



## Supply Chain collaboration and Management (SCM) in Iran construction industry, a survey

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### Abstract

*This paper is aimed to focus towards the adoption and implementation of supply chain management (SCM) in Iran construction industry. The findings are based on literature review and views of construction companies in Iran. Our finding suggest that though construction companies have limited knowledge of SCM and need better conceptual understanding to reap the benefits of SCM. In addition to above the research focuses to explore and investigate different problems which might affect the supply chain management (SCM) process in the built environment industry, in particular, the construction companies in Iran. It appears that construction supply chain management (SCM) in Iran is still at its infancy and must some awareness of the philosophy of SCM be informed. Contractors identified the procurement (purchasing) is the most favorable SCM functionality and improved production planning as key targets for the application of SCM in construction. Barriers Faced during implementation included: Poor understanding of the concept, low workplace culture, Lack of top management commitment, and an inappropriate support structures. Training and education at all levels in the industry are necessary to overcome these barriers.*

**Keywords:** Supply chain, construction industry, supply chain management, collaboration, procurement, partnering.

### Introduction

During the last decade, especially in recent years, many researchers have emphasized the benefits of supply chain management philosophy to the construction industry in order to improve the performance of construction and reduce large waste caused by inefficient materials management and control<sup>1</sup>. Iran construction industry initially started as traditional approach but due to huge and massive development in recent years industry had adopted the new technologies and new concepts in construction industry; however little research has been conducted on SCM process in construction projects. To deal this space and to look into the obstacles for implementation of proper SCM concept, this research task is conducted in particular to fast growing country in the world Iran construction industry sector. The intension of this paper is to find out the awareness of the industry in implementing the SCM, the obstacles facing the industry and reasonable benefits which can be realized in proper implementation of this concept. The study focuses on SCM concept, how Iran construction sector adopted SCM patterns, and suggest its possible future usage. The survey conducted for Iran construction industry to get involved into the Iran construction industry professionals and organizations to identify their views and hidden barriers in adopting this process in their organizations. In addition, the main target of this investigation is to study current strategy of the organizations in adopting the chain management and supplier assessment practice, the usefulness of relationship between the main stakeholders of Project for example contractors, supplier and

client. This study is to identify problem in SCM adoption in a Iran construction industry and also increase awareness in the Iran construction sector to avail utmost benefits by adopting SCM as tool. In addition to this, the study is focused on the following issues: i. To review and critically appraise the current literature on SCM and to determine The relevance of the literature in current built environment industry practice. ii. To identify the use and setbacks in implementing the SCM concept in Iran Construction industry. iii. Recommendations for effective ways to SCM relationship between the parties (i.e. Suppliers, contractors and their clients) in Iran

With proper implementation SCM technique, the organizations can reap the following benefits as short term and long terms as well and Egan re-think construction report also suggest that the increase of 10% in annual turnover of the organization with right and innovated application tools of SCM. Bureaucracy reduction in organization, good understanding and knowledge of end-market trends, innovation in design, efficient in utilizing the resources and skills, enhanced safety and after-sales service to the end-user, flexibility and a tactical capability to plan and innovate, improved employee motivation and team-working.

### Literature Review

**An Overview of Supply Chain Management:** The supply chain is defined as sequence of processes and flows, which are considered to meet the final requirements of the customer. Hence different stages may be considered during decision

making and execution to the final consumption. Usually the supply chain includes producer and suppliers but it depends upon the logistic flows, retailers, consumers and so on. Therefore we can say that supply chain not only includes producer and supplier but new supply chain artifacts can be defined for example new product development, marketing and customer services. Supply Chain Management concept first originated in a manufacturing industry and Toyota was the first to adopt SCM in their delivery system Toyota a very famous auto industry implemented this delivery system<sup>2</sup>. The adoption of SCM was incorrect time, which increases the interaction with production line and also decreases the inventories. Since the evolution of SCM in car manufacturing industry gained more attention and independent status<sup>3</sup>. A Triple P (People, Planet and profit / Prosperity) concept was introduced by Cooper and, they suggest triple p deals with people, planet and profit, which has a great Impact on the SCM processes but there, are still additional characteristics which may be Considered for example: social, environmental and financial problems<sup>4</sup>. provides an extensive literature on SCM and Cousins et.al provides SCM from Academics point of view<sup>5</sup>. Differentiates SCM key decisions in three ways: these are Supply chain business process, supply chain management component and supply chain network structure. This conceptual relationship emphasize on the SCM, to fulfill the need of SCM, industry has to go through several steps to design and implement the successful integration of SCM to their existing systems. The supply chain management distinguishes itself from the

traditional management system approaches in many different aspects as illustrated in the table-1<sup>6</sup>. The eleven elements are distinguished based on traditional and supply chain management. In Supply chain inventory management approach is jointly taken but in traditional it is an interdependent effort. Time horizons in traditional management are short term but in supply chain these are long term. The compatibility and channel leaderships are not considered in the traditional management but in supply chain these are considered as key 16 factors. The speed of information, inventory and flows become distributed not warehouse oriented in the supply chain management, which has more advantage and are easy to handle and distribute in the distributed supply chain environments<sup>7</sup>. Published seven principle of supply chain management, these principle were seven time tested and offer value to the organization to adopt the SCM in their organizations<sup>8</sup>. They describe that each principle can provide three types of benefits these are: revenue growth, asset utilization and cost reduction. These principles suggest that the goal and opportunities of the companies can be reviewed<sup>9</sup>. And listed the viewpoints encountered in the industry and 4C's in supply chain management these are: communicative, coordinated, collaborative and co-operative. He argues that most of the companies fit one of six viewpoints showed in the table-2. Their viewpoints are arranged from narrowest to the broadest supply chain point of view. The first view point is a functional viewpoint and the supply chain executive for this viewpoint is none that means there is no supply chain for the functional viewpoint<sup>10</sup>.

