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## Using SCOR model to gain competitive advantage: A Literature review

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### Abstract

*In a developing and globalizing world, there is a fierce competition between the supply chains of the companies. The supply chain of a product involves activities from manufacturing raw materials to a final product which is eventually delivered to end user. The Supply-Chain Operations Reference (SCOR) provides a standard description of supply chain processes, performance metrics, best practice and enabling technologies. The basic structure of the reference model inspects the five supply-chain processes: Plan, Source, Make, Deliver, and Return. The purpose of this study is to develop and show application of the SCOR model for the companies. In this study, articles on SCOR model are evaluated. Observations and recommendations are shared according to the research gaps in the literature.*

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**Keywords:** : Supply Chain, SCOR Model, Literature review

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### 1. Introduction

There is a high competition between the companies. In order to be profitable, firms increase their efficiency of their supply chain and decrease their costs. Keeping this on the mind, companies should integrate their processes, and compare them with other firms. In this way; they can analyze, improve and benchmark processes, evaluate process analysis and pinpoint the performance measurements. These performance measurements can easily be measured, and evaluated.

According to Bolstorff et al (2012), ‘moving together as one’ natural behavior of fish is actually crucial in explaining supply chains. Because separation can cause fish to die, for global supply chains, misalignment, failure to move as one, can mean, poor service, high inventory, unexpected costs, constrained growth and profits and loss of market share. The important point is to how to move one, without disturbing other areas which are working well.

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Supply chains have evolved into efficient chains with using latest tools and technologies. Aiming to increase level of service, supply chain sellers, had a need to use a standard model to base their operations and measure their performance. In order to gain a competitive advantage and improve organizational performance of the companies, SCOR model is developed by Supply Chain Council (SCC), to measure performance of the chain. It provides standard terminology which can be used for deciding, arranging and implementing supply chain processes. SCOR model has several processes. These processes are named as plan, source, make deliver and return.

**Plan:** It is analyzing the information and forecasting market trends of goods and services. Marketing and finance departments apply planning process by monthly and yearly reports.

**Source:** It is a procurement system with procurement model. It includes search, negotiation and evaluation agents to amend supplier selection, negotiation, and evaluation.

**Make:** It is the manufacturing of goods not only in terms of time but also about production belt and batch.

**Deliver:** It is the processes, which provides finished goods and services to reach planned or actual demand.

**Return:** It is processes, returning the goods or receiving the product. Trkman et al (2010)

Figure below shows SCOR model processes

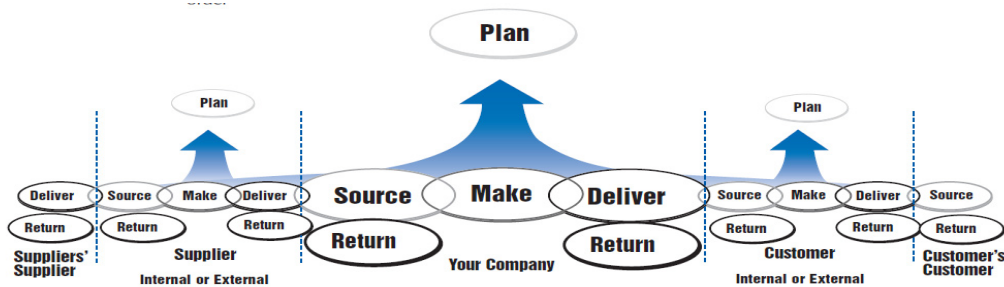


Fig 1. SCOR Model (Supply Chain Council : SCOR 9.0 Overview Booklet, 2008 )

The SCOR model establishes the notion of business process reengineering (BPR), performance measurement, and logistics management by combining these techniques to cross functional framework. This framework has four levels.

