Original Article: Supply Chain Complication Using CSCMP Standard

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ABSTRACT

Due to the large-scale reorganization of business processes and structures, as well as the changing world of industry, the concept of supply chain and its management has become particularly important. In this approach, organizations can use the core capabilities of other organizations to optimize capabilities, increase their effectiveness and improve customer satisfaction, instead of attempting to have the best performance in all areas. The concept of supply chain emerged in the late 1980s and became widely used in the 1990s. Before that, terms like performance management were used instead of supply chain management. Accordingly, supply chain management pertains to integrating organizational units throughout the supply chain and coordinating the flow of materials and information in order to meet customer demand and with the aim of improving the competitiveness of a complete supply chain. In other words, supply chain management is a set of approaches that are effectively used in integrating suppliers, producers, warehouses and distributors in order to produce and distribute goods in the required quantity and in the right place and at the right time to minimize system costs in order to provide the required level of services. Rapid developments and changes have led organizations to research logistics and supply chain to overcome their uncertain environment.

Introduction

So far, different definitions and versions of supply chain have been proposed. According to one of these definitions, the supply chain includes all direct and indirect steps involved in completing a customer order request. The supply chain is not only related to the manufacturer and supplier, but also includes transportation, warehouses, retailers and even the customers themselves. In general, supply chain is a chain that includes all activities related to the flow of goods and conversion of materials from the raw material stage to the final delivery stage to the consumer. About the flow of goods, there are two other flows: One is the flow of information and the other is the flow of financial resources and credits [1-3].

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Accordingly, one of the challenges faced by officials related to logistics and supply chain in companies is how to identify problems in the field of logistics and supply chain. The diversity and large number of issues raised in the supply chain management philosophy complicate the task of selecting the best remedial measures to improve supply chain performance. Therefore, considering the fact that the first step in reviewing and improving the supply chain is diagnostics, identifying the methods of diagnosing and analyzing the supply chain is one of the important things that people active in this field should be familiar with. This study intended to be practical and to provide a suitable method for diagnosing complications of Iran Darok Pharmaceutical Company. As a result, while providing an overview of the situation of Iran Darok supply chain, various problems and complications were identified, prioritized and analyzed [4-6].

In today's world, supply chain management is a key and strategic factor in increasing the effectiveness and achievement of organizational goals. Accordingly, supply chain management should be considered as one of the vital areas of organizational management. This area of management, like other areas, requires monitoring, supervision, diagnosis, improvement and ultimately leading to excellence to gain and strengthen competitive advantages, performance measurement, continuous improvement and efficient and effective management. According to studies conducted by Iran Darok Company during the past years, no systematic and organized effort has been made to study, measure or diagnose the company's supply chain [7]. Of course, various diagnostic and improvement projects have been defined and implemented in an island and unit form, but unfortunately, different units are not aware of each other's situation and these projects have not been carried out at the organization level with an overview of the organization's supply chain. However, due to the need to solve supply chain problems and create a competitive advantage in this area, it is necessary to define projects in principle as soon as possible to implement diagnostic process and measure the performance of Iran Darok supply chain at the organization level [8-10]. According to the above-mentioned necessities, the present inquiry sought to implement a method to identify and extract the supply chain complications of the company. In today's competitive business environment, companies and organizations use a variety of technologies and management sciences to create competitive advantage through tools. Data management and knowledge management and optimization of organizational processes such as production or communication are organized [11]. One of the most important management sciences that has raised very useful issues in this field is supply chain management. By using this tool, the organization will be able to develop its business relationships by optimizing the exchange of information with business partners such as raw material suppliers, product distributors and freight contractors. In this way, the company's enterprise will be able to market its product in a much shorter time and reduce production time and waste costs [12].

Supply chain

Supply chain is an integrated system of interconnected processes in order to:

1) obtain the required materials and components;
2) convert raw materials into products;
3) do product valuation;
4) distribute products to customers and
5) facilitate the transfer of information between supply chain components, including suppliers, manufacturers, distributors, intermediaries, retailers and customers [13].

The main goal of this chain is to reduce costs, increase effectiveness and efficiency, and generally increase profits for all its stakeholders. This chain consists of two opposing currents: The direct movement (flow) of products from the raw material supplier to the customer and the return movement (reverse) of information and materials from the customer to the suppliers.

By definition, a supply chain includes all activities related to the flow and conversion of goods from the raw material stage (extraction) to deliver to the final consumer as well as related information flows. In general, supply chain is a chain that includes all activities related to the flow of goods and conversion of materials, from

the stage of preparation of raw materials to the stage of delivery of the final goods to the consumer.

Supply chain management

Supply chain management involves the integration of supply chain activities as well as related information flows by improving chain relationships in order to achieve a reliable and sustainable competitive advantage. Therefore, supply chain management is the process of integrating supply chain activities and related information flows through improving and coordinating activities in the supply chain, production and supply of the product.

For effective supply chain management, it is essential that suppliers and customers work together in a coordinated manner, through partnerships, information communications, and dialogue. This means a rapid flow of information between customers and suppliers, distribution centers and transportation systems, enabling some companies to create highly efficient supply chains. Suppliers and customers must have the same goals and mutual trust. Customers trust their suppliers in the quality of products and services. In addition, suppliers and customers must participate in supply chain design to achieve common goals and facilitate communication and information flow with each other. Some companies try to gain control of their supply chain through general control using the ownership and integration of all the various components along the supply chain from the supply of materials and services to the delivery of the final product and customer service. But even with this type of organizational structure, different activities and operational units may be incoherent (Figure 1). The organizational structure of the company should focus on coordinating different activities to achieve the overall goals of the company.

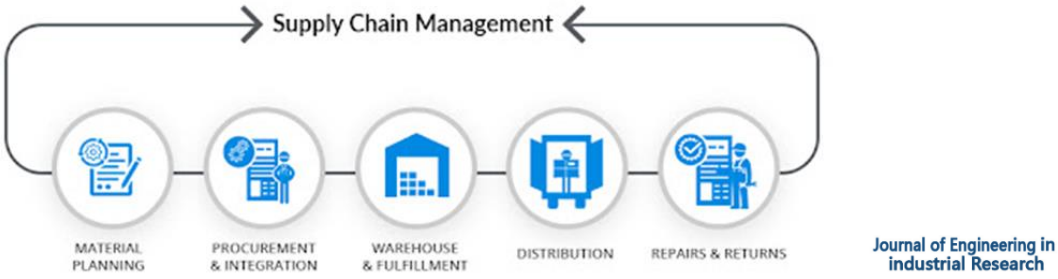

Figure 1: Supply Chain Management

Main components of supply chain management

Supply chain management has 3 main processes including: a) information management; b) logistics management; and c) relationship management. As far as information management is concerned, today, the role, importance and place of information is obvious to everyone. Proper circulation and proper transfer of information makes processes more efficient and effective and easier to manage. Coordinated and appropriate information management between partners will have an increasing impact on speed, accuracy, quality and other aspects. Considering logistics management, in the analysis of production systems, the subject of logistics includes the physical part of the supply chain. This section includes all physical activities from the raw material preparation stage to the final product, including transportation activities, warehousing, production scheduling, etc., and occupies a relatively large part of supply chain activities. In fact, the logistics area is not only the flow of materials and goods, but also the axis of supply chain activities, which relationships and information are the supporting tools to improve activities.

