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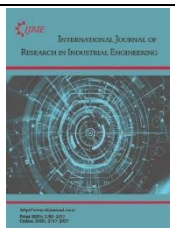

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Provide a Structural Model of Lean Sustainable Supply Chain With Total Quality Management Approach in the Automotive Industry

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Abstract

Improving supply chain management performance is one of the critical issues to gaining a competitive advantage for companies. In this regard, one of the valuable solutions is the lean approach. A lean approach helps eliminate supply chain waste. On the other hand, considering the existence of the automobile industry in Iran and the presence of many parts manufacturing industries to meet the needs of automobile manufacturers, the implementation of the lean approach in the supply chain of organizations active in this field is essential and creates a competitive advantage in them. At first, by reviewing the literature, eight key factors that cause the supply chain to be clean were identified, and 40 supply chain experts were assisted using a questionnaire. The normality of the data distribution was examined using the Kolmogorov-Smirnov test. The main result of this study was the pattern of factors affecting the purity of the supply chain in the automotive parts industry. This model includes the leveling of factors affecting the supply chain, which provides managers with a comprehensive view and attitude about the relationships between these variables.

Keywords: Supply Chain, Lean Approach, Auto Parts Industry, Path Analysis, Interpretive Structural Modeling.

1 | Introduction

Production environments are usually complex and dynamic. As a result, pressure scheduling is inefficient because frequent design updates are required. In addition, to reduce the effects of changes in the production system, it is necessary to maintain large amounts of buffer reserves to ensure a good level of service. In contrast to production pressure planning methods, lean manufacturing systems use a traction-type strategy in which upstream production begins only in response to downstream customer demand [2]. Lean manufacturing systems typically use Kanban

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tools to issue new production orders and control inventory in the process [3]. As a result, product accumulation between stations is significantly reduced [1].

A lean manufacturing system has been proven as an effective production system in the last few decades [23]. Lean production methods use a complex system of technical measures to increase production performance through waste disposal and continuous improvement of production processes [4].

Since the last decades of the twentieth century, with the decline of Ford manufacturing systems, manufacturers worldwide have sought to create clean and flexible processes to improve the performance of their business network [6].

Today, efforts are focused on streamlining business networks, especially supply chains. After streamlining their internal processes, manufacturers seek to improve their performance by optimizing the processes of other partners in their business network [5]. The performance of each member of the production chain is highly dependent on the behavior and performance of other members [7].

The purpose of lean manufacturing is to reduce waste in human resources efforts, inventory, the time required to deliver the product to the market, and the necessary production space to meet customer demand and, at the same time, produce quality products efficiently and economically [10]. This approach revolves around the elimination of waste [9]. Loss takes on different forms and exists at any time and place. Losses can be hidden in policies, procedures, processes, product design, and operations [11]. It wastes resources but does not add any value to the product. Lean production reduces the cost of production per unit of a product by trying to eliminate waste and, at the same time, improve the product's quality [12]. Utilizing a lean manufacturing methodology reduces production time, increases product quality, increases personnel efficiency, increases market flexibility, reduces inventory, increases the life of machinery and equipment, and ultimately reduces overhead costs [13].

Lean manufacturing goes beyond simple programs or techniques. This methodology is a new approach to aligning vision, culture, and strategy [14]. It must be implemented in an integrated system to create a culture and operating philosophy to modify or eliminate activities that do not add value [15]. In general, activities that make added value the customer pays for and other activities ignored by the customer should be reduced or eliminated [16]. Therefore, the value stream refers to those characteristics of the company that add value to the desired products or services [17].

The supply chain can be considered as a chain that tries to establish effective communication between customers and suppliers through effective management of material, information, and money flow [16]. Chiocca et al. [4] described one of the critical supply chain strategies as the swing approach. Zahedi et al. [34] have defined lean strategy as lean strategy develops a flow of productive value from supplier to end customer. Sundram [١٧] defines a lean approach as identifying and eliminating value-added cottage activities wasted in business processes. Tortorella, Mirando, and Maroudin [13] define the concept of the lean base means more output with fewer resources, such as less human effort, less equipment, and less time and space.

