



Effect of Supply Chain Integration on Companies' Competitive Advantage

Maninder Singh, Sanjeev. K. Sharma, Suresh. K. Chadha

Abstract: *The lack of implementation of SCI in construction companies is one of the major cause that these companies does not gain competitive advantage in this competitive world. SCI is calculated on various variables. The main aim of this study is to find the effect of Supplier Partnership and Logical Integration as the major variable related to supply chain over Competitive Advantage. Initially the questionnaire was checked for validity and reliability. Then SEM is applied using smartPLS software. Correlation reported that Strategic Partnership is having moderate positive and Logical Integration is having high positive relation with Competitive Advantage. And regression reported that overall SCI is having a strong and positive relation with Competitive Advantage. Further research is advised as this study was having limitations.*

Keywords: *SCI – Supply Chain Integration, SEM – Structural Equation Modelling, SME – Small-Medium Enterprise*

I. INTRODUCTION

Companies are including new ways of managing their supply chain, like adoption of techniques, such as, Just-In-Time, Lean manufacturing and Enterprise Resource Planning (ERP) (Gunasekaran et al., 2001)¹². SCI is defined as the strategic integration of both internal and external organization processes (Flynn et al., 2010)¹⁰ and also tries to evaluate that how well the supply chain partners work in a collaborative manner to attain the beneficial outcomes (O'Leary-Kelly & Flores, 2002)¹⁹.

Organizations (Silva, 2011)²³ are implementing SCI for building the sustainable value of the company. As per the definition of SCM, the major objective of SCI is to efficiently move the products/services, finances and information from the source to the destination (Leuschner, et al, 2013)¹⁷. The lack of implementation of the SCI has crucial consequences on the performance of the supply chain because of the low turnover of the inventory, delays in the procurement process, inappropriate forecasting and quality degradation of the raw materials and final products, etc. results in the losses for the supply chain members companies and individual companies (Hariharan et al., 2018)¹³. This will have a negative impact on the satisfaction of the consumer (Wong et al., 2011)²⁵.

SCI is composite of the two major dimensions: (1) Internal Integration and (2) External Integration (Flynn et al., 2010)¹⁰. Internal integration is defined as “the level to which a company re-engineers the strategies of its organization and synchronizes its processes to fulfill the demands of the customers” (Kahn & Mentzer, 1996)¹⁴. Organizations are putting their efforts to get rid of the internal functional barriers and to make the resources flow effortlessly across the various departments of the company to lead an internal integration (Gunasekaran et al., 2004)¹¹. Internal integration helps bring cooperation in all the departments of the organization (Wong et al., 2011)²⁵. Internal Integration if not implemented properly and the challenging objectives of various departments, may lead to deceit of work, and wastage of the resources. The overall performance of the supply chain will be having a negative impact because of this (Pagell, 2004)²⁰. Even, the internal integration within a company helps to reduce the irregularities in the information provided (Narasimhan & Kim, 2002)¹⁸.

(Farooq, 2014)⁹ The integration of the activities and the process with the customers and the suppliers is included in the external integration. There are many different strategies and benefits of integrating with the companies suppliers. These strategies includes, sharing of the information, planning collaboratively, forecasting jointly and production (Ragatz et al., 2002)²². However, the integration with the customers allows the organization to provide better and improved customer services, and market opportunities could be expanded, and quick response to the customer needs (Swink et al., 2007)²⁴.

Yu, et al, (2013)²⁷, reported internal integration enables external integration, and both together affects the financial condition of the company and the customer performances. Flynn et al, (2010)¹⁰, explained the main idea behind external integration is to develop and preserve a collaborative relationship with the suppliers and the customers. For enhancing the performance of the supply chain and the organizations competitive advantage, internal and the external integration are very crucial (Prajojo & Olhager, 2012)²¹.

II. LITERATURE REVIEW

There is vast literature available on the SCI. Researches has been done on managing integration of the supply chain in relation to the enhancement of the competitive advantage of the company. SCI is in the introduction stage in India, especially in construction industry. Review of Literature is conducted into two parts, namely Supplier Partnership and Companies' Competitive Advantage and Logical Integration and Companies' Competitive Advantage.

