THE EFFECT OF KNOWLEDGE MANAGEMENT ON LEAN PRODUCTION THROUGH THE MEDIATING ROLE OF EMPLOYEE PERFORMANCE

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ABSTRACT

The present study aims at investigating the effect of knowledge management (KM) on lean production through the mediating role of employee performance in two factories situated in Fars's Industrial Estate. Therefore, according to the study subject, the lean production method's variables are specified as KM and employee performance. The study is an applied research in terms of the objectives and it is carried out based on a descriptive-correlation method. The study population included 120 individuals out of whom 92 individuals were selected as the study sample volume. Convergent-construct validity test was used to determine the validity of the questionnaires used in the current research paper and combined technique and Cronbach's alpha test were applied to determine the reliability thereof. The study hypotheses were examined using structural equations model through adopting the partial least squares before which the goodness of fit was evaluated for the measurement model, structural model and the overall model. The obtained results signify that the proposed hypotheses are all confirmed.

Keywords: *Knowledge Management, Lean Production, Employee Performance.*

INTRODUCTION

At present, knowledge is being transformed into one of the main assets of the organizations that are seeking for competitive advantage in a dynamic market. Knowledge originates from the intra-organizational resources. Such resources incorporate information on the internal processes, projects, clients and shareholders and stakeholders. Business methods evolve in market variegations. In the today's market, many of the companies implement various projects to cope with these variable environments. Projects rake a large deal of intellectual knowledge that can be later on utilized by similar companies for increasing the value, competition and improving the performance of the prospective projects (Khalil Abady et al, 2016). On the other hand, nowadays, the manufacturing companies are under various pressures including customers' wants, in-time and less costly delivery, new product development and innovation, manufacturing of various types of products, zero deficits, product quality and sometimes even product customization. The lack of adherence to the standards and requirements can jeopardize the economy in such desirable markets. Considering the idea that the lean production can cause reduction in wastes and enhancement in productivity (De la Vega-Rodríguez et al, 2018) and also according to the fact that reduction in waste brings about an increase in productivity (Hadiyaty et al, 2018), the present study considers lean production as a way of elevating productivity and decreasing wastes and manufacturing corresponding to the client needs and,

finally, a way for proving persistence in the competitive world of today. Lean production is comprised of a collection of techniques that cause reduction in wastes if well pooled and implemented (Wilson, 2010); this is while the wastes are found produced by manufacturing activities that do not result in added value. The objective in lean production is increasing competition through making proper and on-time use of resources (Sergar et al, 2018). According to the importance of production management, the current research paper deals with KM and employee performance as factors influencing it.

The implementation of lean production systems is something beyond the redesigning of some manufacturing processes. Fundamental changes are to be created in the individual's knowledge otherwise they cannot last long. The majority of the lean production execution processes explain sequences of required works but they fall short of taking knowledge blending into consideration. Therefore, it is necessary to explicate the knowledge flow and the way it is described. Therefore, KM investigation and implementation in an organization should be dealt with. The western companies have not been able to acquire their expected outputs even with the lean production implementation and it took them years to figure out they have implemented the lean production principles in separate and not in an integrated manner following which the manufacturing companies endeavored to apply final production systems so as to gain more sustainable results. However, most of the implementations were not found accompanied by the expected results (Dambrosky et al, 2012).

Several authors have highlighted that many of the companies are concentrated on visible elements of lean production system (LPS) such as methods and instruments and tend to change their plans and processes while the vital factors related to the sustainability of lean production execution are more pertinent to the individuals connected with technology than the technology itself (Bouzdegan et al, 2000; Povansvaran, 2008). Generally, there are identified special requirements that should be consistent with PLS implementation. These requirements are: leadership, organizational culture, planning, organizational structure and knowledge of the production management system (Dambrosky et al, 2009).

Thus, the successful and sustainable implementation of production management system occurs when the staff have adequate amount of knowledge regarding the PLS tools and methods (Dambrosky et al, 2012). Therefore, the present study investigates the knowledge pertaining to production management within the KM format. Jensic (2002) defines knowledge "based on the information interpreted regarding the receiver's experiences and expectations. Knowledge is the necessary prerequisite for a purposive action". Hence, KM is required for organizational knowledge systematization (Dambrosky et al, 2009). Nonaka (1995) knows KM as a process that leads to the creation of new knowledge the dispersion of which is extensively determined via organization, products, services and technologies as well as new systems. Therefore, KM is considered as the creation, dispersion and manifestation of knowledge. KM can take place in a centralized on decentralized manner (Dion Port, 1998).

