

PRIMARY RESEARCH

Kaizen and employee performance: A path analysis

Mehdi Shojaei¹, Parisa Shojaei^{2*}¹ Master of Industrial Engineering, Shahryar Branch, Islamic Azad University, Shahryar, Iran² Assistant Professor, Department of Community & Preventive Medicine, Faculty of Medicine, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

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Abstract

Kaizen (Japanese) means continuous improvement or change to achieve a better result and focuses on continuous improvement of the manufacturing, engineering, or business management process. Kaizen philosophy is based on the principle that the way of human life, including work life, social life and family life, should be continuously improved. The aim of this study is to path analyzed the effect of kaizen on improving employee performance. In this study, Kaizen was implemented in unit of one of the products of an automotive company in Iran, in 2018 and then its effect on the performance of the personnel was investigated. Data were analyzed by SPSS-22 and Lisrel-8.8 software using statistical path analysis. According to the findings, the final path model fitted based on CFI =0.25, RMSEA=0.51 index. Also among direct paths, "Automation" with $\beta=7.66$ and "order at work (5S)" with -0.38 had the greatest and least impact on employees' performance, respectively. It is very important to use standard devices and tools to automate activities to have better results on employee performance. The overall impact of kaizen on performance is clear, but one way to determine which dimension has the greatest impact is through path analysis, so that by identifying direct and indirect effects on performance, we can focus more on identifying drivers and barriers to kaizen implementation. Convincing managers to implement kaizen in their system, teaching its implementation steps to managers and personnel with different views and expertise at different organizational levels. In fact, the impact of kaizen on the performance and productivity of the organization may take some time, but the officials of the organization expect to see the result of this implementation faster and have a significant increase, especially in the field of financial profit.

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INTRODUCTION

Kaizen, a Japanese term to describe continuous improvement, was coined by Imai (1986) (Cuscela, 1998). The goal is to continuously improving cost, quality, flexibility, and productivity (Marin-Garcia, Garcia-Sabater, & Bonavia, 2009); (Rahmanian & Rahmatinejad, 2014). Evidence indicates that manufacturing organizations can use lean methods and tools to improve their actions and processes (Belekoukias, Garza-Reyes, & Kumar, 2014). Nowadays, most of the automotive manufacturers have improved their production performance by supporting the lean production paradigm in order to achieve better results in today's competitive market. By doing this, they hope to improve

performance and get better results in the market results (Marin-Garcia et al., 2009). When organizations need to change their performance, they should take advantage of specific human resource management practices (such as training, teamwork, and continuous improvement) (Taira, 1996). In fact, the implementation of kaizen can prevent the loss of committed and responsible employees as a tool for improvement and change (Brunet & New, 2003). Employee performance basically depends on several factors, including performance appraisal, employee satisfaction, job security, training and development, organizational structure, compensation, motivation, and so on. In organization, job performance is one outcome individual that is influenced by

*corresponding author: Parisa shojaei

†email: shojaee7@gmail.com



several factors, among them are of these things are influenced (Kasyadi & Virgana, 2021). While in this study based on the explanation above and conceptual model, the objective is analyzed direct and indirect path influence of kaizen on each dimension of employee performance. Kaizen can lead to better management of organizations and ultimately their success through increasing the knowledge of employees (Butterworth, 2001). The National Productivity Organization of Iran started the kaizen improvement movement by carrying out a study of the productivity management cycle in five government agencies of Kerman province and for the first time in the country, it brought kaizen to the field of services, especially government organizations, in 2002. Now, the continuous improvement movement (Kaizen) has begun in various sectors of Iran's industrial and services industries it continues to gain real status in improving the country's productivity and development (Rahmanian & Rahmatinejad, 2014). Most studies in Japanese manufacturing companies have shown the importance of kaizen in improving organizational performance. Research identifies kaizen as a strategic tool to achieve organizational goals (Berhe, 2021). Kaizen can improve operational efficiency, service quality and reduce operating costs (Atta-Ankomah, Appiah Kubi, & Ackah, 2022; Mahmud, 2018). Kaizen increases job performance and employee motivation, and may move employees to higher levels of growth need strength (Ameer, 2017; Atta-Ankomah et al., 2022). According to various studies in which the effect of kaizen on the performance of the company and its employees has been determined, the purpose of this study is to survey the effect of the implementation of kaizen in one of Iran's companies supplying automobile manufacturers on employee performance by path analysis.

