SUPPLY CHAIN MANAGEMENT PERFORMANCE EVALUATION: COMPREHENSIVE LITERATURE REVIEW

Emel YONTAR[1]

Süleyman ERSÖZ[2]

Abstract

Supply Chain Management Performance Evaluation (SCMPE) has become a necessity for businesses. In this study, the publications in the field of performance evaluation in supply chain management are analyzed. The distribution of the studies which deal with the issue of SCMPE is between 1991-2019 according to years. The literature review is made on the databases ScienceDirect, Scopus, Taylor&Francis Online and Emerald by using the keywords (Supply Chain Management, Performance Evaluation, Performance Assessment). For SCMPE, as a result of publications reviewed, it is seen that the most frequently used model encountered in literature researches is SCOR-based studies and Balanced Scored Card, model. However, recent research has drawn attention to those using different or integrated methods of performance evaluation in supply chain management. Performance evaluation criteria are determined as the most studied and least studied. For future studies, the scope of the study can be extended by adding more databases.

Keywords: Supply Chain Management, Performance Evaluation, Measurement Metrics

JEL Codes: M11, M19, L25

1. INTRODUCTION

With the world becoming a global market, Supply Chain Management (SCM) plays an important role in the efficient and efficient management of enterprises. Particularly, an evaluated supply chain management creates awareness in terms of deficiencies and errors in the enterprise. For this reason, performance measurement is included in the supply chain line and thus, it is provided to adapt to the developing market. There are quite common studies on the subject. In this study, it is aimed to draw attention to the publications performing performance evaluation in supply chain management and to guide the enterprises.

Supply Chain Management is a key strategic factor for increasing organizational effectiveness and for better realization of organizational goals such as enhanced competitiveness, better customer care and increased profitability (Gunasekaran et al., 2001).

A performance measurement system plays an important role in managing a business as it provides the information necessary for decision-making. According to Kaplan (1990), ''No measures, no improvement,'' it is essential to measure the right things at the right time in a supply chain and virtual enterprise environments so that timely action can be taken. Performance metrics are not measuring the performance. Good performance measures and metrics will facilitate more open and transparent communication between people leading to cooperative supported work and hence improved organizational performance (Gunesekaran and Kobu, 2007).

Performance measurement is an analysis of whether or not a business has reached its pre-determined goals. Given that the non-measurer cannot be managed, in order to gain access to the level of performance desired by the business, it is first necessary to have developments in the field of performance measurement.

The performance measures implemented in supply chain management provide the potential problems that may arise and occur at every stage of the chain and provide necessary pre-cautions to the enterprises.

Due to playing a critical role in the success of businesses, the evaluation of chain performance is an important analysis in order to develop an effective and effective supply chain. According to Parker (2000), it is important to measure supply chain management performance for the following reasons; (1) identify success; (2) identify whether they are meeting customer requirements; (3) help them understand

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[1] Lecturer, Tarsus University, Mersin, Turkey, eyontar@tarsus.edu.tr, ORCID ID: orcid.org/0000-0001-7800-2960

[2] Prof. Dr., Kirikkale University, Kirikkale, Turkey, sersoz40@hotmail.com, ORCID ID: orcid.org/0000-0002-7534-6837

their processes; (4) identify where problems bottlenecks, waste, etc., exist and where improvements are necessary; (5) ensure decisions are based on fact; (6) show if improvements planned, actually happened.

Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of an action. A performance measure is a set of metrics used to quantify the efficiency and/or effectiveness of an action (Neely et al. 1995). A performance evaluation system should provide managers with sufficient information about innovation, internal processes, customer and finance, improvement (Kaplan and Norton 1997). Even many systems are used for this work, such as the Balanced Score Card (BSC) and the Supply Chain Operations Reference Model (SCOR) model. These methods have been popular in strategy formulation with clearly defined suitable performance metrics.

Chain performance has many elements in it and these elements are composed of many variables that can be measured by quantitative and qualitative methods. Maskell (1989) suggests seven principles of Performance Evaluation System: (1) nonfinancial measures should be adopted; (2) measures should change as circumstances do; (3) measures should stimulate continuous improvement (4) measures should vary between departments or companies; (5) measures should be simple and easy to use; (6) measures should provide fast feedback and (7) the performance measurement should be directly related to firm's strategy. There are several metrics in the literature and in this study, the issues of supply chain performance evaluation are analyzed, and the criteria used for evaluation, the methods that use these criteria in analysis, and the different study topics are addressed. Publications between 1991-2019 to perform supply chain management performance evaluation studies have been reviewed. Also, which methods have been used in the studies and which performance evaluation criteria are included in the evaluation are shown. In the literature, supply chain management is also understood in terms of the number of publications reviewed in which performance evaluation sub-jects are studied more.

