

# Implementation of Lean Production Principles and Its Relationship with Performance in Small and Medium-Sized Food Industry Enterprises in Khuzestan Province, Iran

M. Molla<sup>1</sup>, E. Abbasi<sup>1\*</sup>, S. Choobchian<sup>1</sup>, and S. D. Haji Mirrahimi<sup>2</sup>

## ABSTRACT

Lean production system is a new management approach and a business strategy that results in the elimination of waste (costs and time) and improvement of the performance and overall value of an organization. The main objective of this study was to investigate factors influencing implementation of Lean Production Principle (LPP) and its relation with the performance of Small and Medium-sized Food Industry Enterprises (SMFIEs) in Khuzestan Province. This study was a kind of descriptive-correlation and causal-relation that was conducted through a survey technique. Statistical population of the study consisted of all managers in Small and Medium Enterprises (SMEs) in Khuzestan food industry (N= 307). By using Krejcie and Morgan's tables and stratified random sampling method, 170 person were selected as sample, of which 161 person completed the research questionnaires (return rate 94.7%). The results show that among the eight factors that influence the implementation of LPP, three variables of "customer relationship management", "human resource management", and "employees' empowerment" have the most direct effects on LPP and, ultimately, the highest total effect on SMFIEs performance. The implementation of LPP could explain about 31 percent of variances in SMFIEs performance. Conducting justification and education workshops not only enhances the knowledge of SMFIEs managers, but also helps implement the LPP and, subsequently, improves the performance of SMFIEs.

**Keywords:** Customer relationship management, Employees' empowerment, Human resource management.

## INTRODUCTION

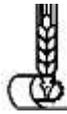
Small and medium enterprises (SMEs) play a crucial role in the growth and development of the economy through generating employment opportunities, reducing regional imbalances, industrialization of rural and backward areas and assuring equitable distribution of resources (Ali, 2016). Manufacturing SMEs are important for a nation's economy. On average, SMEs contribute 42% to a country's gross domestic product and provide work for 54% of its labor

force. However, many SMEs struggle to survive (Beck *et al.*, 2005; Armstrong, 2013; Knol *et al.*, 2018). These enterprises (SMEs) are the backbone of the Asian economy. They make up more than 98% of all Asian businesses that provide two out of three private sector jobs in the region. Therefore, it is vitally important for Asia's economic success to have fully functioning support measures for SMEs (Yoshino and Taghizadeh Hesary, 2016). Meanwhile, in most countries in the world, SMEs face similar problems, such as lack of economic knowledge, weak management experience, inability to influence

<sup>1</sup> Department of Agricultural Extension and Education, College of Agriculture, Tarbiat Modares University (TMU), Tehran, Islamic Republic of Iran.

<sup>2</sup> Imam Khomeini Higher Education Center, Karaj, Islamic Republic of Iran.

\*Corresponding author, e-mail: enayat.abbasi@modares.ac.ir



environmental change and high vulnerability. From this perspective, the limitation of financial resources in comparison with large companies, the weakness in the provision and maintenance of efficient human resources and lack of mercenary and supportive institutions for marketing and export are the common problems of these firms (Ali Mirzaei *et al.*, 2011).

Globalization and emerging technologies have enormous impacts on the manufacturing industry around the world. This scenario has increased new entrances to the market environment and prompting stiff competition in the market place (Achanga *et al.*, 2006; Punnakitikashem *et al.*, 2013). Competition between manufacturing enterprises has caused challenges for most of the enterprises to adopt modern production techniques and tools (Kafuku, 2019). Seeking globalization and competitiveness between enterprises markets are also changing rapidly with customers demanding. In fact, customers look for high quality and variability products at substantially lower prices. Furthermore, cost pressures caused by energy, materials, labor costs and many other factors increased continuously (Simões, 2008). Meeting the challenges of worldwide competition in manufacturing or services requires operating policies, practices, and systems that eliminate waste and create competitive value for the end-use customers. It is also a crucial tactic and requirement for manufacturing companies, in the 21st century, to recognize the need of operational flexibility and managing time performance (by shortening the new product development cycle) to improve and gain a competitive advantage that is a constantly moving target in today's turbulent environment (Simões, 2008). Implementing LPP helps companies to achieve this competitive advantage.

Today's competitive environment has created many changes in organizations and production systems. In this environment, companies need to offer products to consumer markets with better quality, more variety, lower prices and lesser production costs. Lean production is the solution. The birthplace of lean production is Toyota

Corporation in the island of Nagoya, Japan. In the 1950s, Eiji Toyoda with company engineer (Taiichi Ohno) traveled to America and visited Ford Motor Company and concluded that the principles of mass production are not implementable in Japan, because this system is full of dissipation. On this basis, they created a new method, which was later named "lean" (Krafcik, 1988). Lean production has been defined as doing more with less (Womack *et al.*, 1990). In its simplest terms, lean production can be described as the elimination of waste (Liker, 2004). It was, however, Womack and Jones (1996) who provided the world with a vision of what lean is about, and summarized lean thinking based on five principles: (1) Precisely specify value by specific product; (2) Identify the value stream for each product; (3) Make value flow without interruptions; (4) Let the customer pull value from the producer; and (5) Pursue perfection (Powell *et al.*, 2013). The ultimate goal of a lean organization is to create a smooth and high quality process that is able to produce finished products and provide service to satisfy customers' demand with no waste (Zhou, 2016; Jani, 2018).

Recent studies show that SMEs development is closely linked with growth (Beck *et al.*, 2005). As the world economies are recovering from the financial crisis of 2008-2009, many economies urgently need to create employment opportunities for their citizens. In this respect, creation and growth of SMEs is an important idea due to significant contributions by SMEs to employment (Ardic *et al.*, 2011).