- Level 1 – identifies the important supply chain processes- plan, source, make, deliver and return. It aids firms to form supply chain management objectives.
- Level 2- explains the main process categories that exist in real and created supply chain in an enterprise. For instance, the source part has 'source stocked products', 'source make-to-order' and 'source engineer-to-order products'
- Level 3- includes information for the supply chain management to plan source and build goals for supply chain management strategy. This also consists of definitions, benchmarks, and system software capabilities.
- Level 4- centers on implementation. Since the supply chain management implementations are special to each company, the specific parts of level 4 are not explained in the SCOR model. (Wang et al 2005)

The purpose of this research is to categorize the SCOR model according to following titles: the successful usages of SCOR model, strategic alignment between business and IT strategies, performance measurement, and limitations on SCOR model, ERP and Performance Measurement, Modeling for Supply Chain Management and Theoretical Frameworks. The result of this literature review is revealed, in order to shed light on the gaps of the SCOR model.

## 2. Research Methodology

There are many papers on SCOR model. However, this literature review is intended to find gaps of the studies for SCOR model which can guide readers for the future research. This literature review is used publishers such as Springer, Elsevier, Emerald, Interscience Enterprise. SCOR model is not new concept; however its version is updated in time being. For this reason, main focus of this literature review focused on time period between 2006-2014 in order to evaluate different versions of SCOR model.

Along with these articles, Supply Chain Excellence, A Handbook for Dramatic Improvement Using the SCOR model accompanied this literature review. This books' third edition gives insight about the 'tips and techniques based on experience with projects'. Using previous editions, it updated and expanded key concepts, steps, tasks, outcomes, and behaviors. It gives project timeline to global and small businesses, focuses on performance, integrates to SAP functionality, gives examples on Level 4 of SCOR model and uses SCOR 10.0 version.

## 3. Approaches of Articles

After the literature review, articles about SCOR model are researched. Total number of 28 sources are evaluated. 4 articles are the example of successful usages of SCOR model in research studies, 2 of them are about strategic alignment between business and IT strategies, 3 of them are the limitations of SCOR model ERP, and performance measures, 5 of them are modeling for supply chain management, 3 of them are theoretical frameworks.

### 3.1 The Successful Usages of SCOR model

Among 27 journal articles, four papers (14,8%) showed the successful usages of SCOR Model. (Hakim 2004) electronic supply chain management is a tool for supply chain management. The procedure of this study consists of standardization, interdependency identification, business process mapping and flow analysis. SCOR model is used with IDEF0 technique for mapping the processes. These techniques provide top-down decomposition approach to inspect processes. IDEF0 is used in order to recognize interdependencies and inspects risks in the flow of material and information throughout the supply chain.

(Lestari et al 2013), suggests that SCOR model is very useful tool for supply chain and states that it supports "Best practice module". Therefore, "Process wizard" software can be applied for arrangement of the supply chain.

(Zuniga et al 2013 ) inspects the sourcing process in recent supply chains. "Concepts, variables and factors connected to supply chain and supply chain management, mineral raw materials industry, the exploration, development and extraction processes" are researched in literature review. SCOR model is used with DCOR to extend the sourcing model. As a result, it is found that SCOR model cannot be extended to a model in this process. However DCOR is useful in earliest processes of the sourcing process, then it can be used with SCOR model. Level 3 analysis is required in order to identify key performance indicators and best practices.

(David et al 2014) states that there are many studies in literature about performance measurement. However, in each study different properties of performance are evaluated. That led to many definitions in performance measurement system. There are not enough consensuses about its parts and characteristics of performance measurement. Many of studies are theoretical models and there is not much information about application of them. Suitable optimization techniques to form integrated performance measurement and management systems are planned to be tested.

### 3.2 Strategic Alignment between Business and IT Strategies, Performance Measurement

Among 27 journal articles, two papers (7%) showed the alignment between business and IT strategies, performance measurement.

(Lopez et al 2007), asserts that Information Technology and Supply Chain Management are center of attention by the researchers on following areas such as information systems, artificial intelligence, simulation, telecommunications,

economics and business management. Integration of information systems with supply chain management is crucial in order to increase the revenues of each member in supply chain. Additionally, this paper also states that (cited by Chandra et al(2001) many industries such as textile, automotive, pharmaceuticals require integration and standardization which is presented by information systems.