Further, relationship management is the factor that leads us to the end of the discussion, and perhaps the most important part of supply chain management because of its construction and form. Relationship management has a tremendous impact on all areas of the supply chain as well as its level of performance. In many cases, the information systems and technology required for supply chain management activities are readily available and can be completed and deployed in a relatively short period of time. But

many of the initial failures in the supply chain are due to the poor transmission of expectations and the result of behaviors that occur between the parties involved in the chain. In addition, the most important factor for successful supply chain management is reliable communication between partners in the chain in such a way that the partners have mutual trust in each other's capabilities and operations.

Measuring and evaluating the supply chain

In today's markets, competition between companies and the use of different techniques is increasing and changing. In order not to lag behind this scene, fundamental changes in the organization are necessary. The survival of a company depends on how well it responds to customer needs. It is very difficult for a work company to meet all the requirements; as a result, outsourcing strategy is one of the main strategies to reduce this difficulty.

Today, the country's managers are facing a serious problem in measuring the performance of their organization. Using the right tools and having performance indicators in different industries allows them to know their performance position in comparison to the performance range of other competitors inside or outside the country. Proper supply chain performance plays a key role in the success of an organization and the sustainable achievement of its goals, especially profitability. In this regard, the establishment of a supply chain performance measurement system is recommended to continuously improve its performance (Figure 2).

Adequate supply chain means timely production, on-time delivery and controlled costs from supplier to customer. Therefore, creating a performance measurement system in the supply chain can be an effective aid in the production and timely and cheap delivery of an organization. Thus, performance measurement in the supply chain is a process to analyze performance management, reduce costs, reduce risk and enable continuous improvement in value creation and operations.

Figure 2: What is Supply Chain Management?

In general, if something cannot be measured, it cannot be managed. In fact, the basic rules of performance measurement systems include an in-depth look at the nature of value-added processes, guiding organizational progress toward goals, and providing important and key feedback related to organizational strategy success. More importantly, the performance measurement framework is crystallized not only in the behavior of managers who are responsible for development in a competitive situation, but also includes all executive personnel. However, the concept of performance measurement almost always precedes the achievement of strategic goals. Recognizing the performance of the organization and thus measuring the performance of the organization will determine the stages of its development and improvement. The supply chain performance measurement system enables the organization to review, evaluate and control the performance of the organization. It is also possible to use the same methodology and criteria in evaluating the levels of the organization. And, it facilitates making decisions in a systematic framework. In other words, decisions can be made in the chain that move towards the goals of lean production.

Necessity of measuring performance in a supply chain

The scientific development of a regular and coherent supply chain requires the development of evaluation tools. Reasons for the need to study

the criteria and indicators for measuring supply chain performance are discussed in the subsequent paragraphs.

Lack of a balanced approach

Most companies have realized the importance of financial and non-financial performance metrics; but they have failed to recognize these criteria in a balanced framework while some managers and researchers have focused on financial performance indicators and others have focused on operational indicators. These differences do not lead to the creation of criteria that give a clear picture of organizational performance. In order to have a balanced approach, we need to consider both financial performance indicators that are important in strategic decisions and external reporting and non-financial performance indicators that better manage the control of day-to-day production and distribution operations. In general, companies usually have a large number of performance indicators they add again at the suggestion of their employees and consultants, while performance appraisal can be better done using a small number of criteria that play a critical role in success (Figure 3).

Figure 3: Lean Supply Chain Management: Expert Guide

Lack of clear distinction between criteria at strategic, tactical and operational levels

The metrics used in performance measurement influence decisions made at the strategic, tactical, and operational levels, and it is sometimes difficult to distinguish between these levels. Using this classification, each criterion can be assigned to the level that is most appropriate. It is clear that for effective management in a supply chain, management must consider all the goals of the supply chain and the metrics used in it. The metrics used to measure performance and improve it must properly capture the nature of the organization's performance. To measure and improve effective performance, measurement objectives should state the organization's objectives, and the selection criteria should strike a balance between financial and non-financial criteria that can relate to the strategic, tactical, and operational levels of decision-making and control.

In fact, a comprehensive performance management system includes a large number of management processes including identifying indicators, targeting, planning, communicating and measuring indicators, monitoring, reporting and receiving feedback from the current situation, which ultimately helps to identify the main complications of the organization and improve them. In this regard, studies related to performance appraisal systems will either lead to the creation of conceptual models, documentation and diagnostic reports, or the implementation of operational-information systems. In these systems, all the main processes of a comprehensive performance management system can be found integrated. These information systems measure and monitor key performance characteristics (KPIs), which are, of course, critical to optimizing supply chain performance.

Supply chain complications

Organizations in every chain seek to improve operational structures. Then, two important questions arise, first, "What are the opportunities for improvement?" and "Which opportunity will create more value for the

organization given the existing constraints?" In this regard, diagnosing complications by answering these questions helps the organization to gain value and create improvement. Diagnosing an organization is like diagnosing a patient's problem by a doctor. People see a doctor for three reasons: a) For a routine examination, b) when they see symptoms of the disease, or c) when they have a serious problem and emergency situation.

In this case, the doctor tries to diagnose the patient's disease and prescribe appropriate treatment for his various pains. Organizations can use a similar method to diagnose their organization (Gower, 2003). On the other hand, one of the most important processes in most organizations can be considered processes related to supply chain management. Therefore, supply chain diagnosis helps organizations to effectively evaluate the supply chain and ultimately improve it.

Simply examining a supply chain involves a series of disciplined and structured evaluations of the supply chain. Diagnosis is made to identify opportunities for viable improvement and improve the performance of the organization by providing solutions. In fact, diagnosis helps the organization to effectively evaluate and review the supply chain and ultimately improve it. In other words, supply chain diagnosis to identify improvement opportunities that are feasible is done to provide solutions to improve the performance of the organization; this process can be done in the following four steps: a) Definition and program; b) measuring and evaluating the performance of the current chain; c) identifying opportunities for improvement and their value; and d) finalizing business mode.

Of course, there are many similarities between the two concepts of diagnosis and performance appraisal, and some sources have assumed that the terms diagnosis and assessment are the same. However, in the forthcoming project, an attempt has been made to distinguish between these two terms. This means that diagnostics can be considered as an in-depth process to identify opportunities for system improvement that is possible after measuring and evaluating system performance [15].

Supply chain complaint history

In the logistics and supply chain literature, diagnostic tools are relatively few. Most logistics diagnostic methods rely on performance measurement criteria and in most cases are quantitative tools. In some cases, modeling techniques are used, but there are problems and obstacles in applying these techniques. The first is the time-consuming nature of these techniques. It usually takes a long time to complete the diagnostic process using these methods. On the other hand, to use these techniques, a pre-prepared database of modeling information of companies and similar industries with similar strategies in the field of logistics and supply chain is needed.

