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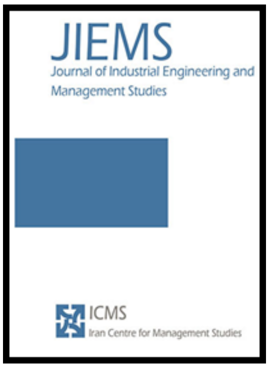

Organization's performance measurement model based on the critical success factors of the reverse supply chain in airline industry with a quality gap approach

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Abstract
Airline industry is one of the main infrastructures for sustainable development of a country. The quality of the reverse support service will be effective in increasing the safety and health of the structures, reducing the impact of disasters and reducing costs. The aim of this study is to evaluate the performance of an organization based on the main factors of reverse supply chain with the service quality approach using the Data Envelopment Analysis (DEA) model. In this research, firstly, performance indicators have been identified and then the efficiency of the 24 main factors of reverse supply chain success in the airline industry is determined by the output-oriented DEA-BCC model. The main efficient and inefficient factors are determined by EMS software. Performance measurement can be very useful for managers to allocate resources because it can provide patterns for inefficient units to achieve efficiency and performance improvements.

Keywords: data envelopment analysis; quality gap; reverse supply chain; airline industry.

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1. Introduction
The aerospace industry is one of the main infrastructures for the sustainable development of the country. In a sustainable system, harmony with the environment is an indispensable necessity. Identifying the key success factors can help achieve this goal by providing the necessary background for the development and dynamics of this industry. Therefore, it is important to know the factors that influence the performance of the reverse supply chain (Mardani et al., 2020). Today, reverse logistics has become one of the most challenging issues in the airline supply chain. In this regard, identifying the enablers of reverse supply chain performance enablers will be important and essential and will have a significant impact on the success of the competitive position of the airline. The present study aims to improve the efficiency of strategic plan mapping by improving the efficiency of enablers.

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In a sustainable system, the dynamism and harmony with the environment and the variability adapted to environmental changes are irrefutable necessities. Because the airline industry has a strong dependence on its equipment and facilities, and the provision of services without the proper use of this equipment is not feasible, the management of physical assets in this industry has a great importance (Kumar and Parida, 2010). Functional evaluation seems necessary to create dynamism and avoid languor, and as a result the disappearance of the organization in the current environment (Wongrassamee, Gordiner and Simmons, 2003).
The performance evaluation of organizations is a process for measuring organizations' inclination or deviating from their goals (Kiakohooro et al., 2011).
Gopal and Thakkar (2012) found out that in order to measure organizations based on their goals and missions, and the amount of achievement or deviation from goals in order to create an effective supply chain, it is essential to develop a supply chain performance assessment system. Proper supply chain performance plays a key role in the success of an organization and the sustainable achievement of its goals, and in particular its profitability. Supply chains are fluid and continuously they adjust themselves to the changes in the supply and demand of the products that deal with (Hugos 2003**).** In order to achieve the expected performance of supply chains, it is necessary to evaluate their management performance (Standtler et al., 2005).

1.1. Literature Review

Several studies of reverse supply chain performance evaluation are as follows:
Hassanpour (2019) worked on the evaluation of Iranian electronic products manufacturing industries using an unsupervised model, ARAS, SAW, and DEA models. It was used to classify and analyze about 33 IEPMI via an unsupervised model, Additive Ratio Assessment (ARAS), Simple Additive Weighting (SAW) and Data Envelopment Analysis (DEA) models. It was found that the ranking systems based on ARAS and SAW presented the same results for IEPMI. DEA model was also classified IEPMI in terms of efficiency score.
Considering the important role of the uncertainty and fuzzy investigation (Mostafaeipour et al., 2019), a strategic performance with Fuzzy DEA (FDEA) was evaluated by Shafiee and Saleh (2019). This study aimed to expand a set of proper performance evaluation indices that embraces strategies for sustaining top performance using SWOT analysis inside a Balanced Score Card (BSC) outline for the large commercial bank branches in IRAN by operating an FDEA.
Akbarpoor and Salari Dargi (2019) worked on the performance evaluation of decision-making units using a DEA Model and Artificial Neural Network (ANN). The input-driven CCR model and the Anderson-Peterson (AP) method were used to rank the units in the DEA model, and then the ANN approach was employed to evaluate the performance of the units using the hybrid models (DEA-Neuro). The results of the computational efficiency analysis of the units by utilizing this model demonstrated the high power of the network in computing and resolving the performance.
Naderi (2019) studied the efficiency of academic departments at a public university in Iran. This paper examined the performance efficiency of 77 academic departments at a public university in Iran using data envelopment analysis (DEA), which applies a multiple input and output variables approach. Using various DEA models, obtained different estimates for efficiency scores which show that the type of model used affects the efficiency scores. The results of the DEA models also illustrated the existence of scale inefficiencies and the relatively large heterogeneity among the departments.
Karimi-Ghartemani, Shekarchizadeh and Naser (2018) evaluated the performance of customer relationship management with DEA. In this study, CRM efficiency among the customers of the Iranian banks was analyzed using a Network DEA (NDEA) approach.

