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Barriers to the Implementation of Supply Chain Management- Case of Small to Medium Sized Contractors in Turkey

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Abstract: ***Construction is a project based production which requires effective and efficient use of materials, machinery, technology and human resources. Supply Chain Management, as a contemporary management approach, has become an important element in the construction project management to improve the efficiency and productivity of construction projects. Despite of its many advantages for both contractors and suppliers, implementation which requires a systematic management approach and technological support may result in contractors' lack of interest to the subject, especially for small to medium sized contractors working in developing cou ntries like Turkey. Many organization, production or sector based problems may additionally affect the implementation. This research, thus, focuses on exploration of barriers to implementation of supply chain management by small to medium sized Turkish contractors who specialize in residential building construction. A questionnaire survey was conducted in order to collect related data. Twenty one barriers to the implementation of a successful supply chain management which were determined during literature review were listed in the questionnaire and respondents were asked to rank their significance by using Likert Scale of Five. In order to collect data, face to face interviews were undertaken with a total number of a hundred and four small to medium sized Turkish construction contractors who specialised in residential building construction. Collected data was statistically analyzed and the barriers were grouped under seven factors through Factor Analysis. These factors were named as; lack of trust to the suppliers, lack of information technology infrastructure and resistance of the suppliers to change, short-term and price-oriented approaches, lack of top management support, production being project-based and large in volume, widely spread contentious relationships in the industry and difficulties in accessing the resources. When these factors were analysed according to factor loadings, it was concluded that the main problems that were faced by small to medium sized contractors in Turkey were difficulties in accessing resources like information technology and consultants. Research findings additionally showed that trust on suppliers was very low and the demand from employers/clients was the main drive for the contractors.***

Keywords: Supply Chain Management, Supplier Selection, Construction and Project Management, Construction Industry, Factor Analysis

1. Introduction

Residential building construction has an important share of construction output in Turkey. 2015 records show that 60% of total construction output is residential buildings and that ratio is expected to increase due to the factors like the urban transformation programme, the decrease in the share of Turkish contractors in foreign construction markets like Russia, Africa and Middle East and the continuous decrease in other construction investments in the domestic market since 2013 (Sezgin and Aşarkaya, 2015). The competition is fierce especially for small to medium contractors as the number of large contractors focusing on residential building construction increases due to the above mentioned factors. Thus, small to medium sized contractors have to focus on strategies which would increase their product/ service quality and decrease production unit costs in order to have a competitive advantage. This can only be achieved through a successful supply chain management which focuses on how to use firms' own suppliers, processes, technologies, and capabilities as construction process encompasses the flows of materials, labor, information, plant, equipment and temporary works that originate from a variety of different parties.

Literature review shows that a successful supply chain management can eliminate cost and time overruns and increase the process performance and in turn the competitive advantage of construction firms (Egan, 1998; Dainty et al., 2001, Xiaolong et al., 2007). While the role of long-term supplier relationships based on a win-win approach are considered to have a vital importance in the success (Hill, 1998; Van, 2005; Monczka et al., 2005; El-Mashaleh, 2009; Hatmoko and Scott, 2010; Prajogo and Olhager, 2012), it may not be that easy to be successful as many barriers to the implementation may exist. Different researchers like Akintoye et al. (2000), Vrijhoef and others (2001) and Dianty et al. (2001) have categorized these barriers. According to Akintoye et al. (2000) major barriers to the implementation of supply chain management are;

- Lack of senior management commitment,
- Lack of understanding the concept of supply chain management,
- Having an inadequate organizational structure to support the supply chain management system,
- Low commitment of partners,
- Uncertain strategic benefits and,
- Lack of appropriate information technologies.

In another study, conducted by Vrijhoef et al. (2001), difficulties related with supply chain management implementation in construction sector have been stated to be due to the following reasons;

- Lack of guidance to create alliances with supply chain partners,
- Failure to develop measures for monitoring the alliance
- Lack of appropriate organizational institutionalization,
- Lack of integration of the company's internal procedures,
- Lack of trust within and outside the company,
- Organizational resistance to the concept of supply chain management,
- Lack of integrated information systems and electronic trade systems that connect the companies,
- Failure to expand the vision of the supply chain that comprises the major business processes in addition to purchasing or distributing products.