In Iran, SMEs have only four percent of the total number of enterprises and create almost 15.5 percent of national employment. However, large enterprises constituting 13 percent of total enterprises contribute to 0.2 percent of national employment. Growth in the context of employment by SMEs over the 10-year period from 1996 to 2006 was approximately 0.60 percent across the board (Farsi and Toghræe, 2014). According to Iran's Statistics Center (2014), industrial SMEs of all provinces are almost equal in

terms of compensation for annual services, but they differ in terms of productivity. Productivity of industrial SMFIEs is lower in Khuzestan province than in other provinces. The field of activity for SMEs is numerous. Almost 19.73% of the country's SMEs operate in the food and beverage industries. In fact, this industry ranks second after the production of other non-metallic mineral products, in terms of the major activity of industrial SMEs, indicating the importance of the food and beverage industries throughout the country's industry (Iran's Statistics Center, 2014). SMFIEs face with different challenges such as limited access to finance, lack of databases, low R&D costs, low financial participation, high production costs, low standard and quality of production, inadequate packaging of manufactured products, weak transport system and poor commercial laws and regulations. These challenges lead to slow growth of these enterprises and need to be addressed by planners and policy makers (Amin Bidakhti and Zargar, 2011). By identifying and eliminating waste and improving production and customer-centric processes, a lean production system can lead to increased productivity in SMFIES. There are different researches about the implementation of LPP. To see all the details in one glance, these lean-focused scholarly papers are summarized in Table 1.

There is no consensus in previous studies on the main factors influencing implementation of LPP. Although certain factors including standardization, ongoing training, teamwork, participation and empowerment, versatility, commitment to company values, and contingent rewards, promoting flexibility and versatility, investing in training, and committing to variable compensation are suggested by different authors (Olivella *et al.*, 2008; Martínez-Jurado *et al.*, 2014). In general, based on previous studies, it is possible to discover elements that need to be considered more closely in order to succeed in implementing the LPP in SMFIEs. In the present study, these factors are adopted from

the conceptual model of lean production implementation of Roslin *et al.* (2014) and included management commitment, employee empowerment, employee involvement, teamwork, human resource management, customer relationship management, supplier relationship management and use of information technology. In Table 2 these variables and their definitions are presented (Figure 1).

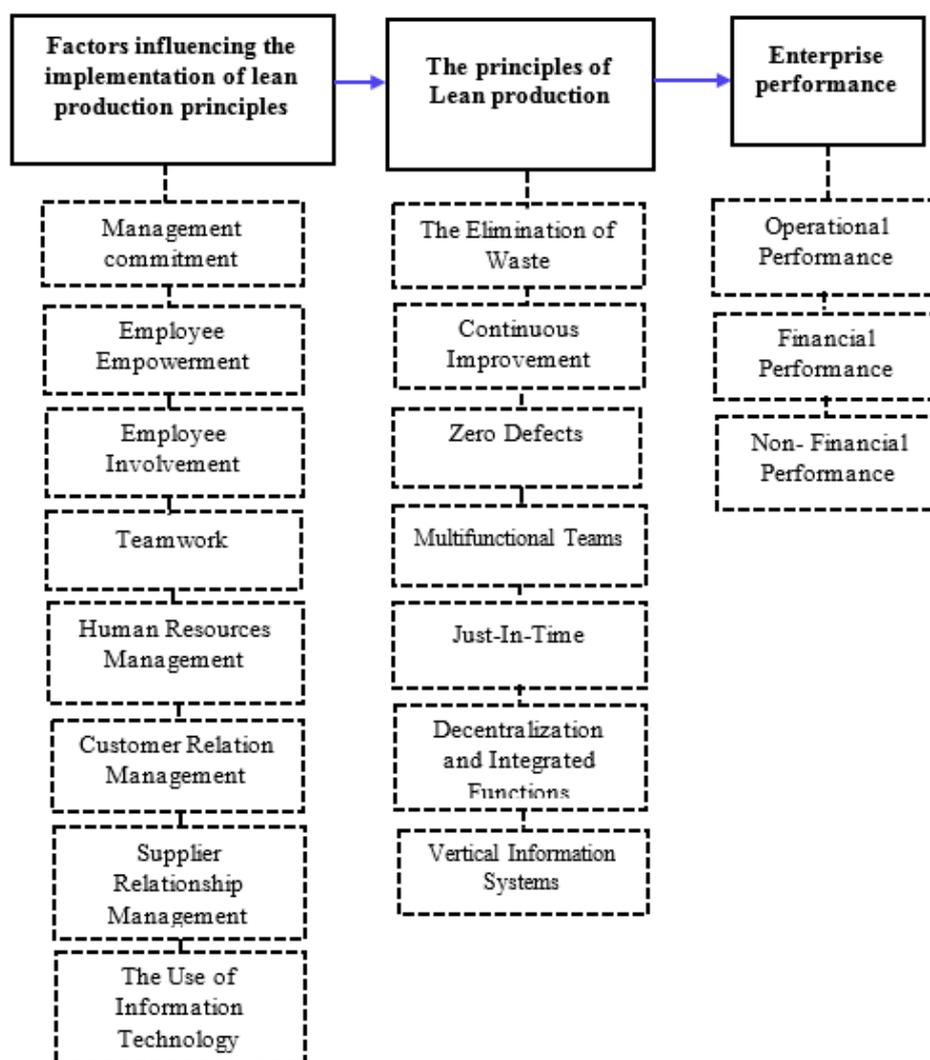
Based on the aforementioned reviews and theoretical framework of the research, the present study attempted to investigate the factors affecting implementation of the LPP and its relationship with the performance of SMFIEs in Khuzestan Province. To achieve this goal, the research objectives included determining the correlation between research variables and causal analysis of the effect of research variables on the SMFIEs performance.