**Table-1**  
**Difference between Traditional Management and Supply Chain Management<sup>6</sup>**

Element	Traditional Management	Supply Chain Management
Inventory management approach	Interdependent effort	Joint reduction in channel inventories
Total cost approach	Minimize firm costs	Channel wide cost efficiencies
Time horizon	Short term	Long term
Information sharing and monitoring	Limited to needs of own current transactions	As required for planning and monitoring purposes
Coordination	Single contact for the transaction between channel pairs	Multiple contacts between firms and channels
Joint Planning	Transaction based	On-going
Compatibility	Not relevant	For key relationships
Breadth of supplier base	Large	Small
Channel leadership	Not needed	Needed
Sharing of risks and rewards	Each on its own	Shared over long run
Speed of information, inventory and flows	Warehouse orientation	Distribution center

**Table-2**  
**Viewpoints Towards SCM (Ayres :2010)**

Viewpoint	Focus	Supply Chain Executive
Functional	None, Stand-alone department	None
Procurement	Incoming Supplies	From procurement
Logistics	Distribution to channels	From distribution
Information	Integration through technology	From IT or operations
Process reengineering	Cost reduction	From operations
Strategic	Profit-adding capabilities	Up and coming manager

Described the software components that are useful to increase the productivity across the organization<sup>11</sup>. He suggested network based approach, which has great impact on the distributed environment of the organization. The different components of the organizations can be integrated into the network based software and the supply chain can be the one component of the existing software<sup>12</sup>. The author suggested the web services can be implemented for the distributed components for example data warehouse management, inventory management and so on<sup>13</sup>. The author has described the technical details for the major distributed components that can be integrated to the Supply chain tools. We do not focus on the software technical details; however integrated software's in distributed environments has great impact on the efficiency, reduces risks and enhance the productivity of the organizations<sup>14</sup>. The suggested goals and means of businesses processes related to IT systems. The figure 1 provides an integrated business process based on performance view, process view and IT view. Every supply chain performance indicator should be processes in process view connected with the enterprise business process which is acted as a mediator, after processes the link is integrated to the IT system, which provides goals and means of supply chain system<sup>15</sup>.

**Clients and their suppliers:** It is believed that clients and contractors can efficiently manage supply chains by adopting the Japanese production techniques<sup>16</sup>. suggest that the approach should be "based on what is appropriate for the specific circumstances of the business transaction." both consider that management practices, which have been successful under one set of circumstances, may not be applicable in all cases and promote appropriateness to the current situation. Most of the customers have modernized their supplier base in compliance with Latham report and the initiation of partnering procurement technique. ALDAR real Estate is familiar example here in UAE who introduced bulk tendering for a package of separate projects to reduce the number of suppliers. They realized that the formation of closer relationships with suppliers will lead to improved construction performance<sup>18</sup>. Many of the reputed organizations in the pre-Egan era realized that benefits could be gained from strategically aligning their supply chains<sup>17</sup>.

Surveyed a number of client organizations who have "challenged their traditional approaches to construction procurement, and have designed more effective and efficient innovative strategies, in an attempt to deliver required business benefits<sup>19</sup>. Consider that "it can be more sensible for the business to identify the requirement for a differentiated approach towards effective influence in supply chains." This understanding correlates with the views by In the post-Egan era report that does not allow for the diversity in the built environment. Fundamentally construction industry is hard to handle SCM process within organizations. However, if organizations approach a contract with a non-adversarial attitude and a willingness to co-operate then success can be ensured<sup>20</sup>.

**The Role of Supply chain in Construction Industry:** The manufacturing industry is the pioneer industry which introduces the concept of SCM as a new and important tool to perform the business process in a systematic and well defined way to save time, enhance quality and realize profit For the construction industry the SCM concept is not new, this was introduced in the construction based industry in 1980 however this industry still have not fully 28 adopts SCM as business process<sup>21</sup>. The construction industry SCM processes are scattered and are partially adopted. Therefore the literature focused on the roles, responsibilities of supply chain management in the construction industry and to explore the successful implementation of SCM and lesson learn by the different industry sectors<sup>21</sup>. The building and construction industry can be divided into three main categories: building construction; heavy engineering construction and trade construction; While building construction can be further divided into residential and non-residential for example commercial and industrial building. This product is in the construction industry where customer innocence huge investment on the final product in relation to its physical aspects<sup>22</sup> and the transport parameters<sup>23</sup>. In some cases, customers select a manufacturer (contractor), specialist suppliers and material suppliers. Long- term, efficient supply contractor relationships in is vulnerable to disruption .developed a list of 10 bottlenecks that hinder the procurement of construction that may have application to SCM. These include