Dianty et al. (2001) grouped barriers to the supply chain coordination and integration as follows:

- Problems related with attitude: Parochial 'win-lose' attitude, short-term focus, subcontractors and suppliers not being allowed to participate in the early stages of the production process, lack of; praise for good performance and understanding of sub-contractors' and suppliers' problems.
- Problems related with the quality of information: Low information quality, insufficient information exchange and, less transparency along with limited communication.
- Financial/cost related problems: Competitive tendering procedures which are based on the price but not on life-cycle costs, serious problems with payments between customers, main contractors, sub-contractors and suppliers due to hostile relationships.
- Programming/timing related problems: Unrealistic and uncertain supply time of materials and equipments.

The above listed findings together with the barriers discussed by researchers like Hill, 1998; Van, 2005; Monczka et al., 2005; El-Mashaleh, 2009; Hatmoko and Scott, 2010; Prajogo and Olhager, 2012, Shreejith B. (2012); Christian B. (2011); Liu et al.(2012); Singh et al. (2005), Rajesh and Rituraj (2012), Gosling et al.(2015) are summarised and listed as;

(1) Information technology infrastructure of the suppliers being inadequate,
(2) Business owners (employers) being more important than suppliers and subcontractors for the contractors,
(3) Lack of consultants to guide the firms,
(4) Lack of company information systems that enable information sharing with the suppliers,
(5) Short-term objectives and price-oriented approaches in the sector,
(6) Suppliers hesitation about being a part of a new system due to the potential problems and risks,
(7) Inappropriate quality of materials provided by the suppliers,
(8) Working with the same supplier for a long period of time having a negative impact on the quality,
(9) Short-term objectives and price-oriented approaches in the industry requiring short-term relationships with suppliers,
(10) Suppliers not employing quality management or quality systems,
(11) Working with many suppliers hindering systematic implementation of supply chain management system,
(12) Project-based production in the construction industry preventing the implementation of supply chain management,
(13) Suppliers being far away and transport cost being high,
(14) Difficulties related to the management of stock,
(15) Cooperation established with suppliers not being compatible with the internal procedures of the companies,
(16) Prevalence of hostile relations in the construction process hindering relationships based on mutual trust,
(17) Little trust to the suppliers that they would do what they have promised,
(18) Suppliers not being interested in a long-term cooperation,
(19) Top management who does not know the concept of supply chain management,
(20) Top management not being open to the idea of any change in their management styles,
(21) Company"s organizational structure not being supportive for a cooperation with the suppliers.

2. Material and Methodology

In order to achieve the aim of the study a questionnaire was formed. Questionnaire included questions related with the profile of the respondents, profile of the companies, problems related with the suppliers, factors that are important for a successful supply management implementation, the information technology usage of the companies, priorities of the companies while choosing their suppliers and subcontractors, barriers against the implementation of supply chain management and the potential benefits of supply chain management implementations for the companies. The questions except the ones related with the profile of the respondents were asked to be answered by Likert Scale of 5; 1 'not significant at all' and 5 presenting 'very significant'. Evaluation criteria for Likert Scale questions are given in Table 1. Findings related with the barriers to the implementation of supply chain management are discussed in the following sections.

Table 1: Evaluation Criteria for Likert Scale Questions

Score Interval (Mean)	Significance for the respondents
1,00 – 1,79	Very low level
1,80 – 2,59	Low level
2,60 – 3,39	Medium level
3,40 – 4,19	High level
4,20 – 5,00	Very high level

The questionnaire has been implemented to a total number of 104 small to medium sized (number of employees less than 100) Turkish construction contractors which specialised in residential building construction. Questionnaire survey was first distributed to 500 firms via e –mail but due to the low response rate face to face interviews were then preferred.

The respondents were firm managers (33%), site managers (35%), project managers (15%) and other technical personnel like architects and civil engineers (17%) who were familiar with supply chain management of their companies.