So far, several methods have been proposed for logistics and supply chain diagnostics, which are described below. The SCOR model was introduced in 1990 by the Supply Chain Association. SCOR is a process reference model that aims to provide a common language for communication between chain members.

In 1996, the supply chain association developed the SCOR model for logistics diagnostics. This method, although seemingly simple, can only be used by organizations that have used this model to implement the chain. In 1999, the modeling tool method was introduced by the Performance Measurement Group, a subsidiary of the Supply Chain Management Association. The performance measurement team collected information about the performance of various covered organizations and used this information to provide services to its covered organizations, called supply chain management modeling services. Organizations use these services to diagnose problems in their systems. But this method could only be used for member organizations.

The value chain evaluation model was another tool used to diagnose supply chain complications. This model developed a web-based supply chain diagnostic tool based on the ORSCOR model. This model identified the important values of the chain and collected the required information from successful member companies of the Logistics Association, and enabled member companies to identify their strengths and weaknesses by comparing their organization with successful organizations. This method, like the modeling method, could only be

used by the member companies of the association [16].

Rapid search is another way to diagnose logistics systems that uses a systematic approach to selecting, combining, and inferring qualitative and quantitative supply chain data. This method does not provide complete information about the existing problems and is mostly used to diagnose information systems. In the diagnostic process, organizations seek comprehensive information on the strengths and weaknesses of the organization along with a clear path of Identify solutions. One of the most important issues in diagnosing a complication is time. Diagnosis should be made as soon as possible [17].

Performance indicators and criteria in a supply chain

Designing performance appraisal indicators is one of the issues that is of special interest both in academic circles and in practical forums. The relevance of these indicators to organizational goals is of particular importance on which Fortin and Parker (2009) have done many studies. Herbert (2003) evaluating supply chain value identified the following steps:

Step 1: A team of representatives from all members of the supply chain must be formed. The operational basis of this team is the integration of supply chain and business processes. This team is responsible for identifying the current state of business processes.

Step 2: In this step, the team analyzes its findings and then extracts critical performance indicators. Therefore, it can be said that the current situation is carefully examined and introduced in the form of a series of indicators.

Step 3: In this step, the assessment team tries to cover the weaknesses identified from the previous step.

These indicators allow the organization to take a closer look at the real state of its business and, by defining criteria, set a standard line for performance, performance metrics, and definitions of feedback goals for the future.

By defining the right set of criteria, the performance of activities is measured in a supply chain and efforts are made to improve and construct diagnostic and decision-making facilities more quickly. According to Melnik et al. (2019) performance indicators have three functions:

1) Control; which means that with the help of performance indicators, managers and employees can control and manage the performance of resources;

2) communication: The performance of the organization makes sense to other people through performance indicators and can be expressed; and

3) improvement, which is achieved when it is possible to identify the gap between the organization's performance and expectations of the organization. As a result, with the help of performance indicators, the organization can be improved.

In a performance measurement system (PMS), it is very important to pay attention to the selection of appropriate indicators. In this regard, many models have categorized processes and indicators related to supply chain performance. The advantage of using these evaluation models can be considered in the following ways:

a) These models have generally been used by a large number of successful organizations and companies and therefore have passed the test;

b) using these models will prevent errors such as ignoring some activities or other errors and will lead to clearer and simpler implementation conditions;

c) some of these models specialize in evaluating and measuring processes in a domain. For example, the SCOR model can be used professionally to manage the processes associated with organizations that are broadly related to the supply chain management category; and

d) due to the implementation of these familiar name models in large organizations and in various business fields, it will be possible to implement modeling and compare the organization with top organizations in a relatively simpler way.

Supply chain performance measurement and evaluation articles

In this section, we review important research and articles that have been published in reputable journals over the years. The authors of

these articles have presented materials on performance measurement systems and evaluation and complication of supply chain and drug supply chain, some of which are mentioned below. It should be noted that the amount of detail in each of the following articles varies according to the importance of that article and the availability of the full text of the articles.

Bimon (1999), after reviewing the literature on supply chain management and performance measurement, described the problems with performance-based performance appraisal systems such as cost, and then categorized the indicators in the main body of his paper. Functional in three categories: a) resources (inputs), b) outputs, and c) flexibility.

For each of the three categories of performance indicators, there is an example, but the indicators related to the discussion of flexibility are discussed in detail in this article. Overall, this article can be considered as one of the first and most important research studies related to the systematic design of a framework for measuring supply chain.

Introducing the Balanced Scorecard (BSC) model and stating its relationship to supply chain performance measurement, Kligenen and Smith (2003) discussed the importance and need to predict supply chain performance. In this paper, simulation method is introduced as an effective method in analyzing supply chain performance indicators and 4 methods required for simulation are introduced as follows:

Spreadsheet simulation

In this method, by defining the relationship between the indicators, various scenarios can be easily examined. For example, if we define the new inventory index as equation (1), then by changing each of the three indicators of sales, old inventory and production, changes in new inventory can be analyzed.

(1) New inventory = old inventory + production-sales

System dynamics (SD)

With the help of this simulation method, complex and continuous time relationships between various variables can be modeled, which is one of the best applications of SD in the field of analyzing the effects of leather whipping.

Discrete dynamic event simulation

This simulation method defines entities and analyzes their possible behavior in different environments. Discrete event simulation method is used as an important tool in MRP and ERP modules to measure the costs and benefits of various operational and strategic policies (Figure 4).

Figure 4: Functions of Supply Chain Management Software Stock Photo

Business games

These simulation models generally simulate a real-world including supply chains and the environment interacting with it by considering complex social and human behaviors. These engaging simulations can be called management or business games.

The paper then presents a statistical methodology based on the design of experiments to be able to find important and fundamental factors affecting the performance indicators of the supply chain. This article also reviews the research conducted in the field of systems optimization based on the simulation method and introduces the important features

of the optimal solution such as stability and flexibility. This study, in fact, by reviewing various articles, offers a different proposal in the field of creating PMS for the supply chain. Based on the proposal presented in this article, it is possible to analyze supply chain performance indicators by simulation method, and this can be very useful in optimizing decisions and re-engineering business processes. The four main steps suggested in the Kligen (2003) can be summarized as follows:

a) Selecting a supply chain;

b) selecting and determine a list of performance indicators and sub-indicators and then using the BSC model to achieve the most important indicators;

c) designing a simulation model to explain how supply chain performance indicators change in the face of environmental changes and management control factors; and

d) performing sensitivity analysis, optimization and various analyzes to better understand and understand supply chain behavior.