the need for extensive preparation for the approval procedure, conflict of interest between organizations within the project organization and the need to work with to public service<sup>24</sup>. Noted that the current research in the construction supply chain management, while helpful, easy construction and the environment due to the transient nature of production and construction projects. He concluded that relatively little is known about the construction supply chain management. However, it was recognized that SCM is the promise of engineering design, planning, construction and project management in a common manner. Although effective SCM is a key element in reducing the cost of construction and partners. Noted that no studies have defined what is SCM in the construction process<sup>24</sup>. Argue that SCM construction, when combined with collaboration and quality management adopted could successfully with the problems of the industry and its customers. They have a wider and clearer visibility of the cooperation project and TQM is a link to your profile by, Wang and Fung with its emphasis on visualization. They conclude that SCM should be an important part of comprehensive quality goals is a general contractor. They recommended that the supply chain management, total quality, the general contractor must have a structure that enables an efficient communication system for communicating with the selected management as part of the project management. This construction is relatively rare in SCM, support the collaboration to increase efficiency and productivity<sup>25</sup> conducted a survey on supply chain management in UK construction industry and they argue that there exists partnership relationship among contractors, suppliers and clients; they only focus on the production planning and purchasing factors for the SCM process in construction industry and lists the barriers which can hindrance the successful process of SCM in construction industry<sup>26</sup>. Discussed four roles of supply chain management as described in the figure-7. These four roles in construction industry can be recognized based on the focus of the industry either construction site or supply chain or even both. The author' sclai Welling and suggest that building and construction industry supply chains can be at firm level or project level<sup>27</sup>. The firm level can provide stable and long term supply chains on the other hand project level supply chain are mostly temporary because their durations are already fixed. Dubois and) describe firm level as permanent networks while project level chains are described as a loose coupling. Identified the partnership relationship related to the alliances, which can be either strategic or project based<sup>28</sup>. The project based alliances are more towards short term alliances for the temporary projects while the strategic alliances focuses on the long term partnership relationship for the large projects and the alliance is based on more than one project. Hence the partnership relationship plays vital role in building and construction industry which develops the trust and commitment. Provides a review on the adoption of SCM in construction industry and suggest that construction experts has some knowledge of SCM, but still they need more attention towards the implementation of SCM by increasing their conceptual understanding and how new SCM can be implemented systematically. The researchers suggest that every domain has its own requirements and management structure

therefore the SCM should be defined differently in different domains<sup>29</sup>. The SCM particularly in the building and construction industry deals with management of materials and also has the relation between contractors, suppliers and distributors recommended the most common characteristics for structural projects for the construction industry, which make hindrances to make fully utilize of supply chain in construction projects, for example one-off projects, the project which are located on different sites (i.e. geographically dispersed) and also the high fragmentation, which is a natural characteristic of any construction project, presents the different views on the building trust among supply chain participants in the construction projects. They argue that trust among participants in supply chain may be affected by the cultural change. However cultural change must be reflected at all levels, especially the middle managers, supervisors and foreman. The more recent research results of Davis (2008) indicates that building and construction industry and even other industry partnerships are now a day's moving towards the relationship marketing. Argued that partnership relationship willbecome the precondition of doing business in construction industry. Provides partnering related problems and resolution in the Malaysian construction industry. He argued that still Mali construction industry is not mature and facing partnering problems, while identifies the barriers in partnering relationship for example project environment, personal knowledge, skill and attitude may become barriers in partnering relationship<sup>29</sup>. And investigates the success of the construction projects in UAE are based on modern electronic communication management system<sup>30</sup>. They provide a state of art on the usage of modern communication technologies in construction industry and also they investigate how these modern system influence the relationship of different project team members<sup>31</sup>. Studies the performance of construction projects in Malaysia; their research is based on quantitative data collection and through questionnaire surveys. In addition, they argue that Malaysian industry is still infancy to adopt the partnering approach their partnering approach is still local based this may be due to the influence of the culture. Semiarid et.al. explains the application of SCM in the Indonesian construction industry. They argue that the SCM processes in Indonesian construction industry are still in infancy or the SCM processes are not adopted at all. However their study is starting points towards the application of SCM in Indonesian construction industry, there still need more research in this area. Barkhi and Doghouse study shows the application of TQM, SCM and CRM implementations in the UAE hotels. UAE also attracts tourist in the, with increase of tourist in the UAE, hotel managements four to five star category hotels have realized the benefits of the supply chain management. This case is a unique case and has relevance to the application of SCM in a UAE industry. Figure-8 shows the qualifications and consequences of TQM, CRM and SCM implementation in UAE hotel industry. From the implementation it has been clearly identified that SCM increases the operation efficiency, so it does not only provide relationship management with the contractor and supplier but has an overall impact on the efficiency of the services delivered by the hotel management.