Collected data was analysed by using SPSS 18 software and Cronbach Alpha coefficient (CAC) was used to determine the understandability of the questions and the internal consistency of the answers. CAC values being over 0,8 indicated „high" consistency of the answers (Çelik and Oral 2016).

Factor analysis was then performed on the variables in order to interpret data in a more organized manner. –Kaiser-Meyer- Olkin Test (KMO) and Bartlett's Test of Sphericity were performed to determine the adequacy of the sample data. KMO value being 0.737, Bartlett's Test value being $\chi 2 = 730,465$, $p= 0,00$ showed that the data set was fit to factor analysis .

3. Findings

Twenty one barriers to the implementation of a successful supply chain management which were determined during literature review were listed in the questionnaire and respondents were asked to rank their significance by using Likert scale of 5. Mode values were used together with mean values during data analysis as focusing on only the mean values causes misdirection when values are measured by Likert Scale as data does not fit a normal distribution.

Table 2: Barriers to supply chain management implementation in the construction industry and problems faced in supplier relations

		Mean	Standard Deviation	Mode
1	Information technology infrastructure of our suppliers are inadequate	3.692	1,31	5
2	Business owners (employers) are more important than suppliers and subcontractors for our company	3,682	1,26	5
3	There is a lack of consultants in the sector to guide the firms	3,596	1,3	5
4	Our firm does not have an information system which is used for information sharing with our suppliers	3,576	1,49	5
5	Short-term objectives and price-oriented approaches in the sector adversely affect the supply of quality product	3,423	1,3	5
6	Suppliers hesitate to be part of a new system due to the potential problems and risks.	3,615	1,19	4
7	We have problems with our suppliers due to inappropriate material quality.	3,163	1,2	4
8	Working with the same supplier for a long period of time has negative impact on the quality.	3,057	1,41	4
9	Short-term objectives and price-oriented approaches in the industry require short-term relationships with suppliers.	3,605	1,16	3
10	Suppliers do not employ quality management or quality systems.	3,336	1,2	3
11	Working with many suppliers hinders systematic implementation of supply chain management system.	3,326	1,18	3
12	Project-based production in the construction industry prevents the implementation of supply chain management.	3,153	1,25	3
13	Suppliers are far away and transport cost is high.	2,971	1,33	3
14	There are difficulties related to the management of stock.	2,663	1,23	3
15	Cooperation established with suppliers is not compatible with the internal procedures of our company.	2,548	1,22	3
16	The prevalence of hostile relations in the construction process hinders relationships based on mutual trust.	2,846	1,22	2
17	We have little trust to our suppliers regarding the fact that they do what they promise.	2,548	1,13	2
18	Our suppliers are not interested in a long-term cooperation.	2,384	1,21	2
19	Top management does not know the concept of supply chain management.	2,644	1,37	1
20	Top management is not open to the idea of any change in their management styles.	2,576	1,39	1
21	Our organizational structure is not supportive for a cooperation with our suppliers.	2,355	1,25	1

When mean values in Table 2 are analyzed, it is observed that none of the barriers have a 'very high' level of significance for the contractors. "Lack of suppliers' information technology infrastructure" which is the most important barrier has a 'high level' of significance and problem of supply chain management implementation by Turkish contractors. Business owners (employers) being more important than the suppliers and subcontractors is the second important barrier to supply chain management implementation. However, when mode values are analysed it is observed that these two factors are considered to have a 'very high level' of importance by most of the contractors and the standard deviation values show that the opinions of the contractors are quite homogenous. On the other side, organizational structure not being supportive for cooperation with the suppliers is stated to be the least important factor (has a 'very low level' of importance) against the implementation of supply chain management by the contractors.

A. Factor Analysis Results

Explained total variance value analysis to the barriers listed in Table 2 showed that 7 factors with eigenvalues greater than 1 (5.578, 1.965, 1.510, 1.445, 1.339, 1.115 and 1.054 respectively), were present. Factors' cumulative variance value is calculated to be 66,699. Factor loadings are given in Table 3. The names of the factors are as indicated in Table 4. These factors summarise the barriers against introduction of supply chain management by small to medium sized contractors in Turkey.