To implement the CRM on the NDEA model, input, intermediate and output variables were service quality, customer satisfaction and customer loyalty, respectively. The paper included a model for assessing CRM with NDEA model and helps managers rank their companies from the customers' point of view.
Sadraey (2017) investigated aircraft performance as an engineering approach. In this study, in order to maintain readiness, reduce events, increase the safety factor and access to airplanes, in addition to the repair program, preventive actions were considered as well as the quality of spare parts and skilled repair technicians, the use of new maintenance and repair concepts, the Line Replaceable Units (LRU) and Minimum Equipment List (MEL). The concept of the LRU denotes that in the new design, systems and components are designed separately from each other that can be separated and replaced individually. The concept of the MEL denotes that the classification is separately designed that each can be separated and replaced individually. It represents the classification of parts is defined in specific groups and despite their failure, aircraft are allowed to fly and continue to operate for a limited period.
Hajirahimi and Khashei (2016) studied the potential of improving the performance of financial forecasting using different combination architectures of ARIMA and ANN models. In this paper, the Auto Regressive Integrated Moving Average (ARIMA) and ANNs, which respectively are the most important linear statistical and nonlinear intelligent models, are selected to construct a set of hybrid models. Empirical results of forecasting the benchmark data sets including the opening of the Dow Jones Industrial Average Index (DJIAI), the closing of the Shenzhen Integrated Index (SZII) and closing of standard and poor’s (S&P 500) indicates that hybrid models can generate superior results in comparison with both ARIMA and ANN models in forecasting stock prices.
Wu et al. (2015) tried to improve the global supply chain with service engineering. They focused on the role of the customer and a principle in the management and engineering of services in the supply chain such that was presented along with the identification and bridge between the SSME and SCM gap. The ways of coordinating these two ways and the challenges and supply chains were examined too.
Cho and et al. (2012) provided a framework for measuring the performance of supply chain management. Based on the level of strategic, tactical and operational performance in the supply chain, the measurement was discussed. In interaction with supply chain processes such as demand management, customer relationship management, supplier relationship management, resource management and capacity management, service performance, information and technology management, and supply chain financing performance measurement was emphasized. Measurement of supply chain performance was done to improve the performance of supply chain services based on the fuzzy Analytical Hierarchy Process (AHP).
Bents et al. (2012) assessed the three organizational units of a task based on BSC scenarios using AHP approach. They provided a nine-step algorithm for this purpose, and for evaluating the unit’s performance, they defined the appropriate sub-criteria for each of the criteria.
Trappey et al. (2010) evaluated the performance of reverse logistics RFID with Genetic Algorithm (GA). This research developed a Qualitative-quantitative hybrid approach that considered reverse logistics using fuzzy cognitive maps and GAs to model and analyzed the implementation of RFID. Fuzzy maps took into account the advantage of expressing relationships between inverse logistic parameters. GAs were applied to provide performance predictions and decision support for reverse logistics efficiency.
Many studies have been performed to evaluate the performance of various systems.

Varmazyar et al. (2016) in their review presented a new comprehensive approach based on the Multi-Criteria Decision-Making (MCDM) and BSC methods for assessing the performance of research and technology centers. Yadav and Sharma (2015) presented a coherent approach based on data analysis and AHP to assess the performance of suppliers in the automobile industry.

Kádárová et al. (2015) proposed a combination of BSC and DEA methods for obtaining comprehensive performance and management systems for industrial companies and their processes.

A hybrid technique using fuzzy decision-making and multi-objective programming was proposed by Tirkolaee et al. (2020) for sustainable-reliable supplier selection in a two-echelon supply chain design. They employed Fuzzy Analytic Network Process (FANP), fuzzy Decision-Making Trial and Evaluation Laboratory (DEMATEL) and fuzzy Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) to rank the suppliers.

Based on the previous research, it seems that so far the performance evaluation of the organization based on the main factors of success classified and the reverse supply chain with the service quality approach has not been accomplished.

In the present era, reverse logistics will play an important role in facilitating this challenge and stabilizing the competitive position of suppliers in the market to reducing costs and time. Since it is not possible to improve the performance level and market position of the manufacturing and service organization without utilizing the supply chain integration capabilities, it is essential to identify the main factors of success for any organization for the success of that organization's goals.