According to (Sakka et al 2010) as cited by (Mc Keen and Smith, 2003), companies cannot be in rival if business and IT strategies are not linked. There is the strategic alignment of Information Technology, when ‘firm’s goals, activities and processes’ are combined with IT systems. (Ye Du at al 2005) , suggests that IT has formed new opportunities in the service sector. They also state that forming and managing IT value chain is important for companies to achieve their goals.

(Sakka et al 2010) as cited by (Papp 1999), in order to be profitable in IT, integration is essential. According to them, alignment takes into account the integration between business and IT. Considering, 500 enterprises, a method is created. Using the alignment model, managers measure the firms’ perspectives, learn to recognize and leverage IT to maximum efficiency. (Shaikh 2013), also mentions that connection between IT and supply chain transformation. Shaikh states that “complementary variables, synergistic effect” supports the relationship. IT supported companies are better off in terms of productive supply chain management combined with SCOR model drivers.

### *3.3 Limitations on SCOR model, ERP*

Among 27 journal articles, three papers (11%) showed the limitations on SCOR model, ERP and performance measurement.

(Lockamay III and McCormack 2004) indicate that significance of supply chain management planning is clearly revealed in literature and is crucial. There is a lack of research connecting supply chain planning practices to supply chain performance. They also reveal that there is a need for supply chain information technology to improve the information sharing, supply chain competitiveness, and the use of ERP systems, advanced planning systems, and internet technologies.

(Wang et al 2005), also states SCOR model is not entire solution for IOS development for supply chain. There are limitations in SCOR model. For global logistics systems, a new framework is offered. However, it is concluded that this framework is not the only way to solve all the problems in supply chain management.

According to (Persson et al 2009), SCOR model is useful tool; however it is not easy to apply to construction industry. That is because SCOR model is not developed for construction industry. (Prakash et al. 2013) discusses the SCOR model. According to the literature review, they reveal that SCOR model is mostly followed in manufacturing industries.

### *3.4 Modeling for Supply Chain Management*

Among 27 journal articles, five papers (18,5%) showed the different modeling for SCOR model.

(Razmi et al 2006) states collaboration is crucial to provide the aim of the supply chain management for tiny cycle times and rivalry. Explaining roles and responsibilities of supply chain is a part of Enterprise Architecture. In this study, SCOR model is used, in order to form supply chain enterprise architecture. Important conclusion is that integration is fundamental in all tools, resources, strategies and implementation of supply chain management.

(Rabe 2006) explains SCOR model, the integrated enterprise modelling (IEM) and a specific distributed simulation method. The application of these techniques is used with different projects. Fraunhofer IPK supported a proposal for business process modeling.

(Sam M.A 2007) suggests that there isn’t one unique way of supply network model for supply chain. Supply chain managers should select which model is best for their company. When considering supply network modelling, supply

manager should think about the questions such as, which concept is essential for them, cost or profit, change or competitive advantage. Modelling can be handy if it is used in a right way.

(Millet et al 2009) stresses using a standard model, which connects information, features and practice with knowledge and skills asserts the alignment of business processes, information systems and ERP implementation has become main subject of their study. In this study, SCOR model is used. It is believed that this SCOR based alignment reference model bolsters a more efficient “multi-view” for ERP projects. This alignment approach can aid business process management in operational environment and can direct a continuous alignment approach including process management in a re-engineering life cycle.

(Alina and Fernando 2013) proposes SCOR model for connecting business objectives with the operations of logistics. It gives a systematic approach to find the performance of the firm in supply chain management. Balanced Scorecard is also used to combine comprehensive management and integrate three levels of management. Integration with it leads all activities logistics process indicators (KPI)’s to suitable for providing successful strategies for the firm. Proposed procedure is applicable for all types of businesses, requires no additional cost

### *3.5 Theoretical Frameworks*

Among 27 journal articles, three papers (11%) showed theoretical frameworks for SCOR model.