Fullan and Brown (2005) presented a paper on the evolution of performance measurement, with recommendations for designing and improving systems, and a framework for measuring performance, as follows:

a) It should be based on the policy and strategy of the organization;

b) it should be based on various criteria and criteria (important and vital activities);

c) these criteria should evaluate work as a group, not individually;

d) specific objectives should be set and continuously modified;

e) measurement should be simple and understandable;

f) information should be collected from the place where its performance is evaluated;

g) graphs are the main method of informing;

h) data must be available on a permanent basis for review;

i) performance should be reported daily or weekly;

j) suppliers should be evaluated based on quality and delivery performance;

k) emphasis should be placed on growth, dynamism, continuous improvement and learning in PM system design;

l) the connection between accounting and performance measurement must be severed;

m) PM systems must be consistent with business objectives and important success factors;

n) it must be able to guide and transmit information in indicators;

o) PM systems should clarify how customer needs and expectations are met;

p) focusing on the indicators that the customer can see;

q) providing indicators that enable all members of the organization to understand their impact on the business;

r) the system includes well-defined and measurable criteria for the organization;

s) workflow should be determined so that indicators can be measured;

t) feedback from performance measurement systems should be reported to various levels of the organization;

u) feedback from performance measurement systems should link different tasks together to ensure support and not hinder the implementation of the strategy;

v) it should enable managers to examine performance in multiple spaces simultaneously;

w) in addition to financial indicators, non-financial indicators should also be supplemented;

x) the product delivery system from the supplier to the customer should be evaluated;

y) the designed performance measurement system is now adapted to the production objectives at different levels of measurement standards;

z) performance measurement system should be designed so that at factory and other levels of performance measurement standards are compatible with the production environment;

aa) performance measurement system should be designed so that information about the company's strategic goals at the factory and at various other levels is shared to create an organizational focus between them;

bb) performance measurement system information related to the strategic goals of different departments should be shared in different tasks in order to create organizational focus in factories and departments;

cc) The performance measurement system should be implemented in a way that it does not provoke or impose policies and undermine them; and

dd) performance measurement systems should be designed to facilitate auditing.

Dealing with the management of a leading company in the field of performance measurement, Smith and Peltz (2003) introduced the missing link between strategic plans and executive cases as a structured and managed performance measurement system. They also pointed out that much of the basic literature on performance measurement, systems, and performance measurement frameworks is the same as the relationship between systems and performance measurement and the environment.

Chow *et al*. (1994), while studying the space of performance measurement, introduced logistics performance as a set of efficiency and effectiveness. They considered the need for accurate logistics knowledge to identify 7 items: Effectiveness, efficiency, quality, productivity, quality of working life, innovation, profitability and budgeting capability.

Beamon (1999) proposed a framework for measuring performance, noting that logistics performance cannot be fully measured by a single measure, and that a performance measurement system should emphasize three distinct types of performance measurement.

Lee and Blington (1992) and Miesel (1992) argued that a performance measurement system should be process-oriented rather than departmental or departmental. Focusing on sectoral limits causes the system to run unsuccessfully.

Aramian *et al*. (2007) introduced a conceptual model for measuring the supply chain performance of the food industry. They categorized the indicators according to their case study (Dutch-German tomato supply chain). The four main categories of their model for supply chain study are: a) efficiency; b) flexibility; c) accountability; and d) food quality.

Also, in this study, the indicators are composed of both financial and non-financial aspects and according to the unique structure of food supply chains.

Maine *et al*. (2009) provided a coherent framework for evaluating supply chain performance for small and medium-sized organizations. Their proposed framework combined the two models BSC and SCOR and then provided the necessary guidance on how to use this model. This study finally introduced a set of supply chain performance indicators for medium and small organizations. It has also shown the relationship between the indicators introduced in this research with the various cycles in the supply chain such as procurement, production, ordering and so on.

Sabrino *et al*. (2011), after an introductory presentation of supply chain evaluations and BSC and SCOR models, introduced the traditional performance management cycle, which was further enhanced by adding a small loop to the cycle. Also, a multi-criteria approach was proposed to determine the weight of each index and calculate the overall evaluation score of each dimension of the supply chain. The steps introduced by Sabrino to evaluate the performance of supply chains are as follows:

a) Creating, organizing and training a work team; this step is considered as the first step in evaluating the performance of supply chains. Also, to determine the optimal number of experts, Subrino has provided a relationship based on the required accuracy, estimating the error rate of experts, and so on;

b) determining the dimensions of indicators and key performance indicators related to each dimension, after determining the working team, it is necessary to determine the various dimensions and key indicators according to the supply chain situation, modeling of other companies, experts' opinions, subject literature and goals of the organization. Performance is related to those dimensions of payment. An important point about the definition of KPIs is that there should not be too much focus on the operational aspects of the supply chain, but the goals and strategies of the organization should also be seen in these KPIs. On the other hand, determining how to measure each of the performance indicators is of great importance. Also, the relationship of KPIs with supply chain processes should be well defined.

c) determining and allocating the ideal value for each KPI; the team created in the first phase

acted according to the nature of the supply chain, past data trends, modeling, subject literature and expert opinions in this section to determine the values that each KPI should reach;

d) analyzing the future of KPIs and related costs; this section analyzes the feasibility of achieving the goals set for KPIs and the achievement costs based on methods based on data, simulation, subject literature and expert opinion;

e) identifying critical KPIs and improving them; after Section 4 (Analysis of KPIs), it is necessary to identify unattainable or costly indicators and design a model for their improvement; and

f) changing the targets of the indicators; in this section, if necessary, we will redefine the target value for KPIs that are most likely to be unattainable in steps 4 and 5. In fact, stages 4, 5 and 6, as an external loop, make it possible to improve the efficiency of the traditional performance management cycle.

In the continuation of the article, a method for determining the weight and priority of KPIs in the overall evaluation of the supply chain is presented, which allows the compatibility of the judgments made by the evaluation team.

Due to the importance of coordination between the various actors in the supply chain and its effects on the effectiveness of chain management, Allam (2013) provided a comparison between supply chain management and a well-balanced and well-functioning reinforcement team. Effective supply chain management has numerous benefits. The benefits of effective supply chain management generally include lower inventories, lower costs, higher productivity, improved ability to respond to demand fluctuations, shorter delivery times, higher profits, and greater customer loyalty, which also include some lean manufacturing goals.

Management and performance evaluation models

Considering the advantages of using well-known and well-known models of evaluation and process management, we will first categorize these models and then briefly define some of the proposed models.

Despite the existence of a large number of different models in the field of performance measurement, few people have categorized and compared between different models. Ganaskaran and Kebu (2017) have categorized the types of models and evaluations according to the following views:

a) From a balanced scorecard perspective; taking into account financial aspects, customers, internal processes, and growth and training;

b) in terms of performance measurement components, such as resources, outputs, and flexibility;

c) in terms of measurement position in the supply chain, such as planning, supply, construction and delivery;

d) from the perspective of decision-making level (strategic, tactical and operational);

e) in terms of the nature of the measurement (financial / non-financial);

f) from the perspective of measurement basis (quantitative / non-quantitative); and

g) from the perspective of traditional or modern measurement (based on performance / based on value).

Also, by examining the types of work done in the field of selecting indicators and performance measurement systems (Table 1), supply chain performance measurement models can be divided into the following three general categories.

