The Effect of Kaizen Implementation on Organizational Productivity through Waste Minimization in Selected Cement Factories located in Eastern Ethiopia

[1]Tazebachew Achenef Alem and [2]Mulugeta Girma Dibiku

[1]Assistant professor at Jigjiga University, [1]Department of Management
[1] Jigjiga, Ethiopia, E-mail- tazebachewa@gmail.com, [1]P.box 1020, Jigjiga, Ethiopia
[2]Assistant professor at Dire Dawa University, [2]Department of Marketing and Management
[2]Dire Dawa, Ethiopia, [2]Email eldanamulugeta@yahoo.com
[2]P.box 1362, Dire Dawa, Ethiopia, [2]https://orcid.org/0000-0002-3166-1595

Abstract

This paper examines the effect of kaizen implementation on organizational performance through waste minimization. kaizen awareness, Sort, Set in Order, Shine, Standardize and Sustain management commitment, culture and kaizen team were used to represent kaizen implementation as predicator variables whereas, defect, motion, transport, waiting and inventory waste were used to represent the mediating variables of waste minimization. Labor, material, personnel and machine were used to represent organizational productivity that consider as outcome variables. Data were collected from useable sample of 284 respondents working on kaizen event in three selected companies i.e., National Cement, Tore and Pioneer Cement Factories located in Eastern Ethiopia. The study used structural equation modeling using Partial Least Squares (PLS 4.0.) as a technique of statistical analysis, considered useful for path models employing indirectly measured latent variables. The finding indicated that kaizen implementation affects organizational productivity through waste minimization. it also indicated that kaizen team and culture from kaizen implementation dimension less affects waste minimization.

Key words:
Continuous improvement; Kaizen; productivity; waste minimization JEL Code: M00

1. Introduction

Globalization has offered several opportunities and many challenges to almost every business organization following the manufacturing's philosophy has witnessed fundamental changes since the elimination of craft production to be replaced by mass production system (Seiji, 2018; Alukal, 2007). New era has started when lean manufacturing perspective is introduced to be competitive in the marketplace critical for their survival and sustainable growth (Lechner, 2009; onzalez-Aleu & Aken, 2016; Aoki, 2008). Study show that the main theme of lean philosophy is to use less but achieve more through eliminating or minimizing non-value added activities and wastes within the system that defined as any process of continuous improvement in any area of life: personal, social, home or work, and when applied to the workplace (Hallgren & Olhager, 2009; Burkitt, et al., 2009; Womack & Jones, 2003; Imai, 2001; Goyal A. , Agrawal, Chokhani, & Saha, 2019). Besides, researchers show that organizations are under pressure to reduce their cost, customer lead-time and cycle time, and increase their productivity and quality (Aoki, Transferring Japanese Kaizen activities to overseas plants in China", 2008; Alukal, 2007; Bulletin, 2017; Rahmanian & Rahmatinejad, 2013; Ishijima, Miyamoto, Masaule, & John, 2022; de Toledo, Pinheiro, Poltronieri, Barbalho, & González, 2023).

It is essential to adopt the lean philosophy in order to stay competitive and survive in the global rivalry situation and answer quests raised by stakeholders (Bane, 2002; Rahmanian & Rahmatinejad, 2013; Erdhianto, 2016; Leksic, Stefanic, & Veza, The impact of using different lean manufacturing tools on waste reduction., 2020). This is true for cement industry too as kaizen helps to achieve business goals and maintain excellence (Maurer, 2004) Imai (2001); contributed greatly to competitive success (Imai, 2001; Bhatt, 2000). simple, low cost, low technology and people focused (Rahmanian & Rahmatinejad, 2013; Lee C. , 1992) and help to be quality producers of goods, reduction in costs, increased (Assefa, 2016; Aoki, 2008; Imai, 2001; Bane, 2002; Treloar, Owen, & Fay, 2001; Janjić, Bogićević, & Krstić, 2019).

Despite kaizen implemented in most cement industries located in developed and developing countries, i,e., China (Aoki, 2008); Mexico (García, Rivera, & Iniesta, 2013; Suárez-Barraza & Ramis-Pujol, 2010); Ethiopia (Tadesse, 2018; Getachew, 2017; Minda, 2018);Kenya (Nderi, 2012); Iran (Soltani & Elham, 2019); Malaysia (Zailani, Shaharudin, & Saw, 2015); organization still under pressure to reduce the downtime, cycle time, inventories and batch sizes ad over all wastes (Pipilikaki, Katsioti, & Gallias, 2009; UNIDO, 2017; Bulletin, 2017; Kharub, Gupta, Rana, & McDermott, Employee's performance and Kaizen events' success: does supervisor behaviour play a moderating role, 2023). Particularly the concern and quest of quality, cost and productivity has been raised by stakeholder (Bane, 2002; Aoki, 2008; Suárez-Barraza & Ramis-Pujol, 2010; Glover, Farris, van Aken, & Doolen, 2011; Tadesse, 2018; Tezel, Koskela, & Tzortzopoulos, 2023) beside, early finding show that the industry need intensive energy and raw materials that cost the organization significantly and determine the row material quality and organizational productivity too (Burkitt, et al., 2009; Bane, 2002; Burkitt, et al., 2009; Glover, Farris, van Aken, & Doolen, 2011; Assefa, 2016).