In this regard, evaluating the performance of the organization based on the main factors of success classified and the reverse supply chain with the service quality approach will be important and will have a significant impact on the success of the competitive position of the organization. In the present study, the aviation industry is considered as one of the most important industries in the country. The lack of a comprehensive and empirical model of reverse support services has led the researchers to present a model for evaluating the performance of the organization based on the main factors of success of reverse supply chain of aviation industry with service quality approach. In the general case, it can be summarized the performance evaluation of the reverse supply chain from the perspective of the researchers in Table 1.

Table 1. Research gap

Researchers	Year	Research tools	Research results		Industry	Research achievements	
			Introducing factors/ indicators	Model/ Pattern presentation		Performance evaluation	Supply chain
Trappey et al.	2010	Genetic Algorithm			Reverse support services	✓	
Bentes et al.	2012	BSC, AHP				✓	
Cho and et.al.	2012			✓	Services	✓	
Liang chuan woo and et.al.	2015			✓	Services		✓
Sadrai	2017				Aviation	✓	
Karimi-Ghartemani, Shekarchizadeh and Naser	2018	NDEA			Bank	✓	
Naderi	2019	DEA			State university	✓	
Akbarpoor and Salari Dargi	2019	DEA-Neuro				✓	
Shafiei and Saleh	2019	FDEA	✓		Bank	✓	
Hasannpoor	2019	ARAS, SAW, DEA		✓	Electronic		

1.2. Importance-Performance Analysis

The Importance-Performance Chart (IPA) is an effective tool for assessing the position of an organization, identifying opportunities for progress, and designing strategies for delivering targeted service. The value of significance and importance is calculated from the geometric mean of comments. Regarding the regionalized chart of observant variables, the model can be categorized into four areas:

High-importance -Low performance group: Reveals organizational weaknesses and priorities for improvement and investment. This area is critical, so it should focus on recovery and development efforts in the area.

Low Importance-Low Performance Group: This area is an indifferent or low priority area and the appropriate strategy for this, is allocating limited resources to the area or neglecting and not investing in it.

High Importance- High Performance Group: Represents the strengths and competitive advantages of the organization and the strategy for this feature is to maintain the current strategy. In this area, the continuation of the situation is favorable.

Low Importance-High Performance Group: The area can be reduced. Represent loss of resources which is attributed to these features and it is possible to use available resources in other areas. Managers should severely restrict their current efforts in this area.

1.3. BCC model

Benker, Charles and Cooper (1984) introduced a new model in the CCR model. This model evaluates the relative efficiency of units with variable returns to scale. Probability models are more restrictive than variable-return-to-scale models because the return-to-efficiency model involves lower-performing units and the amount of performance is also lower. The structure of the model is like the CCR model which is added in the objective function and all constraints as a fraction of a free variable in the W sign. If $W<0$, then the type of return to scale is descending. If $W>0$, then the type of return to scale is ascending. If $W=0$, then the type of return to scale is constant. The output-oriented DEA model will be in the form of Model (1):

Max Φ (1)
Subject to

$\Phi y_{ro} - \sum_{j=1}^{n} \lambda_j y_{rj} \leq 0 \quad r = 1, \dots, s$

$\sum_{j=1}^{n} \lambda_j x_{ij} \leq x_{io} \quad i=1,\dots,m$

$\sum_{j=1}^{n} \lambda_j = 1$

$\lambda_j \geq 0 \quad j = 1, \dots, n$

Φ free sign

where *o* is the index of the decision-making unit and under review. Moreover, y_{ij} and x_{ij} are respectively, the values of the r^{th} output and the i^{th} input for the unit under investigation (unit *o*), and also, respectively, the values of the output r^{th} and the value of the input i^{th} are for the j^{th} unit. Furthermore, s represents the number of outputs, m is the number of inputs, and *n* denotes the number of units.

2. Research methodology

The study is applicable and developmental in the objective. This model is recommended for assessing the performance of the organization based on the main success factors of the reverse supply chain categorized by the quality approach of the airline industry. This model is also proposed to determine the highest efficiency ratio and interfere with the inputs and outputs of other decision-making units in determining the optimal weights for the unit under consideration, the output-oriented BCC model is proposed. The output-oriented model is recommended because the organization does not have control over its inputs and outcomes of the organization depending on the activities and the way of resource allocation. Because solving secondary problems or envelopment model requires fewer operations due to fewer constraints, also, since solving secondary models can determine the optimal recovery (Reference set) of inputs and inactive outputs, in this research, the output-oriented DEA-BCC model is used for output axis.