## MATERIALS AND METHODS

This study was a non-experimental research with an applied purpose. In terms of the time of the data collection, it was a cross-sectional survey and a quantitative research considering the nature of the data. Moreover, it was a descriptive-correlation and causal relationship research in terms of the method of data analysis. The statistical population of the present study included 307 managers of SMFIEs in Khuzestan Province. Out of them, 27 managers were from medium-sized enterprises and 280 from small food enterprises. The sample size was estimated as a total number of 170 individuals, using Krejcie and Morgan's (1970) sample Table. The sampling method used was stratified random sampling with proportional assignment. For sampling, the cities of Khuzestan Province were firstly classified in five directions: north, south, east, west and center. From each of these categories, three cities with the largest number of SMEs were selected. These cities were Andimeshk, Dezful and Shoosh (north), Behbahan, Abadan and Mahshahr (south),



Izeh, Malek Garden and Ramhormoz (east),



**Figure 1.** Theoretical framework of the research (Adopted from: Roslin *et al.*, 2014).

Khorramshahr, Hoveizeh and Azadegan Plain (West) and Ahvaz, Shoshtar, and Masjed Soleyman (center). Questionnaire was the main tool for data gathering. The content and face validity of the research tool was confirmed by a panel of agricultural extension and education experts as well as experts and managers of the SMFIEs; and based on their opinions, the necessary amendments were made to the questionnaire. The Cronbach's alpha coefficient was also employed to determine the reliability of the study scales.

Then, Cronbach's alpha value for each of the scales was calculated (Table 2). The values of the table indicate that the reliability of the questionnaire was acceptable for conducting the research (Habibpour Gatabi and Safari Shali, 2010). The SPSS was also employed for data analysis. The statistical methods used to analyze the data included some descriptive statistics (frequency, mean, etc.) and inferential statistics (correlation test and path analysis).

**Table 1.** Summarized lean-focused scholarly papers.

| Title   | Author(s)                         | Result(s)  |
|---|-----------------------------------|--|
| Lean production implementation in Malaysian Automotive Industry   | Nordin <i>et al.</i> , 2010       | Malaysian automotive industry spends more attentions and resources in internal areas such as firms' operation and management, compared to external relationships with suppliers and customers.   |
| The application of lean production and its impact on operational performance and critical success factors in SMEs in the food industry. | Dora <i>et al.</i> , 2013         | The application of lean manufacturing practices in food SMEs is still at its infancy. Food processing SMEs place more emphasis on food safety than on process improvement methods. The respondents also indicated that the application of lean manufacturing improves operational performance, especially, productivity and quality. |
| Providing a conceptual model for full-blown implementation of lean manufacturing system in Malaysian automotive industry.               | Roslin <i>et al.</i> , 2014       | The current level of the implementation of lean production system in Malaysia is discussed. The suggested model is expected to contribute as a comprehensive guideline for lean manufacturing system implementation within an organization.  |
| Application of lean manufacturing tools in the food and beverage industries.  | Borges Lopes <i>et al.</i> , 2015 | Several improvements could be found on implementing LPP and tools, e.g., improving production flexibility, increasing employee engagement, and motivating a continuous improvement culture.  |
| Lean implementation within SMEs: A literature review.   | Hu <i>et al.</i> , 2015           | Successful adoption of lean practices within a SME could depend on the prevalence of customer satisfaction within SMEs. Their suggested model provides a good basis for raising awareness for SMEs wishing to implement lean practices.  |
| Lean production assessment in a sugarcane agribusiness: A case study in Brazil  | Satolo <i>et al.</i> , 2016       | It is identified that the organization has a satisfactory performance on lean principles, especially the support given by the technical and applied tools, which support the processes and problem solving categories.   |
| Lean Adoption in a small and medium enterprise: Model validation.   | Deranek <i>et al.</i> , 2017      | Commitment of leadership and management, the skills and expertise of employees, organizational culture, and financial awareness are four vital principles for the successful adaptation of lean practices within the SMEs.   |
| moderating international environment hostility between international corporate entrepreneurship and halal food industry                 | Akbari <i>et al.</i> , 2019       | It is theorized how and when organizational preparedness for corporate entrepreneurship and international entrepreneurship activities could help implementation of lean principles and, consequently, enhance Iranian food industry financial and innovative performance   |
| Organizational preparedness for corporate entrepreneurship performance in Iranian food industry   | Akbari <i>et al.</i> , 2020       |  |

## RESULTS AND DISCUSSION

Based on the results of descriptive statistics, 92.5% of the respondents were male and 46.6% were in the range of 39 to 52 years old. Also, 47.2% of the respondents had less than 17 years of experience, 40.4% of them had a bachelor's degree, and 82% of the respondents had not participated in management training courses. Besides, 66.5% of the studied companies had more than 10 years of experience, and 88.2% of these companies were small enterprises. Also, 72 percent of companies had fewer than 34 employees and 82% of the respondents did not have enough information about the lean production system.

### Matrix of Correlation Coefficients between Main Variables of the Research

Correlation matrix was used to determine the relation between the main variables of the research (Table 3). The results showed that there were positive and significant correlation between management commitment, empowerment of employees, employee participation, teamwork, human resource management, and customer relationship management with implementing the LPP and performance. The relationship between two variables (supplier relationship management and use of information technology) with LPP and performance was not significant. The results showed that there was a positive and significant relationship between management commitment and implementation of LPP. Findings of researchers such as Zhavah Tash and Kabaranzad Ghadim (2014), Seyyed Hosseini and Bayat Turk (2005), Knol *et al.* (2018), Alefari *et al.* (2017), and Godinho Filho *et al.* (2016) confirm this finding. According to the findings, there is a positive and significant relationship between staff empowerment and implementation of LPP. The result is that the more capable employees are in performing different tasks, identifying and solving problems, they can better learn and apply the principles of lean

production. This result is in line with the finding of Alefari *et al.* (2017). There was a positive and significant relationship between staff participation and implementation of LPP. In fact, the more employees are involved in the decisions of the company and the manager uses their ideas properly, the more likely they are to implement the LPP. The results are in line with the findings of previous studies (Alefari *et al.*, 2017; Godinho Filho *et al.*, 2016). There was a significant positive relationship between customer relationship management and implementation of the LPP. This result is in line with the results of Feghhi Farahmand (2017), Godinho Filho *et al.* (2016), and Knol *et al.* (2018). Direct Effect of Implementation of LPP and Indirect Effect of Factors Affecting Its Implementation

To better understand the effect of the independent variables on the dependent variable, the research variables are denoted by Latin letters in Figure 2.