The lean supply chain is a strategy based on cost reduction and flexibility, focusing on process improvement through reducing or eliminating waste that flows throughout the product life cycle [21]. Nili et al. [17] formulate the supply chain in this way. Describe: A supply chain that eliminates non-value-added, loss-making steps throughout the chain through continuous improvement efforts.

Also, a quality commitment is required throughout the organization to ensure that the products and services have the designed quality [20]. This attitude to quality management throughout the organization manifests itself in what is referred to as total quality management [22]. Comprehensive quality management envisages the same basic principles of quality assurance, total quality control, and quality control throughout the company [23]. Organizations that have used TQM have gained many benefits, including producing higher quality products, more satisfied customers, reduced costs, improved financial performance, quality performance, and innovation, as well as improved employee satisfaction [24]. In addition, if TQM is successfully implemented, it provides an excellent competitive advantage. Another definition of TQM by TQM is a multidimensional structure: Kainak is presented as a total quality management philosophy that strives for and can achieve continuous improvement in all tasks of an organization [25]. Applying and developing total quality management, despite its many benefits (such as well-known customers, capable employees, higher revenue, lower costs, etc.), also faces many challenges or obstacles [26].

Given that the strategy of the Government of the Islamic Republic of Iran in the auto parts industry is to achieve self-sufficiency and localization of this industry, this situation has created a new problem for companies active in the auto parts industry [14]. Today the production of knowledge and its optimal application in processes has increased the knowledge and ability of managers and experts in this industry [2٥]. Therefore, this study seeks to provide a model of supply chain hair factors in the offshore sector of the auto parts industry [23]. Iran's Industrial Engineering and Construction Company are one of the most essential and prominent companies active in the country's offshore sector of the auto parts industry [١٧]. The supply chain of the Industrial Facilities Company is relatively traditional, which means that most attention is focused on general criteria such as quality, delivery time, and price in the supply chain [20]. Therefore, according to many stakeholders and customers, this company has not been able to obtain their satisfaction as it should be, and reforms should be made in this company regarding the process of supplying goods [6].

According to what has been said, this study, conducted in Iran Engineering and Construction Company of Industrial Facilities, seeks to determine the factors affecting the purity of the supply chain in the automotive parts industry by reviewing the literature and the background and statistical analysis [٢٦]. Then, using an interpretive structural approach, explain the research model and validate it from quantitative and qualitative dimensions [٢٥].

Given that the main issue in our country is self-sufficiency in the automotive parts industry and the localization of this industry, this study seeks to provide a model of factors affecting the supply chain in this sector [7].

In the automotive industry, quality problems and rework in the supplier environment will mean more precautionary storage and inspections before the items are distributed to the automaker. This will lead to higher costs and delays and a waste of resources. Therefore, the performance of each member of the supply chain is essential and should be viewed with an integrated view of the chain, and according to this point, the need to create a lean supply chain is felt.

2 | Theoretical foundations and research literature

There are several definitions of the supply chain, with Green [14] defining supply chain as: All the steps that directly or indirectly play a role in meeting customer demand. In terms of supply chain commerce, a network of participants and different operational channels from inside and outside the organization affect the desirability of supply chain outputs [۲۶]. Leite and Braz [21] define a supply chain as the flow of information, payment materials, and raw material services between factories and warehouses.

The supply chain also includes organizations and processes that produce products, information, and services and deliver them to end customers. Supply chains come in many shapes and sizes and can be very complex [7]. The main goal in all supply chains is to reduce costs, increase effectiveness and efficiency and generally increase profits for all its stakeholders [2]. Therefore, scientific and rational management of the supply chain is one of the essential components of leadership. Strategically, a competitive advantage can be achieved [۲۵].

Lean supply chain thinking came into being at the same time as lean manufacturing thinking was first formed and implemented in Japan [15]. In a lean supply chain, attention is paid to the continuous improvement of activities through which it is possible to eliminate operations that do not create added value during a supply chain [34]. For this purpose, activities are carried out through which supply time, reduction of economic production, decrease in costs, and increase in profitability can be provided [16].

McIntosh et al. [10] define that total quality management means providing high-quality products and services through the participation and cooperation of all stakeholders, working groups, customer orientation, continuous improvement, and process performance by using quality management techniques and tools to help increase satisfaction and organizational performance [2۰].