METHODS

The study was performed in the unit of one of the products of an automotive company in Iran using both quantitative (survey) and qualitative (interviews and documents) methods in 2018. All employees of the unit (120 people) were recruited and the sampling method is a census. Employee performance questionnaire and kaizen have been used as

measurement tools. The kaizen (continuous improvement) questionnaire include 31 questions and was prepared and standardized by Shakib (2016). 11 functional dimensions of the employee performance evaluation questionnaire (reliability, attitude, work quality, initiative, judgment, cooperation, work quantity, security learning and personal development, person, leadership) developed by (Moghimi & Ramezan, 2011). Since the aim of this study was to investigate the effect of operational kaizen on employee performance, therefore, it is necessary to evaluate employee performance once before and once after the implementation of kaizen. Thus, before and after the implementation of the Kaizen process, the staff performance evaluation questionnaire was completed by the supervisor of 120 employees of this unit. We used a qualitative study through focus group discussions and individual interviews to determine the initial conceptual model of Kaizen's impact on employee performance. Therefore, in this regard, two focused group discussions (12 people in each group discussion) and 5 individual interviews were conducted. Participants using purposive sampling were selected and the process of data collection continued until data saturation. The characteristics of the participants in these group discussions and individual interviews included: a. experts who work in welding fields, quality, production systems, systems of offers, training, and 5S, b. heads and supervisors of the unit, c. at least one-year of activity in his field, and d. signing the informed consent form to participate in the study. At the end of this section, from the qualitative data analysis obtained from these group discussions and interviews, a preliminary conceptual model of the effect of kaizen on employee performance was obtained (Figure 1). In this study, to determine the relationship between kaizen factors and employee performance, the goodness of fit of a path analysis conceptual model was studied. Based on the results obtained, a logical description was deduced. SPSS-22 and Lisrel-8.8 software were used for data analysis based on path analysis. Paired *t*-test and linear regression were used to survey the relationship between employee performance, kaizen dimensions and demographic variables after kaizen implementation. The confidence interval was 95% and the *p*-value was <0.05.

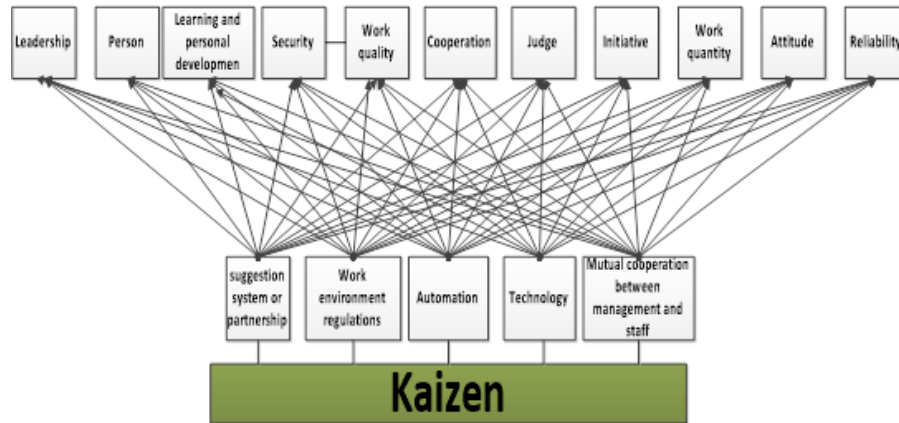


FIGURE 1. A conceptual model of the relationship between employee performance and kaizen

RESULTS

The participants in this study were 120 men whose mean age was 38.81 ± 3.80 years.

Table 1 shows the demographic characteristics of the participants.