The aim of this literature review firstly gives insight to the people who will perform supply chain performance evaluation studies. The other purposes are,

1. To understand the importance of performance evaluation in supply chain management.
2. To indicate the performance metrics with detailed studies.
3. To put the whole table in its general form without discriminating between different sectors.
4. To suggest some future research directions based on the gap.

This study attempts to provide an overview of performance evaluation studies in supply chain management systems. The publications on performance evaluation related to supply chain management between 1991-2019 are investigated. The results are tabulated for the performance measurement system. Performance evaluation criteria are determined as the most studied and least studied. The aim of this study is to reveal the performance evaluation criteria with a detailed analysis.

2. LITERATURE REVIEW

Based on the literature, we define supply chain performance as the ability of the supply chain to deliver the right product to the right place at the right time at the lowest logistics cost (Zhang and Okoroafo, 2015).

Supply chain performance evaluation problems range from assessing the performance of independent organizations to evaluating the performance of the all supply chain system and it is one of the most comprehensive strategic decision problems to consider. According to this, the performance evaluation of the supply chain means evaluating the performance of distribution, production, planning, purchasing, and marketing organizations independently (Xu et al., 2009).

In the literature, many different approaches are used in determining performance metrics. When the 79 publications between 1991 and 2019 are examined, the result in Figure 1 is revealed. In Figure 1, 69 of 79 publications are included to form this graph. Since 10 publications, which are not included in this graph, are related to examining the impact on performance evaluation, 69 publications are used. Accordingly, other approaches have the widest range (54%). 37 publications, 54% of which, are studied using different approaches (questionnaire, simulation, comparison, etc.). The relevant data is described

in Figure 2. 54% of the publications developed different approaches and contributed to the literature by developing new evaluation criteria or examining only performance evaluation criteria inspired by previous studies.
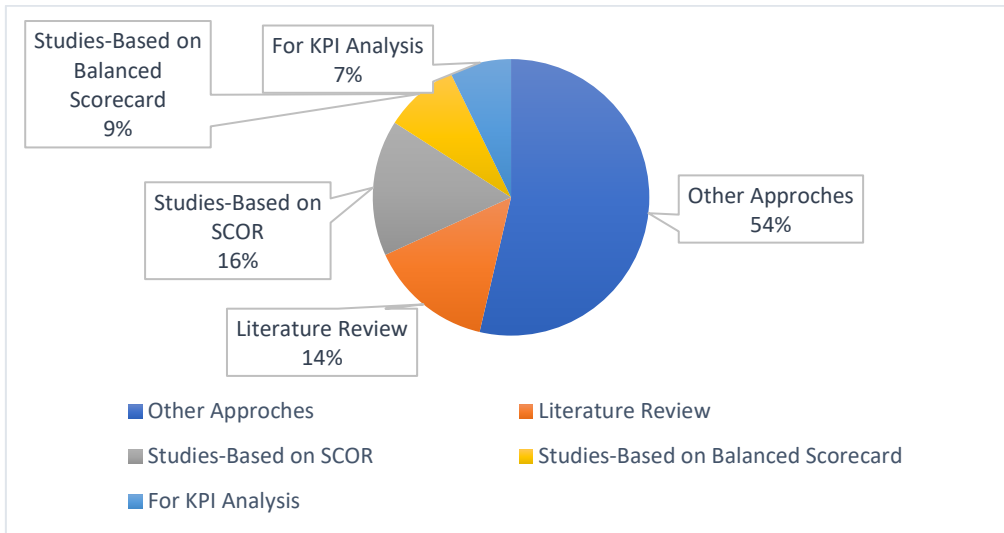
Figure 1: Approaches used in supply chain performance evaluation metrics
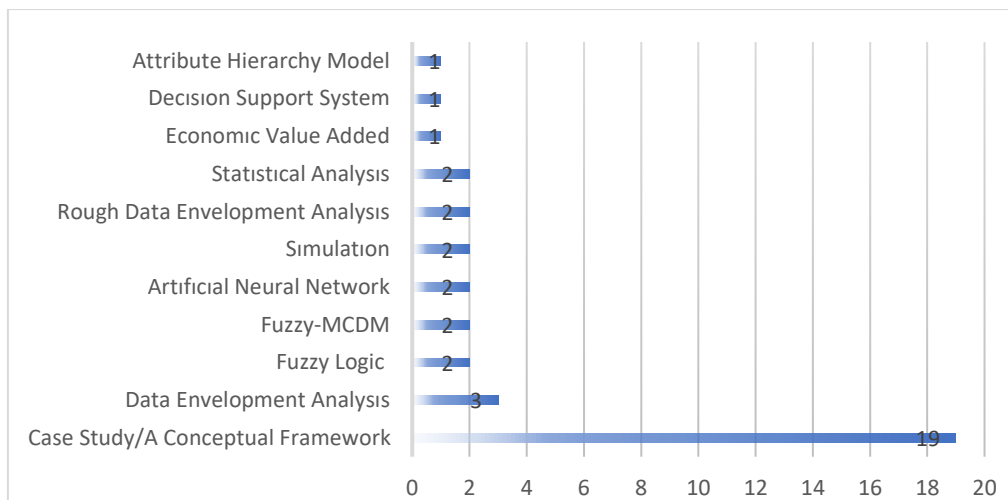
Figure 2: Distribution of methods used in other approaches