3 | Research methodology

The present research is descriptive-survey research in terms of method and applied in terms of purpose. Based on the review and analysis of research literature, this study identified the factors affecting supply chain resilience as described in *Table 2*.

As mentioned, eight factors were identified in the first stage that provides lean apples in the supply chain by reviewing the research literature [26]. Then, a questionnaire was used to assess the impact of these factors on the supply chain of the auto parts industry. In the next step, the factors found to be effective enter the interpretive structural modeling process.

Table 1. Factors affecting supply chain volatility based on literature review

Row	Variable	Source	Definition
1	Information sharing	Abdullah and Matsui 2009, Womak 1996	Information sharing enables organizations across the supply chain to understand and plan for their customers' demands promptly.
2	Total Quality Management	Hong and Dismax 2006, Cho and Moda and Kui 2008	Includes items such as process standardization, process control, promoting a culture of continuous improvement, ISO, and the 5S grooming system (research background).
3	Leadership and management	Kanan and Long 2009, Abdullah and Fan 2007	In some cases, some are 1- Problem recognition 2- Quick and at the same time accurate decisions 3- Development and promotion of lean culture 4- Definition of values and goals of the organization and development of a strategy to achieve these goals and values.
4	Cooperation throughout the supply chain	Jayaram and Drog 2008, Singh and Bahardavj 2013	That means having a long-term relationship throughout the chain (supplier, manufacturer and customer)
5	Application of technology	Sharafat et al. 2016, Lee S. Rao and Rago NASAN 2005	Provide appropriate hardware and software to perform tasks and provide services
6	Employee participation	S. Rao and Rago NASA 2005, Wayne Gratten and Pagel 2011	Refers to the involvement of the organization's forces, especially experts in the two areas of decision-making and lean execution
7	Minimize delivery time	Agos and Haji Noor 2012, Chu and Quinn and Lee 2008	Delivery time is between the order being announced and the order being delivered.
8	flexibility	Chu and Quinn and Lee 2008, Su and Sun 2010	The ability of the supply chain to move to a new situation that is more favorable than before

According to *Table 2*, the initial research model based on the factors affecting supply chain volatility can be drawn in *Figure 1:*

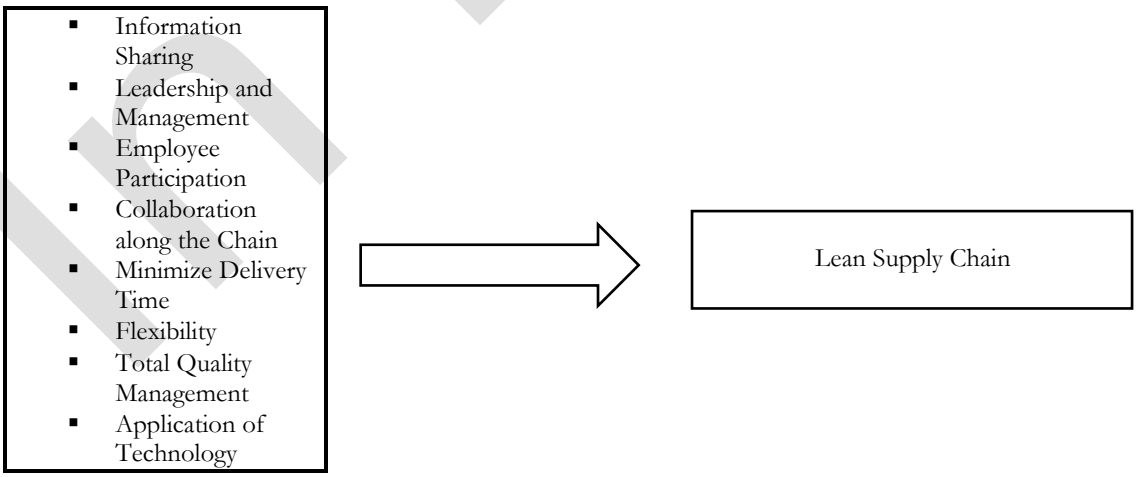

Figure. 1. Initial Research Model [26].

3.1 | Validity

The questions of this research questionnaire are all from previous studies, and the literature was extracted. However, to be clear, concise, and appropriate, the questions were provided to 12 statistical sample experts from the automotive parts industry. After reviewing and correcting, the final questionnaire was developed. Hence, the validity of the content was confirmed.

