

Analysis of Supply Chain Management in Small Scale Residential Construction Sector

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Abstract

This paper presents the results of a questionnaire survey on supply chain management in the small-scale residential construction sector. The results indicate that the small-scale residential construction sector needs to improve its resource management, understand customer requirements, and adopt new technologies. The concept of supply chain management is new to the residential construction sector, and it requires awareness of the implementation of the philosophy. For the implementation of SCM in the small-scale residential construction sector, contractors need to concentrate on construction resource planning as a key target. The barriers to the successful implementation of SCM in the residential construction sector are a lack of conceptual knowledge, workplace culture, and a lack of IT. These barriers can be overcome by creating awareness of supply chain management.

Key words- supply chain management, residential construction sector, small scale industry, awareness, and implementation.

3. Introduction

Globally, the residential building industry plays a vital role in promoting social cohesion and economic activities. However, it is also infamously disjointed, ineffective, and prone to unexpected delays and price overruns—problems that are frequently exacerbated in the small-scale sector of the business. This sector, which mainly consists of individual residences, modest housing complexes, and restoration projects, faces specific challenges, such as limited financial resources, diminished negotiating leverage, and dependence on traditional, often confrontational, procurement procedures. In recent decades, Supply Chain Management (SCM) has

become a critical strategic method for improving effectiveness, environmental responsibility, and resilience across sectors, and its potential use in construction has sparked substantial academic interest. Conventional construction supply chains are usually marked by a lack of integration, inadequate information sharing, and hostile relationships among customers, major contractors, and numerous subcontractors and suppliers. According to Abdelmageed and Zayed (2020), these deficiencies are a main focus for improvement using current technologies such as Modular Integrated Construction (MIC), which requires a highly connected and collaborative supply chain. Similarly, as Agapiou (2020) discusses, choosing an acceptable procurement channel is a critical choice that has a significant impact on SCM effectiveness; however, its intricacies in small-scale projects are sometimes missed. While the advantages of integrated SCM and off-site manufacturing have been widely proven for major projects (Banks et al., 2018; Hairstans et al., 2018), their application to smaller enterprises and projects remains challenging and underexplored. The quest for green and sustainable supply chain management (GSCM) is a common subject in the literature. Researchers such as Badi and Murtagh (2019) and Cataldo (2022) have thoroughly examined the incorporation of environmental factors into construction SCM, emphasizing motivators such as regulatory pressure, environmental responsibility, and long-term cost reductions. Cataldo, Banaitien'e, and Banaitis (2021) developed metrics to quantify sustainability in building supply chains. However, the execution of these techniques in the small-sized residential sector faces significant challenges, including perceived greater upfront costs, a lack of knowledge, and inadequate client demand for green construction, making a feasibility assessment critical. Cataldo, Banaitien'e, and

Banaitis (2021) developed metrics to quantify sustainability in building supply chains. However, the execution of these techniques in the small-sized residential sector confronts significant challenges, including perceived greater upfront costs, a deficiency of knowledge, and inadequate client demand for green construction, making a feasibility assessment critical. The use of enabling technology poses both difficulties and opportunities for small-business contractors. Building Information Modelling (BIM), as noted by Georgiadou (2019), has the potential to transform design, coordination, and supply chain integration; nevertheless, its implementation in UK real estate developments, particularly small ones, is impeded by cost and skill-related obstacles. Furthermore, the use of a digital ledger, as advocated by Du et al. (2021), offers unprecedented openness and privacy in transactions, but its feasibility for small businesses must be confirmed. Mandićák et al. (2021a, 2021b) found that Information and Communication Technology (ICT) and big data have a beneficial influence on economic sustainability and cost reduction. This suggests that small actors can benefit from technological leapfrogging. The literature also demonstrates a considerable emphasis on mathematical modeling and strategic structures for optimizing SCM. Studies have used a variety of methodologies, including mixed fuzzy-based strategies for sustainable supplier selection (Hoseini et al., 2021) and system dynamics to model utilization pathways (Ghufran et al., 2021), as well as structural equation modeling (SEM) to examine the impact of material sustainability on performance (Kamal et al., 2021). These sophisticated tools are useful for analyzing complicated connections, although they are frequently built and tested on larger company supply chains. Their relevance and sustainability to the unstructured, relationship-based networks seen in small-scale homes require careful consideration. Despite this extensive corpus of information, a major gap still exists. Existing research has mainly focused on large-scale projects, industrialized construction (Hussein et al., 2021), and the viewpoints of major contractors. The small-scale residential sector, which serves as the foundation of the housing markets of many nations, remains relatively understudied. This introduction demonstrates the necessity of a focused study of SCM in this particular situation. It will examine the particular difficulties that small-scale contractors

