source: (Khalfan et al., 2010)

Characteristics of Construction Supply Chain

In terms of structure and function, the construction supply chain is characterized by the following elements (Vrijhoef & Koskela, 2000):

It is a convergent supply chain that directs all supplies to the building site, where the item is built from incoming materials. In contrast to production systems in which numerous products flows through the factory and are supplied to many clients, the construction factory is designed around a single product.

Except in special cases and circumstances, it is a temporary supply chain that produces one-off construction projects through repeated reconfiguration of project organizations. As a result, the construction supply chain (CSC) is characterized by uncertainty, fragmentation, and, most significantly, the separation of the design and implementation of the created thing.

It is a typical make-to-order supply chain, with each project results in the creation of a new product or

prototype. With a few tiny exceptions, there is little duplication. However, for projects of a certain type, the approach can be pretty similar.

Newly, Jordan has been blended into the global market. As a result, and in order to compete with international contractors, domestic contractors must devise development strategies. According to reports, only a limited percentage of domestic contractors have access to the world's most advanced management and construction technologies. Local contractors also require industry support to compete globally.

Currently, only few major contractors, such Sterling BIM, Dimension 7, and BIM Management Jordan, are working to use the Design-Build model and BIM system in order to achieve extra value and raise their profit margin (AL-Smadi & Alhndawi, 2021). It might be a new trend and strategy for Jordanian construction companies.

Besides from the Design-Build model (DB) and the BIM technology, supply chain management fits the

current expectations of Jordan's construction sector. However, its approach is not commonly recognized.

RESEARCH METHODOLOGY

Participants in the survey are people who have worked with major contractors and have been involved in construction and industrial projects. Emails and online questionnaires were used to gather the data. The respondents were asked to indicate the extent to which the factors were limited

using a five-point Likert scale ranging from 1 to 5, with 1 being "least extent" and 5 being "large extent". Following the data collection process, 110 responses were obtained, with (7 out of 110) from top management (6.36 %), (35 out of 110) from project managers (31.8 %), (28 out of 110) from construction site engineers (25.4 %), (22 out of 110) from members of the (PM) department (20%), and (18 out of 110) from low-level managers or engineers (16.45 %).

Table 1: Structure of the sample used in the survey

Contributor	Number of respondents
Top Management	7
Project Managers	35
Construction Site Engineers	28
Project Management Department	22
low-level managers or engineers	18

RESULTS AND DISCUSSION

According to the survey results, a high percentage of the respondents (81%) agreed that adopting supply chain management to construction is significant. Furthermore, when respondents decided to support supply chain management, some of the main gains were fulfilled. Firstly, it provides a number of benefits to all members of the supply chain and contributes to increased efficiency. Secondly, it contributes with improving the relationships among project participants and stakeholders, as well as the creation of optimal circumstances for all supply chain members to collaborate.

However, it was observed that several issues with Jordanian construction remained. For example, 95% of respondents use the basic modes of communication (email, faxes, cell phone, or face-to-face) to connect and share key data. Only 5% of them use networked information systems and have a supply-specific software tool. The primary method of materials procurement used by contractors is determined by the site request (more

than 90%). It is the most basic buying approach, with the main goal of satisfying the building's material requirement without optimizing calculation. Furthermore, the subcontractors' working scheduling is frequently proposed by themselves (47%), the main contractor (22%), or a combination of the main contractor and their subcontractors (31%). All of these put the contractors' ability to apply supply chain management to the test.

20 factors were determined from the survey questionnaire as main obstacles for adopting supply chain management to the Jordanian construction sector. The main important factors were divided into three major categories. First one is factors related to industry, second one is factors related to project implementation and finally factors related to the participants in a project. *Table 2* includes the most important factors related to industry consider as main obstacles for adopting supply chain management to the Jordanian construction sector.

