

Presenting the Model and Prioritization of Lean Production Success Drivers (Case Study: Iran Khodro Company)

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Abstract

The purpose of the current research is to present a model and prioritize the drivers of lean production success (case study: Iran Khodro Company). The statistical population and statistical sample of this study consists of 20 experts (managers) of Iran Khodro production department. In this research, first, the most important key success factors of lean production were determined using the validity technique of the content validity ratio, then the interpretative structural modeling of the determined factors was discussed, and in the final part, the key success factors of lean production were prioritized using the OPA technique. The indicators of “senior management support and commitment, training and evaluation, use of lean concepts and techniques, kaizen team, employee participation, project consultant, reward system, lean suppliers, alignment with the organization's strategy, effective communication and lean customers” were identified, respectively. Ranks 1 to 11 have been assigned.

Keywords: lean production success, Iran Khodro company, senior management, lean customers

INTRODUCTION

Today, many organizations face many problems in implementing lean production systems. One of the reasons mentioned in the literature for observing such a situation is the non-alignment of the pure values system with the values governing the organization. Despite the wealth of lean production studies, the effective and efficient use of this system is still facing problems. It seems that the root of these problems lies in the lack of a comprehensive model for evaluating and checking lean production in manufacturing companies. On the other hand, identifying the key success factors in line with the mission and achieving goals is essential in any organization. In most of the studies that have examined the critical success factors of lean production, a set of factors have been introduced in general in industry and services. However, every organization has its own critical factors. Considering the fact that the automotive industry is a mother industry in a sense, and on the other hand, taking into account the huge

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potential and importance of the automotive industry in the field of development and job creation, the successful implementation of lean principles in this industry will lead to a significant increase in the competitiveness of production. Domestic producers, by taking advantage of the features of lean production, can continuously reduce costs and prices, which will naturally spread to other industries as well. According to the perspective of the automobile industry until the horizon of 1404, achieving the first place in the region, the fifth place in Asia and the eleventh place in the world, relying on the development of competitiveness, is the main goal of this industry. On the other hand, the

industrial trustees of the country, the strategies to achieve the set goals are “creating a car manufacturing and production base with a domestic and joint brand name or a globally recognized name and brand in the region with an emphasis on the export of manufactured products, creating a manufacturing base for the production of parts and Car collections with a reputable domestic or global brand name in the region with an emphasis on competitive advantage, attracting direct or joint domestic and foreign investment and finally creating a base of automotive design, testing and engineering service centers in the region, so that perhaps through this, the industry The car can present its products in the selection basket of buyers at the international level. This strategic document continues to describe 9 strategies with 71 steps for the development of the automobile industry.

THE IMPORTANCE AND NECESSITY OF RESEARCH

In today's world, which is moving towards the future with an incredible speed, the effort to be better and remain in the field of competition has brought about many changes in organizations, companies and manufacturing factories, and considering the scope and complexity of goals, processes and structures An organization in the competition scene, organizations can continue to survive if they are responsive to the demands and expectations of customers and stakeholders. Lean production achieves this goal by eliminating waste and maximizing the efficiency of facilities and human resources in order to satisfy the needs and demands of customers. It is very important for customers and consumers to be able to get the product they need at the right time, with the right quality and the right price. On the other hand, it is important for companies to be able to offer products with customer's opinion in order to maintain a competitive market. Similarly, it is important for the country's policymakers that domestic products can help to improve the consumption pattern. Due to consumption and production reasons, the country's domestic industries should fundamentally revise their methods in order to increase production efficiency, reduce costs, increase quality and create the possibility of competition; Because it is in unequal competition with foreign competitors. Applying the principles of lean production can move in the direction of these goals. Examining the production process of the automobile industry in the world and the process of changes in the world's major automobile companies shows that the production methods have changed towards lean production and lean thinking, and the localization of this production method in the automobile companies of our country seems necessary. In addition to increasing the satisfaction of the countrymen and domestic customers by increasing the quality and reducing the production costs, this production method will provide the conditions for international competition, increasing exports and improving the balance of payments and developing the country's economy.