face when implementing integrated, environmentally friendly, and cutting-edge SCM processes. This evaluation attempts to identify transferable best practices, articulate specific barriers, and propose a strategic framework for improving SCM performance to drive efficiency, sustainability, and resilience in the small-scale residential construction sector. This was achieved by synthesizing insights from the literature on construction SCM, sustainability, technology adoption, and procurement.

2. Literature Review

Supply chain Management has important role in firm's performance and attracted serious research attention over the last few years. According to Thomas and Griffin (1996), supply chain management (SCM) represents the pinnacle of the evolution of procurement, purchasing, and other supply chain operations. According to Hall (2000), a number of factors, such as laws and customers, are pressuring businesses today to adopt more sustainable practices. Dey and Cheffi (2012) also point out that government regulators, non-governmental organizations, academics, and industry participants are becoming increasingly interested in sustainable supply chains and their management as a result of pressure from various stakeholders to commit to sustainable practices and performance management.

Based on a green supply chain PM framework, Bhattacharya et al. (2013) determine the green causal relationships between the constructs (such as organizational commitment, etc.) and test them using a collaborative decision-making approach with a fuzzy analytical network process based green balanced scorecard.

Performance measurement and green supply chains have been the subject of a plethora of literature in recent years as environmental protection has gained increasing attention. Gavronski, Lee and Klassen (2008)

3. Methodology

3.1 Questionnaires design

This research based on sampling survey by using questioners. A two page close-ended questionnaires send to builders of residential construction firm. These questions consist of three segments which are related to back ground information of firm, SCM relevance, and an implementation and barriers of SCM in residential firm.

The questionnaire was designed to reflect various studies by Latham [1994] report on constructing the team. Egan [1998] report on rethinking construction, Akintoye et al. (2000) studied on a survey of SC collaboration and management in the UK construction industry.

The final section of the questionnaires was done by using a five-point likert scale in that 5 indicating “strongly sure” and 1 indicating “strongly differ”.

3.2. Sample design

The questionnaires send to 30 largest builders in local area, choose of builders according to their experience. In respond to 28 replies were receiving after 15 days. Therefore, respond rate is 60%. The result of proposal survey base on respond rate.

4. Data Analysis and Result

The complete information is statistically analyzed as per response received from different respondents. The results are shown in tabular kind, which represents the percentage of responses of every question asked. The survey results are then compiled and static analysis has been done by using Microsoft excel.

Table 1 Employee strength of organization

Employee strength	Respond percentage
Less than 30	12.71%
25 to 50	15.25%
50 to 100	18.87%
100 to 200	62.78%
More than 200	8.10%

Table 2 Experience of firm in residential construction sector

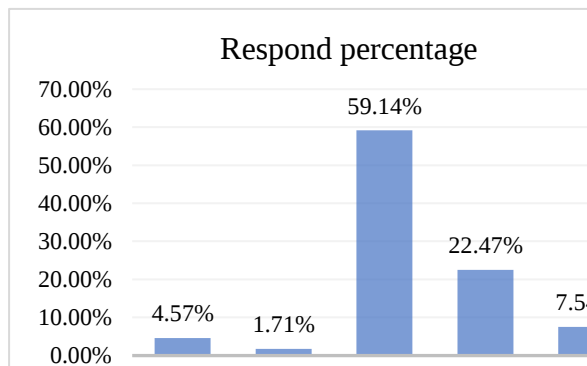
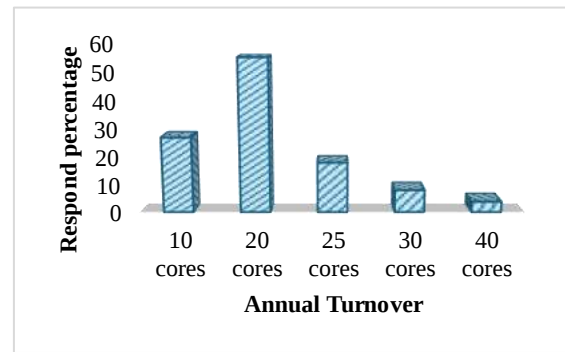


