

## Structuring and Architecture: A Strategic Concern in Supply Chain Management of the Project

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**Abstract:** Structuring and architecture in the supply chain is one of the four key elements in the strategic management of supply chain in the construction industry; however, surveys conducted show that there are different views on chains architecture. Using the Grounded theory, this study examines the structure and architecture of supply chain project in two industries including building dams and power plants and provides suggestions for improving the architecture of supply chain project in the construction industry.

**Key words:** Structuring and architecture, supply chain management of the project, strategic project management, structure, suggestions

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### INTRODUCTION

Structuring and need for attention to it, have always been considered as a contributing factor in the formulation of strategy. Chandler (1962) in his book on the structure and strategy of the four large Americans organization, including “DuPont”, “General Motors”, “Standard Oil” and “Sears R Block” has pointed to the need to comply with the structures of the strategy and the importance of the strategy. Moreover, in his book “visible hand”, he developed many of these ideas (Chandler, 1977). Mansfield has introduced the arrangement of resources as the fourth component of the strategy. Robbins limits the generalizability of Chandler’s findings but he supports the impact of the structure and strategy (Robbins and De Cenzo, 2014).

Studies in supply chain management also consider structuring and chain of Architecture as one of the four elements of strategy in the supply chain. The surveys conducted in the construction industry in Iran indicates that pat attention to architecture and structuring in the supply chain is inevitable.

According to the above, this study investigates the status and necessity of structuring and chain architecture in strategic management of supply chain projects. For this purpose, using Grounded theory, a comparative study was conducted between supply chain architecture in plants and dam construction projects as subsets of the construction industry. Architecture and structure of the supply chain in these two industry were evaluated and

compared. And effective parameters on each chain are extracted using Grounded theory. In the final section, some suggestions are presented in order to optimize the structuring and architecture in the supply chain of the projects.

**Research background:** Research shows that structuring and architecture in chain is known as one of the elements of strategic management in the supply chain (Fig. 1) (Cetinkaya *et al.*, 2011).

Also, surveys conducted in supply chain projects in Iran have identified the structuring and architecture as one of the key factors in managing the challenges within the supply chain. On the other hand, in the supply chain architecture, this mechanism is called relations department. Chain collaboration models explain the four types of architecture due to its structure. In the first case which is called the coordinated market or arm’s length of sales contract, the buyer and supplier can retain the market relations. This implies that the product (a) is standard or can be easily customized and suggests that the buyer’s needs be met by a range of companies. The second mode is the horizontal cooperation between members of the networks in which there are cooperation and lasting relations and companies are legally independent but economically dependent on their parent company. In the third mode, there are symmetrical dependence and vertical cooperation in strategic networks between independent companies, legally and economically and finally, the fourth mode includes