Research Background

Taghipour et al. [1] studied “Risk analysis in the management of urban construction projects from the perspective of the employer and the contractor.”

Mirzaie et al. [2] studied “The relationship between social bearing capacities with conflict as a result, in the perception of the visiting historical sites.”

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Taghipour et al. [21] studied “Insurance performance evaluation using BSC-AHP combined technique.”

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Taghipour et al. [24] studied “The impact of motives from obtaining ISO 9001 certification on organization performance (including case study).”

Yaghoubi et al. [25] studied “Students learn and learn using the effects of smart schools.”

Taghipour et al. [25] studied “The impact of working capital management on the performance of firms listed in Tehran Stock Exchange (TSE).”

Alamdar khoodaki et al. [6] studied “Effect of integrated marketing communication on brand value with the role of agencies reputation (including case study).”

Abdi Hevelayi et al. [26] studied “Predicting entrepreneurial marketing through strategic planning (including case study).”

Taghipour et al. [27] studied “Evaluating Project Planning and Control System in Multi-project Organizations under Fuzzy Data Approach Considering Resource Constraints (Case Study: Wind Tunnel Construction Project)”. *Management, International Technology and Science Publications (ITS)*, 2020, Vol 3, Issue 1, 29-46. 10.31058/j.mana.2020.31003

Taghipour et al. [28] studied “Application of Cloud Computing in System Management in Order to Control the Process”.

Mahboobi et al. [29] discussed “Assessing ergonomic risk factors using combined data envelopment analysis and conventional methods for an auto parts manufacturer”, occupational injuries are currently a major contributor to job loss around the world.

Taghipour et al. [30] studied “The identification and prioritization of effective indices on optimal implementation of customer relationship management using TOPSIS, AHP methods.”

Taghipour et al. [31] studied “Investigating the relationship between competitive strategies and corporates performance (case study: Parsian Banks of Tehran).”

Taghipour and Moosavi [32] studied “A look at gas turbine vibration condition monitoring in region 3 of gas transmission operation.”

Azarian and Taghipour [33] studied “The impact of implementing inclusive quality management on organizational trust (case study: educatin).”

Ghadamzan Jalali et al. [34] studied “Explain the relationship between intellectual capital, organizational learning and employee performance of Parsian Bank Branches in Gilan province.”

Taghipour and Vaezi [35] studied “Safe power outlet.”

Khorasani and Taghipour [36] studied “The location of industrial complex using combined model of fuzzy multiple criteria decision making (including case study).”

Mohammadi et al. [37] studied “Investigating the role and impact of using ICT tools on evaluating the performance of service organizations.”

Rahmani et al. [38] studied “Providing health, safety and environmental management (HSE) program in metal mining industry (including case study).”

Tarverdizadehet et al. [39] studied “Predicting students’ academic achievement based on emotional intelligence, personality and demographic characteristics, attitudes toward education and career prospects through the mediation of academic resilience.”

Arsalani et al. [40] studied “Investigating the effect of social media marketing activities on brand awareness.”

Hoseinpour et al. [41] studied “The problem solving of bi-objective hybrid production with the possibility of production outsourcing through Imperialist Algorithm, NSGA-II, GAPSO Hybrid Algorithms.”

Moradi Lalekaei et al. [42] studied “Measurement of the country of origin of the brand of branding and brand loyalty.”

Habibi Machiyani et al. [43] studied “Designing a smart model for managing Iranian chain stores based on business intelligence (case study of proma chain store).”

Taghipour [44] studied “A review of the sustainability indicators’ application in vehicle routing problem.”

Pourkhosravani et al. [45] studied “Identifying and prioritizing investment risks in digital markets using multi-criteria decision making techniques and data mining.”