TABLE 1. Demographic characteristics of the participants

Variable		N	%
Marital Status	Single	28	23.3
	Married	90	75.0
	Divorced or widowed	2	1.7
	Total	120	100.0
Educational Level	Diploma	46	38.3
	Associate Degree	55	45.8
	Bachelor	18	15.0
	Master	1	.8
	Total	120	100.0
Organizational Position	Supervisor	5	4.2
	Master worker	5	4.2
	Manager	1	.8
	Head	2	1.7
	Expert	4	3.3
	Labor	103	85.8
Total	120	100.0	
Work Experience	1-10	103	85.8
	11-20	17	14.2
	Total	120	100.0

The findings showed a significant difference between the mean performance dimensions before and after kaizen implementation in the paired *t*-test (Table 2). According to this table, all eleven dimensions of employee performance

increased after the implementation of kaizen in this unit, and according to the paired *t*-test, all of them had a significant increase ($p \text{ value} \leq 0.05$).

TABLE 2. Comparison of performance scores before and after kaizen implementation

Performance dimensions	Di-implementation (Mean±SD)	Before Kaizen implementation (Mean±SD)	Kaizen After implementation (Mean±SD)	p-value
Reliability		13.09±1.89	17.09±2.02	<0.001
Attitude		7.97±2.10	14.55±1.26	<0.001
Work Quality		10.17±6.07	18.49±2.68	<0.001
Initiative		7.18±1.65	11.10±1.18	<0.001
Judgment		5.53±0.73	7.10±1.61	<0.001
Collaboration		13.31±1.03	14.19±2.13	<0.001
Work quantity		5.20±0.96	6.40±0.76	<0.001
Security		6.56±1.40	11.57±1.87	<0.001
Learning and personal development		5.91±1.14	7.82±1.76	<0.001
Person		5.91±1.14	6.01±1.25	<0.001
Leadership		16.63±3.37	26.79±2.92	<0.001
Total performance		140.74±2.58	112.98±9.48	<0.001

Bivariate correlation analysis showed that all dimensions of kaizen were directly correlated with all dimensions of employee performance. The effects of kaizen on employee performance were investigated using path analysis (Figure 2). After this modification, the indicators of the model show the suitability and the logical relationship that exists between the variables is based on a conceptual model (Table 3). GFI,

CFI and RMSEA indexes were used to check the fit of the model. Based on the conceptual model, the results showed the desirability, high suitability and rationality of the relationships of the parameters. Based on this, there was no significant difference between the model fitted based on path analysis and the conceptual model drawn based on the qualitative data of the study.

TABLE 3. Goodness of fit indices for the model

Model Index	X2	DF	p	GFI	CFI	RMSEA
	20.48	66	0.07	0.94	0.92	0.01

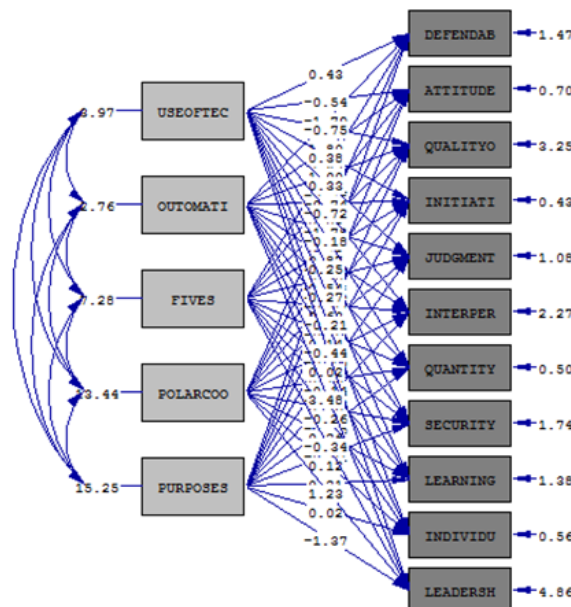


FIGURE 2. The full empirical model (Empirical path model for effects of kaizen on employee performance)

