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Study of Supplier Evaluation and Development Practices in Supply Chain of Construction Industry

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***Abstract*: Supply chain management is very strong concept in production and manufacturing industry although in construction industry it has incomplete perspective prescription. Due to multistage organization network of organization and relation become complex for large project. This dissertation work mainly understands the concept of supply chain management and construction supply chain. Supplier is key element in supply chain management. Selection and evaluation of supplier in supply chain management is an important aspect. A variety of methods are available for supplier evaluation. This vendor selection methods and selection issues are studied in dissertation work. In this project the actual supplier evaluation process is studied. In this project various types of supplier, various supplier systems and supplier evaluation criteria were studied. Diverse supplier evaluation methods were studied in this project work. Supplier evaluation criteria is developed with the help of research papers, interviewing project promoters and experienced vendors from this field. An Analytical hierarchy process used for selection of best suppliers among them which is adaptable and feasible for Construction supply chain in India.**

***Keywords*: Supply Chain Management, Supplier Evolution, Organization Network.**

1. Introduction

Construction industry is broad industry which includes large activity of construction. In this activity material and their procurement is important parameter. About 60-70% cost engaged in construction are for material itself. Material procurement is prior important step of purchase action. Wider range of supply activity included in procurement process as compared to purchasing action. It typically includes a broadened view of the buying role with enhances participation of buyer in related materials activities. These activities are:

- Participation in the development of materials and service requirement and their specification.
- Conduct of material studies and management of value analysis,
- Conduct of extensive material market studies,
- Conduct of all purchasing function,
- Management of supplier quality,
- Arrangement of bound transportation,
- Management of stores and inventory control.

Procurement process focuses on strategic matter compared to typical implementation process of purchase. During the construction project , materials account for a big part of products and project costs. The total cost of installed materials (or Value of Materials) may account for 50% or more, even though the manufacturing cost may be a minor part of the total, probably 20-30%. Supplier is important key in supply chain management. In general no importance is given to evaluation and development process of vendor. While developing a supplier survey for the purchaser it is to be decided which performance criteria to include. The primary criteria are cost/price, quality and delivery, which are generally the most obvious and most critical areas that affect the buyer. For many items, these three performance areas would be enough, however for critical items needing an in-depth analysis of the supplier's capabilities, a more detailed supplier evaluation study is required.

A. Problem Statement

To understand the concept of supply chain management and construction supply chain following research papers has been studied. In this study role of supply chain in construction, development and progress in adoptability of supply chain management in various industry were studied.

1) Ruben Vrijhoef (2000)

The author argued that due to construction peculiarities, supply chain management has four specific roles in construction. Practical initiatives in each role to advance the construction supply chain are analyzed The author suggest three contributions to knowledge. Firstly, various existing initiatives towards construction supply chain development are explicitly related to a generic SCM methodology. In this context, four roles of SCM have been identified. Secondly, the present status of construction is empirically assessed from a supply chain viewpoint. The result of this investigation was revealed to be compatible both with previous observations in construction and in make-to order supply chains. The result provides a new, empirically founded understanding of construction supply chains and shows that great potential exists for their

improvement Thirdly, based on the new empirical understanding and generic theories of SCM, limitations in each role have been recognized and discussed. These limitations had previously only rarely been discussed.

2) Akintola Akintoye (2000)

The author studied the results of a questionnaire survey of supply chain collaboration and management in the top the UK construction industry contractors. The results indicate the formation of a significant number of partnerships/ collaborative agreements between contractors, suppliers and clients following the publication of the Latham (1994) and Egan (1997) reports. It appears that construction supply chain management (SCM) is still at its infancy but some awareness of the philosophy is evident.

Contractors identified improved production planning and purchasing as key targets for the application of SCM in construction. Barriers to success included: workplace culture, lack of senior management commitment, inappropriate support structures and a lack of knowledge of SCM philosophy. Training and education at all levels in the industry are necessary to overcome these barriers. Supply chain collaboration and management has been used in many industries to gain competitive advantage. From the retail industry to the automotive and the agricultural industries, the philosophy has examples of successful applications. The Supply Chain Council developed a supply chain operations reference model in order for different industries to apply the philosophy and improve their own strategy. The construction industry has been relatively slow to adopt SCM as a management strategy to be due to the well documented unique nature of the construction process and bespoke product with various stakeholders and a variety of objectives. The contractors' opinions were surveyed because of their pivotal role in the construction supply chain, previously referred to.