So, in the today's era of information, companies have access to a large volume of information and knowledge related to production management but the majority of the companies hire advisors to support and instruct their employees in this regard due to the complicacies of lean production (Dambrosky et al, 2009) and a large part of KM pertains to knowledge acquisition and implementation and blending within the whole organization (Dambrsky et al, 2012).

RESEARCH BACKGROUND

Dambrosky et al (2012) have carried out a research called "KM in lean production systems". In their study, the LPS and KM are exposited. The results of their study are indicative of the important role of KM for the successful implementation as well as the sustainability of LPS.

Abulvash et al (2018) conducted a research named "the role of staff empowerment as the intermediary variable in the relationship between the knowledge and information management systems with the employee performance" in Jordan's pharmaceutical industries. The study objective is the investigation of the relationship between KM, information systems and staff empowerment and their effect on employee performance. The study results indicated that there is a positive and significant relationship between KM and employee performance.

Kesling et al (2009) performed a research titled "the investigation of the effect of KM on the organizational performance results in a transitional economy" in Croatia. In this study, LISREL and structural equations model were employed to process the data. The study results signify the effect of KM on employee performance, organization performance and production improvement.

Rabi'ei et al (2010) carried out a research entitled "investigating the relationship between KM and employee performance improvement in educational-therapeutic centers in Zanjan". The study was a descriptive research that was undertaken in two educational-treatment centers affiliated with Zanjan's medical sciences university. The study population included all the nursing staff of the center with MA and higher degrees; 130 individuals were selected as the study sample volume and surveyed using a questionnaire consisted of three parts: demographic information, KM status and nursing employee performance evaluation. The nurses working in the hospitals acquired intermediate scores for their perceptions of the KM status; on the contrary, the matrons evaluated the performance status of the nurses under their own supervision as strong. There was found a significant relationship between KM status and nurses' performance with an intensity equal to r=0.40 and p=0.000. The need for knowledge, knowledge dispersion, knowledge application and knowledge preservation and storage were found most correlated and a significant relationship was evidenced between the economic performance and skillfulness in change with the nurses' performance. No significant correlation was documented between knowledge development and improvement and knowledge evaluation with the nurses' performance improvement. So, it can be concluded that the organizations that are looking for acquiring and preserving competitive advantage should pay a greater deal of attention to KM and its effect on employee performance improvement and organizational performance because KM can set the ground for the staff so as to keep pace with the knowledge stream thereby to improve their performance and cause the organization to be improved in its performance and customers to be elevated in their satisfaction levels.

Hemmat Ghadim (2013) conducted a research called "investigating the relationship between KM aspects and lean production (case study: automobile spare part manufacturing companies in Azerbaijan-e-Sharghi Province)". The study aimed at determining the relationship between aspects of knowledge management and lean production. To do so, they proposed and tested five hypotheses. The study population included the heads of all the automobile part manufacturing companies in Azerbaijan-e-Sharghi province. The study sample volume was selected equal to 132 companies using Cochran formula from which 132 managers were selected based on simple

randomized sampling method. Bhat's knowledge management standard questionnaire and a researcher-constructed lean production questionnaire were utilized to test the study hypothesis. Kolmogorov-Smirnov and Pierson correlation tests were employed to analyze the data. The investigation results indicated that there is a significant relationship between aspects of KM and lean production.

THEORETICAL FOUNDATIONS AND HYPOTHESES

The world is progressing in a transition from industrial era to knowledge era for which reason the organizations have noted the importance of information as assets possessed by their human resources and they are now determined to make better use of knowledge in creating qualified elements enabling the humans to innovate and excel (Sheikh et al, 2016). Knowledge is envisioned as one of the most valuable modern assets. The organizations are amongst the most important manufacturing factors in possession of human resources and capital that are the primary propellers of economic growth and the catalysts of technology development and production elevation. Knowledge creates innovation and then converts it to the processes and products (Marov and Xu, 2015). The main objective of KM is to provide the organization with a constant flow of knowledge and turn it to a practical attitude serving the organizational goals (Massadeh et al, 2017; Suto et al, 2016). Knowledge management is a process that is composed of knowledge creation, knowledge locating and knowledge transferring in a consistent manner and learning how to put it into use for achieving objectives. Knowledge management is organized through arranging, collecting, purging and dispersing knowledge amongst the staff members (Massadeh, 2016; Ababdeh and Hatlameh, 2013). Thus, KM incorporates four processes: knowledge creation, knowledge sharing, knowledge storage and knowledge application (Ardin, 2012).