Definition 2.1: The main factors of the reverse supply chain success in the airline industry are divided into four categories based on the importance-performance zoned diagram. The model will run for each quartet. The input of the proposed model is the main success factor of the reverse supply chain in the airline industry. Assume that l is the number of respondents, P'' is the function of responsive characteristic, then the value of the function P can be calculated from the following theorem:

$$P=\sqrt[l]{\prod_{k=1}^{l} P''_k} \tag{2}$$

Definition 2.2: Analysis of service quality gap is considered as the output index. Assume that *SQ* is the quality of the provided service, *c* the number of characteristics, P'_{ab} is the understanding of the actuator function of *a* according to characteristic *b*, E_{ab}, is the expectations of the service quality for the characteristic *b* associated with the stimulus *a*, then the service quality gap can be calculated from the following theorem:

$$SQ=\sum_{b=1}^{c}(P'_{ab} - E_{ab}) \tag{3}$$
$$SQ_a=(P'_{ab} - E_{ab})$$

Because the gap's optimality is zero, for service quality, non-zero numbers including positive and negative ones are a quality service gap and should be optimized. Therefore, in order to insert data into the data envelopment analysis software, the gap data in gap analysis is calculated to the reverse absolute value-form, so that the lower gap can have a higher numerical value and a higher gap have a lower numerical value.

Definition 2.3: Assume that there is *n* decision-making units DMU_j (j=1, 2,…, n) which use x_{ij} input to generate an output and also assume that output vector y_{ij}, and Definitions (2-1) and (2-2) which will result in the introduction of this equation and Model (4). This model is recommended for evaluation of the organization based on the main success factors in the reverse supply chain with the approach of the quality of the services in the airline industry.

Max Φ (4)
Subject to

$$\Phi\frac{1}{|(\sqrt[l]{\prod_{k=1}^{l}P"_{ok}})-E_{ro}|}-\sum_{j=1}^{n}\lambda_j\frac{1}{|(\sqrt[l]{\prod_{k=1}^{l}P"_{rk}})-E_{rj}|}\leq 0 \qquad r=1,\dots,s\,,\sqrt[l]{\prod_{k=1}^{l}P"_{rk}}\neq E_{rj}$$

$$\sum_{j=1}^{n}\lambda_j(\sqrt[l]{\prod_{k=1}^{l}P"_{ik}})\leq(\sqrt[l]{\prod_{k=1}^{l}P"_{ok}}) \qquad i=1,\dots,m$$

$$\sum_{j=1}^{n}\lambda_j=1$$

$$\lambda_j\geq 0 \qquad j=1,\dots,n$$

Φ free sign

Since the pattern of the secondary model is output-oriented, the objective function tries to increase the output level (Φ) by keeping the input level constant. In fact, Φ is a real decision variable, and λ is a non-negative vector of decision variables that, that in this model, the selection of any permissive λ_i, create a high limit for inputs and a low limit for DMU_0 data and against these Φ limits, related to λ>0, provides a better option to associate with Max $\Phi^{=}\Phi^{*}$, this causes Φ^{*} as the target pattern for other inefficient units to provide optimal optimization.

3. Research Data

The statistical population of this step of the research is comprised of academic and industrial experts. To determine the importance of the main factors of success, academic experts were used and to determine the performance of the main factors of success, industrial experts were employed with the help of a questionnaire. Using the geometric mean, the importance and performance value of the main factors of success of the reverse supply chain is calculated. For data analysis from descriptive and inferential statistics, with the help of statistical software SPSS 16.0, and Microsoft Excel 2010 were used.
Analysis of service quality gaps, in the shape of descriptive and sectional from the customers of 6 organizational units of the aviation industry company was performed.
Data analysis by paired *t*-test of SPSS 16.0 software was performed.

3.1. Sensitivity analysis

In this section, the sensitivity analysis of model indicators is discussed considering the output-driven approach. For this purpose, each time one of the outputs is deleted and redesigned. Finally, the sum of the amount of distance between the efficiency numbers obtained by the output elimination and the initial efficiency number is calculated.

Table 2. Sensitivity analysis of performance evaluation of decision-making units

Determining the distance	The amount of distance in the BCC model
Quartet1	CSF22 (34.37435)
Quartet2	CSF9 (14.38566)
Quartet3	CSF15 (4.266039)
Quartet4	CSF10 (9.67238)

According to Table 2 and the degree of efficiency difference, it is observed that the elimination of output «CSF22» has a greater impact on the results. Then, respectively «CSF9», «CSF10» and « CSF15» are important.

4. Findings

We consider 24 main success factors of the reverse supply chain that each one of them uses an input (the value of the performance of the main success factor of the importance-performance zoning diagram, which is the result of the geometric mean of the responses of the respondent's performance) to produce an output (Quality service gap). The input and output data are shown in Table 3.