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1.1 Supplier Partnership and Companies' Competitive Advantage

Briscoe et al. (2001)⁴ had examined skill that were necessarily required for the efficient SCM partnerships in the construction industry of United Kingdom, and found that partnering, lean production, attention to the skills aspects had been neglected. The SME skills were explored by the researchers in relevance for developing more effective supply networks. They interviewed SME companies to check whether the existing knowledge of the employees, skills that they use and attitudes they carry were suitable for accomplishing better integration in the supply chain. They had found significant attitudinal barriers that barred full association between the key contractors and their subcontractors at that level. They further stated skills that already existed in construction supply chain needed to be discovered and developed to assist successful partnering.

Beach et al. (2005)² suggested that the main concern in the industry of construction was improvement of projects effectiveness and analyzed that partnering development in UK construction industry was difficult to be applied especially at the levels lower in supply chain. Progress after adopting partnering in UK construction industry was studied and future implications were recommended. Partnering experiences that the main contractors were having with subcontractors were investigated and a framework was developed including the success factors were depicted and found that clients were the major barrier in partnering adoption in construction industry not suppliers.

Errasti et al. (2007)⁷ suggested that subcontractors in the industry of construction were under enormous pressures due to the maintenance of quality, providing efficient service, and trying to reduce the cost of investment made and foremost amongst those was identified as working closely with their suppliers. They had found that the issue related to the partnering development process had not been entirely assigned to the contractors in the industry of construction. They involved development process of partnering with two of the subcontractors from the industry and suggested that partnership development process had to be improved so as to gain competitiveness in construction industry. They further suggested that if subcontractor concentrated purchase volume from few numbers of suppliers and implemented a development process of partnership, significant improvement could be made. Researchers had also suggested that considerable value in cost savings could be attained by outsourcing activities and materials suppliers.

Bygballe et al (2010)⁵ proposed that there was no joint view to explain the relationships of partnering in the industry of construction. The literature was examined to find out the assumptions take up while understanding the relationships in partnering. Further, the literature was compared with the definition given by the Construction Industry Institute's in year 1991 and found that the sharing of information and understanding each other and developing trust between partners improved the profits in construction. They discussed the findings and suggested that theoretical perspective of understanding and developing trust had to be implemented. They further found supply chain had to focus on developing long-term relationships in between the clients of the company and main contractor.

Banerjee, M., & Mishra, M. (2017)¹ surveyed the executives of the major food retailers that were operational in India and studied their viewpoints on SCI, companies performance and the competitive advantage of the companies. SCI incorporated nine dimensions and competitive advantage incorporated four dimensions. Researchers found a strong positive relation to of SCI and complete advantage and firms' performance. Information that is required by the suppliers to be shared to them timely and taking decision of the company by inclusion of the suppliers came out as the most important dimensions related to SCI.

1.2 Logical Integration and Companies' Competitive Advantage

Dainty et al (2001)⁶ reviewed the United Kingdom construction sector and suggested that the initiatives that were taken up by the manufacturing industry should be adopted in construction in industry for the purpose of increased productivity and reduced costs. They focused on the application of the supply chain by the clients of the companies, consultants they have and large contracting organizations. They further found that little attention was paid towards the integration of SMEs in the work of subcontracting and material supply. Researcher presented the findings focusing on the responsibility of SMEs in developing construction supply chain were presented. In-depth interview method and discussion done by focus groups were done with a wide range of companies that supply materials and the subcontractors and found that significant barriers existed (such as attitudinal barriers) to integration of the suppliers in the construction industry. They suggested that if the industry had to attain profits out of their companies using the integration of supply chain in SMEs, they had to put much more dedicated efforts.

Xue et al. (2007)²⁶ proposed a framework of supply chain as an innovative mode of management that provided novel explanation for the resolution of the problems like low productivity of goods, increased cost of projects and time overruns beyond the competition dates, high fragmentation and high level of disagreements in construction industry from systems point of view. They further found that coordination or logical integration was the major issue to enrich the performance of the construction in supply chain and also identified internet assisted integration mechanisms for improvement of construction performance. Firstly, auction and contracting of projects, and secondly, coordinated flow of information (**Bhojanna, 2013**)³.