Abulvash et al (2018) express that employee performance is a concept that has drawn the attentions of many researchers in management field of science for such a reason as the importance of such other concepts as individual and organization. Employee performance is defined as behavioral responses reflecting what an employee has learnt and has been instructed. Employee performance is the product of the mental and psychological capabilities. Siljanen (2010) states that employee performance is, in fact, employees' behaviors that are determined through interaction between the staff's efforts and competencies and the organization because behaviors are reflective of the staff's competencies for achieving the objectives set by the organization and they are the results of job accomplishment by the employees (Kinato et al, 2016). But, a distinction has to be made between behavior and accomplishment; behavior is manifested through employee's work in an organization but its success is the effect or the result that remains after the work is finished while performance is the interaction between the behavior and the accomplishment of an assigned job and this is the sum of the results and behaviors that can be achieved altogether (Inderman and Sahed Bayat, 2013). Edgar and Garry (2005) think that there are four primary elements for the performance management process, including the satisfaction of the managers' expectations and staff in the work assignments, the place where the work is carried out, the way it is done and the expected results of the performance. Also, the performance results and the way they can be enhanced are discussed in informal sessions between the management and the staff. Also, the staff instruction and preparation is examined and the rewards and wages are determined for the staff considering the

performance in the end and, eventually, it is the managers who make decisions in regard of moderating the rewards and wages to be paid to the staff following their evaluation of their performance (Edgar and Garry, 2005; Massadeh et al, 2016).

Knowledge is one of the most important organizational resources because it resides in the minds of the staff, clients, suppliers, documents and their procedures and it is the result of data processing turning them into usable information that has to be comprehended so that it can be repeatedly applied and rehearsed during the work to be, finally, institutionalized in the individual's minds as a mental state and clearly exhibited through experiences, skills and intelligence of the staff (Fernandez and Sabraval, 2010). Furthermore, KM is one of the main pillars sought by organizations and it is one of the best methods for enhancing performance through reconstructing and instructing the workforce. Organizations are also looking for ways to collect, store and expand information in all administrative levels and also to develop information for making investments in new knowledge and knowledge recruitment so as to maximize capacities and productivities for achieving the best performance (Sheikh et al, 2016). Jardat et al (2011) showed that the KM influences the staff via manipulating the individual's learning which is deemed as intellectual or fixed change brought about in the individual's behavior. It is this process that allows individuals acquire information and skills via interacting with the social and cultural systems in their periphery.

It can be stated regarding the lean production that it is a type of manufacturing things with little or without wastage of the materials. Wastage refers to anything that is produced other than the required equipment, materials, parts and work time. Wastes are divided into seven classes: extra production wastes, wastage of waiting time, transportation wastes, inventory wastes, movement wastes and wastages pertaining to product defections. A great many of the companies are currently looking for ways to achieve lean production (Taj, 2008). According to what was mentioned, the study hypotheses can be proposed as below and they will be dealt with in regard of their being confirmed or rejected in the data analysis section:

Primary Hypothesis:

Knowledge management (KM) influences lean production through the mediating role of employee performance

Secondary Hypotheses:

First Assumption: KM influences the employee performance

Second Assumption: employee performance influences the lean production

Third Assumption: Km influences the lean production

An investigation of the studies performed in this regard made it clear that no research has been done investigating the relationships between all the aforementioned variables simultaneously. Therefore, according to the foresaid materials, the study conceptual model is designed as shown below:
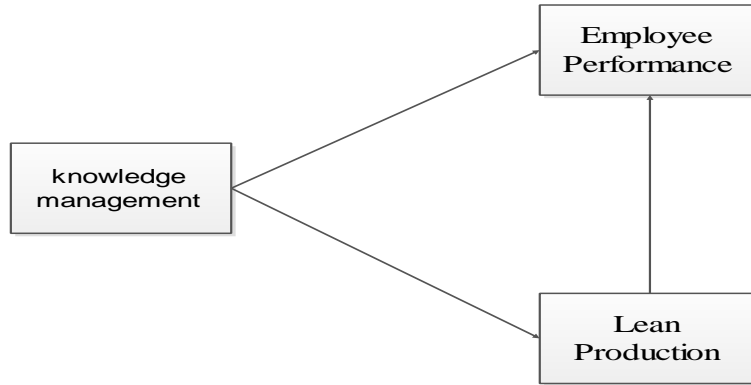
Figure 1: study conceptual model

RESEARCH METHOD

The present study is an applied research that has been conducted based on a descriptive-correlation method. The study population included 95 individuals out of whom 76 individuals were selected as the study sample volume. The required information were collected using KM questionnaire designed by Kesling et al (2009), employee performance questionnaire designed by Saleh et al (2015) and lean production questionnaire made by Zare'e and Pourzamany (2013). The convergent-construct validity technique was used to investigate the validity of the questionnaires and the combined technique and Cronbach's alpha method were applied to examine their reliability.