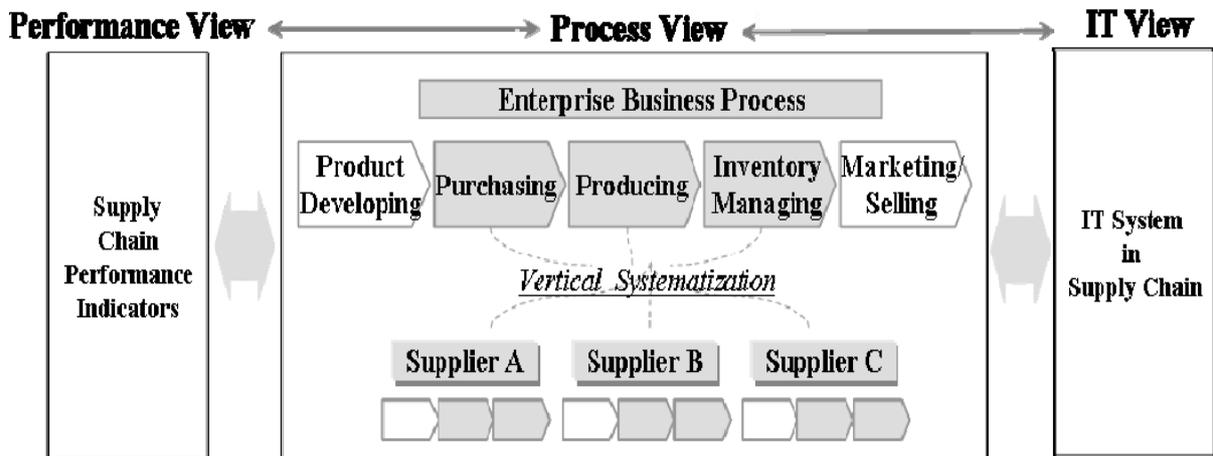
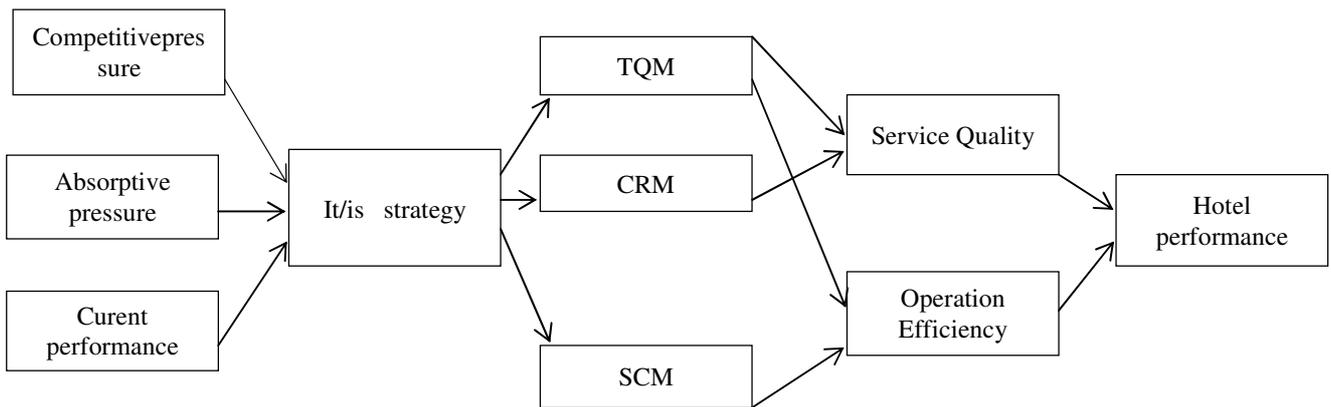


Figure-1

Conceptual framework of methodology (Goals and Means of Supply Chain an IT System View (Byoung, 2008)

Figure-2



Antecedents and Consequences of TQM, CRM and SCM Implementation

**Current Status of Iran Construction Industry:** The application of SCM in Iran construction industry is still infancy, most of the researchers focus on the business process projects and little or no research has been done on Iran construction industry. As SCM is not a new concept in the business community and for the Iran construction industry, the researchers from neighboring countries for example Saudi Arabia have focused on the SCM application in construction industry but still there approaches did not get any attention by the construction experts. They are still using traditional methods to manage the industry processes. Iran construction industry still running the traditional chain process and little or no use of modern chain process for example SCM, hence more research is needed to fulfill this gap especially in Iran construction industry. If we compare Iran construction industry with other countries in the world, we will notice that supply chain processes are adopted by very small amount of the building and construction industry. This is fact that construction industry is little bit hard

domain for the SCM due to the temporary life cycle of the projects. Provide a Fuzzy Expert Systems by research and consider in other industries for decision and evaluate supplier and subcontractor in construction industries in Iran. In this study the literature and consultation with experts, appropriate indicators for evaluating suppliers have been extracted and the majority of these parameters are linguistic. By using fuzzy logic, fuzzy expert system using a evaluation of supplier and selection of materials, provided a software by using programming languages , C # and matlab. And in this year also they defined that the use of value engineering solutions in supply chain management of large construction companies can be Desirable to be able to bring successful projects.<sup>31</sup>

## Methodology

**Research design:** The population frame for the study consisted of the construction companies in Iran. Vision and content for

review, and also provide a key role in the response of the participants in this survey. Weak or badly designed survey questions in this poll are meaningless raw data and reviews may affect a meaningless question. Due to this important point in relation to the structure and outline of the questionnaire prepared for the purpose, goals and objectives of the study are described in this article. Design and purpose of the study, the questionnaires were considered for mining contractors in the SCM. The questionnaire included five pages, the contractors were selected. Questionnaire should be given the right environment for data collection is selected. The most relevant questions to obtain appropriate responses were selected for analysis. The actual content of each question carefully examined to ensure transparency means for the respondent to answer questions in a very efficient and in less time. Reply monotone that comparisons can be easily done. avoid duplication, arrogant and theoretical questions. Twelve short questionnaire included queries. In order to assist contractors with clarity and understanding of the concept of SCM, SCM questionnaire starts with a definition and thus a more reliable answer to queries achieved. The questionnaire consisted of three sections cover the following types of questions<sup>32</sup>: i. Background information, ii. Coordinated relationship among contractors and all stakeholders in the project, iii. Importance of SCM in organizations, iv. Main goals to construct supply chain, v. Important factors for successful implementation of SCM, vi. Functions within construction which contractors consider important for efficient SCM, vii. Factors which contractors consider important when forming supply chain relationship, viii. Obstacles to SCM implementation.

The techniques applied for the data collection have major impact on the significance of the final results of the research. Therefore care must be taken when deciding the data collection methods. The following two methods we have adopted for our data collection: Personal Interviews by face to face or on telephonic talk or by sending the questionnaire to the corresponding person in the organization. we try other way such a send survey by email or another way that we try it, we design a weblog about supply chain management in construction industry and uploaded a Persian survey in this weblog (<http://mohyedinnavab.blogfa.com/>) but we don't have any good responses in this way because The most of the response we got by email or snail mail, during our telephonic interviews the companies were bit reluctant to provide information. In our data collection effort we selected 50 top most reputed construction companies in the Iran, from which 40 companies responds positively to our efforts and participated in the survey. In this section we will analyze all the data collected during our survey.