Table 3. Input and output data of main success factors of the reverse supply chain in the airline industry-under study organization

CSF	Value of the performance of the main success factor						Importance of the critical success factors in service quality
	Respondent No. 1	Respondent No. 2	Respondent No. 3	Respondent No. 4	Respondent No. 5	Respondent No. 6	
CSF1	4	3	4	3.17	2.62	2.62	2.417
CSF2	3.3	3.17	3.17	3.3	2.52	3.17	2.322
CSF3	2.88	2.88	2.88	2.88	3.17	2.29	2.34
CSF4	2.88	2.88	2.88	3.42	2.88	2.52	2.258
CSF5	3.63	2.62	2.88	3.63	3	3.3	2.119
CSF6	2.88	2.88	2.88	3.42	2	3.63	2.973
CSF7	2.88	2.62	2.88	3.3	3.56	3.17	2.521
CSF8	3.91	3.3	3.3	4.31	2.62	2.88	3.073
CSF9	3	3.63	3.63	3.63	2.62	2.62	2.975
CSF10	4.31	3.17	3.17	3.42	3	2.88	2.799
CSF11	3.3	2.88	2.88	3.17	2.62	2.08	2.268
CSF12	2.88	2.52	2.52	2.71	2.29	2.29	1.66
CSF13	3.91	2.62	2.29	4.64	2.29	2.29	2.025
CSF14	2.62	2.62	2.62	3.91	3.17	4	2.577
CSF15	2.29	2.29	2.29	3.68	2.88	2.62	2.956
CSF16	3.3	3.3	3.3	3.91	2.52	4.64	2.818
CSF17	3.3	3.3	3.3	3.91	3.3	4	2.627
CSF18	3.91	3.3	3.3	3.91	2.47	3.3	2.857
CSF19	3.63	3.3	3	4.31	3.91	3.42	2.908
CSF20	4.31	3.3	3.3	4.64	3.91	3.11	2.628
CSF21	3.3	3	3.3	3.56	2.29	3.11	1.991
CSF22	2.88	2.62	2.88	3.63	2.62	2.62	2.882
CSF23	4.22	2.29	2.29	2.88	2.88	2.88	2.141
CSF24	2.62	2.62	2.62	3.17	2.62	2.88	2.027

The main success factors that are categorized in the zoning importance-performance diagram are shown in Figure 1. The importance of the main factors of success by academic experts and the performance of the main factors of success by the aviation industry experts was determined. Data related to the level of importance and performance of the two-dimensional IPA network is shown in Figure 1. And the main factors of the success of the reverse supply chain of the aviation industry were categorized into four areas: "Centralization, Competitive Advantage, Indifference and Reducible District".
Model (4) is implemented in EMS software and the performance status is obtained in Table 3. As can be seen, as a result of the implementation of the BCC model, 16 main factors of success among 24 main factors of success are ineffective. Reference units have been identified to increase the efficiency of inefficient units and the rate of change of inefficient unit outputs is shown to be proportional to the reference units. The main factor of success of customer satisfaction for becoming an efficient unit should be changed to 1.0000 similar to the reference unit 4.