The convergent-construct validity technique was used to investigate the validity of the questionnaires and the combined technique and Cronbach's alpha method were applied to examine their reliability. The convergent-construct validity was evaluated using confirmatory factor analysis (LISREL). The study hypotheses were examined using structural equations model with partial least squares approach. Before determining the study model's goodness of fit, the structural model and the overall model have to be subjected to assessment.

The convergent-construct validity technique was used to investigate the validity of the questionnaires and the combined technique and Cronbach's alpha method were applied to examine their reliability. The convergent-construct validity was evaluated using confirmatory factor analysis (LISREL). Two scales have to be taken into account for the investigation of the convergent-construct validity: 1) the factor loading amount for every latent variable should be larger than 0.5 and generally larger than 0.7 in the ideal mode; 2) the mean value of the variance extracted for every latent variable has to be larger than 0.5 (Ramin Mehr and Charsetad, 2013). Also, the combined reliability technique and Cronbach's Alpha method calculations were carried out in LISREL and SPSS. Table (1) shows the reliability and validity test results of the questions given in the abovementioned questionnaires. The factor loading of each question in the main three constructs of the study can be observed in table (1). As it is shown in the table, the entire factor loadings are statistically significant. Because the factor loadings are larger than 0.5 (indicating their being statistically significant) and observing that the mean extracted variance values are larger than 0.5, the existence of convergent validity is confirmed for all three main constructs. Also, all the coefficients of Cronbach's alpha and combined reliability were found larger than 0.7 which is reflective of an appropriate reliability of the questionnaires used herein.

<div align="center">Table 1. factor loadings, Cronbach's alpha, SCR and AVE</div>

Component	Item	Factor	t>1	AV	CR	Cronbach's Alpha
Lean production	The up-to-date policies regarding productivity, quality and security as well as problem-solving are clear-cut and straightforward for the entire teams in the organization	0.84	✓	0.656	0.905	0.878
	The work teams are instructed and empowered in the organization and take part in problem-solving and continuous improvement.	0.8	✓			
	In order to perform preventive maintenance and continuous improvement of the instruments and processes, the organization makes use of time tables.	0.7	✓			
	There is an effective project management process featuring specified temporal objectives and costs for commencing new productions in the organization	0.7	✓			
	Necessary work-related instructions and product quality characteristics have been declared to the employees in all work areas.	0.8	✓			
Knowledge Management	Integrate different sources and types of knowledge	0.78	✓	0.664	0.908	0.894
	Convert competitive intelligence into plans of action	0.83	✓			
	Take advantage of new knowledge	0.89	✓			
	Acquire knowledge about our business partners	0.80	✓			
	Exchange knowledge with our business partners	0.77	✓			
Employee Performance	Our employees are able to help customers when needed.	0.91	✓	0.731	0.950	0.928
	Our employees explain items (services) features and benefit to overcome customers' objection.	0.82	✓			
	Our employees point out and relate item (service) features to customers' needs.	0.74	✓			
	Our employees approach customers quickly.	0.86	✓			
	Our employees suggest (services) customers might like but did not think of.	0.94	✓			
	Our employees ask good questions and listen attentively to find out what customer wants.	0.88	✓			
	Our employees are friendly and helpful to customers.	0.82	✓			

STUDY FINDINGS

The present study made use of structural equations modeling through adopting partial least square approach to examine the study hypotheses. Before testing the study hypothesis, the goodness of fit of the measurement model, structural model and overall model have to be investigated. Table (2) lists the indices obtained for measurement model, structural model and overall model of the study primary and secondary hypotheses.