Famiyeh et al (2018)⁸ examined the effect of SCI on the competitive strength of the company and the operational performance attained by the company with regard to reducing cost to the company, improving the flexibility in working, cultivating the quality of products/goods and improving the delivery of the products. They used survey approach and collected 164 responses from different industries. Researchers used SEM to examine the relationship. Findings indicated that competitive strength of the company and the overall operation performance was positively affected by the SCI.

Kwak et al (2018)¹⁶ proposed and then validated a theoretical model which was used to investigate whether risk management abilities of the company were affected by the innovation in supply chain. These management capacities of managing risk included resilience and robustness in global SCM operations. Kotni (2019)¹⁵ Researchers tried to examine how competitive advantage would be improved by these capabilities. A questionnaire based survey was conducted with South Korean logistics intermediaries and manufacturers. The data was analyzed using confirmatory factor analysis and SEM. Researchers found that the innovative use of supply chains had a positive influence on the capability of risk management of the companies, which further had a significant impact on improving competitive advantage.

III. RESEARCH OBJECTIVES AND HYPOTHESIS

Many researchers have worked earlier on SCI and found many essential details that could benefit other researchers. However there are very few studies that have worked on the construction companies with regard to SCI. The research question for this study comes out to be “What is the effect of SCI on the Competitive Advantage of the construction companies?”

And objective of the study is framed as: -

Objective 1: Effect of Supply Chain Integration on the Companies’ Competitive Advantage

1.3 Variables of the study

Supply Chain Integration have been identified and classified differently by a number of authors. On the basis of review of literature, SCI construct is divided into two extensively used variables, i.e, Supplier Partnership and Logical Integration.

Supplier Partnership (SP) –SP is defined as the relation between the company and the suppliers of the company which are intended to enhance the capabilities of the company to them maximize their profits. It helps companies to involve only few key supplier which in turn help companies to work in better and efficient way.

Logical Integration (LI) – LI is a mechanism of coordination the internal as well as the external business activities including the manufacturers, suppliers, distributors and the customers of the company.

Competitive Advantage (CA) – CA is the degree to which the company has the capability to create a defensive position against the existing competitors and to maintain the position in future market.

2.2 Hypothesis of the Study

For the purpose of this study hypothesis is framed on the basis of the review of literature. Hypothesis based on the explicit survey done on the earlier researches is given below: -

H1: Proper implementation of Supply Chain Integration enhances Companies’ Competitive Advantage.

H1a: Proper implementation of Supplier Partnership enhances Companies’ Competitive Advantage.

H2b: Proper implementation of Logical Integration enhances Companies’ Competitive Advantage.

IV. RESEARCH METHODOLOGY

This study deals with two major variables that is decided on the basis of the review of literature and on the basis of through discussion with knowledgeable people of construction companies, i.e, Supplier Partnership and Logical Integration. For the purpose of the study, structured questionnaire is designed having two sections. First section includes the general description of the respondents and the second section includes the questions asked on Supplier Partnership, Logical Integration and Competitive Advantage. Six items each are designed for Supplier Partnership and Logical Integration and five items are designed for Competitive Advantage on the basis of the items used in the earlier studies.

For the collection of data, respondents above the engineering position were taken into account. And data is collected from these engineers that are working on the construction projects in the state of Punjab. Projects are selected on the basis of the investment and importance of the project to the state. And simple random sampling is be used to select the respondents from the selected construction projects.

Finally a framework is designed where “SP” represents Supplier Partnership, “LI” represents Logical Integration and “CA” represents Competitive Advantage. SP1 to SP6 are the items included in Supplier Partnership, LI1 to LI6 are the items included in Logical Integration and CA1 to CA5 are the items included in the Competitive Advantage and then finally SEM is be applied. Using smartPLS, discriminate validity is be checked and then statistical tools, i.e, correlation and regression is be applied to find out the association and dependence of Supplier Partnership and Logical Integration on Competitive Advantage.