Table 2: Factors related to industry

Factors Related to Industry	Mean
Conflicts and difficulties are more common than in other sectors and industries.	3.89
Legal considerations, price changes, and labour protection and safety	3.77
Projects are short-lived and have a limited time frame.	3.68
Projects are frequently and unreliably changed.	3.62
Improper of sufficient standardization of manpower, equipment, and material	3.17
Having a lot of people involved in the supply chain leads lack of communication and misunderstanding.	2.78

Table 3 below includes the most important factors related to project Implementation consider as main obstacles for adopting supply chain management to the Jordanian construction sector.

Table 3: Factors related to project implementation

Factors Related to Project Implementation	Mean
Inadequate supply chain and supply chain management expertise	3.98
Inadequate organizational structure to support the mechanism and work system	3.96
A lesser degree of clarity, limitation, and inadequacy in supplying project information and announcement	3.90
A low degree of clarity, limitation, and inadequacy in supplying project documentation, data and announcement	3.83
Lack of Systematization and collaboration among relevant project stakeholders	3.77
Inadequate resources for integrating processes	3.5

Table 4 shows the most important factors related to the participants in a project consider as main obstacles for adopting supply chain management to the Jordanian construction sector.

Table 4: Factors related to participants in the project

Factors Related to participants in the project	Mean
Focusing on personal interests instead of the project participants' overall interests	3.86
The chain's needs cannot be met by owner financing.	3.83
The competitive tender process reduces its applicability (Prime focus on bid prices, without focus on real cost)	3.82
A lack of loyalty and commitment from top level management	3.77
Inadequate resources for integrating processes and managing logistics in each project situation	3.75
With case of international enterprises participate, there are differences in language, protocols, and techniques.	3.74
No direct interactions lead to foster long-term sustainable relationships with the stakeholders	3.72
Problems and disputes between the participants and stakeholders are more common than in other sectors.	3.64

Based on factors related to industry the main factors that considered as obstacles to applying the concepts of supply chain management and construction supply chain management respectively are: (1) conflicts and difficulties are more common than in other sectors and industries, (2) legal considerations, price changes, and labour protection and safety, (3) projects are short-lived and have a limited time frame, (4) projects are frequently and unreliably changed,(5) improper of

sufficient standardization of manpower, equipment, and material, (6) Having a lot of people involved in the supply chain leads lack of communication and misunderstanding.

Based on survey's results for obstacles related to project implementation in order are: (1) inadequate supply chain and supply chain management expertise, (2) inadequate organizational structure to support the mechanism and work system, (3) a lesser degree of clarity, limitation, and inadequacy in supplying project information and announcement, (4) a low degree of clarity, limitation, and inadequacy in supplying project documentation, data and announcement, (5) lack of systematization and collaboration among relevant project stakeholders, and (6) inadequate resources for integrating processes.

Last but not least the factors related to participants in the project (construction projects) are in order are: (1) focusing on personal interests instead of the project participants' overall interests, (2) the chain's needs cannot be met by owner financing, (3) the competitive tender process reduces its applicability (prime focus on bid prices, without focus on real cost), (4) a lack of loyalty and commitment from top level management, (5) inadequate resources for integrating processes and managing logistics in each project situation, (6) with case of international enterprises participate, there are differences in language, protocols, and techniques, (7) no direct interactions lead to foster long-term sustainable relationships with the stakeholders, (8) problems and disputes between the participants and stakeholders are more common than in other sectors.

CONCLUSION

Supply chain management has benefitted multiple industries, particularly the industrial sector, in improving their performance and competitive capability in nowadays global marketplaces. The construction industry, on the other hand, is still constrained in its effectively implementing supply chain management concepts and techniques. Considering the viewpoint of the major contractors during the building phase of the project, twenty significant causes and factors of constraining the using of supply chain management system

in Jordanian construction sector are found in this research. Based on these findings, the contractors might provide some solutions to assist them in reforming and upgrading the supply chain management application level. It will assist contractors in increasing productivity, optimizing costs, and increasing their competitive advantage in today's extremely competitive industry.

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