<div align="center">Table 2. model's goodness of fit indices</div>

Goodness of fit indices of the measurement model					
Construct	Correlation with other constructs		CR	AVE	Indices' factor loading
Employee performance	0.281	0.414	0.940*	0.693*	Between 0.773* and 0.877*
KM	0.281	0.533	0.935*	0.743*	Between 0.792* and 0.877*
Lean production	0.414	0.533	0.938*	0.752*	Between 0.832* and 0.918*
Summary of the structural model's goodness of fit evaluation					
Construct	R^2		Adjusted R^2		Q^2
Employee performance	0.079		0.070		0.046
Lean production	0.360*		0.346*		0.244
Overall model's goodness of fit evaluation					
GOF	$\overline{R^2}$		*Communalities*		
0.400	0.220		0.729		
*significance in 0.95% confidence level					

The model's goodness of fit was investigated using factor loadings and extracted variance mean, combined reliability and discriminant validity examinations. As it can be seen in table (2), the entire factor loadings of all the questions pertinent to the study main variables are significant in a 95% confidence level and there is no need for eliminating any of them. Also, the mean extracted variance values and the combined reliability of both model's variables, as well, are significant in 95% confidence level. Furthermore, AVE value of the study constructs is found larger than the second exponent of the construct's correlation with the other constructs and this is indicative of the idea that the discriminant validity is confirmed for all of the model's constructs.

The structural model's goodness of fit, as well, was determined using such indices as R^2, adjusted R^2 and Q^2. As it is shown in table (2), R^2 and adjusted R^2 values of lean production are significant but these values were not found significant for employee performance. Chin (1998) introduced three values, namely 0.19, 0.33 and 0.67, as the criterion values indicating weak, medium and strong R^2. Based thereon, R^2 values of lean production and employee performance that were obtained equal to 0.360 and 0.079, respectively, in the present study should be classified as correspondingly strong and weak. Q^2 index determines the model's power of prediction. The obtained values, namely 0.02, 0.15 and 0.35, respectively indicate the weak medium and strong prediction power of the model for the endogenous construct. The amounts of this index for the lean production and employee performance were 0.244 and 0.046 that can be classified as relatively strong and weak. GOF scale is used to investigate the goodness of fit for the overall model that controls the measurement model and structural model:

$$\text{GOF} = \sqrt[1]{Communalities \times \overline{R^2}}$$

Communalities is obtained from the communal mean values of the indices or the study questions. Wetzels et al (2009, p.187) introduced three values of 0.01, 0.25 and 0.36 as the criterion values indicating weak, medium and strong goodness of fit (GOF).

Study Hypothesis Test

Next, the study hypothesis will be tested. The direct, indirect and general effects of the independent variable on the dependent variable have to be examined. Diagram (1) demonstrates the path coefficients (direct impacts' values) of the independent variable on the dependent variable. P-values can also be seen in the figure.
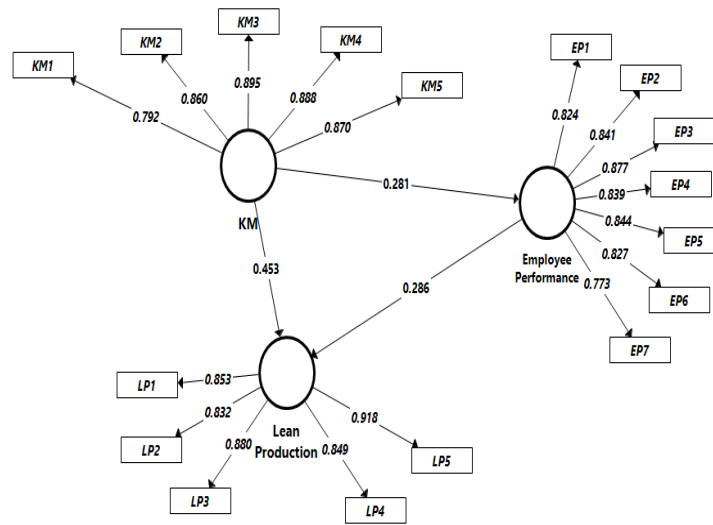
Diagram 1. study hypotheses model and P-values

Table (3) summarizes the results of independent variables' direct effects on dependent variable.