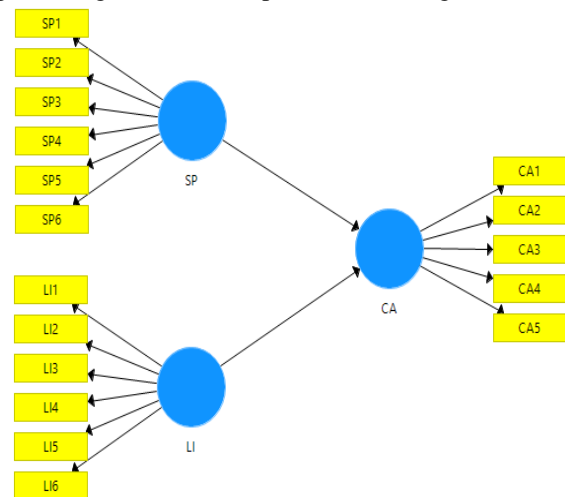


Figure 1: Framework for the Study



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V. RESEARCH FINDINGS

By visiting the selected construction projects in Punjab, simple random sampling is used to collect data with the help of structure questionnaire. Data is being collected from 99 respondents that are working in construction projects above the position of engineers in the selected project in Punjab. Framework designed is first tested for reliability and validity by using smartPLS. Below is the analysis shown of the same: -

Table 5.1: Cronbach's Alpha, Composite Reliability and Average Variance Extracted

Variable	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
CA	0.896	0.924	0.708
LI	0.921	0.939	0.719
SP	0.848	0.890	0.581

Where CA stands for Competitive Advantage, LI stands for Logical Integration, and SP stands for Supplier Partnership

As per table 5.1, it can be inferred as Cronbach's Alpha value for Competitive Advantage, Logical Integration and Supplier Partnership is 0.896, 0.921 and 0.848 respectively, which is greater than 0.7. This means that the data collected using the questionnaire is reliable for the study. Even Composite Reliability is 0.924 for Competitive Advantage and is 0.939 for Logical Integration and 0.890 for Supplier Partnership, which also are greater than 0.7, means that the questionnaire is reliable.

Average Variance Extracted is also depicted in the table and it reports as 0.708 for Competitive Advantage, 0.719 for Logical Integration and 0.581 for Supplier Partnership, which is greater than 0.5. This means the questionnaire is convergent valid.

Further Discriminate Validity is calculated. For this calculation square root of the Average Variance Extracted is calculate and put in the diagonal and checked if all the remaining values are below this square root value. This method is used in Fornel and Larcker (1971). It is calculate and reported below in table 5.2.

Table 5.2: Discriminate Validity

	CA	LI	SP
CA	0.841		
LI	0.828	0.848	
SP	0.760	0.720	0.762

Where CA stands for Competitive Advantage, LI stands for Logical Integration, and SP stands for Supplier Partnership

As per the above table it can be reported that the questionnaire is discriminate valid. Hence the data collected on the questionnaire is valid and reliable for the study. Further test of association (correlation) and dependence (regression) is applied and is reported one by one.

VI. DATA ANALYSIS AND INTERPRETATION

SmartPLS software is used for the purpose of analysis. One by one hypothesis are being tested and reported below.

H1a: Proper implementation of Supplier Partnership enhances Companies' Competitive Advantage.

For the evaluation of the above hypothesis, first correlation is applied. In smartPLS correlation value is reported as path coefficient. The results are reported below: -

Table 6.1: Correlation between Supplier Partnership and Competitive Advantage

	CA
CA	
SP	0.349

Where CA stands for Competitive Advantage and SP stands for Supplier Partnership

From the table above it can be interpreted that the correlation coefficient value $r=0.349$. This means that the Supplier Partnership is having a moderate ($0.3 > r > 0.5$) positive association with Competitive Advantage.

H1b: Proper implementation of Logical Integration enhances Companies' Competitive Advantage.