Table 1: Division of performance appraisal methods from three perspectives

Examples of approaches	Description	Comments
Balanced scorecard model	These methods determine the indicators and performance measurement systems by considering the strategies and goals of the organization.	Based on the result
Ganaskaran Framework	By considering different levels of decision making, they determine indicators and performance measurement systems.	Hierarchical
Types of process classification frameworks such as APQC and SCOR frameworks	By considering the processes related to the supply chain, they determine the indicators and performance measurement systems.	Based on the process

Supply Chain Operation Reference Model (SCOR)

The supply chain operation reference model is a tool for displaying and analyzing supply chains. The model was developed by the Supply Chain Association (SCC), a non-profit organization, as an industry standard for supply chain management. The association was formed in 1996 with 69 member companies and today companies from all over the world interested in improving supply chain knowledge are members of this association. SCOR is the first general framework for evaluating and improving supply chain management and performance. Unlike optimization models, this model does not provide any description of the mathematical formulas of a supply chain, and instead uses a series of standard words and processes. In other words, the SCOR model has very wide standard definitions, terms, and metrics to evaluate supply chain performance.

This model includes a description of standard management processes, a framework for expressing the relationship between these standard processes, standard metrics for measuring the performance of these processes, and management experiences with the best performance in these processes. The SCOR model strikes a balance between horizontal (inter process) and vertical (process hierarchy) perspectives, and its use allows organizations to use a common approach and standard processes to improve the overall performance of the chain. They are effective and are the first model that can be used in shaping a supply chain based on business strategy (BS). This model uses well-known concepts of business process reengineering (BPR) approaches, modeling and performance measurement in an integrated framework, and by specifying the status of each process, suggests an improved mode for it and set operational goals for each process according to performance metrics in similar companies.

The SCOR model is a reference model and provides a framework for identifying efficient and effective activities throughout the supply chain. The scope of application of this model is from suppliers to suppliers to customers. The scope of the SCOR methodology includes the following:

a) All communications and interactions between the company and the customer from receiving the order to issuing the invoice;

b) all work performed on a product or service from supplier to supplier to customer, including equipment, resources, spare parts, bulk materials, software and services; and

c) all company and market interactions from forecasting and determining demand to completing and delivering each order.

It should be noted that SCOR does not explain or describe sales and marketing processes, technology research and development, product development and after-sales service. SCOR also includes training, quality and information technology, but is not explicitly mentioned in the model.

Main levels in the SCOR model

The SCOR model has four levels that start from the company or supply chain and move towards the flow of materials and workflow and information activities at the lower levels, and finally, by implementing these methods, create a competitive advantage and change the business conditions of the organization. These levels are as follows:

Level 1

It provides a broad definition of the types of planning processes, sourcing, manufacturing, delivery, and return, and it is at this point that the company forms its competitive supply chain goals. Level 1 processes are known as SCOR processes and can be defined in relation to each step or level of the supply chain and are divided into five general categories (Gunaskaran et al., 2002).

This model includes the following four main management activities: a) PLAN; b) SOURCE; c) MAKE; and d) DELIVER.

In other words, this model provides a common and standard process-oriented language in the four above-mentioned decision areas between partners and stakeholders in a supply chain. Of course, since the fifth edition of this model, the return area (RETURN) has been added to the previous four areas to consider environmental issues and material recycling, which indicates

the importance of inverse logistics in the overall supply chain cycle.

Level 2

It defines 27 possible process modes of the supply chain. A company can design both its actual and desired supply chain by choosing from these core processes. Level 2 processes are known as SCOR processes and can be defined in relation to each of the SCOR processes. Therefore, Level 2 processes can be defined in more detail and specificity according to Table 2.

Table 2: Level 2 processes of the SCOR model

	P	S	M	D	R
Pn (Planning process)	P1 (Supply Chain Planning)	P2 (Supply planning)	P3 (Construction planning)	P4 (Delivery Scheduling)	P5 (Product return scheduling)
Ex (executive process)	P1 P2 P3 P4 P5	S1 (Supply of stored items) S2 (supply of construction items to order) S3 (supply of engineering items to order)	M1 (construction for warehouse) M2 (build to order) M3 (engineering to order)	D1 (Delivery of stored product) D2 (Delivery of ordered product) D3 (delivery of engineering product to order)	R1 (Return of stored product) R2 (Return of ordered product) R3 (Engineering product return for order)
En (empowerment process)	EP (Scheduling Empowerment)	ES (Supply Empowerment)	EM (manufacturing empowerment)	ED (Delivery Enabling)	ER (Back Empowerment)

Level 3

It determines the information needed for the design and sets goals for improvement more specifically by detailing the information of each of the Level 2 core processes.

Level 4

It focuses on implementation and exists when the company selects its supply chain improvement projects to implement. Therefore, this level is defined according to the needs of each company and in accordance with it. This model also offers many criteria for supply chain performance, ranging from general indicators to highly detailed operational indicators. The key indicators that measure and describe the overall performance of the chain are the key performance indicators. Due to the hierarchical nature of the SCOR model, these indicators often include more operational criteria and indicators. For example, the key delivery performance index has two sub-criteria, one of which is the timely delivery sub-criterion defined as the percentage of orders that have been delivered on or before the due date.

The types of processes refer to the scope of the SCOR model and include the same five general activities of planning, sourcing, manufacturing, delivery and return. At the second level, these activities are broken down into process classes according to the type of construction policy. Each of these process classes, in turn, has different elements that have inputs, outputs, and performance metrics with specific information requirements.

GSCF model

This model was developed in 1994 by Ohio State University and the Global Supply Chain Forum. The GSCF model describes supply chain management as the integration of key business processes from the end consumer to the main supplier that provides valuable products, services and information to customers and shareholders. The Global Supply Chain Association identified eight key processes throughout the supply chain that form the core of supply chain management. These eight

processes took place within the supply chain and involved the departments as well as the member organizations in this chain one after the other. Thus, as the process definition implies, it is not limited to one department or organization and continues throughout the supply chain from primary suppliers to final customers and consumers. These processes include (Lambert et al., 1998; 2000; 2001; 2005): a) Customer relationship management process; b) customer service management process; c) demand management process; d) order fulfillment process; e) production flow management process; f) supplier relationship management process; g) product development and commercialization process; and h) referral management process.

Among the above 8 key processes, customer relationship management and supplier relationship management processes provide the basis for the organization to connect with the organization's external partners and extend the supply chain links. Also, the importance of each of these core processes can vary depending on the type of organization.

CPFR model

By definition, participation means working together, especially collaborating in intellectual endeavors. According to Hartmouth (2018), participatory planning is a decision-making process to coordinate the individual plans of supply chain members with the aim of achieving partnership in the field of information symmetry.

One of the relatively new innovations in participation in supply chain management that helps its real integration is CPFR or participatory planning, forecasting and reprocessing. According to the VICS definition, this technique is a business activity that integrates information from multiple business partners to plan and meet customer demands. This technique is a business-management approach in the supply chain that seeks to create coordination between supply chain components to reduce inventory, increase revenue, increase product availability, and reduce transportation costs. The CPFR process consists of 9 stages, which consists of four main activities: Planning, supply and demand management, implementation and analysis (Stadler, 2009). Despite promising results from the implementation of this approach in some companies over the past decade, its implementation by companies has been lower than expected. One of the reasons for this is the obstacles for companies to move forward in its implementation. It is necessary for senior managers of economic enterprises to be aware of the requirements and implementation problems in order to prevent them before starting the implementation with their business partners.