According to the path diagram, indirect paths, "automation" with $\beta=7.66$ and "Order in the workplace (5S)" with $\beta = -0.38$, respectively, had the most and least effects on employee performance. "Automation" positively affects employee performance, and employee performance will be higher with a higher level of "Automation." On the other hand, the employee performance will be decreased with a higher level of "Order in the workplace (5S)". According to the path model, "the use of robot technology in production" with an overall effect ($\beta = -1.18$), it had a negative impact on employee performance. As the use of technology in pro-

duction increased, employee performance decreased. "Collaboration between staff-management" with overall effect ($\beta = 0.79$) positively affects employee performance. "Employee suggestion system" adversely affected employee performance with overall effect ($\beta = -2.18$); thus, the employee suggestion system decreased employee performance. In this model, 49% of the variance of the employee performance parameter is explained by the parameters affecting it. Table 4 shows the direct and overall effects of the mentioned parameters on employee performance.

TABLE 4. Goodness of fit indices for the model

Kaizen Dimensions	Direct Effects	Model Coefficients	t-value	R2	Errorvar
The use of robot technology in production	-1.18	.209	4.28	0.49	3.44
Automation of activities (automation)	7.66	2.346	4.20		
Order in the workplace(5S)	-0.38	.885	6.36		
Collaboration between staff-management	0.79	.836	7.05		
Employee suggestion system	-2.18	-.780	4.23		

DISCUSSION

According to the results of this research, the mean score of all dimensions of employee performance increased after the implementation of kaizen. Kaizen implementation had the greatest impact on employees' attitudes. After introducing kaizen, employees had a more positive attitude towards work. Kaizen implementation improved both management practices and working conditions significantly. Both managers and employees found that employees' attitudes toward work improved with the implementation of kaizen. According to the results of the study by (Atta-Ankomah et al., 2022), kaizen, especially in relation to sales and profit, leads to a positive and significant effect on the company's performance, and in some companies, it also improves the productivity of the workforce (Atta-Ankomah et al., 2022). It is better for systems to implement kaizen to identify areas of improvement and change. Using a small kaizen approach allows employees to develop ideas for small projects that can be completed in a short period of time (Abuzied, 2022; Gilang, 2018). As a result of implementing kaizen in organizations, new thinking, change of attitude, critical thinking, culture of continuous improvement, improvement of work environment, and lean process without waste and cost reduction are created (Kurniawati & MeilianaIntani, 2016). From the point of view of companies providing clinical services, wage growth is closely related to increasing employee attitudes toward work (Shimada & Sonobe, 2021). As with earlier versions of kaizen, kaizen may function as a "no-

change" alternative that increases the number of possible paths and reduces the number of inequities (Craig, Rand, & Hartman, 2022). Based on the results of Cheser (1998) study indicate that kaizen boosts employee enrichment and motivation and may require employees to grow at higher levels (Cheser, 1998). According to the (Hashim, Zubir, Conding, Jaya, & Habidin, 2012), there was a positive and direct relationship between the kaizen event and the innovation performance in Malaysia's automotive industry (Hashim et al., 2012). One of the goals of Kaizen is to develop people's creativity and curiosity to lead them to create value for customers (Alosani & Al-Dhaafri, 2022). In order to ensure performance change after implementing kaizen, conducting a survey is a very effective tool. These surveys in Australia have led to their significant success in creating an effective structure, strengthening corporate culture, and promoting flexibility and speed of response (Gibb & Davies, 1990). Doolen, Van Aken, Farris, Worley, and Huwe (2008) empirically demonstrated that even within the same organization, kaizen may cause different successes and improvements. In addition to the need to have sufficient motivation in the human force, the effective implementation of Kaizen is very important and key, and also the practical commitment and belief of the management to the philosophy of Kaizen, patience and tolerance, and not rushing to get early results can be The success of Kaizen implementation is very effective (Doolen et al., 2008). The results of the research by Sharifi, Nikpour, Akbari, Majlesi, and Rahimi (2008) in-