3) Keah Choon Tan (2001)

Over the past decade, the traditional purchasing and logistics functions have evolved into a broader strategic approach to materials and distribution management known as supply chain management. The author reviews the literature base and development of supply chain management from two separate paths that eventually merged into the modern era of a holistic and strategic approach to operations, materials and logistics management. In addition, this article attempts to clearly describe supply chain management since the literature is replete with buzzwords that address elements or stages of this new management philosophy. The author also discusses various supply chain management strategies and the conditions conducive to supply chain management.

The development and evolution of supply chain management owes much to the purchasing and supply management, and transportation and logistics literature. As such, the term &supply chain management' was used in many ways, but three distinct descriptions dominate prior literature. Firstly, supply chain management may be used as a handy synonym to describe the purchasing and supply activities of manufacturers. Secondly, it may be used to describe the transportation and logistics functions of the merchants and retailers. Finally, it may be used to describe all the value-adding activities from the raw materials extractor to the end users, and including recycling.

4) Mohammed Saad (2002)

The author examines the early progress towards the adoption of supply chain management (SCM) relationships in construction. It is based on a literature review and survey of the views of construction practitioners. The author contend that SCM has many of the features associated with a 'fifth generation innovation'. The author suggests that although construction practitioners have some knowledge of SCM they need a better conceptual understanding of it and new and more systematic approaches to its implementation. The author has shown that there is significant awareness of the importance of SCM and its main benefits in construction. It was seen as a multi-factor innovation, which can help construction overcome its fragmentation and adversarial culture, improve its relationships and better integrate its processes. Its effective implementation is also perceived as dependent upon continuous and shared learning and strong commitment from key partners such as clients. The survey also indicates an additional inconsistency in that although learning is perceived as important, the type of learning being undertaken does not match the competencies and the cultural changes needed for such a complex, multi-factor and dynamic innovation. The results of the survey confirm the role of clients and their advisors in leading and championing change in construction. They also view the role of the champion as important but again reveal some inconsistencies in their understanding of SCM by not scoring it as a significant factor in partner selection

2. Scope of project

The scope of the present work includes the understanding of the best practices in the existing supplier evaluation systems in construction industry and other industry; suggest necessary improvement and development practices. This study will be carried out based on literature review and questionnaire survey. Subsequently, data collection from the questionnaire survey will be analyzed using the statistical methods, and their results will be tabulated. It follows by discussions, conclusions and recommendation

3. Aim and objective

1. To understand concept of supply chain management in construction industry.
2. To study various supplier evaluation practices & supplier evaluation systems adopted by the project promoters and the Contractors in supply chain in construction industry.
3. To the study of vendor development practices in construction industry and suggest necessary improvement.

4. Methodology

Supplier Evaluation System

The three general types of supplier evaluation systems used today are;

1. Categorical method, Cost-Ration method,
2. Linear averaging method.

The guiding factor in deciding which system is best is;

1. Ease of implementation &
2. Overall reliability of system.

It should be noted that implementation of the results is the matter of the buying organization's judgment.