In this section, in order to calculate the direct effect of the LPP on performance, the LPP as the independent variable and the variable of performance as a dependent variable were entered into regression analysis using enter method; and the effect of the LPP on performance was measured (Tables 4, 5, and 6). Then, to calculate the indirect effect of factors influencing the implementation of the LPP on performance, it is necessary to calculate the beta value for the two paths. The first path direct effect of LPP on performance and the second path direct effect of factors affecting the implementation of LPP on LPP. The factors influencing the implementation of LPP are management commitment, employee empowerment, employee participation, teamwork, human resource management, and customer relationship management. These factors only have an indirect impact on the performance variable, and the LPP variable has only a direct effect on performance. Based on the results of Table 6, the variables of customer relationship management, human resource management, and empowerment of employees have the

**Table 2.** Research variables, their definitions, sample items and Cronbach's alpha.

| Components                                  | Variables                        | Definition   | Reference(s)   | Sample item  | items  | Cronbach's Alpha |             |
|---|----------------------------------|--|--|--|--|------------------|-------------|
| Factors affecting the implementation of LPP | Management commitment            | Commitment of management to financial support, encouragement, active participation, and monitoring of lean invention.  |  | In this company, the employees work in accordance with their competence and skills.                    | 7  | <b>0.70</b>      |             |
|   | Employee empowerment             | The ability to solve problems and the ability to perform various tasks in employees.   |  | The company's employees are continuously analyzing their work process and doing things in better ways. | 5  | <b>0.77</b>      |             |
|   | Employee involvement             | Employees contribute to all programs and activities that help to improve the company's work procedure and production.  |  | Employees are involved in the company's decisions.   | 3  | <b>0.68</b>      |             |
|   | Teamwork                         | Teamwork means that the company's employees have the ability to do group work.   | Achanga <i>et al.</i> , 2006; Boyer, 1996;             | The employees of this company prefer group interests to individual interests.                          | 3  | <b>0.83</b>      |             |
|   | Human resources management       | Improving the relationship between the employees and between herself/himself and the employees.  | Dora, 2014   | Every employee has a clear understanding of their job description.                                     | 5  | <b>0.76</b>      |             |
|   | Customer relation management     | Close customer contact, customer visits to the company, and customer participation in presenting current and future products of the company.   | Drew <i>et al.</i> , 2004; Roslin <i>et al.</i> , 2014 | The company welcomes customers' ideas in determining the future products.                              | 6  | <b>0.72</b>      |             |
|   | Supplier relationship management | Close contact with the supplier, visiting of suppliers from the company, providing feedback on product quality, supplier participation in creating a quality and appropriate product, etc. |  | We give feedback to our suppliers on quality and performance.  | 3  | <b>0.68</b>      |             |
|   | Use of information technology    | Use of equipment and devices to access information at all stages of production electronically and to activate the internet and the company's site.   |  | The company has equipped systems that provide information to employees on various production lines.    | 3  | <b>0.80</b>      |             |
|   | The LPP                          | Elimination of waste   | Identification and minimizing the waste.               |  | Employees identify and eliminate any additional processes, activities or costs that do not add value to the product. | 3                | <b>0.84</b> |

Table 2, continued...

**Continued of Table 2.** Research variables, their definitions, sample items and Cronbach's alpha.

| Components  | Variables                                 | Definition  | Reference(s)                | Sample item   | items | Cronbach's Alpha |
|-------------|---|---|-----------------------------|---|-------|------------------|
| Performance | Continuous improvement<br>Zero defects    | Engaging employees in lifelong learning process.<br>Preventing the production of defective products.          |                             | The company's employees are continuously reviewing and improving work processes<br>The manager and employees of the company strive to perform their duties with minimal or even no defects. | 3     | <b>0.88</b>      |
|             | Multifunctional teams                     | A number of employees who have the ability to perform different tasks together.                               |                             | In the company, there are groups of people with different specialties who deal with the problems that arise in each part of the production process.   | 3     | <b>0.89</b>      |
|             | Just-in-time delivery                     | Transferring of high responsibility to workers who are truly valuable.  |                             | In the company, time gap between product production and its delivery is short.  | 3     | <b>0.74</b>      |
|             | Decentralization and integrated functions | Reducing the hierarchical level in an organization.   |                             | In the company, more responsibilities and supervision are assigned to multifunctional teams.  | 3     | <b>0.67</b>      |
|             | Vertical information systems              | Sharing information through organization in a timely manner.  |                             | Our company makes the necessary decisions at the right time by receiving feedback from customers.   | 3     | <b>0.80</b>      |
|             | Operational performance                   | Alignment of all SMEs units to ensure that they are working together to achieve core business goals.          |                             | Reducing the product production time cycle is the basis of all employee activities in the company.  | 5     | <b>0.71</b>      |
|             | Financial performance                     | A subjective measure of how well SMEs can use assets from its primary mode of business and generate revenues. | Roslin <i>et al.</i> , 2014 | The company's revenue has grown in recent years.  | 4     | <b>0.90</b>      |
|             | Non-financial performance                 | Contained in SMES refer to customer equality, internal processes and people measurement perspectives.         |                             | The company strives to develop new products/ services.  | 4     | <b>0.67</b>      |