3.2| Reliability

Cronbach's alpha was used to measure each structure's reliability and internal compatibility. For this purpose, Cronbach's induction values of each system were calculated using SPSS software. Considering that all Cronbach's alpha values are above 0.7, the reliability of the questionnaire was also confirmed.

3.3| Community and Statistical Sample

The statistical population of this research is the experts of the auto parts industry in the offshore sector, and 40 of them have been available as a statistical sample. As mentioned, 12 people were selected out of this number to assess validity, interpretive structural modeling questionnaires, and qualitative validation. It should be noted that the number of experts in interpretive structural modeling should be 12 to 25 people.

3.4 |Data Analysis

In this section, first, using the Kolmogorov-Smirnov test, the normality of data distribution was examined (*Table 2*), and according to the significant levels greater than 0.05, the data distribution is normal.

Table 2. Normality Test

The significance level	Structures (factors)
0.064	Information sharing
0.108	Leadership and management
0.060	Employee participation
0.081	Collaboration along the chain
0.080	Minimize delivery time
0.120	flexibility
0.094	Total Quality Management
0.163	Application of technology
0.073	Lean supply chain

Based on the normality of the data, the regression method was used to measure the effect of factors on supply chain purity in the automotive parts industry. The results are shown in *Table 3*.

Table 3. Regression Test

The significance level	T-Test	Standard coefficients β	Non-standard coefficients Standard error	Non-standard coefficients B	Independent variables
0.000	5.4	0.48	0.574	0.95	Information sharing
0.000	3.34	0.68	0.650	1.46	Leadership and management
0.000	2.34	0.75	0.20	1.92	Employee participation
0.000	3.73	0.65	0.431	1.23	Collaboration along the chain
0.000	2.85	0.73	0.368	1.84	Minimize delivery time
0.000	3.07	0.60	0.457	1.01	flexibility
0.000	3.76	0.50	0.397	0.82	Total Quality Management
0.000	2.10	0.89	0.524	1.62	Application of technology

Due to the significant levels greater than 0.05, all factors (independent variables) affect the dependent variable (lean supply chain in the automotive parts industry). Therefore, all eight factors are used in interpretive structural modeling.

3.5 | Interpretive Structural Modeling

Structural modeling is an interpretive technique that makes it possible to study the system's complexity and structure the system in a way that is easy to understand. Among the advantages of this method are its comprehensibility for users, its integration in combining expert opinions, and its applicability in studying complex systems with various components.

This method analyzes the relationship between indicators by analyzing the criteria at several different levels.

This methodology is summarized in the following steps.

Step 1) Identify the variables related to the problem

As noted, this step was achieved by reviewing the subject literature and the background of research and surveys of experts.

Step 2) Form a self-interactive structural matrix

In order to prepare a self-structural interactive matrix, it is necessary to examine the dependencies of all identified elements in pairs. For this purpose, the following four symbols are used:

To show a one-sided effect: V

To show a one-sided effect: A

To show the two-way effect: X

To show the lack of relationship between two factors: O

For this purpose, first a questionnaire was designed and experts were asked to indicate the type of two-way relationships between the variables using the symbols (V, A, X, O). The results of this section are shown in *Table 4:*

Table 4. Self-interactive compatibility matrix (SSIM)

Row	Variable	8	7	6	5	4	3	2	1
1	Leadership and Management	V	V	V	V	V	V	V	
2	Employee Participation	A	A	A	V	A	A		
3	Information Sharing	A	A	A	V	O			
4	Flexibility	O	X	O	O				
5	Minimize Delivery Time	A	A	A					
6	Application of Technology	V	V						
7	Collaboration Along the Supply Chain	V							
8	Total Quality Management								

Step 3) Create the initial access matrix.

The above collisions must be converted to zeros and ones to obtain the achievement matrix. The desired matrix can be obtained according to the following rules:

-If the cell (i, j) in its matrix has a structural interaction with the symbol V, the corresponding cell in the achievement matrix takes the number one, and its symmetric cell, the cell (j, i), takes the number zero.

If the cell (i, j) in its matrix has a structural interaction of the symbol A, the corresponding cell gets zero, and its symmetric cell (j, i) receives the number one.