Table 3 Annual turnovers for the responding firm



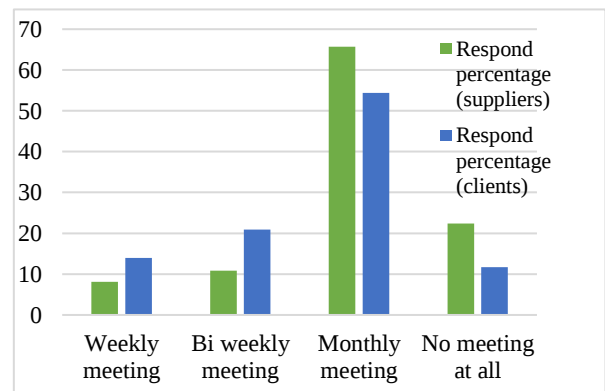
Tables 1 to 3 present the result of background information of firm, were ask to employee strength, experience and annual turnover of the respondents. Table 1 and 2 shows that 60% respondents are small scale residential firm and their experience in this sector is 10 to 15 yr.

Table 3 shows that annual turnover of respondents. There are 50% respondents having 20 to 22 cores annual turnover. Egan (1998) The Skilled Helper: A Helping Method Based on Problem-Management. Brooks Cole, Pacific Grove, CA.

Table 4 Implementation of SCM can save the cost, time and improve the quality.

	Respond percentage (cost)	Respond percentage (time)	Respond percentage (quality)
yes	69	69	55.27
No	11.7	14.58	22.12
Not sure	17.85	18.15	27

Table 5 Respondents conduct meeting with suppliers and clients



1.

Supply Chain Management Relevance to the construction firm

Respondents were asked to provide their opinion on which factor is important to implementation of SCM in their firm. Table 4 result show that cost, time and quality is the most important factor to implement SCM.69% respondent felt that

cost and time is important and 55.27% is quality. Walker and Alber (1999) the business organizations always want to reduce the product development time, production costs and improve the quality of product with proper implementation of SCM technique, the construction firm will take advantages.

2. Contractor relationship with suppliers and clients

The question asked to contractors they had conduct meeting with suppliers and clients to maintain relationship at the time of project implementation stage. Table 5 show that 65.71 % respondents are conduct a monthly meeting with suppliers and 54.37% with clients at project implementation stage. 22.41% and 11.71% respondents are not conducting meeting with suppliers and contractors respectively.

Table 6 Important functions of internal organization to SCM

Function	Strongly sure	Sure	Not sure	Somewhat differ	Strongly differ
Optimum Inventory	53.57	25	0	21.42	0
Smooth construction process	46.42	35.71	17.85	0	0
Easy procurement process	64.28	35.71	0	0	0
storage	53.57	21.42	0	25	0
other	7.14	0	0	0	0

Table 7 Important features of SCM to maintain relationship with clients

Function	Strongly sure	Sure	Not sure	Somewhat differ	Strongly differ
Benefits of costs	71.42	25	3.57	0	0
Smooth construction process	35.71	50	14.28	0	0
Easy sealing process	46.42	39.28	14.28	0	0
Maintain quality	64.28	17.85	14.28	3.57	0
other	28.57	32.14	28.57	3.57	0

Table 8 Important features of SCM to maintain relationship with suppliers

Function	Strongly sure	Sure	Not sure	Somewhat differ	Strongly differ
Benefits of cost	60.71	21.42	17.85	0	0
Provide Better service	64.28	21.42	14.28	0	0
Smooth construction process	46.42	42.85	10.71	0	0
easy procurement process	53.57	28	21.42	0	0
other	3.57	0	0	0	0