**Table 3.** Correlation coefficients between variables.

|                                  | Management commitment | Employee empowerment | Employee involvement | Teamwork         | Human resources management | Customer relation management | Supplier relationship management | Use of information technology | LPP              | Performance |
|----------------------------------|-----------------------|----------------------|----------------------|------------------|----------------------------|------------------------------|----------------------------------|-------------------------------|------------------|-------------|
| Management commitment            | 1                     |                      |                      |                  |                            |                              |                                  |                               |                  |             |
| Employee empowerment             | 0.392**<br>0.000      | 1                    |                      |                  |                            |                              |                                  |                               |                  |             |
| Employee involvement             | 0.344**<br>0.000      | 0.498**<br>0.000     | 1                    |                  |                            |                              |                                  |                               |                  |             |
| Teamwork                         | 0.287**<br>0.000      | 0.505**<br>0.000     | 0.489**<br>0.000     | 1                |                            |                              |                                  |                               |                  |             |
| Human resources management       | 0.533**<br>0.000      | 0.446**<br>0.000     | 0.565**<br>0.000     | 0.412**<br>0.000 | 1                          |                              |                                  |                               |                  |             |
| Customer relation management     | 0.249**<br>0.001      | 0.567**<br>0.000     | 0.403**<br>0.000     | 0.434**<br>0.000 | 0.394**<br>0.000           | 1                            |                                  |                               |                  |             |
| Supplier relationship management | 0.122<br>0.124        | -0.146<br>0.064      | 0.054<br>0.501       | -0.127<br>0.108  | 0.141<br>0.075             | -0.135<br>0.087              | 1                                |                               |                  |             |
| Use of information technology    | 0.099<br>0.212        | -0.016<br>0.839      | -0.013<br>0.871      | 0.070<br>0.379   | 0.024<br>0.761             | -0.104<br>0.188              | 0.168*<br>0.033                  | 1                             |                  |             |
| LPP                              | 0.335**<br>0.000      | 0.617**<br>0.000     | 0.416**<br>0.000     | 0.436**<br>0.000 | 0.552**<br>0.000           | 0.681**<br>0.000             | -0.079<br>0.323                  | 0.032<br>0.690                | 1                |             |
| Performance                      | 0.325**<br>0.000      | 0.472**<br>0.000     | 0.406**<br>0.000     | 0.410**<br>0.000 | 0.466**<br>0.000           | 0.539**<br>0.000             | -0.061<br>0.323                  | 0.049<br>0.690                | 0.556**<br>0.000 | 1           |

\*\* Significant at 0.05 error level.

**Table 4.** Standardized and unstandardized coefficients of factors affecting the implementation of LPP.

| Model                            | Unstandardized coefficient<br>B | Std error | Standardized coefficients<br>Beta | t      | Sig   |
|----------------------------------|---------------------------------|-----------|-----------------------------------|--------|-------|
| (Constant)                       | 22.303                          | 3.541     | -                                 | 6.299* | 0.000 |
| Management commitment            | 0.032                           | 0.182     | 0.011                             | 0.174  | 0.862 |
| Employee empowerment             | 0.865                           | 0.223     | 0.279                             | 3.886* | 0.000 |
| Employee involvement             | -0.580                          | 0.342     | -0.116                            | -1.693 | 0.093 |
| Teamwork                         | 0.299                           | 0.282     | 0.068                             | 1.060  | 0.291 |
| Human resources management       | 1.096                           | 0.250     | 0.316                             | 4.387* | 0.000 |
| Customer relationship management | 0.791                           | 0.139     | 0.375                             | 5.691* | 0.000 |

**Table 5.** Analysis of direct and indirect effects of independent variables on performance.

| Row | Independent variable                      | Type of effect  | path         | Effect based on beta coefficients | Total direct and indirect effect |
|-----|---|-----------------|--------------|-----------------------------------|----------------------------------|
|     |   | Direct effect   | _____        | _____                             |                                  |
|     |   |                 | X1 → X7 → X8 | $0.011 \times 0.556 = 0.006$      | 0.006                            |
|     |   |                 | X2 → X7 → X8 | $0.279 \times 0.556 = 0.155$      | 0.155                            |
| 1   | Factors influencing implementation of LPP | Indirect effect | X3 → X7 → X8 | $0.116 \times 0.556 = -0.064$     | 0.064-                           |
|     |   |                 | X4 → X7 → X8 | $0.068 \times 0.556 = 0.037$      | 0.037                            |
|     |   |                 | X5 → X7 → X8 | $0.316 \times 0.556 = 0.175$      | 0.175                            |
|     |   |                 | X6 → X7 → X8 | $0.375 \times 0.556 = 0.208$      | 0.208                            |
| 2   | The LPP                                   | Direct effect   | X7 → X8      | 0.556                             |                                  |
|     |   | Indirect effect | _____        | _____                             | 0.556                            |

**Table 6.** Analysis of direct and indirect effects on performance.

| Row | Variables                             | Direct effects | Indirect effects | Correlation coefficient | Total causative effects | Total non-causative effects |
|-----|---------------------------------------|----------------|------------------|-------------------------|-------------------------|-----------------------------|
| 1   | Management commitment (X1)            | -              | 0.006            | 0.325**                 | 0.006                   | 0.319                       |
| 2   | Employee empowerment (X2)             | -              | 0.155            | 0.472**                 | 0.155                   | 0.317                       |
| 3   | Employee involvement (X3)             | -              | -0.064           | 0.406**                 | 0.064                   | 0.342                       |
| 4   | Teamwork (X4)                         | -              | 0.037            | 0.410**                 | 0.037                   | 0.373                       |
| 5   | Human resources management (X5)       | -              | 0.175            | 0.466**                 | 0.175                   | 0.291                       |
| 6   | Customer relationship management (X6) | -              | 0.208            | 0.539**                 | 0.208                   | 0.331                       |
| 7   | LPP (X7)                              | 0.556          | -                | 0.556                   | 0.556                   | 0                           |

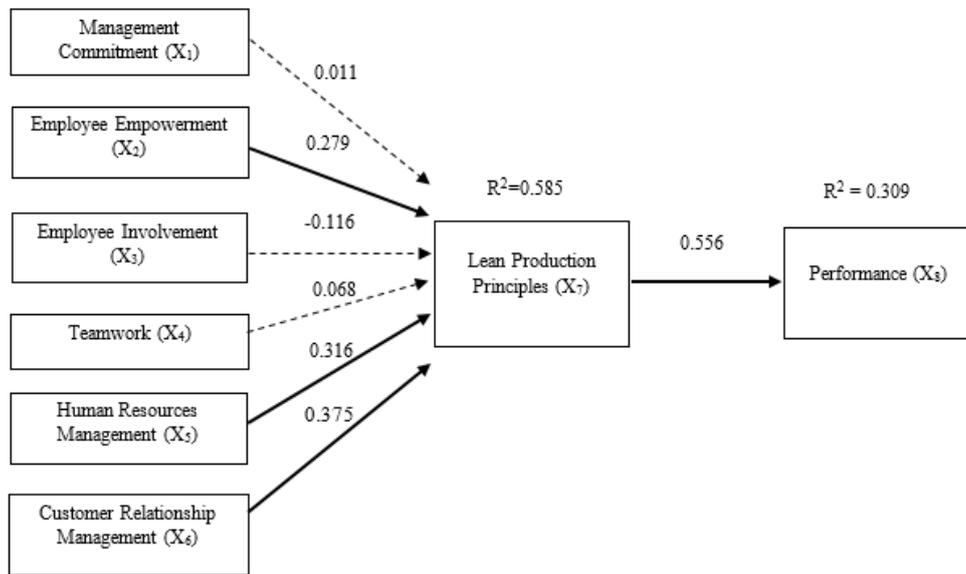


Figure 2. Causal analysis model of the effect of research variables on the performance.