-If the cell (i, j) in its matrix has a structural interaction of X, the corresponding cell in the acquisition matrix gets the number one, and its symmetric cell, i.e., the cell (j, i), also gets the number one.

-If the cell (i, j) in its matrix has a structural interaction with the symbol O, the corresponding cell in the achievement matrix takes the number zero, and its symmetric cell, the cell (j, i), also takes the number zero.

If i = j, an access matrix is placed at the input.

Based on the rules stated, the initial access matrix is shown in *Table 5*.

Table 5. Initial Access Matrix

Variables	1	2	3	4	5	6	7	8
1	1	1	1	1	1	1	1	1
2	0	1	0	0	1	0	0	0
3	0	1	1	0	0	0	0	0
4	0	1	0	1	0	0	1	0
5	0	0	0	0	1	0	0	0
6	0	0	0	0	1	1	1	1
7	0	1	1	1	1	0	1	1
8	0	1	1	0	1	0	0	1

Step 4) Create the final achievement matrix

After obtaining the initial access matrix, considering the property of transferability, if (j, i) are related and also have a relationship (j, k), then (k, i) are related, The final achievement matrix is obtained.

The method of obtaining the access matrix is using the Euler view, in which we add the proximity matrix to the unit matrix and then bring this matrix to the power of n if the matrix elements do not change. The matrix must be constructed according to the Boolean rule. The final achievement matrix is obtained from preparing the initial achievement matrix by entering the transferability rules. *Table 6* adds the values of dependence and influence to the final achievement matrix (*Table 5*).

Table 6. Final Matrix Table

Variables	1	2	3	4	5	6	7	8	Infiltrate
1	1	1	1	1	1	1	1	1	8
2	0	1	0	0	1	0	0	0	2
3	0	1	1	0	0	0	0	0	3
4	0	1	0	1	0	0	1	0	2
5	0	0	0	0	1	0	0	0	1
6	0	0	0	0	1	1	1	1	5
7	0	1	1	1	1	0	1	1	7
8	0	1	1	0	1	0	0	1	4
Dependence	1	7	4	3	7	3	4	4	

Step 5) Determine the levels and form an interpretive structural pattern

To determine the level, using the achievement matrix, the achievable set (output) and the prerequisite set (input) are determined for each variable. The achievable set of each variable includes the variables that can be reached through this variable. Need includes variables through which this variable can be reached. In order to avoid prolonging the article, further explanation is omitted (*Table 6*):

Table 7. Six Iterations in Determining the Levels of Factors Affecting the Lean of the Supply Chain

Level	Joint collection	Output set	Input set	Variable
The First Repetition				
First	1	8-7-6-5-4-3-2-1	1	Leadership and management
	2	2-5	1-2-3-4-6-7-8	Employee participation
	3-8	2-3-5-8	1-3-6-7-8	Information sharing
	4-7	2-4-7	1-4-7	flexibility
	5	5	1-2-3-5-6-7-8	Minimize delivery time
	6-7	2-3-5-6-7-8	1-6-7	Application of technology
	4-7-8	2-3-5-6-7-8	1-4-6-7-8	Application of technology
	7-8	2-3-5-6-7-8	1-6-7-8	Total Quality Management
The Second Iteration				
Second	1	1-2-3-4-5-6-7-8	1	Leadership and management
	2	2-5	1-2-3-4-6-7-8	Employee participation
	3-8	2-3-5-8	7-4-1	Information sharing
	4-7	2-4-7	8-7-6-5-3-2-1	flexibility
	5	5	7-6-1	Minimize delivery time
	6-7	2-3-5-6-7-8	8-7-6-4-1	Application of technology
	4-7-8	2-3-5-6-7-8	1	Collaboration along the chain
	7-8	2-3-5-7-8	8-7-6-4-3-2-1	Total Quality Management
Third Repetition				
Third	1	1-3-4-6-7-8	1	Leadership and management
	3-8	3-8	1-2-3-4-6-7-8	Information sharing
	4-7	4-7	1-4-7	flexibility
	6-7	3-6-7-8	1-2-3-5-6-7-8	Application of technology
	4-7-8	3-4-7-8	1-6-7	Collaboration along the chain
	7-8	3-7-8	1-4-6-7-8	Total Quality Management
Fourth Iteration				
Fourth	1	1-6-7	1	Leadership and management
	6-7	6-7	1-6-7	Application of technology
	7-8	7-8	1-6-7	Collaboration along the chain
	7-8	7-8	1-6-7-8	Total Quality Management
Fifth Repetition				
Fifth	7	1-7	1	Leadership and management
	7	7	1-7	Collaboration along the chain
Sixth Repetition				
sixth	1	1	1	Leadership and management