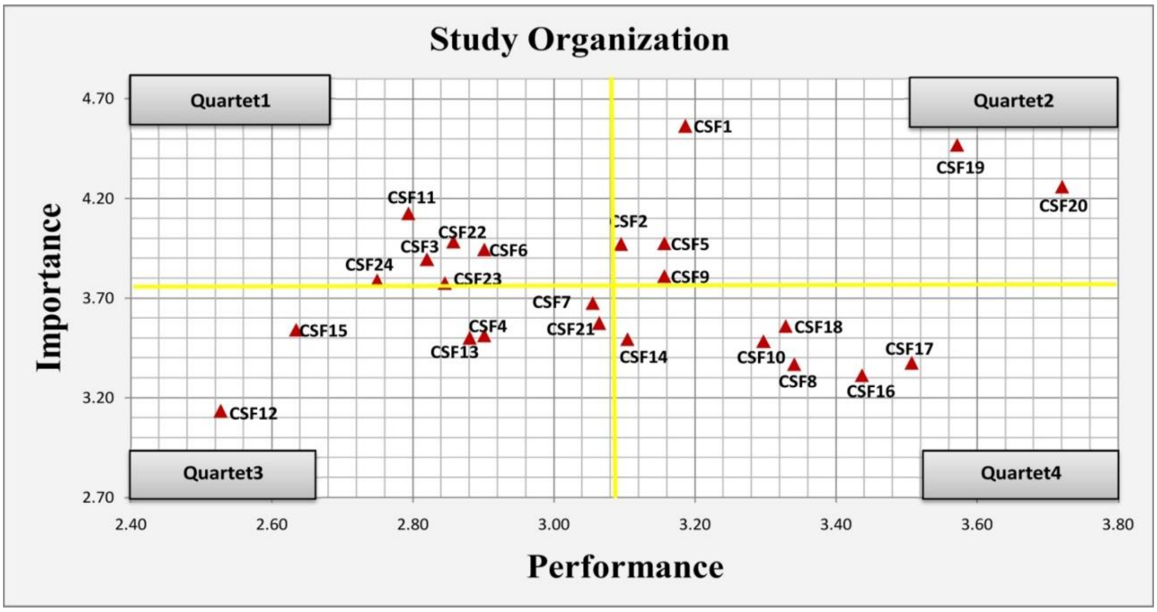

Figure 1. Analysis of Importance-Performance of the main success factors of the reverse supply chain in the airline industry - under study organization

The first step in Organization Performance Assessment is to select the proportional evaluation model that decision-makers aim to evaluate their units based on them. The conceptual model of research is suggested as a framework for Organization Performance Assessment and also identifying the opportunities for improvement of the aviation industry with the IPA chart and also identifying problems and planning for improvement of service delivery by analyzing the service quality gap in the aviation industry. To increase the level of performance of the organization based on the main factors of the success for inefficient units, it should be possible to improve the level of performance that can be achieved by changing the inefficient group outputs based on outputs of the reference units in Table 4.

Table 4. The result of implementing the BCC model in EMS software

CSF	Efficiency	Reference critical success factor and the rate of change in outputs in proportion to outputs of reference critical success factors
Quartet 1		
Q1_CSF3	1412.57%	6(0.3636) 4(06364) 4
Q1_CSF6	331.82%	4(1.0000)
Q1_CSF11	191.50%	6(0.6364) 4(0.3636) 4
Q1_CSF22	100%	
Q1_CSF23	2938.67%	6(0.0909) 4 (0.9091)
Q1_CSF24	100%	
Quartet 2		
Q2_CSF1	417.84%	4(1.0000)
Q2_CSF2	100%	
Q2_CSF5	562.70%	4(1.0000)
Q2_CSF9	100%	
Q2_CSF19	357.84%	4(1.0000)
Q2_CSF20	590.27%	4(1.0000)
Quartet 3		
Q3_CSF4	196.93%	5(1.0000)
Q3_CSF7	165.34%	5(1.0000)
Q3_CSF12	100%	
Q3_CSF13	262.27%	5(1.0000)
Q3_CSF15	100%	
Q3_CSF21	327.91%	5(1.0000)
Quartet 4		
Q4_CSF8	100%	
Q4_CSF10	300%	1(1.0000)
Q4_CSF14	100%	
Q4_CSF16	372.46%	1(1.0000)
Q4_CSF17	528.74%	1(1.0000)
Q4_CSF18	283.23%	1(1.0000)

Organizational performance is divided into two categories of inefficient and inefficient based on the key success factors of the reverse supply chain, which by moving towards efficiency can optimize the performance of the organization by utilizing its resources. The inefficiency of an organization's performance comes from the difference inefficiency from number one. Inefficient groups for business can move towards efficiency through two approaches: "reducing available resources-inputs and increasing output". The amount of output deficiency in inefficient unit outputs is determined by the reference unit in Table 4.

The result is the creation of a healthy competitive environment in the aerospace industry, is improving the performance of the organization and achieving the desired level of efficiency. On the other hand, optimizing the performance of an organization saves on input resources and increases output and ultimately reduces the cost of the organization.

As seen from the implementation of the BCC model, in the first quarter, the main success factors are "cooperation of supply chain components and beneficiaries commitment", in the second quarter, the main success factors are "transport and performance of supply chain", in the third quarter, the main success factors are "environmental awareness of the supply chain and supply chain reliability" and in the fourth quarter, the main success factors are "technology and standardization". The main reference success factors to increase the efficiency of each inefficient major factor is determined and the amount of outputs change is shown from the inefficient success factor in proportion to the main reference success factor. The continuous improvement context for the proper performance of the main inefficient success factors must be created.

5. Conclusion

Identifying the main factors of success of the reverse supply chain proposed by this study helps researchers, active individuals and also managers to improve their performance by familiarizing themselves with the reserve supply chain. The performance evaluation of the organization presented in this research will improve performance continuously and create opportunities for organizational excellence. Performance appraisal, making the system intelligent and motivates people to behave well and the main part is the formulation and implementation of organizational policy. The findings of this research are generally applicable to all components of the reverse supply chain and are particularly applicable in the aviation industry. The reverse supply chain with service quality approach was studied and the obtained results are categorized to help evaluating the performance of the organization based on the main factors of success and.