most total effects on performance, respectively. It should be mentioned that other key lean "supplier relation management" and "use of information technology" practices were omitted from the rest of the study due to the statistically not significant relationship. The results showed that there were significant and positive relationship between the two variables of factors influencing the implementation of LPP and the LPP with performance. Also, the LPP had the most direct effect on performance and the variable of factors influencing the implementation of LPP had the most indirect effect on performance.

Our research results show that among the eight factors that influence the implementation of the LPP three factors of customer relationship management, human resource management and employees' empowerment, have the most direct and indirect effects on the LPP and, ultimately, enterprises performance, respectively (Figure 2). This result indicates the

important role of capable employees and paying attention to the customer expectations in achieving the goals of SMEs. Employee empowerment, in turn, can provide the basis for their active participation, doing teamwork, as well as more attention of management to fulfill their commitments. The outcomes of this study are consistent with the findings of previous studies (Yadav *et al.*, 2019; Panwar *et al.*, 2018; Bevilacqua *et al.*, 2017; Belekoukias *et al.*, 2014; Alcaraz *et al.*, 2014; Dora *et al.*, 2014; Wiengarten *et al.*, 2015).

## CONCLUSIONS

This study clearly demonstrates that it would be impossible to implement a lean production system without paying attention to the factors affecting it. According to the theoretical framework of the research, several factors affect the implementation of LPP. These factors include management commitment, employee empowerment,

employee involvement, teamwork, human resources management, customer relationship management, supplier relationship management and the use of technology information. Among these variables, two variables of customer relationship management and supplier relationship management do not have relationship with the intermediate dependent variable, implementing LPP. The remaining five factors could explain 58.5 percent of changes in LPP. Also, the LPP explains about 31 percent of variances in SMFIEs performance. Among the factors affecting LPP, three variables of customer relationship management, human resources management, and employee empowerment have the most total effect on FISMEs performance, respectively. Also, these variables have the most indirect and correlation with the performance. Despite the existence of an acceptable correlation between other variables (Management commitment, employee involvement, and teamwork) and performance, the effect of these variables on performance becomes somewhat weaker in the analysis in which the effect of other variables are included. In the model, only one variable directly affected the performance of SMEs, LPP. This variable could effectively affect the performance. The high value of total non-causative effects of the variables (Table 6) show that, despite high correlation between these variables and performance, they cannot affect performance. This issue can be investigated in the future research with more and different variables. It is worth noting that lean production in the Iran's agricultural sector in general, and the food industry in particular, is a new issue. Fortunately, although most managers of SMEs do not have enough knowledge about it, but they have followed the principles of lean production on a small scale in their companies. Therefore, by conducting workshops, positive actions can be taken to better implement these principles and help managers to improve their SME's performance. As with other studies, this

study also had limitations that may affect the generalizability of the findings. The first limitation of the study was to investigate a limited number of variables affecting the implementation of LPP as well as performance. The second limitation was the insignificant effects of the two key lean implementation factors (supplier relationship management and using information technology), which were omitted from the examination. This may be due to the low use of information technology in FISMEs, which also leads to little communication with suppliers. This issue needs further investigation in the future research. The third limitation of the study were the SME's managers, who, in some cases, refused to provide information about their company because of the confidentiality. Also, the limited information of SMFIEs managers on lean production may lead to inaccurate responses.

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#### REFERENCES

1. Achanga, P., Shehab, E., Roy, R. and Nelder, G. 2006. Critical Success Factors for Lean Implementation within SMEs. *J. Manuf. Technol. Manag.*, **17(4)**: 460-471.
2. Akbari, M., Danesh, M., Dolatshah, P. and Khosravani, A. 2019. Moderating International Environment Hostility between International Corporate Entrepreneurship and Halal Food Industry. *J. Agr. Sci. Tech.*, **21 (3)**:545-560.
3. Akbari, M., Sakhdari, K. and Danesh, M. 2020. Organizational Preparedness for Corporate Entrepreneurship Performance in Iranian Food Industry. *J. Agr. Sci. Tech.*, **22 (2)**:361-375.