Considering the levels of each of the criteria presented in *Table 7*, the interpretive structural model of this research is drawn according to the transferability according to *Figure 2*:

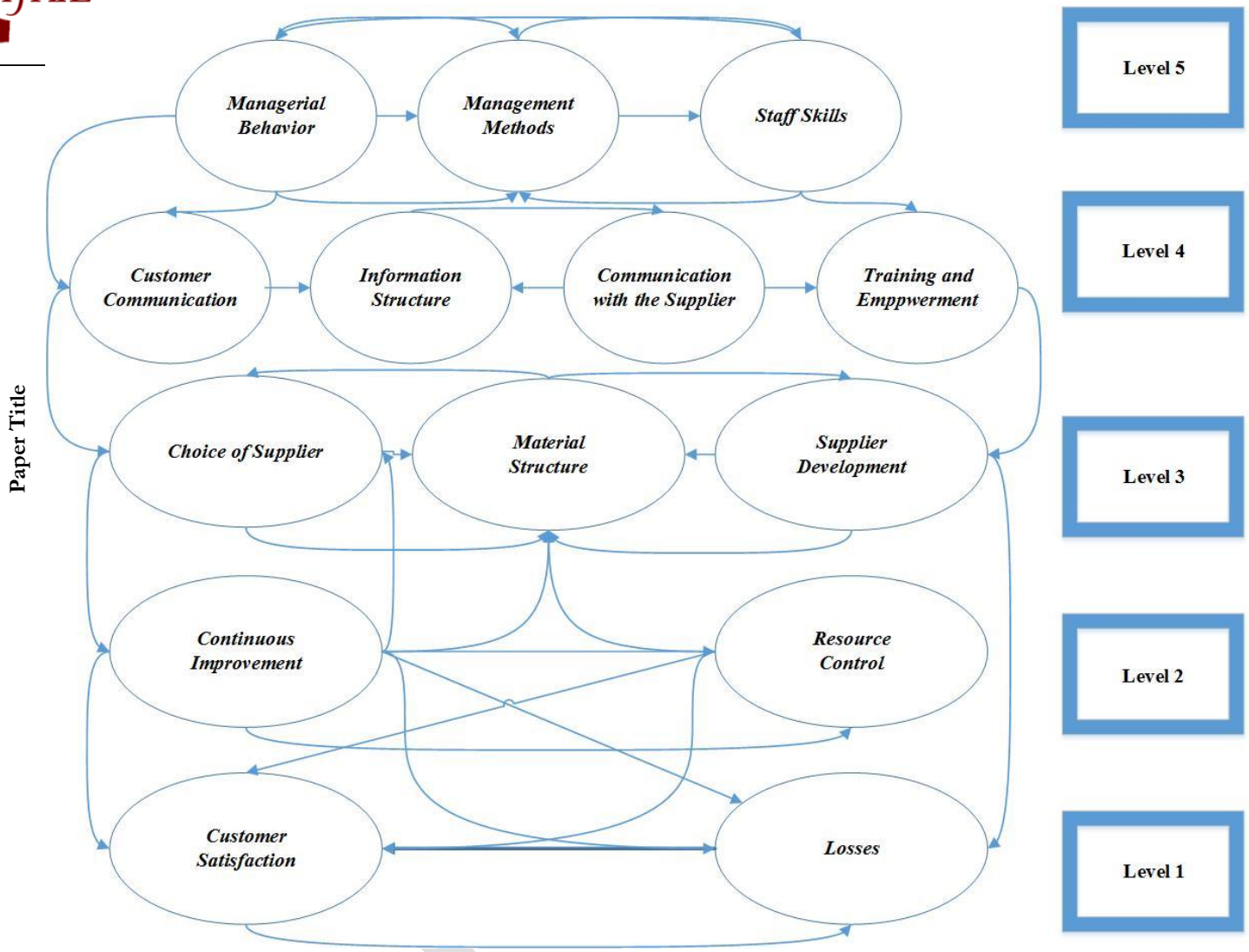

Figure 2. Structural Model of This Research

According to the final interpretive structural model, it can be concluded that apart from the relationship that the above factors have with the lean supply chain and affect it, each of the factors may also interact with each other.