In Figure 1, for another important study, it is seen that the most frequently used model encountered in literature researches is Supply Chain Operations Reference-based (SCOR) studies (16%) as shown.

The SCOR model is a supply chain performance evaluation model. The SCOR model can help the supply chain participants to improve the efficiency of supply chain management by the reference model (Yeong-Dong et al., 2008). There are six levels within the SCOR model. Level 1 is top-level that deals with process types and defines the six key management processes (planning, making, enabling, sourcing, returning and delivering). Level 2 is the categorization of core processes. Level 3 contains process elements that provide an insight into the operation of a supply chain. Level 4 defines specific supply chain management practices. Level 5 involves the planning of activities within each task. Level 6 describes the rules for each activity (Yeong-Dong et al., 2008).

To give examples of users of SCOR models, Yeong-Dong et al. (2008) evaluated the supply chain performance according to the SCOR model. Ağar (2010) added sectoral innovation to the literature by using the SCOR model in the white goods sector. Alomar and Pasek (2014), who have presented a different model, proposed a new model that aligns supply chain strategies with the standard processes of the SCOR model in order to evaluate and improve the performance of small and medium-sized enterprises.

The Balanced Scorecard (BSC) model was used by the authors at a rate of 9% as shown in Figure 1. The BSC approach has been proposed by Kaplan and Norton (1992) as a tool to evaluate corporate performance from four different perspectives; financial, customer, learning and growth and internal business process. Özbakır (2010) conducted a supply chain performance evaluation study using the Balanced Scored Card method.

In Figure 1, 14% literature review studies are included in the studies discussed in this article (Neely et al. 1995; Shepherd and Günter, 2006; Gunasekaran and Kobu, 2007; Agami et al., 2012; Sillanpaa, 2012; Kazemkhanlou, 2014; Abou-Eleaz et al., 2015; Lima-Junior and Carpinetti, 2017; Maestrini et al., 2017). Another study group has been working on Key Performance Indicator (KPI) Analysis (7%) (Cai et al., 2009; Chae, 2009; Rodriguez-Rodriguez et al., 2010; Anand and Grover, 2015; Gamme and Johnson, 2015).

Figure 2 shows the distribution of the methods studied and used in the analyzes except for SCOR and Balanced Scorecard models. Also, it is a fact that the SCOR model alone is sufficient in the first place to evaluate supply chain performance, but in recent studies, it draws attention that uses different methods or integrated systems. In Figure 2, SCOR and Balanced Score Card models are separated and the distribution of the methods used in the analysis is given.

According to Figure 2, only 37 publications from 1991 to 2019 used different methods for performance evaluation. Nineteen publications from these studies have developed a different conceptual framework for performance evaluation by focusing on various subjects and various sectors, and in most of them, they have only been subject to supply chain performance evaluation criteria. In other studies, different methods have been examined on performance evaluation criteria. These different methods are Data Envelopment Analysis-3 times, Fuzzy Logic-2 times, Fuzzy-Multiple Criteria Decision Making (MCDM)-2 times, Artificial Neural Network-2 times, Simulation-2 times, Rough Data Envelopment Analysis-2 times, Statistical Analysis-2 times, Economic Value Added-1 times, Decision Support System-1 times, Attribute Hierarchy Model-1 times which are used in the process of solving them.