Table 3: 9-step CPFR process

planning	Define and develop cooperation arrangements and regulations
	Creating a joint business plan
Forecast	Performing sales forecasts
	Identifying sales forecast errors
	Fixing sales forecast errors
	Performing goods order forecasting
	Identifying errors in predicting the order of goods
	Fixing product order errors
Reprocessing	Finalizing the order of the goods

In the CPFR model, the planning phase is the most important because in this phase, agreements and collaborations between the members of the supply chain are determined and the rest of the steps are only operational tasks that are performed according to the rules created in the planning phase (Table 3). In fact, compared with the previous two process-oriented models of supply chain management, the CPFR model focuses on information technology, seeking to improve supply chain planning by improving conventional flow through the use of conventional tools and processes. As a result, the CPFR model is

considered as the third comprehensive supply chain management methodology.

Balanced Scorecard (BSC) model

In general, the goal of any performance measurement system is to lead all managers and staff to the successful implementation of organizational strategies. Organizations that can translate their strategies into a performance measurement system perform much better in implementing their strategy; because they have conveyed their goals to all the personnel of the organization. A balanced scorecard is a card in which a strategy is linked to an integrated set of financial and non-financial metrics.

The Balanced Scorecard was developed in 1992 by Kaplan and Norton to measure performance, which includes a set of metrics that give managers a broad but comprehensive view of their business. Until 2001, the Balanced Scorecard was recognized as one of the 15 most widely used, low-error and effective management tools among managers of various companies in 22 countries around the world, and its number is increasing day by day. In the balanced scorecard approach, the organization is divided into four different aspects, these four aspects are:

a) Money: This aspect is typically related to profitability and is measured by the rate of return on investment and economic value added;

b) customer aspect: This aspect includes measuring the overall results of the success of the company's strategy such as customer satisfaction, customer retention and so on;

c) aspects of internal business processes: This aspect includes internal processes that have the greatest impact on customer satisfaction and the success of the organization in achieving financial goals; and

d) growth and learning aspect: This aspect is considered as an infrastructure for the organization that in order to achieve long-term growth and improve the human resources, organizational methods, etc. must be managed.

It should be noted that these funds, which are considered in the balanced scorecard, can be changed. In other words, the organization may not pursue financial goals, in which case it can eliminate the financial aspect for this organization and consider another aspect. This means that the named funds, which are considered in the Balanced Scorecard, are flexible and changeable, both in number and in type and name.

The framework demonstrates that a balanced scorecard is a concept for interpreting organizational strategic goals into a set of performance indicators across the four aspects of finance, customer, internal processes, and growth and learning. With a balanced scorecard, an organization improves both the current performance and the efforts for the reform process, staff training and the increase of information systems.

Given the above, many researchers have used the BSC model (or innovative models based on the logic of this model) to define the supply chain performance evaluation system. However, due to the strategic nature of the indicators in the evaluation of the BSC model, it is better to use a combination of this model with models that focuses more on the process and operational aspects of evaluation. Therefore, many researchers have proposed combining the BSC model with models such as SCOR.

APQC model

The APQC model was established by the American Center for Productivity and Quality in 1977 at the request of top companies listed in Fortune Magazine and US government officials. The Process Classification Framework (PCF) provided by the American Center for Productivity and Quality (APQC) is based on the Porter value chain. This framework, which has been obtained from the study and modeling of hundreds of top global organizations and has been updated several times, is one of the reference process models in the world of management in which all existing processes of the organization have been identified as much as possible. It can be said that this model is one of the best frameworks that help organizations, given the industry in which they operate, identify the processes needed to create value for the customer and take action to improve these processes.

This model presents all the processes of a production-service organization in four levels of process categories, process groups, process and activity. Process categories are the highest level of processes in an organization, such as customer service management, financial resource management, or human resource management. Process groups are the next level of organizational processes, which can include after-sales service, supply of goods, accounts payable, and hiring staff. At the next level are the processes, which are a set of interrelated activities that produce output and output in exchange for receiving input and consuming resources. Process performance is constantly monitored by the standards of management control systems in the organization. The last level is the activities.

Activities are events and happenings that occur during the execution of a process. Receiving customer requests and handling complaints or negotiating purchase contracts are examples of these activities. The APQC model has a meta-industrial model and eleven models for the aerospace and defense industries, automotive, banking, production and broadcasting of radio and television programs, consumer products, education, electricity producers, oil upstream, oil downstream, pharmaceuticals and telecommunications. The APQC model at its highest level has five categories of operational processes and seven categories of management and support processes

Supply chain diagnostic methods

In this study, we have tried to differentiate as much as possible between the two concepts of supply chain evaluation (SCAudit/ Evaluation) and supply chain complication (SC Diagnosis). In this section, we try to specifically introduce the various tools and methods of supply chain diagnostics. Of course, most logistics diagnostic methods rely on performance metrics, and in most cases are few tools. That is, by defining macro-scales followed by various quantitative operational indicators, they record and document supply chain processes. Then, by performing optimized mining and chat analysis, they try to compare their performance with other industry leaders. Although quantitative methods are more accurate in diagnosing supply chain complications, the existence of various problems reduces their effectiveness in practice. Issues such as lack of appropriate data for measuring indicators, lack of standard definitions in how indicators are calculated, difficulty and cost of access to data from other organizations for proper optimization, etc. are among the various problems that occur when implementing a diagnostic model. We will face it a little.

On the other hand, some diagnostic methods qualitatively identify bottlenecks and complications. For example, by asking a series of questions with zero and one answers (yes / no), they seek to find complications. The following example can show the difference between the two approaches:

Suppose the organization has a problem with the quality of the final product or service provided. If we want to identify the above complication with a quantitative approach, it is necessary to first measure a number of quantitative indicators. For example, the quality of raw materials, the percentage of defective parts produced, the percentage of consumables in the product. We then compare these indicators with the ideal value, which can be an indicator value for successful companies, and if there is a significant difference, we record this problem as a complication. But if we want to discover the above complication with a qualitative approach, we have to find these complications by asking a series of appropriate questions including:

1- Is the product manufactured in accordance with the manufacturing instructions or not?

2- Does the product meet the customer's needs or not? and

3- Is the customer completely satisfied with the product or not?

Now, with a proper analysis of the answers to the above questions, we can understand the existence of a problem in the quality of the offered product.

Another category that is significant in the discussion of supply chain diagnostics is the two-term output-oriented diagnostics versus structure-based diagnostics. In output-oriented diagnostics, attempts are made to examine the supply chain performance in various areas such

as delivery agility. However, in structural-oriented diagnostics, regardless of how the organization performs and exits, we seek to examine the problems that exist in the supply chain structure, which may not even have a direct impact on the organization's performance and output in the areas under study. For example, to clarify the difference between the two approaches, we consider the organization as a sick person who has referred to a doctor for a check-up. The doctor has two approaches to check the health and disease points of the person. In the output-oriented approach, the physician first asks the patient about the important and basic activities. Suppose the patient walks a lot. Therefore, the doctor asks the patient to walk with him for several hours so that he can check the characteristics such as heart rate, transpiration rate, inhale and exhale and other characteristics to see if it has a negative effect on his performance (in this example, walking), to be used as a clue in diagnosing complications.