Sharifzadeh and Taghipour [46] studied “Evaluating the efficiency of dam construction management and ways to improve it.”

Moosavi and Taghipour [47] studied “Turbine vibration condition monitoring in region 3.”

Molavi and Taghipour [48] studied “A survey on electrical cars advantages.”

Molavi and Taghipour [49] studied “An overview of electric vehicle concepts and its features.

Abolghasemi [50] studied “operational and credit risk model on planning management and efficiency of banks admitted to the stock exchange.”

Akbarnezhadbaei et al. [51] studied “Modeling the application of knowledge management system in order to improve the technology governance in the automotive industry of Iran using the data mining environment.”

Akbarnezhadbaei et al. [52] studied “Determining a model for evaluating the knowledge management system in order to improve industries with the focus on educational technology and applying data mining concepts.”

Karimi et al. [53] “The impact of environmental transformational leadership on organizational citizenship behavior (Case study: Municipality of 22nd district of Tehran).”

Hashemi et al. [54] studied “The effect of personal factors on increasing the productivity of low-level employees in the General Welfare Department of Tehran Municipality.”

Ganjali et al. [55] studied “Strategic analysis of household hazardous waste reduction.”

Taghipour et al. [56] studied “The impact of managerial factors on increasing the productivity of low-level employees (including case study).”

Ganjali et al. [57] studied “Investigating the relationship between environmental awareness and the level of education and occupation of people.”

Safdarpour et al. [58] studied “The effect of government support on innovation ability (including a case study).”

RESEARCH QUESTIONS

The present research was conducted in order to provide a model and prioritize the drivers of lean production success with ISM and OPA approaches. This research was done in response to the following questions:

1. *Question 1:* What are the most important key factors for the success of lean production?
2. *Question 2:* What are the most important key factors for the success of lean production?

Type of Research Method

The current research can be considered an applied research in terms of its purpose and a descriptive-survey in terms of data collection, and since it studies a specific society, it is included in the category of case studies.

SOCIETY, STATISTICAL SAMPLE AND SAMPLING METHOD

The statistical population and statistical sample of this study consists of 20 all experts (managers) of Iran Khodro production department; The opinions of these people are used to determine the most important indicators and present the model. Also, in order to prioritize the indicators, the opinions of seven experts who were randomly selected among the experts were used.

TECHNIQUES USED IN RESEARCH

OPA Method

This method can be used in individual or group decisions. In the case of group decisions, through this method, the experts and their priorities are first determined; Experts may be prioritized based on their experience or knowledge. After prioritizing the experts, the indicators are prioritized by each expert. Meanwhile, each expert ranks the options based on each feature and sub-indexes if any. Finally, by solving the linear programming model provided by this method, the weight of indicators, options, experts and sub-features is obtained simultaneously. A significant advantage of the proposed method is that from the two-by-two comparison matrix, the decision matrix (without the need for numerical input), normalization methods, averaging methods for aggregating experts' opinions (in group decisions) and does not use language variables. Another advantage of this method is the possibility for experts to comment only on indicators and options of which they have sufficient knowledge and experience. OPA is a technique that can be used to determine the importance of indicators or to rank options. Not depending on linguistic expressions and the small number of questionnaire questions compared to other methods, not needing a decision matrix, not needing a pairwise comparison matrix, not needing normalization techniques, not needing averaging methods to combine experts' opinions, among the advantages of this method is. Another advantage of this method is the possibility for experts to comment only on the features and options of which they have sufficient knowledge and experience.

Index Ranking Based on OPA Method

In order to rank the indicators based on the OPA method, the following steps must be taken:

- 2- Prioritizing experts' opinions:
- 1- Prioritizing indicators based on the opinions of each expert

Table 1 shows the characteristics of the experts.

Table 1. Rank of experts.