(Trienekens et al 2008) presented four current models for information system and design. Models are explained as follows: SCOR model, CPFR (Collaborative, Planning, Forecasting, and Replenishment, ISA- S95 standards for enterprise and manufacturing integration, and Integration Specifications developed by Open Applications Group (OAG) supported by industry and software companies (ex. IBM, SAP, ORACLE, BOING FORD ). Future research of this paper will be on application of these models.

(Zdravkovic et al 2010) asserts that reference models have crucial role in supply chain management. However, it is not complete in application domain. SCOR model is used in order to advance its usage and OWL specification of SCOR concepts is used, in order to protect the original approach. The motivation of this study is to develop a model links strategies with information technologies using AHP and TOPSIS methods based on SCOR model.

(Roshan and Jenson 2014) also states that literature shows that there are a wide variety of measures and frameworks. However, theoretical models do not give specific information on how to apply these models. The validity and practicality of measures and metrics need to be explained. There is also a need for optimization techniques to be tested.

There are successful applications of SCOR model to the companies. Different models for supply chain management are offered. Additionally, balanced scorecard and performance measurement are considered in articles. Strategic alignment between business and IT strategies is recommended in articles. However, there are limitations on SCOR model, and ERP, performance measurement and application of SCOR model is recommended for companies in articles.

## **4. Techniques**

Techniques which are used with SCOR model are; AHP, Simulation, and Topsis. Short literature review, is presented below.

AHP is one of Multi Criteria decision making method that was developed by Prof. Thomas L. Saaty. It is a method to collect ratio scales from paired comparisons. The data can be derived from actual measurement such as price, weight etc., or from subjective opinion such as satisfaction feelings and preference. (Najmi, Gholamian, & Makui, 2013) cited from Bhagwat and Sharma, prioritized SCM metrics and different performance metric levels using AHP method. Survey is used as an accompanied tool.(Najmi, Gholamian, & Makui, 2013) cited from Chan (2013),

also used AHP method to decide according to priority of performance measures. The writer depicts the implementation of it by pair wise comparison.

Two papers (5%) applied AHP technique to evaluate the performance of Supply Chain with SCOR model. (Sellitto, 2015) stresses that this industrial sector has unpredictable relationships and information flow among partners. AHP method is used with SCOR model to justify this situation. (Kocaoglu, Gülsün, & Tanyaş, 2013), emphasizes that AHP and SCOR model can be best evaluation technique to be used together. This is because, AHP gives aspect of human mind to categorize elements in to different levels. SCOR model is also a hierarchical and has different process levels. (Aydın, Eryuruk, & Kalaoglu, 2014) compared the successful brands according to their performance attributes. Criteria are adapted to the SCOR model and AHP is used in order to determine the priorities of the criteria.

One paper (0.1%) applied simulation technique to evaluate the performance of Supply Chain with SCOR model. Simulation is developing a model of an actual or theoretical physical system, transferring the model on a digital computer, and evaluating the results of data. Simulation has a main goal of 'learning by doing'. (URL 1) (Najmi, Gholamian, & Makui, 2013) cited by Persson and Olhager (2002) used simulation method to pinpoint interrelations between parameters in supply chain. They decided different supply chain designs according to quality, lead times and costs as the key performance parameters. (Vijay, 2005) used simulation method with SCOR model. This is because SCOR model is powerful on technical dimensions, but weak on social dimensions. Simulation approaches supports the successful modelling and improving supply chains.

Three papers (0.05%) uses TOPSIS to evaluate the performance of Supply Chain with SCOR model.

Topsis is a mostly used approach in literature. It maximizes the benefit criteria of properties and minimizes the cost criteria of properties. (Kocaoglu, Gülsün, & Tanyaş, 2013) mentions that TOPSIS is used when the chosen alternative have the shortest distance to the ideal point. It is advantageous since it gives opportunity to decide quickly. (Seifbarghy, Mohammad, & Mohsen, 2010) uses TOPSIS with SCOR model in order to analyse the supply chain of Mobarakeh Company. Several projects are proposed, based on SCOR model and prioritized using SCOR model. (Golparvara & Mehdi, 2009) explains the process and results using SCOR model to analyze the supply chain of Iranol Oil Company (IOC). Making numerous interviews with the managers, and some new projects are proposed. These projects are prioritized using TOPSIS.