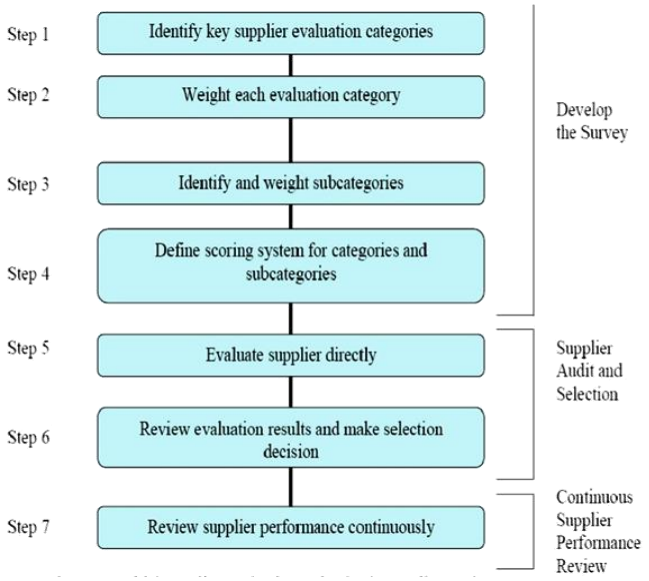


Fig. 1. Framework of Supplier Evaluation System

Defining The Objectives and Selection Criteria

One of the first steps when developing a supplier survey is for the purchaser to decide which performance categories to include. The primary criteria are cost/price, quality and delivery, which are generally the most obvious and most critical areas that affect the buyer. For many items, these three performance areas would be enough, however for critical items needing an in-depth analysis of the supplier's capabilities, a more detailed supplier evaluation study is required. 1) Quality of product 2) past performance Finance 3) Equipment capabilities and human resource 4) Price 5) Capacity to supply 6) Maintaining relation 7) Location of site 8) Delivery at a time 9) compensation for damage.

Application of Analytical Hierarchy process (AHP)

The comparative tables are given below

Table 1
Attributes

Attributes	A	B	C
A	1	5	6
B	1/5	1	4
C	1/6	¼	1

Indicates A is 5 times more preferred than B, A is 6 times more preferred than C.

Table 2
Nearness to site

Vendors	S1	S2	S3
S1	1	3	4
S2	1/3	1	¼
S3	¼	½	1

Table 3
On time delivery experience

Vendors	S1	S2	S3
S1	1	1/3	1/5
S2	3	1	3
S3	5	1/3	1

Table 4
Past experience of the defect rate

Vendors	S1	S2	S3
S1	1	5	4
S2	1/5	1	¼
S3	¼	4	1

Table 5
Weightage to the attributes

Vendors	A	B	C	P vector Avg of A,B,C
A	1/1.36	5/6.25	6/11	0.691
B	(1/5)/1.36	1/6.25	4/11	0.223
C	(1/6)/1.36	(¼)/6.25	1/11	0.084
Total	1.36	6.25	11	

Indicates A is 5 times better than B, A is 6 times better than C

Table 6
Nearness to site

Vendors	S1	S2	S3	P vector
S1	1	3	4	0.621
S2	1/3	1	¼	0.238
S3	¼	½	1	0.137

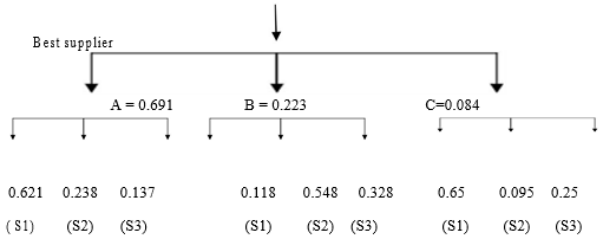
Table 7
On time delivery

Vendors	S1	S2	S3	P Vector
S1	1	1/3	1/5	0.118
S2	3	1	3	0.548
S3	5	1/3	1	0.328

Table 8
Past experience of the defect rate

Vendors	A	B	C	P Vector
A	1	5	4	0.65
B	1/5	1	1/4	0.095
C	1/4	4	1	0.254

Hence the best supplier is obtained by



S1 = (0.621*0.619) + (0.118*0.223) + (0.650*0.084) = 0.465
S2 = (0.238*0.619) + (0.548*0.223) + (0.095*0.084) = 0.277
S3 = (0.137*0.619) + (0.328*0.223) + (0.254*0.084) = 0.179

As,

S1 = 0.456 S2 = 0.277 S3= 0.179
S1 is the most weighted one to be the supplier. Hence he should be given the job.

5. Case study

Supplier evaluation is new emerging concept in supply chain of construction industry. As large purchasing activity is done in construction industry. Procurement of material is important part in construction activity because material required about 65-70% of overall cost of construction. ABC analysis is done widely for purchasing activity in construction industry. Various materials like Brick, Sand, Cement, Steel, Aggregate, Timber, Paint, CI pipe etc. are used in construction activity.