The loss factor affects customer satisfaction and causes customer dissatisfaction. The factor of continuous improvement has a direct effect on losses. The supplier selection factor has a direct impact on resource control. The training and empowerment factor affects the flow structure of materials. The material flow structure factor immediately affects the information flow factor. The factor of management behavior affects customer relationships, and ultimately the factor of employee skills affects the structure of information flow.

It should be noted that to avoid the complexity of the model and its quantitative validation, the above two relations are ignored. This is because the template can be tested in software.

Validation of the template After designing it, it needs to be validated. This research has done validation from two quantitative and qualitative dimensions.

Quantitative validation To validate the template quantitatively, smartPLS software version 2 is used, and the template can be drawn in *Figure 3*:

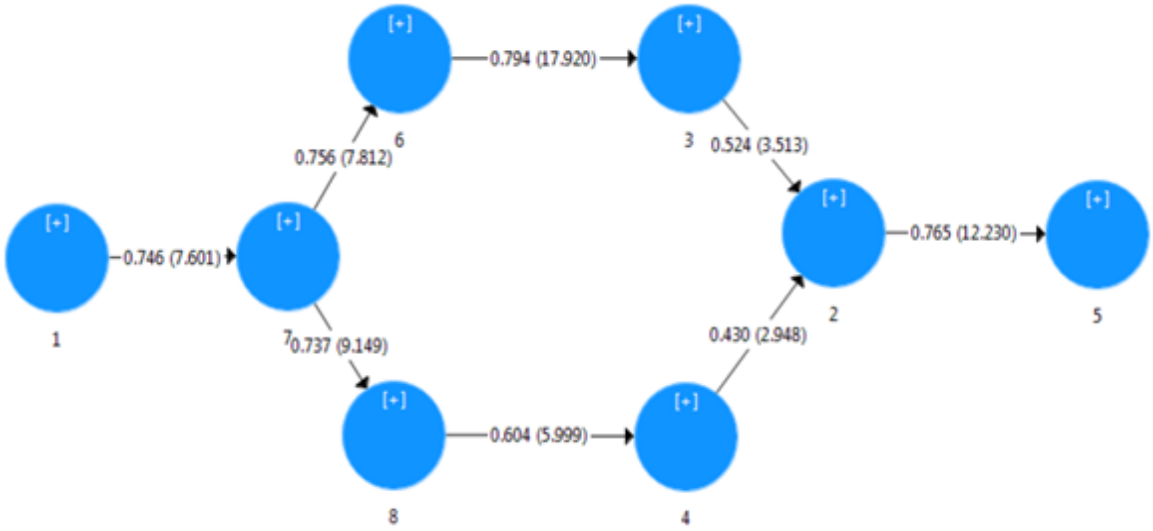

Figure 3. Quantitative Validation of the Model

It is observed that all the numbers in parentheses are greater than 1.96, and the factor loads are greater than 0.4. Therefore, the structural pattern of interpretation is quantified.

3.6 | Qualitative Validation

Regarding quality validation, the following questions were asked by 12 experts:

1. If the statistical population of the research changes, is the model still valid?
2. Do all variables exist in the real world?
3. Are the communications logically valid?
4. Do the variables remain almost constant over time?
5. Is it possible to improve the system based on the model variables?
6. Based on the specified variables, can this pattern be generalized to the entire offshore sector of the auto parts industry?

Regarding all the above questions, the answer of the experts was positive, which means the qualitative validity of the model and its generalizability to the whole sector of the auto parts industry.