Only SCOR or BSC based studies are not included in Figure 2, integrated studies are emphasized. According to this, SCOR-MCDM (Kocaoğlu, 2009; Alomar and Pasek, 2014; Sellitto et al., 2015; Deva et al., 2019), SCOR-regression (Hwang et al., 2008), SCOR-Fuzzy Expert System (Ganga and Carpinetti, 2011), SCOR-Data Envelopment Analysis (Aydoğdu, 2011), SCOR-Fuzzy Logic (Ayçın and Özveri, 2015), BSC-Uncertain Clustering Algorithm (Shi and Gao, 2016), SCOR-SEM-MCDM (Dissanayake and Cross, 2018), SCOR-Artificial Neural Networks (Lima-Junior and Carpinetti, 2019) methods are used.

From these studies, Kocaoglu (2009) evaluated the strategic targets and operational targets by using the SCOR model and the Analytic Hierarchy Process (AHP) technique. The results from the AHP were taken as strategic weights and used with Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). Strategic and operational targets were evaluated together with the developed model. Similarly, Aydogdu (2011) used the SCOR model and the Data Envelopment Analysis in their study to evaluate supply chain performance. Sellitto et al. (2015) developed a two-dimensional model with performance standards adapted from the SCOR model for performance evaluation in supply chains and have determined importance levels of performance criteria by using the AHP method. Ayçın and Özveri (2015), on the basis of the SCOR model, also created a supply chain performance model that was formed by integrating the fuzzy logic approach. Shi and Gao (2016) developed a performance evaluation index system based on the Balanced Scored Card model and then applied the Uncertain Clustering Algorithm. This study has become a new classification method that is worthy of practice.

As a result of extensive literature research, Shafiee and Shams-e-alam (2011) used the Rough Data Envelopment Analysis method to evaluate supply chain performance. Yavuz and Ersoy (2013) used the Artificial Neural Networks method to study the retail industry to measure supply chain performance in their studies. Zhu (2010) also developed a model with Artificial Neural Networks. Behind this study, Özalp (2016) studied the Economic Value Added (EVA) method which is a value-based measurement method in the measurement of supply chain performance.

In the literature, there are studies designed to reveal the elements, applications, and variables that affect supply chain performance as well as studies in supply chain performance evaluation. Lin and Lin (2002) investigated the impact of various levels of sharing of order, stock, and demand information on supply chain performance in electronic commerce. Ecevit Satı and Öçlü (2012), the effect on the performance of supply chain management logistics activities in the retail sector in Turkey evaluated through literature research and with this assessment of logistics management in the retail sector in Turkey have attempted to identify the detection of the effects on the SCM. Li et al. (2006), five dimensions (strategic supplier relationships, customer relations, level of information sharing, information sharing quality and postponement-delayed differentiation) related to supply chain management applications were established and these applications examined the relationship between competitive advantage and business performance. Rexhausen et al. (2012) noted the importance of demand management performance oversupply chain performance. Today, they emphasized that demand management needs to be studied more. In addition to this study; Bıçakçı and Üreten (2017), addressed demand management and supply base management issues, which play an important role in supply chain performance in their studies and they thought that it would be useful to evaluate these effects with an empirical study. As a result of analysis; both demand management, distribution management and supply based management practices have had positive effects on supply chain performance. Referring to a different topic, Macchion et al. (2017) used a simulation model to evaluate the performance of different supply chain configurations in personalized product production. Tarafdar and Qrunflen (2017) explained that applications and information systems, such as 1) strategic partnerships, 2) customer relationships and 3) postponement, act together to mediate a positive relationship between agile supply chain strategy and supply chain performance. Hull (2005) developed a model that defines the performance of supply chains based on supply and demand flexibilities. Unlike other studies in the literature, Chen et al. (2014), developed a model to study the effects of behavioral factors on supply chain performance. Again, in a different study, Kocaoglu (2013), hypothesized that the use of ERP II in internal and external integration areas in supply chain management examined the effects of the enterprises on supply chain management performance. The use of ERP II separately in external and internal supply chain integration has shown that the enterprise does not provide a complete improvement in supply chain performance.