In the structure-based approach, the physician has a checklist of various features as well as the degree of softness of those features, regardless of what the patient's core activities are. For example, what should the heart rate be like? Or what should be the diameter of the cornea of the eye? Or other items. As a result, by measuring the mentioned characteristics in the patient and comparing them with the soft value, he accesses the complications and concerns in the patient.

It is important to note that in the output-driven approach, some complications and disease points may not be found. Because the focus is on the things that affect the performance and output of the organization. However, in the structure-oriented approach, despite the fact that all the features are at their normal level, the performance and output of the organization may have various problems. For example, a person may be normal in terms of various characteristics such as blood pressure and blood lipids, but cannot walk for a long time! Conversely, a person who walks very well but has an abnormal cornea may be dangerous to him.

As a result, it seems that in order to implement the principles of a complete diagnostic in the supply chain, it is possible to use a combination of two structure-based and output-oriented approaches. Among the outlet-based diagnostic methods, we can mention the fast search approach and Fugin method. Complication methods such as MMOG / LE or Lambert can also be considered as structure-based methods.

Model simplicity is one of its powerful criteria, but it can be even detrimental if there is no proper understanding of what needs to be simplified and how to simplify it (Dibono, 1998). In general, when choosing a diagnostic method, you should pay attention to various factors, including:

a) Type of diagnostic method in terms of quantity or quality;
b) type of diagnostic method from the perspective of output-driven or structure-driven;
c) the degree of detail of the diagnostic method;
d) the cost of implementing the method and performing the diagnosis;
e) whether it is possible to compare with the pioneers or not;
f) duration of complication detection with the help of the desired method;
g) the amount of skill required for the diagnostic team to use the method;
h) the degree of compliance of the model and method of diagnosis with the structure, processes and characteristics of the organization under study;
i) whether the complication detection method makes it possible to prioritize complications; and
j) the degree of specialization of that method for the organization under review.

What follows are some widely used methods of supply chain diagnostics.

Quick search method

Quick Search (QS) is a diagnostic methodology for supply chain operations developed by Naim et al. (2018) at Cardiff University in the United Kingdom. This method is able to inform the company of the path it needs to take and the improvements it needs to make in its supply chain. The QS methodology steps are based on the UDSO procedure, and this diagnostic tool offers suggestions for simplifying and optimizing supply chain business processes. In summary, the UDSO procedure used to simplify

and better understand what needs to be simplified can be summarized as follows:

a) Perception (U): This section defines the problem, the limits of the system, and scales to measure its performance. In a business process, to define the scales for measuring system performance, it is necessary to determine the customer needs in terms of service level, quality, total costs and total cycle time and convert them into performance indicators;

b) documentation (D): Modeling of existing operations is done by one of the written, oral, graphic, mathematical, software or a combination of them. This should be done before implementing any solution to perform a profit and loss analysis. These models define the benchmarks from which solutions are judged;

c) simplification (S): It is the use of scales and models developed to eliminate waste in any form, such as time waste, material waste, information waste, and capacity waste. This approach is to search in order to find opportunities to create a common interface across the boundaries of different parts of the supply chain; and

d) optimization (O): Once processes are identified and consolidated, then control methods (using ICT) are used to ensure their consistency, reliability, and clarity.

Important features of this methodology include efficiency, very fast implementation time, as well as the possibility of creating cause and effect analyzes to identify the causes of complications found. On average, each QS project will take about 25 hours, and it is recommended that the QS project be analyzed and implemented as a team of four with a business representative.

Prior to the implementation of the 4 main phases, two steps are taken to identify the appropriate supply chain and gain the support and approval of the business sponsor. On the other hand, attracting the support of a commercial sponsor can justify the allocation of resources to do the work and also help to determine the scope of the methodology. The following are the four main phases of the QS methodology: a) Initial presentation, b) data collection, c) data analysis, and d) feedback.

a) Initial presentation

In this phase, the QS methodology will be explained to all people involved in the project. A number of products are selected as examples for in-depth analysis and interviews are scheduled, and questionnaires are also assigned to appropriate personnel.

b) Execution of QS using four data collection techniques

The QS diagnostic method uses four types of data to improve the validity of the information obtained: Qualitative questionnaires, process maps, structured interviews and archived quantitative data. During the implementation of QS, eleven quality questionnaires are completed. Also, in the second form of data used, a supply chain process map is drawn to obtain an accurate understanding of the flow of materials and information for each value chain. The third type of data collected during QS is through structured interviews conducted with various groups of senior and middle management. The last type of data required is the data stored in the organization. This archived data can be divided into 4 categories:

a) data related to the supply of materials and products from suppliers;

b) data related to value-added processes that the organization implements on raw materials;

c) data related to the delivery of products and meeting demand; and

d) data related to control and the above three categories of planning.

Table 4: Quantitative information required from databases in Quick Scan method

Initial data collected during the Quick Scan	Data sources
Measuring supplier performance, scheduling, invoices, cancellation of contracts, materials statement, forecasts, receipts, supplier quality reports, MRP, delivery time and warehouse reporting.	Supply materials from suppliers
Waste reports, cycle times and their variability, production schedule and amount, production line shutdown reports, inventory composition, capacity planning and asset recording.	Value-added processes

Delivery frequency, number of categories to end customer, market variability, product life cycle, customer ordering process and forecast accuracy.	Product delivery
Time series of customer orders, supplier orders, demand forecasts, purchase orders, number of changes in case of materials, delivery frequency, etc.	Control and planning

Data analysis

Various analytical tools are introduced in this phase of the project that can be used as needed. Tools such as cause and effect charts, Pareto analysis, optimization database usage and financial performance ranking are some of the tools that can be used. In order to find the inappropriate points of the organization and analyze them, the following steps can be performed:

Step 1

It involves approving the outline of the supply chain and key business processes under consideration. Then brainstorming sessions are held to identify and document initial perceptions and comments.

Step 2

It is to quantify and justify these initial impressions. For example, if we conclude that the inventory level is abnormally high, we will use the time series inventory data to quantify and justify this initial perception. In order to validate the initial impressions, we may need additional and more data on a particular topic, to which we should collect new data.

Step 3

It identifies the key drivers of business costs. This is done according to the initial quantified perceptions and through the use of appropriate formulas and financial relationships. For example, the profit of a company that performs heat treatment is mainly determined by the amount of operation of its furnaces.

So far, inappropriate points of the organization have been identified. In the continuation of the analysis phase, we will identify the main complications and construct cause-effect diagrams for these complications. Then, with the help of various methods such as access to optimization databases, appropriate strategies to overcome the root causes and opportunities for improvement are determined, followed by prioritizing improvement measures with the help of financial analysis such as profit / cost.

Providing feedback

In this phase, the results of the work are presented to the management and the business user, and the diagnostic team discusses its findings by providing reports and improvement opportunities to define and consolidate the executive actions agreed upon by the parties.

Finally, all actions taken will be documented in the form of an appropriate report. This methodology has various advantages and disadvantages (Eliassy, 2018). Its strengths are:

a) An almost fast and efficient process;

b) a method of significant complication detection in terms of time scale;

c) providing a holistic view of supply chain structure; and

d) performing by a third party with minimal impact from existing operations.