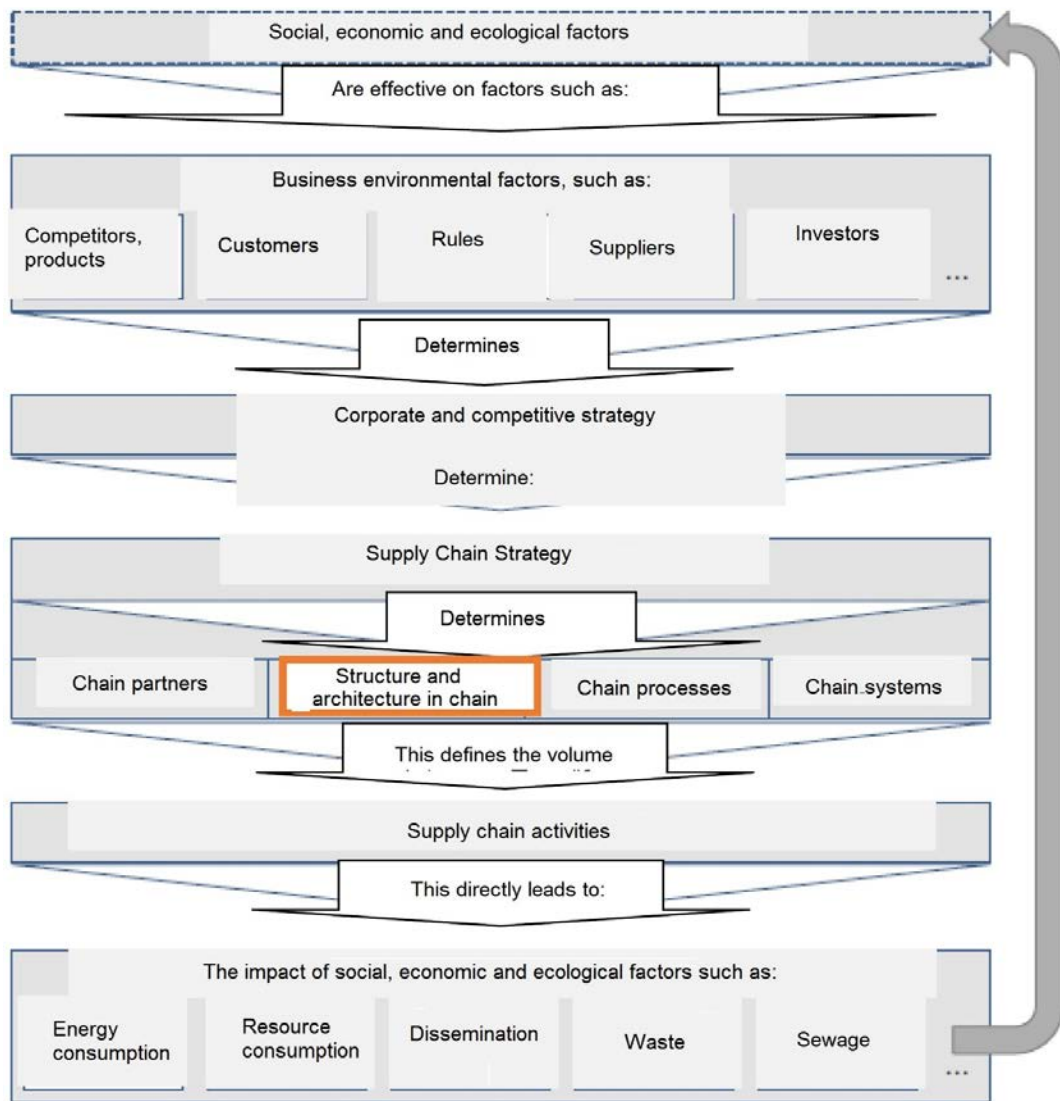


Fig. 1: The position of structuring and architecture in the supply chain management of the project (Cetinkaya *et al.*, 2011)

hierarchical or vertical integration in which the integration causes the loss of legal independence of companies (Brach and Kappel, 2009).

In some industries with complex products, vertical integration has limited desirability because of the pressures related to specialization of activities. On the other hand, there is a need for more coordination with suppliers due to increased customer satisfaction and product complexity (Dyer, 2000). In this regard, Gulati *et al.* (2005) in a study on architectural style came to the conclusion that in terms of differentiation and integration, union-based architectural style is superior to other methods such as arm's length relationship and integration (Gulati *et al.*, 2005). For example, Toyota conducts a large percentage of its transactions through partnership

and other modes of architecture in this company are used less frequently. In contrast, US companies have different architectural profiles and implement a variety of architectures use (Dyer, 2000).

Supply chain management is very important in domestic research and in particular in the automotive industry. The data obtained show that in Saipa's supply chain a high percentage of the cost of components be provided in the form of construction or vertical integration and this is opposite for the supply chain at Iran Khodro so that a high percentage of the cost of components in Iran Khodro be provided by buying from the market or arm's length relationship. The high percentage of the purchase or arm's length in supply chain of Iran Khodro in comparison with Saipa increases transaction costs in

the supply chain of Iran Khodro. In fact, generally, transactions are carried out by arm's length relationship and market in supply chain of Iran Khodro and in contrast, transactions are performed by vertical integration in supply chain of Saipa (Faizabadi and Dastjerdi, 2011).

The results show that, in current circumstances, arm's length and vertical integration have become obsolete in the business environment and especially in industries with complex products, there is a mutual interdependence between employers and suppliers (Krause *et al.*, 2007) which is moving toward the use of combined mechanisms based on alliance or partnership (Williamson, 1985).