## 5. Observations and Recommendations

In this paper, performance of Supply Chain is reviewed along with 27 articles. Figure shows yearly distribution of papers. It is observed that number of papers are increased between 2006-2014 relative to previous years. This explains that researches have paid more attention to SCOR model recent years.

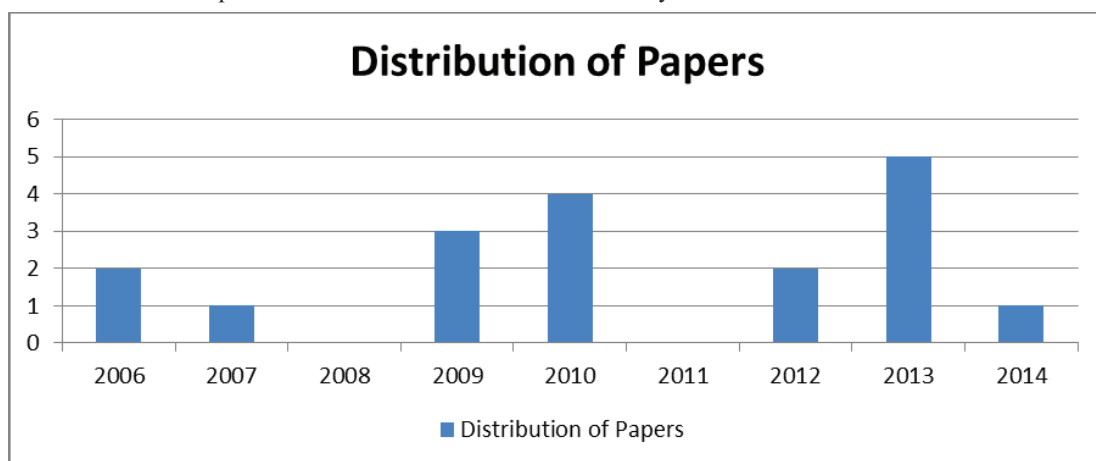


Figure 2 : Distribution of papers

The objective of this paper is to The purpose of this research is to categorize the SCOR model according to following titles: the successful usages of SCOR model, strategic alignment between business and IT strategies, performance measurement, and limitations on SCOR model, ERP and Performance Measurement, Modeling for Supply Chain Management and Theoretical Frameworks.

After literature review, the gaps in literature and the potential research questions are listed below:

- In studied papers, the results are mostly applied in Level 1 business processes, there are not many examples of Level 3 and Level 4 processes.
- There are SCOR model limitations. One of them shows is SCOR model is mostly used in manufacturing firms, and it is not easily adaptable to construction company.
- There are not many studies to implement SCOR model. Studies are case studies.
- There are software products which are presented, such as process wizard, IDEF modeling, e-SCOR, D COR model, ISCOR modeling, viable system modeling, and IBM smart score. They will be evaluated according to their effectiveness and usability in work settings.

## 6. Conclusion

Process modeling and performance measurement are the crucial subjects in SCOR model. How these concepts will apply to the companies will be beneficial to industry. Additionally, in order to make these researches applicable, information technologies integration is also recommended. This integration should be inspected and a good framework should be formed. Move as one, without stopping other areas is the main focus of SCOR model. After the literature review, important gaps on SCOR model are revealed.

With this study, the articles in SCOR model is reviewed and categorized according to following titles: successful usages of SCOR model, strategic alignment between business and IT strategies, limitations of SCOR model, ERP, and performance measures, modeling for supply chain management and theoretical frameworks.

After this study, the gaps in literature and the potential research questions are revealed. These implications can shed light on for future studies.

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