4 | Conclusion

Due to the current challenges in the country, including market saturation and fierce competition, the management is determined to be clean at all stages, including the supply chain. The main result of this study is the model of factors affecting the supply chain leanness in the automotive parts industry and contributes to identifying and empowering the implementation of lean supply chain strategies using the ism method. This model includes the leveling of factors affecting the supply chain, which provides managers with a comprehensive view and attitude about the relationships between these variables. These variables were identified through a review of the literature and a survey of statistical samples. All eight factors were effective at a 95% confidence level. Then, the interpretive structural model of the factors affecting supply chain volatility was presented. In the interpretive structural model, the degree of influence and the effect of reduction and dependence increase at the bottom-up levels. Therefore, paying more attention to the lower-level variables causes the whole system to become lean. Thus, the two factors of leadership and management and then cooperation throughout the supply chain are the basis of supply chain volatility in this industry and cause better grounding for higher level factors. The next priority is with the two factors of use of information technology and flexibility, which is in the third level, and the factors of the fourth level are flexibility and use of information technology. At the fifth level is employee participation, and at the end at the sixth level is the delivery time committee factor. According to the levels of the model, leadership and management is the most influential factor in the model is consistent with the research of Sundram et al. [۱۹], Pero et al. [11] and Zahedi et al. [۱3] and time minimization Delivery is the most influential factor, in line with the research of Adebanjo et al. [1] and Razmi et al. [۲۰]. Pay attention. In this model, managerial methods, behavior, and staff skills are the basic basis for

designing a lean production model because lean implementation principles are impossible without the support of management and skilled human resources. Management methods facilitate information flow and help better communicate with the supplier and the customer. In this model, it is observed that the basis of the model starts from management methods and behavior. In many studies, it has been stated that to implement lean thinking, there must be the support of managers. Ultimately, these factors in the first level lead to eliminating waste and customer satisfaction in the industry. In the national document of the country's energy strategy approved by the Cabinet on 4/28/96, in the section on strategies related to the auto parts industry, the following two cases have been mentioned: "Development and maximum utilization of all related industries to protect the national interests" and "Reduction." Losses and losses in the production, transmission, distribution, and consumption of energy In this regard, models such as the model presented in this study can be considered. Based on the importance of variables and their placement levels, the following suggestions can be made:

Suggestions based on Level 1:

Coordinated and accurate planning, considering different solutions and analyzing them, making quick but at the same time correct decisions, solving problems and conflicts between departments, promoting a culture of responsibility

Suggestions based on Level 2:

A history of working with suppliers, having mutual trust, and building a solid relationship with them lead to bargaining power and prevent problems such as shortage or poor quality of imported goods.

Suggestions based on Level 3:

Promote a culture of continuous improvement and accountability, clarify the responsibilities of staff efforts to solve problems, implement 5S (beautification system) and optimize processes, re-engineer activities, and eliminate bottlenecks.

• Providing the necessary tools and machinery according to the latest technologies, such as cranes, trailers, and devices required for testing and inspection of delivery equipment by manufacturers suggestions based on 4:

Creating the necessary infrastructure to use up-to-date information technology systems and sharing information between the departments involved throughout the supply chain. Existing mechanisms in the organization to adapt to adverse environmental conditions, such as specialized personnel and dispersion. Suppliers, the existence of alternatives to essential equipment

Suggestions based on level 5:

Payments commensurate with the expertise and performance of employees and their encouragement, training, and enhancement of staff empowerment, motivation in

Employees to perform tasks better. Using Employees' Opinions and Welcoming Their Ideas and Rewarding Creative Ideas Some general suggestions for achieving a clean supply chain include:

- continuous and required training of employees is an undeniable necessity
- promoting teamwork and forming teamwork
- Changing attitudes in purchasing to prioritize quality over price
- creating cordial and friendly environments with discipline in the workplace without discrimination between employees

4 .1| limitation

Other factors affect supply chain volatility, such as financial issues and sanctions, which have not been addressed due to some considerations and avoiding complexity and ambiguity in the final research model.

4.2 | Practical suggestions

1. Increase the accuracy of the model by increasing the statistical volume.

2. Use and compare other supply chain strategies to measure it in manufacturing companies and choose the best strategy to select the best supplier and lean supplier.

3. Take measures to improve all the factors mentioned in the companies.

4. Create a more competitive and dynamic environment for the interaction of factors and the purity of the supply chain.

5. Pay attention to implementing lean factors in the supply chain and its tools.

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Conflicts of Interest

All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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