## Data analysis and results

**Information Gathering:** Owing to the large number of construction companies in Iran and variation both in terms of nature of work and size of the company; it was difficult and

unworkable to obtain a probability sample; further complicated by constraints of time and resources. The questionnaire was distributed to the Iran contractors via email and fax and some of them by face to face interview; of which 40 replies were received, amounting to an approximate 80% response. Most of the participants completed the survey and responded via fax and the remaining respondent's survey received either by email or by telephonic interview. The survey results are then compiled and static analysis has been done by using Microsoft Excel and spss. For the analysis of data collected from the survey, the response has been counted for each question. To compute the response rate for each question, response count is divided by the total number of respondent.

- $R.R (\%) = (R.C / NR) \times 100$
- Where as;
- R.R = Response Rate
- R.C = Response Count
- NR = Total number of Respondent Firms

Tables 1-9 show the results of the analysis of this study. Which some of this table show 'F statistics (based on F-ratio or value) which tests the null hypothesis that all groups have the same mean. 'F significant indicates the probability of rejecting the null hypothesis i.e. that there is no difference between the mean values of the groups. Lower probability value indicates that the null hypothesis can be rejected, suggesting that there is a difference of opinion between groups. A probability value (sig.) below 0.05 suggests a high degree of difference of opinion between groups in relation to that factor. For example, in Table 3, in relation to the production planning function, the F ratio is 0.303 and the observed significance level is 0.740, indicating that the null hypothesis cannot be rejected in favor of its alternative. This suggests a consensus between the groups (small, medium and large contractors) in relation to the proposition that the production function is an important internal organization function for SCM.

**Data Analysis:** The complete data is statistically analyzed from as per response received from different respondents. The results are shown in tabular form, which represent the percentage of responses of each question asked. Any discrepancy within the questioning is noted in the written analysis of the results. The data analysis is shown in tabular and graphical format. The questionnaire contains 15 different questions for example questions related to background information is to know the employee strength of the companies, annual turnover, experience related to construction projects and how they implement supply chain, advantage and disadvantage of supply chain and so on.

**Section-1: Background Information (Question 1 to 5):** The questions 1 to 5 are related to the company's basic background information. It is necessary in the survey not to start with the objective questions related to the research. To involve more persons in the survey it is necessary to ask some basic questions that help them to start the survey. These basic questions also

help us to ensure that respondent is from the correct domain, for which we are conducting the survey. We start with the basic question to know the employee strength of the company. It is necessary to know how big is the organization which is supporting or adopting the supply chain management process. From the results of question 1, it conclude that 50% of the respondent of this survey are from small organization, whose employee strength is less than 50. Other response results are also reasonable, which shows that the medium and large organizations also participated in this survey.

Questions 2 is also related to the basic information of the organization, which is related to know the experience of the organization in Iran construction market. This basic question also helps us to get opinion form the big and experienced construction companies in Iran market. The results of question 2 further verified our approach that 50% of the survey participants are experienced and are involved in Iran market more than 15 years.

Questions 3 is related to know the participants annual turnover. The participants were little bit reluctant to share this information but due to the nature of the research they provide us the approximate values, which further validates the size and income of the survey participants, the question is still falls into a basic category of the question we asked. 50% of survey participant's annual turnover is less than 3 million \$ and only 15% participant's annual turnover is greater than 20 million \$. This gives us more confident those survey participants organizations are running in profits. The literature review also gives the references of Egan report of rethinking construction which describes the benefits in increase in annual turnover, productivity and reduction in project duration, reduction in capital cost and defects by adopting the correct methods and tools of SCM.

For analysis, respondents were divided into three groups (small, medium and large) were divided based on their annual turnover, to determine whether their responses were different sizes. Watts (1980) points out that the size of a company can be measured in terms of number of employees, net assets (capital employed), value added (net output) and turnover. Table-3 shows the grouping of the firms, the number in each group, the mean turnover, and the standard deviation for each. Occur the most of the companies were reluctant to share the financial data of their project or annual turnover of their companies, and provides approximate turnover for their companies.

Questions 4 is the starting point to get involve the participant in the survey by asking a basic question to know if he has already adopted the Supply chain or he know about the supply chain processes. We ask a simple question do you support that SCM can help to save cost? Results show that approximately 87.5% of the respondent of the survey support that Supply chain can help them to save cost. That's means supply chain processes have great impact on the saving cost and it is discussed in the literature review which outlines and give reference of Egan

report which says that by adopting proper SCM tools, organization can reduce capital cost and enhance the productivity which results in high annual turnover for the organizations. The organization considered the saving cost as characteristic of the supply chain. Only 12.5 each of the survey participants were either does not support SCM or they do not still sure that cost saving can be the characteristic for the supply management process.

Questions 5 is related to the duration of the projects. This question has very much relevance to SCM concept to know about the project duration for example how much time the organizations take to complete a single project in order to give us a feel that if companies has adopted the SCM tools in carrying out the construction work or not. In the literature review explains that SCM concept can significantly reduce the project duration and it is further explained by Egan report which suggest 10% reduction in capital cost and reduction in project duration if the SCM concept are properly implemented. The results shows that almost all participants have answered this question and validated that big companies approximately 25% are involved in long term project which are more than 3 years duration and also we have companies which took less duration for example approximately 37.5% of the respondent think that they finish project less than 1 year and even small nature of projects are taken by the survey participants. If we conclude from question 1-5 for the basic information: It is clear that almost all types of the construction organizations have participated in the survey and even their businesses are running in profits and they all are covering the Iran markets as well.