These findings can also be useful in enhancing customer satisfaction and effective competition, and in system intelligence and motivating individuals to behave well and formulation and implementation of organizational policies.

The importance of CSFs is recognized by the academic experts in the field of the reverse supply chain. Using the geometric mean, the value of the importance of the main factors of success of the reverse supply chain is calculated. The performance level of the main factors of success of the aviation industry is determined by industrial experts, and the value of the performance of the main factors of success of the supply chain reverse is calculated by the geometric mean. The main factors of success of the aviation industry are categorized by region charts. According to the area diagram, the model observer variables in four regions can be inserted and categorized. The quality of services for the aviation industry was measured using the Quality Gap Model. The data envelopment analysis model presented for the organizational units of the aviation industry will be studied and implemented for all four areas.

Studies have shown that despite a lot of research being done on reverse supply chain and performance evaluation, there has been no research that simultaneously covers these two dimensions. Other researchers have also identified the main factors of success of the reverse supply chain in their studies but they have not the performance review of the reverse supply chain based on the main factors of success of the reverse supply chain. Another aspect of innovation in this research is the supply chain of the aviation industry which has received less attention from researchers. The performance evaluation of this research will also be different from other studies (decision-making with multiple criteria, balanced scorecard and interpretive structural modeling approach). Studies show that this research is innovative in terms of subject matter and research method.

Due to the importance of the airline industry in the country's economy and industry, quality in this industry has a great impact. Quality assurance in the airline industry requires quality adequacy in the various sectors involved in manufacturing including materials, equipment, manpower, standards, production processes, management, etc., that is why the establishment of the Standard for Quality in Airline Industry, Spatial Organizations and Defense Industries

EN BS 9100 will be very effective. Although quality is defined according to the customer's perception, it is evident that compliance of standard is a requirement that is not distorted by the customer's request. Minimum quality is a desirable standard of society and has characteristics that prevent harm to society and the maximum quality to the extent that the customer pays for it and is pleasing to obtain it.

The results of the studies showed that the effective main factors of success are "cooperation of supply chain components, support and commitment of beneficiaries, transportation, supply chain performance, environmental awareness of the supply chain, supply chain reliability, technology and standardization" and other main factors of success are inefficient. In order to reduce the potential effects of the main inefficient success factors performance, it must improve the performance as much as possible, which can be possible by changing outcomes corresponding to the outputs of the main reference success factors.

Moreover, monitoring and improvement of the supply chain performance increased the complexity. A sophisticated performance management system involves multiple managerial processes, such as identifying measurement scales, setting targets, scheduling, communicating, monitoring, reporting, and feedback. It is suggested that supply chain management be used as a process of quantifying efficiency and effectiveness, or as a systematic approach to planning and guiding the data collection and monitoring data performance. In the context of the dynamic supply chain, continuous improvement of performance for most manufacturers and related retailers is critical in order to strengthen competition.

One of the important factors that determine the above factors in the projects is the performance of contractors and suppliers, or, in other words, the way of supply chain performance in organizations. Therefore, organizations need to use new science and technology tools to improve their supply chain in order to succeed. One of the solutions that have been very useful in this matter is the value engineering approach. Therefore, it is necessary to consider this solution in organizations to improve supply chain performance.

Technical inefficiencies can be due to a lack of knowledge about the basic dimensions of the organization's performance, critical success factors and incorrect use of the organization's resources. To be efficient, the organization is capable of gaining knowledge of the proper use of resources by learning from efficient patterns. Efficient units by identifying their strengths and using similar experiences of other efficient units can maintain and improve their performance. The aviation industry can identify and eliminate the weaknesses of the respective units and take action to targeting and proper planning by using the model presented in the research. The methodology used in this study has the objectives of a system of performance control and measurement and can be used as a performance evaluation method in different organizations.

5.1. Research Limitations

- Research findings are limited to data collection time.
- The number of decision-makers is restricted to 6 and the number of the evaluated units is another limitation of this study. The reason is that the results will change by changing the research community.

5.2. Results of importance

The performance of the main factors of the success of the reverse supply chain was shaped in sectional form. It is proposed that this analysis can be carried out in different periods. The development of the performance evaluation model of the reverse supply chain in the aviation industry is recommended with an analysis of the network envelopment.

6. References

Akbarpoor, S., and Salari Dargi, S., (2019). "Performance Evaluation of Decision Making Units Using Data Envelopment Model and Artificial Neural Network (Case Study: Fars Regional Water Corporation)", *International Journal of Data Envelopment Analysis (IJDEA)*, Vol. 7, No. 2, pp. 15-32.

Bentes, A. V., Carneiro, J., da Silva, J. F., and Kimura, H., (2012). "Multidimensional assessment of organizational performance: Integrating BSC and AHP", *Journal of business research*, Vol. 65, No. 12, pp. 1790-1799.