According to this study; the distribution of the studies which deal with the issue of supply chain performance evaluation between 1991-2019 according to years is given in Figure 3. The first study was conducted in 1991 by Fitzgerald (1991). Supply chain performance evaluation studies have been increasing in recent years. Figure 3 is formed utilizing information from studies in Appendix 1 has been prepared.
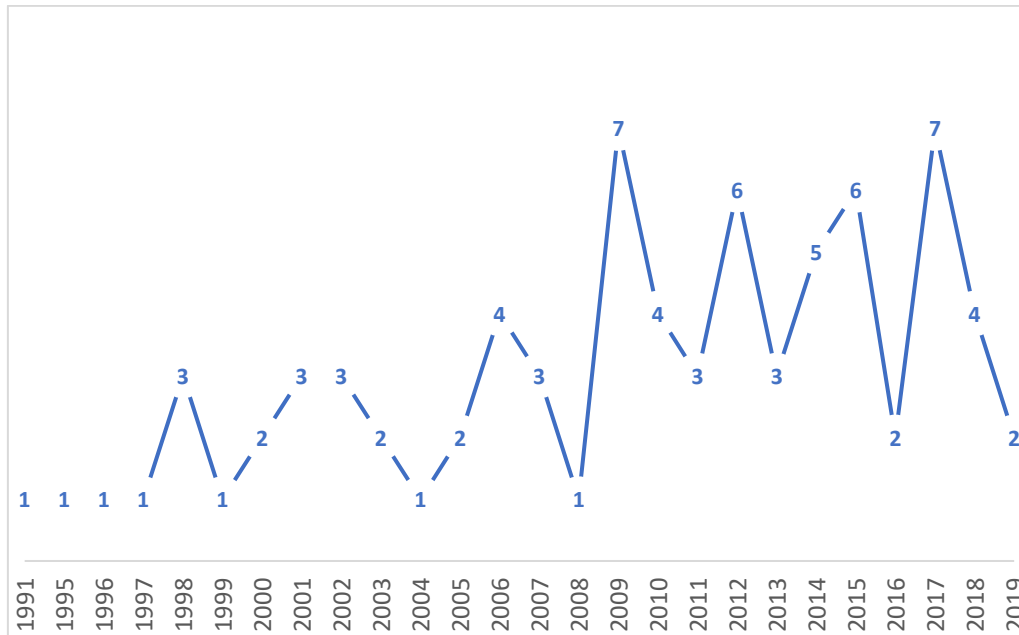
Figure 3: Number of papers by year of publications (publications are shown in Appendix 1)

This graph shows us that while studies on performance evaluation in supply chain management have been relatively low in the first years, it has increased in recent years. As of 2009, the number of studies has increased.

3. PERFORMANCE EVALUATION CRITERIA IN SUPPLY CHAIN MANAGEMENT

Developing a system to measure the performance of the supply chain requires the right selection of indicators first. Each author has gone to different distinctions on the topic and has given different criteria to the literature. In Appendix 1, the performance evaluation criteria are analyzed from 79 publications to 59 reviews. The performance evaluation criteria of the supply chain management and the evaluation criteria of the authors have been taken into consideration from Appendix 1 to Figure 4, it is mainly intended to show which criteria are being used for performance evaluation.

The criteria that the authors use in their studies are given as the main topics in Appendix 1, these main criteria are included in the studies by being reduced to independent sub-topics. In the supply chain, performance evaluation variables and applications used in the literature, firstly Neely et al. (1995) have drawn attention. Neely et al. (1995) considered supply chain performance measures as quality, time, cost and flexibility and formed sub-topics for each. In general, many studies describe supply chain performance measures as quality, time, flexibility and cost. Bagchi (1996) focused on time, quality, cost, and diagnostic measures. Fitzgerald et al. (1991) similarly determined the criteria as quality, flexibility, resource utilization, financial, competitiveness and innovation. Kaplan and Norton (1997) established a system of measurement of supply chain performance on financial, customer satisfaction, innovation, and internal processes.

Beamon (1998) investigated supply chain performance measures in two groups as qualitative (customer satisfaction, flexibility, knowledge and material flow, risk management, supplier performance) and quantitative (a measure of financial, resource utilization and customer responsiveness) and then he classified quantitative measures as both financial and non-financial measures. In Beamon (1999), he created a slightly different model than he did in 1998. In his study, the author evaluated supply chain performance measures in three parts: resource (collect the variables based on accounting and financial data such as total cost, distribution cost, production cost, stock, return on investment, etc. under a group.), output (sales, profit, occupancy rate, on-time delivery rate, order cycle, customer response time,

production preparation time, shipping errors, customer complaints), and flexibility (capacity flexibility, delivery flexibility, mixed flexibility, and new product flexibility).