**Section-II Supply Chain Management Relevance to the Organization (Question 6-10):** The questions 6-10 are asked from the participants to know how they have adopted supply chains in their current organizations. Do they have any good or bad experiences in their processes? Or there any barriers they are facing in implementation of the SCM. If they have not yet implemented will they implement in future. What characteristics of the SCM they will consider. The result of each question is analyzed below:

Questions 6 is related to the basic information of the supply chain management process for example do they have team building sessions, arrange meetings with their clients and vendor during the implementation phases. To adopt successful supply chain management process it is necessary to have communication between the client and vendor and even with the different building teams, who are involved in the implementation of the project.

The results of question 6 indicate that more than 80% of the survey participants doesn't have any meetings to the concerned persons of the project during the implementation phase This results shows that either they are not involved in the project meeting sessions or they do not want to share this information, which is not very good sign for the proper execution of any job

or project. This results shows that there is huge communication gap between the customer and other related project teams. most of survey participants said, they don't have any meeting because they hadn't any long term partnership agreements with any of their suppliers, and they said it's not because of lack of trust between participant, it's because of unstable economic situation includes unstably in price and inventory of goods that result of Sanctions against Iran. For successful implementation of supply chain it is necessary to have the regular meetings with the project teams and the client. Only 17.5% of the respondents was sure about the duration of the meeting. In literature review explains the barriers in implementation of SCM in which communication and interaction between the teams is major issue. The proper communication between the supply team members can enhance the quality of work, reduce project duration and also can play a significant part in avoiding the repetitive work.

Questions 7 is related to the quality of construction project, by taking view of the respondent how they think quality as a characteristic of the efficient supply chain management. The significance of this question is also linked to literature review in which the reference of Egan's report is highlighted which mentions the advantages of proper implementation of SCM tools to reap the benefits of SCM concept. The survey response was very much positive about 67% of the survey respondent thinks that SCM can boost the quality of the construction project and saves lot of management time but still 33% of the survey respondent were not supportive to the quality characteristic for the SCM. This might be interesting to know why they think that SCM cannot boost the quality of construction project or save management time.

Questions 8 is interesting question to know how construction organizations select the supplier do they have any system for the selection, if yes how they select vendor or supplier based on the supply chain. This results show approximately 45% agreed on the experience, which they use for the selection of supplier and vendor. This is how the construction projects differ in the nature of other projects because the construction projects are based on partnership and feedback of last experience plays an important role in the construction companies. Also argued that there exists partnership relationship among contractors, suppliers and clients

in their survey<sup>33</sup>. Provide a Fuzzy Expert Systems by research and consider in other industries for decision and evaluate supplier and subcontractor in construction industries in Iran. Some of survey participant use this software for selecting their supplier<sup>34</sup>.

Questions 9 is asked to the survey participants to know whether they have already implemented the supply chain management or not, if yes does it fulfill your requirements in efficient way? We got an interesting results for this questions as about 56% think that they have successfully implemented the supply chain and getting benefits from it, but did not tell us what type of the supply chain they are adopting. On other hand approximately 44% of the survey participants think that they are either in process of the implementation or partially adopted the SCM process. The Proper system in place inside the organizations not only saves the time but gives more boosts to enhance the company reputation in the market, this question also relates to our literature review in which Lamber and Cooper also emphasized on the SCM process inside the organizations.

Questions 10 is asked in survey to know which SCM functions are most important to internal organization of their company. The six functions were considered for rating, which were most relevant to the internal organization of the supply chain for example production, procurement, operation, storage, inventory and other (if they do have), and they should be rank them from 1 to 5 (strongly differ 1, somewhat sure 2, not sure 3, somewhat support 4, strongly support 5). Table shows contractors' internal functions that are important for consideration in SCM. The most important ones identified by contractors were purchasing (mean value 4.51) followed by function production planning (mean value 4.00). The other three functions (transport, storage and inventory) have relatively similar values. The Production planning looks most favorable to be considered as a internal SCM function. These basic information reflects how the participants of the survey adopted the Supply chain, does they get full or partial advantage from SCM. Ayres (2010) listed view points for supply chain management; the list shows that Procurement view point is focused by incoming supplier and the supply chain executives. The participants of the survey also rated high percentage to the procurement.

**Table-3**  
**Frequency distribution for the responding contractors**

Group	Turnover Million \$	Frequency	%	Mean Turnover	Std-Dev
small	Less than 3	20	50	2.235	1.12
medium	7.5 - 18	14	35	12.76	5.18
large	Greater than 20	6	15	38.71	16.08
	Total	40	100	11.38	

**Table-4**  
**Internal organisation functions important to supply chain management**

function	overall	Turnover million\$			F stat	sig
		Less than 3	7.5-18	More than 20		
Purchasing	4.51	4.31	4.68	4.55	0.302	0.740
Production planning	4.00	4.02	4.00	3.98	0.223	0.803
Transport	3.09	3.07	3.2	3.00	0.217	0.808
Storage	2.98	2.97	3.00	2.98	0.224	0.801
Inventory	2.97	2.81	3.00	3.09	0.067	0.934

**Section-III Implementation and Barriers in Adopting SCM (11-15):** The section III of the survey from Question 11 to 15 focused on the implementation and barriers facing by construction companies for the adoption of supply chain management as a tool. The analysis of each question is explained below:

Questions 11 and 12 focused on the SCM features related to the supplier and client. Table-5 and 6 indicates that a contractor may consider when forming a supply chain with one supplier and customer relationship. The overall rating of 3.58 to simplify the ordering process below rating from 4.17 to simplify the construction process at the 0.05 level of significance (the t "3.87, p" 0.001). Apart from simplifying the ordering process (F statistic ".810, p" 0.081), no significant differences in terms of each of these factors based on size groupings of contractors there. Significant differences in terms of simplifying the ordering process for contractors suggests that small, medium and large counterparts simplify the ordering process itself is more important. This result is not unexpected given that most purchasing departments, contractors mean better resources quickly and efficiently the resources allocated Braysfarsh. Table 6 shows that the most important factor that a contractor will consider when forming a relationship with a customer's supply chain, including relationships Arzanaz is extracted, and then simplify the construction processes, tenders and design. Contractors are expected to simplify the various processes involved in the construction supply chain relationships with customers is one of the main attractions of construction, according to the average value of the above processes as shown in table-6. And Kornelius and Wamelinck show that, due to the huge volume of documents in a construction project, the need for coordination is amenable to SCM. ANOVA results indicate that the three groups of contractors in each of the 5% level of significance of differences. Parker & D'Vaz 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, however it is quite complicated to establish correlation between the use of partnering and SCM management, particularly as both emphasized and promoted the

use of partnering in their respective reports. We can confidently say that any organization that operates SCM also uses the concept of partnering and it is seen from the survey as well. The results suggest that though certain techniques are not a pre-requisite when implementing SCM they perhaps form part of modern management required within today's construction industry.

The literature review also supports this questions as per Gulf Construction magazine close contact with all stakeholders always enhance construction performance of the project.

**In Questions 13:** For contractors, the direct benefits of supply chain collaboration lies in the reducing bureaucracy benefits to customers, improve customer service and increase competition in the market - which ranked third, fourth and fifth respectively. However, no significant difference in the level of 5% between the first and sixth main objectives exist, it indicates that the position is equal in the eyes of the respondents. Objective: Bhmnb direct benefits, in order of importance were placed seventh. The main objective of SCM is being developed for the benefit of customers and the results show that less attention is given to developing benefits for suppliers. Attached importance to the reduction of paperwork and bureaucracy, reflected and<sup>36</sup>. Unlike the supply chain by reducing the cost of considerable importance in the overall placed the target at least by construction contractor's scheme, perhaps because of that - the retailers - the main contractors feel less control over their market. However, as in the PE study consultant, contractor rates, improved quality assurance as one of the main objectives of supply chain collaboration

Outlines the benefits of Supply chain management in comparison to traditional management also suggested the seven points of SCM in which each tool can enhance revenue, growth of any organizations and significant reduction in cost if these principles are adopted in right manner<sup>35</sup>.

**Table-5**  
**Factors in supply chain relationship with supplier**

Function	overall	Turnover million \$			F stat	Sig
		Less than 3	7.5 - 18	More than 20		
Better quality service	4.64	4.70	4.66	4.55	0.654	0.505
Cost benefit	4.50	4.51	4.56	4.45	0.544	0.545
Simplifying the construction process	4.17	4.20	4.22	4.08	0.181	0.865
Simplifying the ordering process	3.58	3.98	3.13	3.63	0.810	0.081

**Table-6**  
**Factors in supply chain relationship with client**

Function	overall	Turnover million \$			F stat	Sig
		Less than 3	7.5 - 18	More than 20		
Cost benefits	4.62	4.77	4.60	4.50	0.355	0.686
Simplifying the construction process	4.23	4.40	4.20	4.10	0.234	0.783
Simplifying the tendering process	4.03	4.10	4.00	4.00	0.023	0.987
Simplifying the design stage	3.88	3.81	3.83	3.98	0.114	0.876
Creating standardization of processes	3.70	3.62	3.77	3.70	0.073	0.927

**Table-7**  
**What are main objective in developing SCM in your organization?**

Function	overall	Turnovermillion \$			F stat	Sig
		Less than 3	7.5 - 18	More than 20		
Increased profitability	4.44	4.48	4.44	4.37	0.085	0.915
Cost reductions within organization	4.43	4.54	4.34	4.41	0.511	0.589
Reducing bureaucracy/ paperwork	4.37	4.39	4.53	4.18	2.090	0.143
Benefits to the client	4.35	4.40	4.64	4.00	0.243	0.880
Improved customer service	4.32	4.20	4.56	4.19	1.980	0.155
Increased market competitiveness	4.30	3.84	4.70	4.35	0.953	0.379
Benefits to the supplier	4.07	3.76	4.12	4.32	1.625	0.208
supplier quality assurance	3.97	3.99	4.02	3.91	0.122	0.876
supply chain reduction	3.66	3.54	4.00	3.43	1.801	0.186

**InQuestions14:** We tried to apply the key success factors in the development of SCM? Table 8 lists the key factors shaping the supply chain collaboration by the contractors intended to show .Cronbach's alpha reliability coefficient ( which represents the reliability of a five-point Likert scale -) is 0.8264 will confirm that the results are reliable, at a significance level of 5 %. The most important factors identified by the contractor seeks to rely on information systems , the reliability of the system, top management support and mutual benefits integrated. The five

were among the top five factors of importance identified by the for the development of effective SCM for food and non- food retailers and suppliers are. Rating Bndypymankaran the free flow of information ' is less than ' mutual interest in the significance level was 5%. This indicates that five factors ( integrated system of information , trust , and reliability of power , top management support and mutual benefit) held in considerable importance above the bottom six , to SCM construction. Two key factors are less important as

development, human resources and frequent meetings were identified. The latter two are also among the least important factors for the development of SCM, in a previous study by, at least compared to the ` integrated information systems may not reflect the current state of the system, ITC , for example in the construction industry instrument rating its relative backwardness compared to other industries Schultz and Unruh concluded that the construction industry is unwilling to trust or share study shows that contractors feel Indeed it is important to do this in order to achieve success in SCM. Perhaps this represents a major cultural shift for the construction industry in Iran. Apart from the development of human resources, ANOVA analysis shows that the views of contractors in each of the factors ( level of significance 5 % ) did not differ .important.