For the evaluation of the above hypothesis, first correlation is applied. In smartPLS correlation value is reported as path coefficient. The results are reported below: -

Table 6.2: Correlation between Logical Integration and Competitive Advantage

	CA
CA	
LI	0.577

Where CA stands for Competitive Advantage and LI stands for Logical Integration

From the table above it can be interpreted that the correlation coefficient value $r=0.577$. This means that the Logical Integration is having a high ($0.5 > r > 0.7$) positive association with Competitive Advantage.

H1: Proper implementation of Supply Chain Integration enhances Companies' Competitive Advantage.

For the evaluation of the above hypothesis, regression is applied in smartPLS and regression value is reported in table below.

Table 6.3: Multiple Regression of Strategic Partnership & Logical Integration with Competitive Advantage

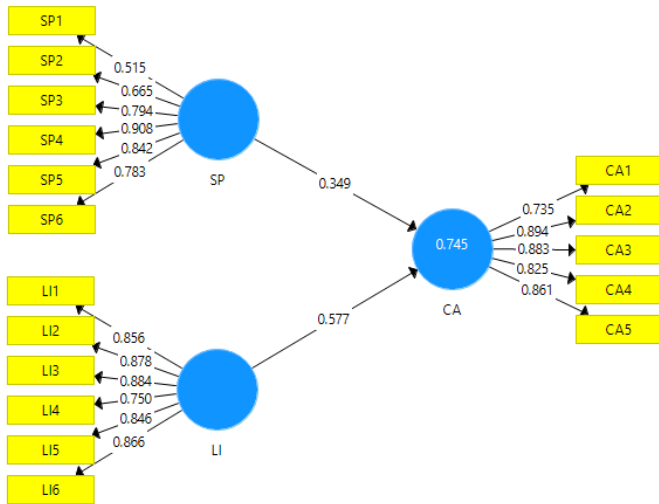
	R Square	R Square Adjusted
CA	0.745	0.739

Where CA stands for Competitive Advantage

As per the above table, Adjusted R Square value is 0.739.

This means that the overall effect of Strategic Partnership & Logical Integration on Competitive Advantage is 73.9%. Below is shown the final evaluated model of the study where “SP” represents Supplier Partnership, “LI” represents Logical Integration and “CA” represents Competitive Advantage. SP1 to SP6 are the items included in Supplier Partnership, LI1 to LI6 are the items included in Logical Integration and CA1 to CA5 are the items included in the Competitive Advantage.

Figure 2: Final evaluated model



Hence it can be inferred that the H1 is fully supported. And also the Objective 1 is fully supported.

VII. CONCLUSION

In the conducted research, following conclusion can be inferred: -

- There is a need of proper training programs for the proper implementation of the SCI, as it is in the early stages of implementation in construction companies.
- If construction companies implement SCI properly, they can achieve better edge over the competitors in the industry.
- Hypothesis testing done on Supplier Partnership and Competitive Advantage shows the correlation coefficient value $r=0.349$. This means that the Supplier Partnership is having a moderate ($0.3 > r > 0.5$) positive association with Competitive Advantage.
- Hypothesis testing done on Logical Integration and Competitive Advantage shows the correlation coefficient value $r=0.577$. This means that the Logical Integration is having a high ($0.5 > r > 0.7$) positive association with Competitive Advantage.
- For the final hypothesis, to evaluate the effect of Supplier Partnership & Logical Integration on Competitive Advantage, regression was applied. Adjusted R Square value calculate using SEM is 0.739. This means that the overall effect of Strategic Partnership & Logical Integration on Competitive Advantage is 73.9%. This shows that if the integration between the suppliers and the activities of the construction project is done efficiently, it leads to better competitive advantage of the company which ensure the better survival of the company against its competitors.

VIII. LIMITATIONS

- For conducting this study there were some limitations as every study conducted have some or the other limitation. Below are the limitation reports of this study: -
- The area of the study was limited to Punjab only, so for father studies the area of the study can be enlarged.
- Respondent that were selected in the study were only above the level of engineers, so for further studies supervisors and foremen’s could be taken into account as these people have the knowledge of the ground level realities.
- The industry picked for the study was on construction, so the results are limited to construction industry only.
- Only two major variable of supply chain management was taken into consideration, which where related to the integration of the supply chain, so for further studies more variables could be taken into account.

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