Yavuz and Ersoy (2013), who developed this study by taking into account this study, also studied the main topics of resource, output, and flexibility in their study. Under the source criterion are production cost, distribution cost, stock cost, warehouse cost, production center profit; under the output criterion are sales, retailer profits, occupancy rate, on-time delivery rate, availability of stock, customer response time, product preparation time, customer complaints, stock turnover rate, economic order quantity, quality, accuracy; as a criterion of flexibility are capacity flexibility, product mix flexibility, new product flexibility, delivery flexibility.

Pires and Aravechia (2001), Angerhofer and Angelides (2006) used resource, output and flexibility criteria in evaluating supply chain performance in their article, inspired by the study of Beamon (1999). Chan et al. (2003) were inspired by the work of Beamon (1998) and tried to demonstrate supply chain performance on an example. Later, Chan (2003b) developed a model to evaluate supply chain performance using the AHP method in the electronics industry. In the model, supply chain performance was determined by quantitative and qualitative variables. So, quantitative variables were cost variables while qualitative variables were quality, flexibility, trust, visibility, and innovation.

For developing a model by separating the variables for supply chain performance into structural and operational levels, Li et al. (2007), in their studies used as a structural level, cost factors; as operational level, added value, customer satisfaction, and flexibility variables.

Gunasekaran et al. (2004) established a framework for measuring performance in the supply chain at strategic, tactical and operational levels, also they emphasized main performance measures related to suppliers, distribution and delivery performance, customer service, inventory and logistics costs.

Brewer and Speh (2000) studied supply chain performance in terms of customer benefit, innovation, internal process, and financial benefit and explained the subject by the Balanced Score Card approach. Tao (2009), in his work, used 16 variables in 4 basic categories: customer satisfaction, information sharing, logistics level, and financial situation.

In addition to the studies mentioned, Narasihman and Jayaram (1998) choose supply chain performance as customer responsiveness and make (manufacturing) performance. Persson and Olhager (2002) used variables such as cost, inventory, quality, lead time and lead time variability. Beierlein and Miller (2000) measured supply chain performance using customer satisfaction (quality), time, cost, assets variables. Fleisch and Tellkamp (2005) evaluated supply chain performance as dependent variables and independent variables. According to the study, dependent variables are cost excluding lost item value, cost including the lost item value, inventory inaccuracy, out-of-stock; independent variables are theft, unsaleable misplaced items and incorrect deliveries.
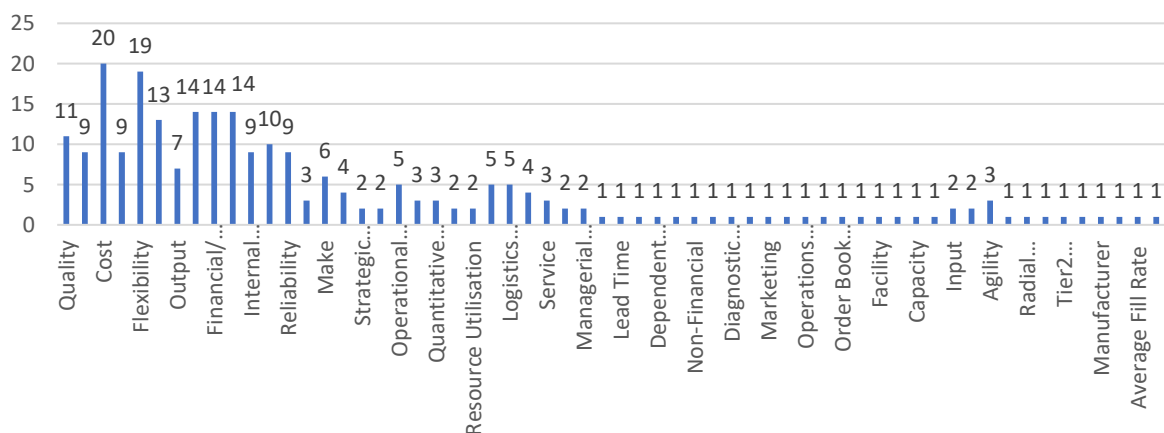
Figure 4: Supply chain performance evaluation metrics (criteria) according to usage quantities

In the result of these studies, it is desired to make a distribution among the criteria and in Figure 4, it is shown which criteria are less, which are more used, or which literatures are new titles and which authors study (Appendix 1). In studies where SCOR and BSC applications are predominantly used, the ratio of the main criteria has also increased due to these models. According to this, the performance evaluation criteria that are used in large numbers are as follows (Figure 5).