Questions15 is an important question and has relation to the obstacles and difficulties facing during the implementation of SCM in their organizations. The result indicatesTable9 show a range of factors that may make it difficult to run an efficient and successful supply chain collaboration. 5 -point Likert-type alpha test indicates that the test is reliable factors (level of significance 5 %). The biggest obstacle to implementing a successful supply chain partnerships poor understanding of the concept, followed by a lack of senior management commitment , inadequate organizational structure to cope with this concept and low commitment of the partners . The least important factor in the lack of proper information technology and its strategic interests were unknown .are significant. ANOVA test for significant differences in any of the obstacles groupings of contractors did not show up. Of three barriers in implementing SCM strategy of

building a culture of leadership in dealing with industry structure and mindset of the organization is concerned. This suggests that an effective mechanism Khsakht SCM calls for re-orientation of education and industry. According to Khaksryt respondents occupied senior positions (Director / Executive Director , " 60 % of respondents ) and is responsible for policy , is surprisingly poor understanding of the concept as the most important obstacle to the implementation of supply chain collaboration specifying construction and managed. Today modern technologies are adopting in every domain, so the supply chain can be fully integrated with the Supply chain management tools to get full benefits of the supply chain processes and this can save time and money. But poor IT infrastructure may become obstacle for the companies to adopt fully SCM in their organizations and this aspect of the questions is also discussed in literature review in which as per Simchi Levisetsuggest that EDI plays a very important role in linking the business portal with the business associates to make sure the accuracy of data exchange between the organizations<sup>39</sup>. Most of they said that Poor-IT infrastructure can influence on the SCM processes. Some companies in the manufacturing industry establish communication networks using standards such as Electronic Data Interchange (EDI) to connect and exchange data with partners However, the implementation of such communication infrastructures usually requires high cost and long configuration time, partly due to the lack of information standardization among trading partners<sup>40</sup>.

**Table-8**  
**Key factors in construction supply chain relationships**

Function	overall	Turnover million \$			F stat	Sig
		Less than 3	7.5 - 18	More than 20		
Integrated information systems	4.56	4.35	4.72	4.61	1.567	0.220
Trust	4.53	4.51	4.53	4.54	0.015	0.985
Reliability of supply	4.35	4.58	4.23	4.23	1.280	0.282
Top management support	4.27	4.01	4.56	4.24	2.167	0.123
Mutual interest	4.00	3.78	4.32	3.91	1.043	0.385
Free flow of information	3.96	3.67	3.76	4.45	0.768	0.476
Joint business planning	3.54	3.65	3.12	3.85	1.876	0.166
Closer links between demand/supply	3.34	3.65	3.50	2.86	2.131	0.143
Manpower development	3.11	3.45	3.33	2.54	4.102	0.025
More frequent meetings	2.79	2.67	2.43	3.27	1.898	0.172

**Table-9**

**What are obstacles and difficulties faced in implementing SCM in your organization?**

Function	overall	Turnover million \$			F stat	Sig
		Less than 3	7.5 - 18	More than 20		
Poor understanding of the concept	4.17	4.00	4.59	3.91	1.931	0.171
Lack of top management commitment	4.02	3.83	3.91	4.33	1.742	0.181
Inappropriate organization structure to support system	3.95	4.00	4.13	3.73	0.247	0.764
Low commitment of partners	3.82	4.02	3.73	3.70	0.158	0.860
Strategic benefits unclear	3.52	3.48	3.42	3.66	0.133	0.877
Lack of appropriate information technology	3.29	3.92	3.01	2.95	1.270	0.380

**Conclusions and Recommendations**

The findings of this research – Supply Chain Management in Iran construction Industry are summarized in this section. The most current and relevant literature review has been conducted in the relation to the supply chain management and their application in construction industry. Based on the findings on the literature review a questionnaire was designed to get actual information of the application of supply chain management in Iran construction industry. The supply chain management in a construction and building organizations is bit complex to understand, which involved multiple functional departments or areas that must be considered when adopting SCM as a tool, these are: procurement (purchasing) of raw material, transportation (logistics), inventory (warehousing) and so on. In our survey Q10 reveals the important functions which are strongly supported by Iran construction companies (i.e. the participants of the survey), if we rate them in an order from first to last, the procurement (purchasing) is the most favorable SCM functionality strongly supported by the Iran construction companies, remaining important SCM functionalities are Production, transportation Storage, Inventory. The respondent of the survey also strongly support that SCM can increase profits and reduce cost and also provides better customer services, decreases paper work, improves supplier quality. Which are considered to be the main objectives of the any supply chain process? These questions further validates our approach to know about Iran construction market for example In Iran construction organizations where supply chain management is a part of their business needs – annual turnover reflects that the participants organizations are running in profits., they can serve better to the customer. After data collection and analysis of that data presented, one can easily conclude that the response received from different organizations was very healthy; and the big companies have participated in this survey. The result shows that the most of companies seems to in process of implementing

SCM techniques and the companies who already running SCM in their process chain are not fully utilizing the SCM concepts instead they know the major benefits of the supply chain processes. Hence it can be concluded that only those companies who are interested in the use of SCM responded to the questionnaire, which would therefore warp the results of the analysis. However given the close (Akintola Akintoye, 2000)In the analysis and verbal discussions with the industry professionals here in Iran it is noted that there is a concern that some of the respondents consider SCM as a 'trendy' topic rather than being suitable to their business. However companies were bit reluctant to share their annual turnover.

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