- Lack of information technology infrastructure and resistance of the suppliers to change
- Difficulties faced during access to resources
- Contentious relationships being common in the industry
- Short-term and price-oriented approaches
- Production being project-based and large in volume
- Lack of top management support
- Lack of trust to the suppliers

Table 3: Extraction rotated factor loadings related to barriers to supply chain management implementation in the construction industry

Components	Factor						
	1	2	3	4	5	6	7
15. Cooperation established with suppliers is not compatible with the internal procedures of the company.	,786						
18. Our suppliers are not interested to a long-term cooperation.	,680						
21. Our organizational structure is not supportive to collaborate with our suppliers.	,624						
10. Suppliers do not employ quality management or quality systems.	,584						
17. We have little trust to our suppliers regarding the fact that they do what they promise.	,496						
6. Suppliers hesitate to be part of a new system due to the potential problems and risks.		,795					
1. Information technology infrastructure of our suppliers are inadequate.		,741					
4. Our firm does not have an information system which is used for information sharing with our suppliers.		,636					
5. Short-term objectives and price-oriented approaches in the sector adversely affect the supply of quality product.			,742				
9. Short-term objectives and price-oriented approaches in the industry require short-term relationships with suppliers.			,700				
7. We have problems with our suppliers due to inappropriate material quality.			,656				
20. Top management is not open to the idea of any change in their management styles.				,821			
19. Top management does not know the concept of supply chain management.				,786			
8. Working with the same supplier for a long period of time has negative impact on the quality.					,841		
11. Working with too many suppliers hinders systematic implementation of supply chain management system.					,740		
12. Project-based production in the construction industry prevents the implementation of supply chain management.					,517		
2. Business owners (employers) are more important than suppliers and subcontractors for our company.						,792	
16. The prevalence of hostile relations in the construction process hinders relationships based on mutual trust.						,596	
13. Suppliers are far away and transport cost is high.							,785
3. There is a lack of consultants in the sector to guide the firms.							,556

Table 4: Factors related to barriers to supply chain management implementation in the construction industry

Factor No	*Implementation barriers in supply chain relationships*	*Frequency %**	*Ranking*
1. Factor	Lack of trust to the suppliers	22,4	7
2. Factor	Lack of information technology infrastructure and resistance of the suppliers to change.	77,9	1
3. Factor	Short-term and price-oriented approaches	57,7	4
4. Factor	Lack of top management support	39,3	6
5. Factor	Production being project-based and large in volume	50,9	5
6. Factor	Widely spread contentious relationships in the industry	57,9	3
7. Factor	Difficulties in accessing the resources	59,8	2

* Sum of the answers "very significant" and "significant"

In this context;

- The most important barrier to the implementation of supply chain management is both suppliers' and contractors' lack of information technology infrastructure.
- According to the main contractors, employers are more important than suppliers and subcontractors. In other words main contractors would give importance to supplier relationships if their employers force them to do so.
- Lack of consultants to guide the contractor in establishing a supply chain partnering is one of the major problem in industry.
- Short-term and price-oriented approaches in the sector adversely affect the management approaches of both contractors and suppliers. Short-term goals triggered by project based production, price-orientation, lack of mutual trust and hostile relationships result in short-term relationships.
- Management of contracting firms are dominated by traditional approaches. Therefore, respondents believe that both top management of contractors and suppliers would resist to new systems.

4. Results

Current research focused on the barriers to the implementation of supply chain management by small to medium sized Turkish contractors which specialise in residential building construction. The questionnaire survey findings showed that there are mainly 7 factors that represent the problem. When these factors are analysed according to factor loadings, it can be concluded that the main problems that are faced by small to medium sized contractors in Turkey are difficulties in accessing resources like information technology and consultants. Research findings additionally show that trust on suppliers is very low and the demand from employers/clients is the main drive for the contractors.

It can finally be concluded that management consultancy is an important requirement for small to medium sized contractors in order to implement a successful supply chain

management. However, contractors who mainly focus on minimising costs may hesitate to invest in consultancy. It is then recommended to the consultants to emphasize the effects of implementation of the system on employer - contractor relationships in order to motivate the contractors to establish a new supply chain management system.

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