Summary and review of previous studies indicates that despite the importance and necessity of structuring and architecture in the supply chain, it has not paid sufficient attention to this issue in the country but there are four models in the chain architecture which can be used as a basis for strategic management of the supply chain. To that end, we've pointed out the weaknesses and strengths in the literature and we have used them as a basis to compare the different architecture in the chains.

## **MATERIALS AND METHODS**

The present study is a qualitative, exploratory and interdisciplinary research by using interpretivism paradigm and overlaps in both supply chain management and project management. This study included project-driven organizations. According to previous research, it must be said that supply chain management is a new theory and there are weaknesses in its pattern, Grounded theory approach to realizing the objective of this study seems appropriate. One of the main strengths of Grounded theory approach is its emphasis on basic social processes and gain insight into social phenomena (Strauss and Corbin, 1998). Also, when we need a theory to explain the process we used Grounded theory (Bazargan, 2008). In this part of the research, in-depth qualitative interviews were used as the primary means of data collection. In order to create focus of the interview, two techniques including follows the mood of the interviewee and key events were used for designing the questions. Collecting and analyzing data continued until theoretical saturation which means when there is no other newer data to receive. In order to analyze the data, we used Grounded comprising the steps of axial coding and open coding and selective coding. In order to advance axial coding phase, the researchers used by Strauss and Corbin (1998) paradigmatic model for

integrating data. In this study, three types of sampling including open, communicative and varied and discriminatal contributed to collect and analyze the data. Accordingly, in three stages, 12 interviews were analyzed. After analyzing the interviews and studies conducted by previous researchers, the main questions about the phenomenon became revealed.

## **RESULTS AND DISCUSSION**

In order to implement research, using Grounded theory, a comparative study was conducted between supply chain architecture in plants and dam construction projects as subsets of the construction industry. Architecture and structure of the supply chain in these two industry were evaluated and compared. For better comparison, the evolution of supply chain architecture in the projects and the factors shaping the architecture have been analyzed and key codes have been extracted.

In power plant construction, architecture in project supply chains dated back to three decades ago. After the Sacred defense, power plant construction was proposed as a key in order to achieve economic development. Also, due to political and regional issues has always been a topic of interest to executives. For this purpose, after the war and during reconstruction period, this became the main objective in the policymaking of the Ministry of Energy. Since, this ministry required a lot of power plants, the managers decided to establish a central entity to manage the power plant projects. In the beginning, there wasn't any strong supplier in this field. For this reason, this parent company was leaning toward the second mode in the architecture. In this mode, horizontal cooperation between members of the networks was formed on the basis of the inner subsidiary of the parent company. Relations were set in such a way that they form cooperative and lasting relationships. Legally, such companies are independent but they are economically are affiliated to the parent company. This architecture could find the greatest value added and in other words, competitive advantage has been maintained. The need to maintain a competitive edge creates an internal chain within the company in which the main components of power plants including turbines, generators (I&C), boilers and other major components except trans are produced entirely by affiliated companies and BOP sub-activities including fuel systems, gas, water, sewage, lighting, communications and similar items be assigned to a electrical and a mechanical contractor to design, supply and Construct (EPC).

On the other hand, experience in implementing power plant projects shows that at different levels, the ministry

**Table 1: Open source code and articles related to the central phenomenon in the development of supply chain architecture in power plant constructions**

Central phenomenon	Categories	Open codes
Collaborative architecture	Advantages of internal chain	Taking advantage of the resources, manpower and technical expertise in subsidiaries in parent company Make maximum use of project financial resources
	External requirements and constraints	Lack of access to powerful domestic suppliers Lack of finance at the right time Sanctions and lack of access to Foreign suppliers Sanctions and lack of access to Foreign suppliers

**Table 2: Open source code and articles related to the central phenomenon in the development of supply chain architecture in dam constructions**

Central phenomenon	Categories	Open codes
Architecture based on arm's length relationship	Characteristics of dam construction project	Standard equipment and materials that can be provided through the market Enormous breadth of activities
	Environmental characteristics affecting the chain	Access to powerful domestic suppliers Lack of dependence on Foreign suppliers and relations
	Employer policies	Project management focus on the employer Lack of attention to the establishment of a centralized entity for major contractors by the public employer

of Energy as a government employer in these projects encountered with various challenges due to lack of funding. And hence, for a long time, they did not have the necessary funds to finance suppliers. Furthermore, the country suffers from the sanctions on many different levels and there was no possibility of cooperation with foreign suppliers. With respect to these issues, with the passage of time, architecture of supply chain in these projects has inclined towards endogeneity affected by external factors. According to the above, a summary of the results is shown in Table 1 according to conceptualize, categorize based on their similarities and common characteristics between the conceptual relations and open codes, concepts and categories in this architecture.