BS EN 9100, (2018). Quality Management Systems. Requirements for Aviation, Space and Defense Organizations.

Cho, D.W., Lee, Y.H., Ahn, S.H., and Hwang, M.K., (2012). "A framework for measuring the performance of service supply chain management", *Computers & Industrial Engineering*, Vol. 62, No. 3, pp. 801-818.

Gopal, P. R. C., and Thakkar, J., (2012). "A review on supply chain performance measures and metrics: 2000-2011", *International journal of productivity and performance management*, Vol. 61, No. 5, pp. 518-547.

Hajirahimi, Z., and Khashei, M., (2016). "Improving the performance of financial forecasting using different combination architectures of ARIMA and ANN models", *Journal of Industrial Engineering and Management Studies*, Vol. 3, No. 2, pp. 17-32.

Hassanpour, M., (2019). "Evaluation of Iranian electronic products manufacturing industries using an unsupervised model, ARAS, SAW, and DEA models", *Journal of Industrial Engineering and Management Studies*, Vol. 6, No. 2, pp. 1-24.

Hugos, M., (2003). Essentials of Supply Chain Management, John Wiley & Sons.

Kádárová, J., Durkáčová, M., Teplická, K., and Kádár, G., (2015). "The proposal of an innovative integrated BSC–DEA model", *Procedia Economics and Finance*, Vol. 23, pp. 1503-1508.

Karimi-Ghartemani, S., Shekarchizadeh, A., and Khani, N., (2018). "A Data Envelopment Analysis Method for Evaluating Performance of Customer Relationship Management", *Iranian Journal of Management Studies*, Vol. 11, No. 4, pp. 743-767.

Mardani, A., Kannan, D., Hooker, R.E., Ozkul, S., Alrasheedi, M., and Tirkolaee, E.B., (2020). "Evaluation of green and sustainable supply chain management using structural equation modelling: A systematic review of the state of the art literature and recommendations for future research", *Journal of Cleaner Production*, Vol. 249, p. 119383.

Mostafaeipour, A., Qolipour, M., Rezaei, M., and Tirkolaee, E.B., (2019). "Investigation of off-grid photovoltaic systems for a reverse osmosis desalination system: A case study", *Desalination*, Vol. 454, pp. 91-103.

Naderi, A., (2019). "Data envelopment analysis of the efficiency of academic departments at a public university in Iran", *International Journal of Education Economics and Development*, Vol. 10, No. 1, pp. 57-75.

Parasuraman, A., Berry, L.L., and Zeithaml, V.A. (1991). "Understanding customer expectations of service", *Sloan management review*, Vol. 32, No. 3, pp. 39-48.

Sadraey, M.H., (2017). Aircraft performance: an engineering approach. CRC Press.

Shafiee, M., and Saleh, H., (2019). "Evaluation of Strategic Performance with Fuzzy Data Envelopment Analysis", *International Journal of Data Envelopment Analysis*, Vol. 7, No. 4, pp. 1-20.

Stadtler, H., (2005). "Supply chain management and advanced planning—basics, overview and challenges", *European journal of operational research*, Vol. 163, No. 3, pp. 575-588.

Tirkolaee, E.B., Mardani, A., Dashtian, Z., Soltani, M., and Weber, G.W., (2020). "A novel hybrid method using fuzzy decision making and multi-objective programming for sustainable-reliable supplier selection in two-echelon supply chain design", *Journal of Cleaner Production*, Vol. 250, p. 119517.

Trappey, A.J., Trappey, C.V., and Wu, C.R. (2010). "Genetic algorithm dynamic performance evaluation for RFID reverse logistic management", *Expert Systems with Applications*, Vol. 37, No. 11, pp. 7329-7335.

Varmazyar, M., Dehghanbaghi, M., and Afkhami, M., (2016). "A novel hybrid MCDM model for performance evaluation of research and technology organizations based on BSC approach", Evaluation and program planning, Vol. 58, pp. 125-140.

Wongrassamee, S., Simmons, J.E., and Gardiner, P.D., (2003). "Performance measurement tools: the Balanced Scorecard and the EFQM Excellence Model", *Measuring business excellence*, Vol. 7, No. 1, pp. 14-29.

Wu, L.C., and Wu, L.H. (2015). "Improving the global supply chain through service engineering: A services science, management, and engineering-based framework", *Asia Pacific Management Review*, Vol. 20, No. 1, pp. 24-31.

Yadav, V., and Sharma, M.K., (2015). Application of alternative multi-criteria decision making approaches to supplier selection process, In Intelligent Techniques in Engineering Management (pp. 723-743). Springer, Cham.

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