Figure 5: Frequently used metrics

Cost-20, Flexibility-19, Financial/Economic-14, Customer Satisfaction/Return-14, Innovation-14, Resource-13, Quality-11, Time-9, Internal Process-9, Responsiveness-10, Assets-9, Reliability-9 times are used the authors which shows at Appendix 1. These frequently used metrics can be preferred over and over again because their reliability is high compared to the new metric.

Other metrics used are Output, Plan, Make, Deliver, Strategic Measures, Tactical/Structural Measures, Operational Measures, Qualitative Measures, Quantitative Measures, Efficiency, Resource Utilization, Information/Information Sharing Degree/Information Technology, Logistics level/Transportation, Inventory Level, Service, Customer Services, Managerial Analysis/Corporate Management, Input, Intermediate Measure, Agility. These metrics are among the preferred metrics.

Except this, it is also observed that 28 criteria (Competitiveness, Lead Time, Lead-Time Variability, Dependent Variables, Independent Variables, Non-Financial, Society, Diagnostic Measures, Integration, Marketing, System Dynamics, Operations Research, Profitability, Order Book Analysis, Pricing, Facility, Human, Capacity, Including Trading Partners Measures, Sustainability, Radial Output, Non-radial Input, Tier2 Supplier, Main Supplier, Manufacturer, Average Inventory Time, Average Fill Rate, Average Cycle Time) are used in performance evaluation by participating in one time for study.

CONCLUSION

This paper presents a literature review of 79 studies that study supply chain performance evaluation. The distribution of the studies which deal with the issue of supply chain performance evaluation is between 1991-2019 according to years. For supply chain management performance evaluation, as a result of publications reviewed, it is seen that the most frequently used model encountered in literature researches is SCOR-based studies and behind, the Balanced Scored Card model is used. But in recent studies, it draws attention that uses different methods or integrated systems. The distribution of methods used 19 publications have developed a different conceptual framework for evaluating performance. Also, the other different methods are Fuzzy Logic, Fuzzy MCDM, Simulation, Rough Data Envelopment Analysis, Artificial Neural Network, Statistical Analysis, Economic Value Added, Decision Support System, Unascertained Clustering Algorithm, Data Envelopment Analysis.

The performance evaluation criteria are analyzed from 79 publications to 59 reviews. In studies where SCOR and BSC applications are predominantly used, the ratio of the main criteria has also increased due to these models (Cost-20, Flexibility-19, Financial/Economic-14, Customer Satisfaction/Return-14, Innovation-14, Resource-13, Quality-11, Time-9, Internal Process-9, Responsiveness-10, Assets-9,

Reliability-9). The other studies have been on the factors affecting performance evaluation in the supply chain management (10 publications) and on a literature review (10 publications).

It is also observed that 28 criteria (Competitiveness, Lead Time, Lead-Time Variability, De-pendent Variables, Independent Variables, Non-Financial, Society, Diagnostic Measures, Integration, Marketing, System Dynamics, Operations Research, Profitability, Order Book Analysis, Pricing, Facility, Human, Capacity, Including Trading Partners Measures, Sustainability, Radial Output, Non-radial Input, Tier2 Supplier, Main Supplier, Manufacturer, Average Inventory Time, Average Fill Rate, Average Cycle Time) were used in performance evaluation by participating in 1 times for study. Thus, these criteria are seen as recently used criteria in the literature. These less-used criteria will be among the criteria included in the subsequent studies of the authors, who have gained value if they give the correct results.

Finally, in this research, we introduce another review and summarize the reviewed researches in a table focusing on the area of application, framework dimensions and established indicators, applied approaches and methods. It is helpful for researchers to direct their future work and research questions to overcome any gab in the existing researches.

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Appendix 1: Supply chain performance evaluation metrics according to the authors