dicating that there is a significant difference between the direct supervisor of the subjects in five functional dimensions: quality of work, cooperation, cognitive status, creativity, and trustworthiness than between the results before and after the formation of the pattern (Sharifi et al., 2008). The Absenteeism and ergonomics have a direct effect on each other. Applying the principles of ergonomics in the work environment prevents injury to workers and reduces absenteeism and costs for the individual and the organization. Kaizen can also produce benefits such as improved communication between employees, improved employee morale and satisfaction, and increased sense of commitment to the company among employees (Vieira, 2012). The simplicity and comprehensiveness of kaizen's model, while its tremendous effect on reforming and improving the work environment, has promoted the performance of the staff in the study group. Kaizen can be extended to all organizational layers and can create various changes at the individual, organizational and even community level (Sharifi et al., 2008). Kaizen is a philosophy and reorganization, a culture tasked with cleaning up the waste in all systems, focusing on one organization; and providing you with two elements, understanding; as measures for permanent change and changes for deep and continuous understanding (Vieira, 2012). According to the path analysis in our study, the most effective impact of kaizen was on employee performance via the automation dimension of kaizen. If a long period of time has passed since the implementation of kaizen in this unit, over time it will have a great impact on other dimensions in addition to the impact on automation. Industries that have implemented kaizen for more than 2 years achieve the best results by implementing various dimensions of kaizen such as automation through waste elimination, cost reduction, better quality and increased productivity (Verma, 2022). The automation indeed increases the speed of work and employee satisfaction, but the devices and tools must be standard to avoid reverse effects. One of the important aspects of the proper implementation of interventions was to support the managers and the presence of the CEO at all steps of the implementation of kaizen. In the research of Marin-Garcia et al. (2009), all the studied companies took measures to improve their performance, especially regarding the improvement of production indicators. The proponents of lean manufacturing have noted the positive impact of the workforce on employees in terms of independence, advanced skills, and empowerment, given their participation in the continuous improvement of the workflow. Studies show that increasing independence is not enough to compensate for the increase in work intensity (Toralla,

Falzon, & Morais, 2012). According to results of some studies, in companies that have a lean system and use the kaizen method, their results in terms of product quality, absenteeism and errors are better than companies that do not use the method (Vieira, 2012). The organization should create a culture of continuous improvement with regard to the well-being and quality of life of employees. In fact, Kaizen covers the ongoing needs of managers and personnel in all aspects of life (Vieira, 2012). Garza-Reyes et al. (2022) stated that the managerial aspects of Kaizen implementation in manufacturing industry include the important factors and challenges related to the pre-implementation stage as well as its implementation to provide the necessary actions for the proper implementation of Kaizen (Saxena, 2022).

CONCLUSION

From 1986 to 2016, the latest kaizen developments were in the three years of the second decade of the millennium, that is, until 2019 (33 years) to cover all possible research in this field (Suarez-Barraza, Miguel-Dávila, & Morales Contreras, 2022). As mentioned earlier, Kaizen has increased the efficiency of companies by reducing waste and improving overall production activities, and it can be implemented in most platforms without the need for large investments. Kaizen model was adopted easily and more comprehensibly among employees of our organizations in Iran. Since Kaizen does not require a large financial investment, it is easy to justify the management of a system to implement it. Also, seeing the results of it in a short period (in some cases, a working day) motivates employees to continuous improvement.

One of the limitations of this study was employees' skepticism about their grading score by their superiors, whether their superiors have evaluated their performance correctly or not. Another limitation was the generalization of the findings to other products of this automotive company and others. However, this study should consider other line production areas in this company and where companies offer a large number of customers with emerging and unpredictable needs. One of the most difficult tasks of any manager or supervisor is to determine the cause of a performance problem. Since the decisions taken to solve the problem depend on the diagnosis of the cause, a correct evaluation will be absolutely necessary. What affects job performance is influenced by several factors. When the performance is great. Several conditions have been created to make this excellent performance possible. Like the implementation of Kaizen, which can have a good effect on every aspect of the employees' performance. Therefore, outstand-

ing performance requires that "all" factors related to behavior are applied in an optimal way. Unfortunately, poor performance can simply be caused by "one" factor that drastically reduces performance. It has not been seen many times that an unexamined performance problem continues and expands to the extent that it turns other factors from

positive to negative, and even by implementing any performance improvement systems, the problem cannot be solved well.

Conflicts of interest

There is no conflict of interest regarding this article.

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