Table 3. the results of independent variables' direct effects on dependent variable

Independent variable	Dependent variable	Path coefficient	Test statistic		Result
			t-value	Significance level	
Km	Employee performance	0.281	3.63	0.000	Significance of the direct effect
Employee performance	Lean production	0.286	3.72	0.000	
Km	Lean production	0.453	4.73	0.000	

As it can be perceived from table (3), the effects of all three independent variables on dependent variables are statistically significant in the primary hypotheses model.
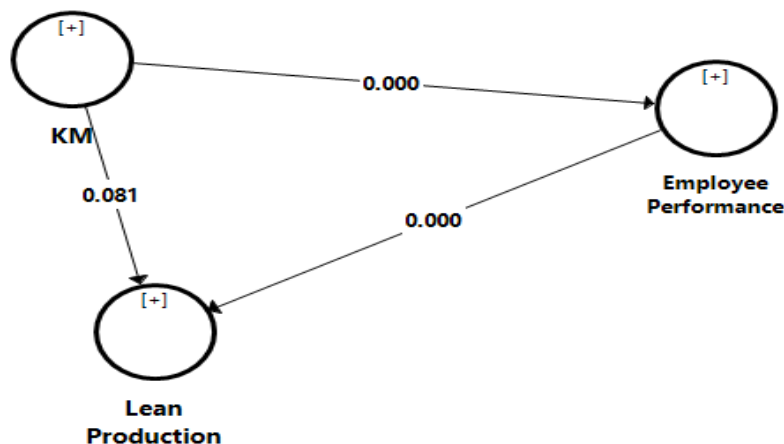

Diagram 2. the amount of KM's indirect effect on lean production through the mediating role of employee performance

As it can be understood from table (4), the amount of KM's indirect effect on lean production through mediating role of employee performance is 0.081 hence statistically significant.

Table 4. the results of evaluating the indirect effect of KM on lean production through the intermediary role of employee performance

Independent variable	Intermediary variable	Dependent variable	Path coefficient	Test statistic		Result
				t-value	Significance level	
KM	Employee performance	Lean production	0.081	2.49	0.013	Significance of the indirect effect

Diagram (3) illustrates the model's general effect based on the above-presented direct and indirect effects.
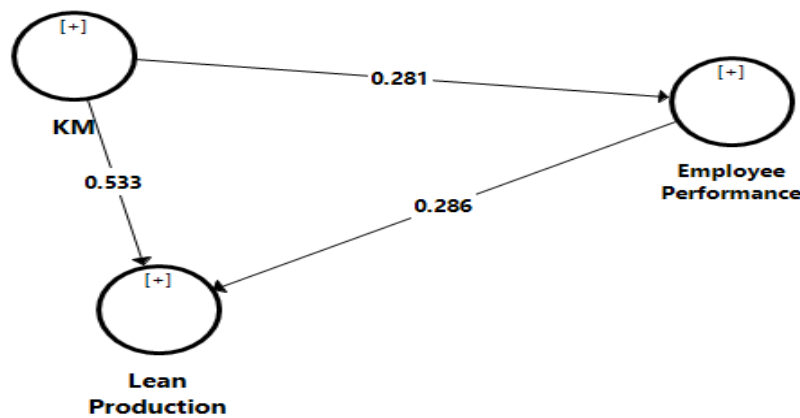
Diagram 3. the general effects of the independent variables on dependent variables

Table (5) tabulates the hypothesis test results. As it is evident, all of the study hypotheses have been confirmed.

1) The result of the first hypothesis test indicated that the KM influences employee performance for a rate equal to 0.281. Based on P-values and t-values, it can be stated with 95% confidence that the H1 assumption is confirmed, i.e. KM positively and significantly influences the employee performance.

2) The result of the second hypothesis test indicated that the employee performance influences the lean production for a rate equal to 0.286. It can be stated based on 95% confidence that the H1 assumption is confirmed meaning that employee performance positively and significantly influences lean production.

3) The result of the third hypothesis indicated that the KM influences lean production for a rate equal to 0.533. Based on p-values and t-values, it can be stated that the H1 assumption is confirmed to wit KM has a positive and significant effect on lean production.

Table 5. results of the study's primary hypotheses test

Row	Independent variable	Dependent variable	Path coefficient	t-value	p-value	Result
1	KM	Employee performance	0.281	3.63	0.000	Assumption H1 is confirmed

| 2 | Employee performance | Lean production | 0.286 | 3.72 | 0.000 | Assumption H1 is confirmed |
| 3 | KM | Lean production | 0.533 | 6.32 | 0.000 | Assumption H1 is confirmed |

CONCLUSION

The results of the present study signify the influence of KM on lean production through the mediating role of employee performance and the entire hypothesis, including the primary and the secondary ones, are confirmed. The results of the present study in the section on the effect of KM on lean production are consistent with the results obtained by Dambrosky et al (2012) and Hemmat Ghadim (2013) and also the results of the present study in the section on the effect of KM on employee performance conform to the findings by Abulvash et al (2018), Kesling et al (2009) and Rabi'ei et al (2010).

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