4. Alcaraz, J. L. G., Maldonado, A. A., Iniesta, A. A., Robles, G. C. and Hernández, G. A. 2014. A Systematic Review/Survey for JIT Implementation: Mexican Maquiladoras as Case Study. *Comput. Ind.*, **65**: 761–773.
5. Alefari, M., Salonitis, K. and Xu, Y. 2017. The Role of Leadership in Implementing Lean Manufacturing. *Procedia CIRP*, **63**, 756-761.
6. Ali, J. 2016. Performance of Small and Medium-Sized Food and Agribusiness Enterprises: Evidence from Indian Firms. *Int. Food Agribus. Manag. Rev.*, **19** (4): 53-64.
7. Ali Mirzaei, A., Asadi, A. and Tahmasebi, M. 2011. Barriers to the Development of Small and Medium Rural Entrepreneurship Enterprises in Khuzestan Province (Case Study: Dates Supplementary Industries). *Journal of Entrepreneurship Development*, **3**(12): 165-184. (in Persian)
8. Amin Bidokhti, A. A. and Zargar, S. M. 2011. Investigating Barriers of Development of Small and Medium Enterprises (SMEs) and Providing a Framework for Supporting These Enterprises. *Work and Society*, **38**:34-48. (in Persian)
9. Ardic, O. P., Mylenko, N. and Saltane, V. 2011. "Small and Medium Enterprises: A Cross-Country Analysis with a New Data Set. The World Bank.
10. Armstrong, C. E. 2013. Competence or Flexibility? Survival and Growth Implications of Competitive Strategy Preferences among Small US Businesses. *Strateg. Manag. J.*, **6**(4): 377–398.
11. Beck, T., Demirguc-Kunt, A., and Levine, R. 2005. "SMEs, Growth, and Poverty: Cross-Country Evidence. *J. Econ. Growth*, **10**(3): 199-229.
12. Belekoukias, I., Garza-Reyes, J. A. and Kumar, V. 2014. The Impact of Lean Methods and Tools on the Operational Performance of Manufacturing Organizations. *Int. J. Prod. Res.*, **52**(18): 5346-5366.
13. Borges Lopes, R., Freitas, F. and Sousa, I. 2015. Application of Lean Manufacturing Tools in the Food and Beverage Industries. *J. Technol. Manag. Innov.*, **10**(3): 120-130.
14. Boyer, K. 1996. An Assessment of Managerial Commitment to Lean Production. *Int. J. Oper. Prod. Manag.*, **16** (9): 48-59.
15. Bevilacqua, M., Ciarapica, F. E. and De Sanctis, I. 2017. Lean Practices Implementation and Their Relationships with Operational Responsiveness and Company Performance: An Italian Study. *Int. J. Prod. Res.*, **55**(3): 769-794.
16. Deranek, K., Chopra, S. and Mosher, G. A. 2017. Lean Adoption in a Small and Medium Enterprise: Model Validation. *J. Technol. Manag. Appl. Eng.*, **33**(3): 2.
17. Dora, M., Kumar, M., Van Goubergen, D., Molnar, A. and Gellynck, X. 2013. Operational Performance and Critical Success Factors of Lean Manufacturing in European Food Processing SMEs. *Trends Food Sci. Tech.*, **31**: 156–164.
18. Dora, M., Van Goubergen, D., Kumar, M., Molnar, A., and Gellynck, X. 2014. Application of Lean Practices in Small and Medium-sized Food Enterprises. *Brit. Food*, **116**(1): 125–141.
19. Drew, J., McCallum, B. and Roggenhofer, S. 2004. *Journey to Lean: Making Operational Change Stick*. Palgrave Macmillan. McGraw-Hill, Gordonsville, VA, USA.
20. Farsi, J. Y. and Toghraee, M. T. 2014. Identification the Main Challenges of Small and Medium Sized Enterprises in Exploiting of Innovative Opportunities (Case Study: Iran SMEs). *J. Glob. Entrep. Res. (JGER)*, **4**(1): 4.
21. Fegghi Farahmand, N. 2017. A Model for Evaluating Lean Production in Small and Medium Industries Using a Combination of Confirmatory Factor Analysis, Clustering and LINMAP Techniques (Case Study of Small and Medium Industries of Basic Metals and Fabric). *Product. Manag.*, **40** (11): 221-258. (In Persian)
22. Godinho Filho, M., Ganga, G. M. D. and Unasekaran, A. 2016. Lean Manufacturing in Brazilian Small and Medium Enterprises: Implementation and Effect on Performance. *Int. J. Prod. Res.*, **54**(24): 7523-7545.
23. Habibpour Gatabi, K., and Safari Shali, R. 2010. *Comprehensive Manual for Using SPSS in Survey Research*. Loyeh Publication, Tehran. (in Persian)
24. Hu, Q., Mason, R., Williams, S. J., and Found, P. 2015. Lean implementation within SMEs: A literature review. *J Manuf Technol Mana.*, **26**(7): 980–1012.
25. Iran Statistic Center. 2014. *Statistical Year Book*. Iran. (in Persian).