On the other part, the supply chain architecture is studied in dam construction projects. After the war and during reconstruction, dam construction was considered in order to achieve objectives such as agricultural development, self-sufficiency and water supply in the dry climate of Iran. Unlike power plant construction, there wasn't any centralized entity to manage projects and the related policymaking were implemented directly by a government agency. During different periods, the governmental employer created a few consulting companies but dam constructions were assigned to various public and private contractors. Unlike power plant construction, access to different suppliers in this industry such as cement manufacturers, equipment and materials within the country was easy and on the other hand, the development of large-scale dam construction in a short period of time after the war, made suppliers interested in the supply chain of dam construction. Much suppliers, participation of quasi-governmental companies as the contractor because of financial attractions, access to standard equipment and raw materials and the presence of a coordinating body at the level of general contractor

prompted that the architecture of the supply chain in dam construction benefited from arm's length relationship. However, in this chain, the employer had faced a lot of difficulties in order to finance the project and this leads to financial challenges in the sector is contracting and stopping the activities of these companies. To solve this problem, the employer tried to assign these projects to the quasi-governmental companies. In this context, financial risk in projects would be reduced and the projects would not be stopped. Unlike the power sector, these quasi-governmental companies do not create a specific strategy, however, in some cases, there is no such possibility in the project. According to the above, a summary of the results is shown in Table 2 according to conceptualize, categorize based on their similarities and common characteristics between the conceptual relations and open codes, concepts and categories in this architecture.

Comparison of supply chain architecture in these two industries showed that each of these two industries, according to internal and external conditions, have internalized collaborative architecture and arm's length relationship; however, investigate the advantages and disadvantages of each of these architectures show that the internalized collaborative architecture is dominant in the supply chains of power plant projects. Despite the causal circumstances, this architecture has challenges as well which means that the exclusivity of supply chain of power plant projects reduces the employer's bargaining power against major contractors and the contractor can impose his demands entirely on the employer. This could have adverse consequences on the quality of service and efficiency in the supply chain in long term. This monopoly reduce the possibility of selecting an alternative suppliers and this alternative gradually eliminates because of a vicious circle.

On the other hand, arm's length relationship in the supply chain of dam construction is not limited mainly to establish long-term relationships and strategic partnerships between members of chains do not form. Also, check out the features of this relationship in the supply chain of the automotive industry show that this architecture provides generally more cost in the chain and because of this, the cost of the implementation of the project often increases. Lack of forming strategic relationships between members has a direct impact on factors such as the quality of the final product and technical knowledge transfer and because relationships are formed in the short term, the possibility to manage financial challenges also reduced.

Due to the disadvantages mentioned in the architectures and according to the research background, it can be seen that the supply chain architecture have weaknesses in these two industries. Review of past research in the chain architecture shows that the use of collaborative supply chain architecture without internalization and monopoly in which the project components between small specialized companies be broken and each of these companies with deep specialized knowledge in a competitive atmosphere in the form of an integrated chain compete with other chains, it can create an ideal architecture in which many of the weaknesses in the two sectors cannot be seen and there are many strengths in them. For example, the possibility of standardization in a chain consisting of small specialized companies can be significantly increased and as a result, the costs would drastically reduce.

### CONCLUSION

The survey results also show that the mechanisms to create such an architecture in the chain is the presence of a General Contractor (GC) that can determine the position of other members in the chain as the main component of the chain. Therefore, one of the challenges is to develop the general contractor companies. The results of the interviews also show that one of the strategies for the establishment of these company is taking advantage of supplying and manufacturing Engineering Companies (EPC) and develop them to the level of general contractor. So as supply chain architecture in the power plant industry was generated because of the major needs, this policymaking in other sectors of the construction industry must be implemented by a governmental employer or even at a higher level that's mean Management and Planning

Organization. The method of formulation and implementation of this strategy at various government levels and private sector should be considered and evaluated in future studies by other researchers.

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