Rank	Score	Work experience	Education	Expert number
1	100	27	P.H.D	Expert 1
1	100	22	P.H.D	Expert 2
1	100	25	P.H.D	Expert 3
2	90	15	Masters	Expert 4
2	90	18	Masters	Expert 5
2	90	16	Masters	Expert 6
2	90	16	Masters	Expert 7

It should be noted that in order to determine the rank of experts, a maximum of 40 points for education (doctorate: 40 points and master's degree: 30 points) and 60 points for work experience (over 20 years of experience: 60 points; 15 to 20 years of work experience: 50 points and work experience of 10 to 15 years: 40 points) is considered. Based on this, experts who scored above 90 were assigned rank 1; Experts who scored between 80 and 90 were assigned 2nd rank.

Determining the Weight and Rank of Indicators Based on Expert Opinions 1

The ranking of indicators is based on expert opinion 1 as described in Table 2. Based on the linear programming code written in Lingo, the importance weights of the indicators are based on expert opinion 1, as described in Table 3.

Determining the Weight and Ranking of Indicators Based on Expert Opinions 2

The ranking of the indicators is based on expert opinion 2 as described in Table 4. Based on the linear programming code written in Lingo, the importance weights of the indicators are based on expert opinion 2, and continue in a similar way until expert opinion 7.

Table 2. Ranking of indicators based on expert opinion 1.

Expert rank	Rank	Symbol	Indicator
1	1	J	Support and commitment of senior management
	2	I	Training and evaluation
	3	H	Kaizen team
	4	G	Employee participation
	5	K	Using lean concepts and techniques
	6	E	Project consultant
	7	D	Lean suppliers
	8	A	Reward system
	9	B	Effective communication
	10	C	Alignment with the organization's strategy
	12	F	Pure customers
The symbol WE1 is used in the model to indicate the opinion of experts			

Table 3. Weight of indicators based on expert opinion.

The weight of expert opinions	Weight شاخصها	Symbol	Indicator
0/198	0/054	J	Support and commitment of senior management
	0/036	I	Training and evaluation
	0/027	H	Kaizen team
	0/021	G	Employee participation
	0/017	K	Using lean concepts and techniques
	0/013	E	Project consultant
	0/010	D	Lean suppliers
	0/008	A	Reward system
	0/005	B	Effective communication
	0/003	C	Alignment with the organization's strategy
	0/002	F	Pure customers

Table 4. Ranks of indicators based on expert opinion 2.

Expert rank رتبه خبره	Rank	Symbol	Indicator
1	1	I	Training and evaluation
	2	J	Support and commitment of senior management
	3	K	Using lean concepts and techniques
	4	H	Kaizen team
	5	G	Employee participation
	6	E	Project consultant
	7	A	Reward system
	8	D	Lean suppliers
	9	C	Alignment with the organization's strategy
	10	B	Effective communication
	11	F	Pure customers

The WE2 symbol is used in the model to indicate expert opinion 2

FINAL WEIGHTS

The final weights of the indicators obtained based on the total opinions of experts are as described in Table 5. As shown in Table 5, the indicators of “senior management support and commitment, training and evaluation, use of lean concepts and techniques, Kaizen team, employee participation, project consultant, reward system, lean suppliers, alignment with the organization's strategy, effective communication with customers Nab” have been ranked 1 to 11 respectively.

RESEARCH RESULTS AND FINDINGS

Question 1: How is the Model of the Key Success Factors of Lean Production with the Interpretive Structural Modeling Approach?