A. Price

Price of the material including the transportation cost is considered as upper most criteria because the cost of material has direct impact on cost of the project. Almost all project promoters, contractor gives most of important to these criteria.

B. Capacity to supply

Capacity to supply the material in single order is second most important criteria decided for evaluation. Many contractor required large quantity of cement and steel at a time in single order, but some of vendors are fails to supply in single order.

C. Financial situation

Financial situation of vendor is an important part as purchasing action is concerned. Creditability is given to the customer which describes the financial situation of vendor. Reputation of vendor in companies is also taken in consideration for financial situation of vendor.

D. Time of supply

Time space between giving the order and actual supply is considered as time of supply the material. Variation is noticed in time of supply in different vendors so this criterion is considered for evaluation.

E. Past performance

The past performance and past experience of supplier in construction field is taken into the consideration for evaluation of vendor. Ascending or descending performance rate of supplier is found out in the criteria.

6. Result

Table 9
Results for weight of each alternative

S. No.	Criteria	Weightage	Percentage of weight
1	Price	0.2531888	25.31888
2	Capacity to supply	0.2017503	20.17503
3	Financial Situation	0.1722713	17.22713
4	Time	0.0782715	7.827152
5	Compensation	0.0710475	7.104752
6	Equipment capability	0.0641406	6.41406
7	Past Performance	0.0587579	5.87579
8	Maintaining relations	0.0522267	5.22267
9	Distance from site	0.0483454	4.834544

7. Conclusion

In India construction industry is second most industry which is given after agriculture on which Indian economy is dependent. Material procurement is important part as construction industry concerned. About 60-70% cost of total construction is engaged in material itself. So the job of material provider supplier is always affecting the buyer's budget. Assessment of suppliers on primary criteria like price, delivery time quality is most obvious. But to know the capability of supplier more critical criteria and in depth study of supplier evaluation is needed. As vast competition in industry to increase the profitability supplier evaluation is needed.

8. Future scope

Varieties of methods are available for supplier selection. Comparative study of these methods will be studied for better findings in construction field. From supplier evaluation in supply chain management are reduced the risk and uncertainties. In depth analysis of this risk will be needed to study. Cost analysis from application of supplier evaluation will be needed to study in depth.

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References

[1] Abdul Aziz Ab. Latif, Hamzah Dato Abdul Rahman, "Enterprises model for Vendor development, The Asian Journal of Technology Management Vol. 2 No. 2, (2009), 65-75.
[2] Akintola Akintoye, Gorge McIntosh, "A survey of supply chain collaboration and management in UK," European Journal of Purchasing & Supply Management, Vol. 6, (2000), 159-168.
[3] Bryman Alan, Bell Emma, "Business Research Methods." 2nd ed. New York: Oxford Publication 2008.
[4] Charles A Weber, "Vendor selecting Criteria and methods", European Journal of Operational Research, Vol. 50, (1991), 2-18.
[5] Doraid Dalalah "Application of the Analytic Hierarchy Process (AHP) in Multi-Criteria Analysis of the Selection of Cranes" Jordan Journal of Mechanical and Industrial Engineering Volume 4, Number 5, November 2010.

[6] Farzad Tahriri, M. Rasid Osman, "AHP approach for supplier evaluation and selection in a steel manufacturing company" journal of industrial engineering and management, vol. 1, no. 2, 2008.
[7] Jack C.P. Cheng, Kincho H. Law, Hans Bjornsson, Albert Jones, Ram. Sriram, "Modeling and monitoring of construction supply chains," Advanced Engineering Informatics, 24, (2010), 435–455.
[8] Keery A. London, Russel Kenly, "An industrial organization economic supply chain approaches for construction industry: A Review," Construction Management and Economics, (2001), 19, 777–788.
[9] Keah Choon Ta, "A framework of supply chain management literature," European Journal of Purchasing & Supply Management, 7, (2001), 39-48.
[10] Marlene J. Suárez bello "A case study approach to the supplier selection process" University of Puerto Rico Mayagüez campus, 2003.