26. Jani, S. Y. 2018. Development of Lean Practices Model for Small and Medium Scale Manufacturing Industries SMEs in Gujarat State. Unpublished thesis, CU Shah University.
27. Kafuku, J. M. 2019. Factors for Effective Implementation of Lean Manufacturing Practice in Selected Industries in Tanzania. *Procedia Manuf.*, **33**: 351-358.
28. Knol, W. H., Slomp, J., Schouteten, R. L. and Lauche, K. 2018. Implementing Lean Practices in Manufacturing SMEs: Testing 'Critical Success Factors' Using Necessary Condition Analysis. *Int. J. Prod. Res.*, 1-19.
29. Krafcik, J. F. 1988. Triumph of the Lean Production System. *Sloan Manag. Rev.*, **30(1)**: 41-52.
30. Krejcie, R. V. and Morgan, D. W. 1970. "Determining Sample Size for Research Activities. *Educ. Psychol. Meas.*, **30(3)**: 607-610.
31. Liker, J. K. 2004. *The Toyota Way: 14 Management Principles from The World's Greatest Manufacturer*. McGraw-Hill, New York.
32. Martínez-Jurado, P. J., Moyano-Fuentes, J. and Jerez-Gómez, P. 2014. Human Resource Management in Lean Production Adoption and Implementation Processes: Success Factors in the Aeronautics Industry. *Bus. Res. Q.*, **17(1)**: 47-68.
33. Mirzaei, P. 2011. *Lean Production: Introduction and Implementation Barriers with SMEs in Sweden*. Unpublished MSc. Thesis, School of Engineering, Jönköping, Sweden.
34. Netland, T. H. 2016. Critical Success Factors for Implementing Lean Production: The Effect of Contingencies. *Int. J. Prod. Res.*, **54(8)**: 2433-2448.
35. Nordin, N., Deros, B. M. and Wahab, D. A. 2010. A Survey on Lean Manufacturing Implementation in Malaysian Automotive Industry. *Int. J. Innov. Technol. Manag.*, **1(4)**: 374.
36. Olivella, J., Cuatrecasas, L., and Gavilán, N. 2008. Work Organization Practices for Lean Production. *J. Manuf. Technol. Manag.*, **19(7)**: 798-811.
37. Panwar, A., Jain, R., Rathore, A. P. S., Nepal, B. and Lyons, A. C. 2018. The Impact of Lean Practices on Operational Performance: An Empirical Investigation of Indian Process Industries. *Prod Plan Control*, **29(2)**: 158-169.
38. Powell, D., Riezebos, J. and Strandhagen, J. O. 2013. Lean Production and ERP Systems in Small and Medium-Sized Enterprises: ERP Support for Pull Production. *Int. J. Prod. Res.*, **51(2)**: 395-409.
39. Punnakitikashem, P., Buavaraporn, N. and Chen, L. 2013. An Investigation of Factors Affecting Lean Implementation Success of Thai Logistics Companies. In *24th POMS Annual Conference*, Thailand, PP. 1-10.
40. Roslin, E. N., Shahadat, S. A. M., Dawal, S. Z. M. and Mirmohammad Sadeghi, S. 2014. A Conceptual Model for Full-Blown Implementation of Lean Manufacturing System in Malaysian Automotive Industry. In *Proceedings of the 2014 International Conference on Industrial Engineering and Operations Management, Bali, Indonesia*. [Http://ieom.org/ieom2014.pdf](http://ieom.org/ieom2014.pdf). 292. Pdf (Accessed June 2 2014).
41. Satolo, E. G., de Moura Hiraga, L. E., Goes, G. A. and Lourenzani, W. L. 2016. Lean Production Assessment in a Sugarcane Agribusiness: A Case Study in Brazil. *Indep. J. Manag. Prod.*, **7(3)**: 937-952.
42. Seyed Hoseini S. M. and Bayat Tork, A. 2005. Lean Production Factors Assessment in Non-Continuous Production Organizations (A Case Study on Sadid Industry Group). *IQBQ*, **9(2)**:59-89 (in Persian)
43. Simões, V. 2008. *Critical Factors of Lean Implementation in Manufacturing Environments*. Unpublished Thesis, Engineering University of Porto.
44. Wiengarten, F., Gimenez, C., Fynes, B. and Ferdows, K. 2015. Exploring the Importance of Cultural Collectivism on the Efficacy of Lean Practices: Taking an Organizational and National Perspective. *Int. J. Oper. Prod. Manag.*, **35 (3)**: 370-391.
45. Womack, J. P., Jones, D. T. and Roos, D. 1990. *The Machine That Changed the World*. Reason Associates, New York.
46. Womack, J. P., and Jones, D. T. 1996. *Lean Thinking*. Simones and Schuster, New York.
47. Yadav, V., Jain, R., Mittal, M. L., Panwar, A. and Lyons, A. 2019. The Impact of Lean Practices on the Operational Performance of SMEs in India. *Ind. Manage. Data Syst.*, **119 (2)**: 317-330.
48. Yoshino, N. and Taghizadeh-Hesary, F. 2016. *Major Challenges Facing Small and Medium sized Enterprises in Asia and Solutions for Mitigating Them*. ADBI



- Working Paper 564. Asian Development Bank Institute, Tokyo. Available: <http://www.adb.org/publications/major-challenges-facing-small-and-medium-sized-enterprises-asia-and-solutions/>
49. Zhavah Tash, H. and Kabaranzad Ghadim, M. R. 2014. Investigating Factors Influencing Lean Production Implementation in Pars Khodro Company. *International Management Conference, Mobin Cultural Ambassadors Institute, Tehran*, [https://www.civilica.com/Paper-ICOM01-ICOM01\\_0983.html](https://www.civilica.com/Paper-ICOM01-ICOM01_0983.html). (in Persian)
50. Zhou, B. 2016. Lean Principles, Practices, and Impacts: A Study on Small and Medium-Sized Enterprises (SMEs). *Ann. Oper. Res.*, **241(1-2)**: 457-474.

## پیااده‌سازی اصول تولید ناب و ارتباط آن با عملکرد در شرکت‌های کوچک و متوسط صنایع غذایی استان خوزستان

م. ملا، ع. عباسی، ش. چوبچیان، و د. حاجی میررحیمی

### چکیده

نظام تولید ناب یک رویکرد جدید مدیریتی و یک راهبرد کسب و کار است که منجر به حذف زباله (هزینه و زمان) و بهبود عملکرد و ارزش کلی یک سازمان می‌شود. هدف کلی این مقاله بررسی عوامل مؤثر بر پیاده‌سازی اصول تولید ناب و ارتباط آن با عملکرد در شرکت‌های کوچک و متوسط صنایع غذایی استان خوزستان بود. پژوهش از نوع تحقیقات توصیفی - همبستگی و علی - ارتباطی بود که با استفاده از یک پیمایش میدانی انجام گرفت. جامعه آماری تحقیق مدیران شرکت‌های کوچک و متوسط صنایع غذایی استان خوزستان ( $N=307$ ) بودند که تعداد 170 نفر ( $n=170$ ) از آن‌ها با بهره‌گیری از جدول نمونه‌گیری کرجسی و مورگان و روش نمونه‌گیری تصادفی طبقه‌ای با انتساب متناسب انتخاب شدند که از این تعداد 161 نفر پرسشنامه‌ها را تکمیل کردند (نرخ بازگشت 94/7 درصد). با توجه به نتایج تحقیق، از بین هشت عامل مؤثر بر اجرای اصول تولید ناب، سه متغیر "مدیریت ارتباط با مشتری"، "مدیریت منابع انسانی" و "توانمندسازی کارکنان"، به ترتیب بیشترین تأثیر مستقیم را بر اصول تولید ناب و در نهایت بیشترین اثر را بر عملکرد این شرکت‌ها دارند. پیاده‌سازی اصول تولید ناب می‌تواند 31 درصد از تغییرات عملکرد شرکت‌های کوچک و متوسط صنایع غذایی را تبیین کند. برگزاری کارگاه‌های توجیهی و آموزشی، نه تنها منجر به تقویت دانش مدیران شرکت‌های کوچک و متوسط صنایع غذایی می‌شود، بلکه به اجرای اصول تولید ناب و همچنین بهبود عملکرد این شرکت‌ها کمک می‌کند.