The model of the key success factors of lean production with an interpretative structural modeling approach has 7 levels:

1. Level 1: Employee participation
2. Level 2: training and assessment, use of lean concepts and techniques, effective communication
3. Level 3: Kaizen team, lean customers
4. Level 4: Lean suppliers
5. Level 5: Project consultant, alignment with the organization's strategy
6. Level 6: Reward system
7. Level 7: Support and commitment of senior management

Table 5. Ranks and final weights of indicators

The weight of indicators	Indicator	Rank
0/223	Support and commitment of senior management	1
0/201	Training and evaluation	2
0/159	Using lean concepts and techniques	3
0/105	Kaizen team	4
0/095	Employee participation	5
0/063	Project consultant	6
0/049	Reward system	7
0/038	Lean suppliers	8
0/034	Alignment with the organization's strategy	9
0/024	Effective communication	10
0/009	Pure customers	11

Based on the scores of influence and dependence, reward system, effective communication, kaizen team, lean customers and lean suppliers were placed in region 1; The use of lean concepts and techniques and employee participation were placed in the 2nd district; Training and evaluation and alignment with the organization's strategy were placed in the 3rd area, and project consultant and senior management support and commitment were placed in the 4th area. Based on this, it can be said that training and evaluation and alignment with the organization's strategy, project consultant and support and commitment of senior management are key variables and should be emphasized more.

Question 2: How is the Prioritization of the Key Success Factors of Lean Production with the OPA Approach?

Based on the results of the OPA technique, indicators of “support and commitment of senior management, training and evaluation, use of lean concepts and techniques, Kaizen team, employee participation, project consultant, reward system, lean suppliers, alignment with the organization's strategy, effective communication and lean customers” They ranked 1 to 11 respectively.

PRACTICAL SUGGESTIONS

1. Considering the important role of training and evaluation in the success of lean production, it is suggested to help empower employees by allocating more funds to training. In this regard, techniques such as superteams can also be used.
2. According to the index of the use of lean concepts and techniques, the following are suggested: the use of quality control circles, superteams, and statistical process control (sample average control chart, P chart, C chart, process capability measurement) error warning mechanisms, self-control is recommended. Since the ultimate goal of comprehensive quality management is continuous improvement, in order to create an environment for (continuous) improvement in the organization, the organization's management and employees must be classified into the categories of continuous improvement; It means that they should pay much attention to the acceptance of the philosophy of improvement, common thinking and group cooperation in the organization, and this requires culture building and the participation of the employees of the organization. In order to improve the teamwork situation, it is suggested to increase the level of convergence and coordination between managers, supervisors and employees in different departments and to encourage and support teamwork.
3. Considering the importance of the project consultant among the key success factors of lean production, it is suggested that when the organization intends to implement the concepts of lean production, it should use the project consultant of lean production. The opinions of the project consultant can be used in matters such as training, determining policies, goals and strategy of the organization, designing the reward system, etc.
4. Paying attention to the effectiveness of human resources management in the implementation of the lean production model: it is suggested to managers to use methods such as multi-tasking employees, job rotation, in-service training, creation of suggestions committees, use of motivational systems, participation of employees and work teams. Use lean production methods in their companies.
5. It is suggested to use techniques and concepts such as simultaneous engineering (simultaneous participation of customers, suppliers and different functional areas of the organization in the product design process that leads to innovation), system focus (forming a team consisting of managers, Engineers and scientists who come together with the aim of converting theoretical results into practical functions), expansion of quality functions, Taguchi, analysis of failure effects, value engineering can be used.
6. Considering the necessity of communication with customers in the application of lean production, managers are suggested to implement lean production in their companies by communicating with customers, focusing on customer needs and receiving feedback from customers. It is also recommended to identify the organization's key customers and make

necessary plans to meet their requirements. For this purpose, to form an expert team equipped with technical and business skills, which leads to innovation and high standards of customer service.

7. It is suggested to apply the lean production model in the company by using methods such as the relationship between the organization and the suppliers, the stability of the cooperation with the suppliers and the evaluation of the suppliers.

Author Contributions

Conceptualization, AR and JA; methodology, JA and MT; software, AR and MT; validation, JA and MT; formal analysis, AR and JA; investigation, JA and MT; resources, AR and MT; data curation, JA and MT; writing—original draft preparation, JA and MT; writing—review and editing, AR and JA; visualization, AR and JA; supervision, JA and MT; project administration, AR and MT. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare no conflict of interest.

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