The disadvantages of this method are:

a) Giving employees a very limited opportunity to participate as a member of the diagnostic team;

b) significantly requirement of prior knowledge of team members; and

c) Needing a lot of training for team members to become proficient in this method.

Method of determining customer value

Customer value determination method or Fugin is a qualitative method to determine the value that the customer expects from the services and products produced. Determining

customer value, like other qualitative methods, is based on in-depth interviews, group focus, and observations. This method differs from other methods in interviewing and data analysis techniques as well as in presentations. In addition, in a simple report, the reporter uses a unique chart to present his report, which is called the value hierarchy.

A) The actual level of products and services whose characteristics are called;

B) the intermediate level, which is the most subjective consideration, and the result of which is what product or service the customer wants or needs, called the result or consequence, and

C) the highest level, which reflects the core value and purpose of the consumer in purchasing a product or service, which is called the desired end.

As mentioned, qualitative methods of interviewing and observation are used to gather the required information. This method also uses two special techniques for interviewing and collecting the data needed to construct a hierarchy diagram. The first technique is the step technique, which is a moderately structured method for interviewing. This technique is specifically designed to measure the dependence and relationship between the three elements of the value hierarchy. This method begins with identifying the features and characteristics desired by the customer, then a set of exploratory questions is used to determine the relationship between the features and results of higher orders and to describe the final step. The second technique is known as the Great Touring Technique, which seeks to explore how the service or product is measured and evaluated by the customer with a specific concept. The interviewer asks the interviewee to describe a specific situation and then explain in full detail what will happen in the organization in that situation.

After the required data is collected from the interviews, the data analysis is performed. In this step, first all the data is encrypted and stored in a database. After saving the information, its accuracy must be confirmed by the interviewee. After confirming the accuracy of the information, the information related to each of the three dimensions (characteristics, results and final stage) should be identified and determined, and then appropriate connections should be established between these three dimensions according to the collected information. These connections actually form the value hierarchy. There are several benefits to using customer valuation techniques. This method causes a lot of information to be obtained from the customer, thus minimizing errors in product or service development. In addition to improving the product, this method also provides the basis for innovation and has a forward-looking approach. This technique can extract the negative features that lead to a problem in the chain.

Customer value determination technique is widely used in various situations and situations. Flint and Mantzer (2019) used the value hierarchy to determine the characteristics of suppliers and customer results in logistics. Therefore, customer value determination technique is a suitable and scalable method for supply chain and logistics diagnostics and by making small changes in it, this method can be used as a powerful diagnostics technique.

Advantages and disadvantages of customer value determination method Strengths

a) Use of value hierarchy;
b) using the structure of the decision tree to prepare the desired questions;
c) the structure used in the design of the two-part questionnaire, one part of which includes the value hierarchy and the second part of which is a list of questions designed in relation to logistics;
d) flexibility of designed questionnaires;
e) using themes to categorize complications; and
f) using the matrix structure to identify the relationship between causes and effects.

Weak points

a) Not using quantitative data;
b) in the method developed for the third level of the value hierarchy, i.e. the values desired by the customer, no new definition is provided and

it is practically removed from the value hierarchy;

c) there is no specific basis for designing the questionnaire questions;

d) in this method, there is no reference to how and on what basis the organization is divided; and,

e) in this method, in the solution presentation section, there is no reference to how to classify the solutions and rank them according to the existing limitations.

Summary of complicated diagnosis methods

The methods introduced in this section can be compared in various ways to select the most appropriate diagnostic method in each organization and business according to the characteristics of that organization. Of course, in addition to the diagnostic methods introduced in the previous paragraph, the possibility of using methods and patterns of measuring supply chain performance is also possible with the diagnostic approach; the five-supply chain diagnostic methods are compared with the SCOR model, which is one of the performance evaluation models and is the basis of most diagnostic methods (Table 4).

Table 5: Comparison between supply chain diagnostic methods

CSCMP	Lambert	MMOG	Foggin	QS	SCOR	Method characteristics
×	×	×	×	✓	✓	**High demand for small data.**
×	×	×	✓	✓	×	**Pays close attention to the output of the organization.**
✓	✓	✓	×	✓	✓	**It is partial.**
✓[1]	✓	✓	✓	×	×	**Low implementation and implementation costs.**
✓[2]	×	✓	×	×	✓	**It is possible to compare with the pioneers.**
✓	✓	✓	×	✓	✓	**Requires considerable skill of the diagnostic team.**
×	✓	✓	×	✓	✓	**It is possible to prioritize complications.**
✓	✓	×	✓	✓	✓	**It is comprehensive to implement in all organizations.**

[1]: Of course, if linked to the OSBC system, it will cost a lot.
[2]: Of course, if it is linked to the OSBC system, optimization will be possible.

Conclusion

Undoubtedly, the third millennium will create new challenges and turmoil for many organizations that they have never encountered before. Increased supply over demand and continuous narrowing of the competitive circle, increasing the diversity of customer tastes and their expectations, shortening the life of products and technologies, complicating the competitive environment and expanding the range of competitive advantages (price, quality, delivery time, place of delivery, packaging, services After sales, how to order, etc.) have added to these complexities. Accordingly, managers cannot manage their organization in a productive and sustainable manner in an environment without sufficient insight and without being equipped with efficient and creative management tools and technologies. On the other hand, market globalization, intense competition and customer orientation are among the reasons that have attracted attention to supply chain management.

Supply chain is an integrated process of supplying raw materials, turning them into the final product and delivering it to the customer. Each of these levels includes its own facilities. Planning, organizing and controlling supply chain activities is called supply chain management. In fact, supply chain management is the art of chain management in order to increase customer satisfaction with the intention of improving its competitive position and profitability.

With accurate and correct implementation of supply chain management, benefits such as cost reduction, increasing market share and building a stronger relationship with the customer will be achieved. Accordingly, supply chain management should be called one of the vital areas of organizational management. This area of management, like other areas, requires

monitoring, monitoring, evaluation, diagnostics, improvement, and ultimately leading to a model of excellence to be required to gain and strengthen competitive advantage, performance measurement, continuous improvement, and efficient and effective supply chain management. To continue research in this field, the following items are suggested:

In this study, supply chain diagnostics have been performed on the assumption of flow (supply chain inward). For a more complete diagnosis, the return flow (from the customer to the supplier) can also be considered and the gaps and gaps in this area of the supply chain can be identified.

All identified complications have been extracted with the aim of improving the status of the organization. In addition, other goals such as environmental protection, irreparable resources and social aspirations of the country, etc. can be considered and complication diagnosis can be done based on a sustainable supply chain.

In the designed questionnaire, the importance of each requirement was determined as zero and one by the senior manager. To examine the importance of each need, 5 options can be considered, such as the executive status, so that the interviewee can determine its importance depending on the organization.

In order to prioritize the proposed projects, all managers can be involved to score each option based on the defined criteria, and finally, by considering the weight for each manager, the average of the total weighted scores can be considered as the final weight.

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