Table 9 Objectives to implementing the SCM concept

Function	Strongly sure	Sure	Not sure	Somewhat differ	Strongly differ
Reduce construction cost	64.28	21.42	14.28	0	0
Benefit to client	35.71	32.14	32.14	0	0
Increase the profit	71.42	21.42	7.14	0	0

Maintain optimum inventory	53.57	28.57	17.85	0	0
Reduce construction time	46.42	32.14	21.42	0	0
Benefit to supplier	35.71	32.14	32.14	0	0
other	17.85	0	0	0	0

Table 10 Major barriers to implements SCM

Function	Strongly sure	sure	Not sure	Somewhat differ	Strongly differ
Lack of concept knowledge	35.71	32.14	32.14	0	0
Not better communication	53.57	35.71	10.71	0	0
Poor management	67.85	17.85	14.28	0	0
Lack of information technology	60.71	28.57	10.71	0	0
other	0	0	0	0	0

3. Important function to efficient supply chain management

Table 6 shows that important function to efficient supply chain management in construction. The five functions were considered for rating, which were most important to the internal organization of the supply chain management. In which 64% easy procurement process, 54% optimum inventory and storage, 46% smooth construction process are strongly sure these supply chain functions in an internal organization. The procurement is most important function of SCM concept according to participant of the survey. This basic information is shows that participants of the survey implement the Supply chain, in their project and getting full advantage. Akintoye et al (2000) listed many functions of SCM in their report and they conclude that procurement is the most important function of SCM to organization.

4. Function consider to maintain relationship clients and suppliers at SCM

Table no 7 and 8 show which is the important features of SCM to maintain relationship with client and suppliers. 72% participants are of the survey strongly sure that cost benefits function of SCM is related to the client and 64% strongly sure the better service provide as SCM feature with maintain relation with supplier. Parker & D'Vaz (1997) suggest that partnering is the main focus for the organization to realize maximum benefits by working jointly and therefore it has much relevance to SCM. When implementing SCM they

perhaps form part of modern management required within today's construction industry.

5. Objectives to implementing the SCM

Table 9 shows that main objective of implementing SCM process in construction. There are seven functions are considered which is related to SCM. 71% participant strongly sure increase revenue is the main objective of SCM implementation and 64% participant strongly sure reduction of construction cost of project is the main objective. 36% participant strongly sure benefits to supplier and client is main objective. Maintain optimum inventory is the main objective participant responded 54% strongly sure. Near about 7% is not sure increase the profit is main objective. 32% participants are not sure benefit to client and supplier. Anderson et.al (2007) also explain the seven principles of SCM in which each point can increase revenue, growth of organizations and reduction in cost if these principles are implemented in right manner.

6. Difficulties face to implementing SCM in construction

Table 10 show factors to make difficulties to implementing SCM in small scale residential construction sector. 68% participant strongly sure that poor management is the main obstacles for implementing SCM process in project. While 18% participant sure this, however 14% are not sure about this obstacle. Another difficulty facing by the construction project is lack of information technology for implementing

SCM concept in their project. 61% participant strongly support this difficult. 18% and 14% participants are sure and not sure about this obstacle respectively. Near about 54% participant are strongly sure non communication is one of the obstacles. While 35% sure and 11% not sure these obstacles. Approximately 36% responds strongly sure voted lack of conceptual knowledge is one of main obstacles in implementing supply chain management concept. The biggest barrier; to implement the supply chain successfully in industry was poor understanding of concept, an inappropriate organization structure and top management commitment state by A. Akintoye et al (2000).

5. Conclusion

The residential building industry's supply chain management is a little more difficult to comprehend because of the fragmented and multifunctional nature of the construction

process; this is taken into account while applying SCM tools. The majority of businesses are curious about the supply chain management idea, and some businesses who are already using it in their projects are not making the most of it; they are ignoring the supply chain's main advantages. The poll respondents are adamant that the supply chain method contributes to cost savings, shorter construction times, and higher project quality. Healthy relationships between suppliers, clients, and contractors are crucial to a company's profitability, and supply chain management (SCM) concepts facilitate the procurement process.

The goal of this study was to determine the two main obstacles to implementing the supply chain management concept in residential construction projects: a lack of information technology and a lack of concept knowledge.

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