Author \ Metrics	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Fitzgerald et al. (1991)	✓				✓			✓	✓														✓							✓																														
Neely et al. (1995)		✓	✓		✓	✓		✓	✓																																																		
Bagchi (1996)		✓	✓		✓																																✓																							
Kaplan and Norton (1997)							✓	✓	✓	✓	✓																																																	
Beamon (1998)								✓	✓											✓	✓																																						
Narasihman and Jayaram (1998)			✓									✓	✓																✓									✓																						
Van Hoek (1998)				✓																									✓									✓																						
Beamon (1999)					✓	✓	✓																																																					
Brewer and Speh (2000)						✓		✓	✓	✓	✓																																																	
Bierlein and Miller (2000)	✓	✓	✓	✓	✓																																																							
Pires and Aravechia (2001)					✓	✓	✓	✓																																																				
Gunasekaran et. al. (2001)							✓								✓	✓	✓																																											
De Toni and Tonchia (2001)		✓																								✓									✓																									
Persson and Olhager (2002)	✓		✓																												✓	✓																												
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Otto and Kotzab (2003)																	✓	✓	✓					✓	✓														✓	✓	✓																		
Gunasekaran et al. (2004)																	✓	✓	✓																																									
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1-Quality 2-Time 3-Cost 4-Assets 5-Flexibility 6-Resource 7-Output 8-Innovation 9-Financial/Economic 10-Customer Satisfaction/Return 11-Internal Process 12-Responsiveness 13-Reliability 14-Plan 15-Make 16-Deliver 17-Strategic Measures 18-Tactical/Structural Measures 19-Operational Measures 20-Qualitative Measures 21-Quantitative Measures 22-Efficiency 23-Resource Utilization 24-Information/Information Sharing Degree/Information Technology 25-Logistics Level/Transportation 26-Inventory 27-Service 28-Customer Services 29-Managerial Analysis/Corporate Management 30-Competitiveness 31-Lead Time 32-Lead Time Variability 33-Dependent Variables 34-Independent Variables 35-Non-Financial 36-Society 37-Diagnostic Measures 38-Integration 39-Marketing 40-System Dynamics 41-Operations Research 42-Profitability 43-Order Book Analysis 44-Pricing 45-Facility 46-Human 47-Capacity 48-Including Trading Partners Measures 49- Input 50- Intermediate Measure 51-Agility 52- Sustainability 53- Radial Output 54-Non-radial Input 55- Tier2 Supplier 56- Main Supplier 57- Manufacturer 58- Average Inventory Time 59- Average Fill Rate 60- Average Cycle Time

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Carvalho and Azevedo (2012)									✓											✓																																								
Cho et al. (2012)																											✓	✓	✓																															
Yavuz and Ersoy (2013)					✓	✓	✓																																																					
Elrod et al. (2013)	✓	✓	✓		✓																																																							
Golrizgashti (2014)								✓	✓	✓	✓																																																		
Arif-Uz-Zaman and Ahsan (2014)	✓	✓	✓		✓																																																								
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Sellitto et al. (2015)						✓								✓	✓																																													
Ayçın and Özveri (2015)			✓	✓				✓	✓	✓	✓	✓	✓																																															
Shi and Gao (2016)								✓	✓	✓		✓																																																
Özalp (2016)			✓				✓															✓	✓																									✓												
Sun et al. (2017)							✓																																										✓	✓										
Hemalatha et al. (2017)								✓	✓	✓	✓	✓	✓	✓																																														
Kozarević and Puška (2018)	✓				✓																																														✓	✓								
Huang (2018)								✓																																									✓	✓			✓	✓						
Ramezankhani et al. (2018)																										✓																														✓	✓	✓			
Dissanayake and Cross (2018)		✓	✓									✓	✓																																						✓									
Lima-Junior and Carpinetti (2019)		✓	✓									✓	✓																																							✓								
Deva et al.(2019)																																																										✓	✓	✓

1-Quality 2-Time 3-Cost 4-Assets 5-Flexibility 6-Resource 7-Output 8-Innovation 9-Financial/Economic 10-Customer Satisfaction/Return 11-Internal Process 12-Responsiveness 13-Reliability 14-Plan 15-Make 16-Deliver 17-Strategic Measures 18-Tactical/Structural Measures 19-Operational Measures 20-Qualitative Measures 21-Quantitative Measures 22-Efficiency 23-Resource Utilization 24-Information/Information Sharing Degree/Information Technology 25-Logistics Level/Transportation 26-Inventory 27-Service 28-Customer Services 29-Managerial Analysis/Corporate Management 30-Competitiveness 31-Lead Time Variability 32-Lead Time 33-Dependent Variables 34-Independent Variables 35-Non-Financial 36-Society 37-Diagnostic Measures 38-Integration 39-Marketing 40-System Dynamics 41-Operations Research 42-Profitability 43-Order Book Analysis 44-Pricing 45-Facility 46-Human 47-Capacity 48-Including Trading Partners Measures 49- Input 50- Intermediate Measure 51-Agility 52- Sustainability 53- Radial Output 54-Non-radial Input 55- Tier2 Supplier 56- Main Supplier 57- Manufacturer 58- Average Inventory Time 59- Average Fill Rate 60- Average Cycle Time