Past studies have also signified, there were many companies failed to achieve the success of the activity in their organizations (Pipilikaki, Katsioti, & Gallias, 2009; UNIDO, 2017; Bulletin, 2017), despite the paramount benefits of kaizen (Assefa, 2016; Bane, 2002; Brunet & New, 2003).

This is because of the internal constraints that impede the effectiveness of the implementation against the expected outcome of the activity that latter affects organizational cost, product quality and productivity in general (Getachew, 2017; Burkitt, et al., 2009; Aoki, 2008; Juhari, Abidin, & Omar, 2011). The authors underline that such organizational impediment significantly effects on the decision made to minimize cost, increase quality and improve overall productivity (Getachew, 2017; Burkitt, et al., 2009; Aoki, 2008; Juhari, Abidin, & Omar, 2011).

García et al. (2013) discovered that two main barriers that hinder the effectiveness of the kaizen activities are employees and management that is also supported by (Suárez-Barraza & Ramis-Pujol, 2010). Suárez-Barraza and Ramis-Pujol (2010) reported that the failures to achieve the objective of kaizen activity happed due to employee resistance to change and no appropriate execution and monitoring of the kaizen project that signify the increment of cost , decline of quality and weak performance of overall organizational productivity (Assefa, 2016; García, Rivera, & Iniesta, 2013; NEWS, PC, 2015; Tiwari, 2017). Nevertheless, these factors are also affecting cement industries while implementing the kaizen philosophy where Ethiopian industries no exception too (Getachew, 2017; Rahmanian & Rahmatinejad, 2013; Minda, 2018; Habte, 2019). Despite no studies found that thoroughly investigates in the eastern cluster (Assefa, 2016; Getachew, 2017; Habte, 2019; Minda, 2018; Girma, 2016; Seid, 2012). Hence, the current research investigates how kaizen implementation affects productivity through waste minimization in cement factory located in the eastern part of the country.

2. Literature Review

2.1 Introduction

Kaizen is the management philosophy and know-how that brings about continuous, participatory, incremental, and low-budget improvements in quality, productivity, cost, delivery, safety, morale, and environment (Bhatt, 2000; Brunet & New, 2003; Alukal, 2007; Brunet & New, 2003; Inoki & Fukazawa, 2007). Kaizen did not bring explosive or sudden changes for the improvement of the organizations, but any improvement or reform will bring productivity enhancement if they are continuous and constant (Girma, 2016; Habte, 2019; Rahmanian & Rahmatinejad, 2013). It improves productivity in a step-by-step, incremental, progressive manner used at various sectors irrespective of their size (Bhatt, 2000; Assefa, 2016). Hence it is an idea to increase labor productivity, business efficiency, product and service quality, and other operational and financial performance (Brunet & New, 2003; García, Rivera, & Iniesta, 2013; Girma, 2016; Hallgren & Olhager, 2009).

The benefits of kaizen include increasing number of private enterprises and implement quality and productivity improvement (Assefa, 2016; Aoki, 2008). The success of the kaizen implementation also established to disseminate kaizen to private enterprise in sustainable manner (Assefa, 2016). Kaizen aims for improvements in productivity (Bhatt, 2000; Otsuka, Jin, & Sonobe, 2018), effectiveness, (Juhari, Abidin, & Omar, 2011) safety, and waste reduction (Brunet & New, 2003; García, Rivera, & Iniesta, 2013; Girma, 2016; Hallgren & Olhager, 2009). Effective implementation of kaizen enables firms to reduce waste, use inventory more efficiently, build employee skills; and create a satisfied stakeholders by improving commitment in their job (Berger, 1997; Brunet & New, 2003).

3. Kaizen in the manufacturing sector

In labor-abundant countries, Kaizen has helped the development of labor-intensive industries, thereby helping such countries achieve inclusive economic growth, and has reduced not only production costs but also the incidence of injury (Imai, 2001; Habte, 2019), machine breakdowns (Habte, 2019; Otsuka, Jin, & Sonobe, 2018), and delayed delivery (García, Rivera, & Iniesta, 2013; Inoki & Fukazawa, 2007) . It has improved morale and accountability (Zailani, Shaharudin, & Saw, 2015). Principles of kaizen

The two key features of kaizen are incremental and involvement of the entire workforce in that process (Lee C. , 1992; Bane, 2002). The workforce needs to participate in producing small but frequent changes by making suggestions for improvement in both process and product ((Imai, 2001). It focuses on the way people approach work (Brunet & New, 2003). It shows how management and workers can change their mindset together to improve their productivity (Bhatt, 2000; Juhari, Abidin, & Omar, 2011). There are many strategies for management success, kaizen is different since it helps focus on a very basic way on how people conduct their work (Berger, 1997; Brunet & New, 2003).

Kaizen took the followings a principle of kaizen i.e. Customer Value (Shah & Ward., 2007); Value Stream (Hines & Rich, 1997); Flow (Womack & Jones, 2003); Pull system (Anumba, 2006; Lee & Lee, 2003) and perfection (Ahlström & Karlsson, 1996). It also includes Teamwork (Yokozawa, 2010; Womack & Jones, 2003; Khan, Bali, & Wickramasinghe, 2007); Suggestion system (Izumi, Kenichi, & Sayoko, 2009; Alukal, 2007; Glover, Farris, van Aken, & Doolen, 2011) and Process orientation (Brunet & New, 2003; Juhari, Abidin, & Omar, 2011) hoping the process is the target and employees can provide improvements by understanding how their jobs fit into the process and the organization in general (Maurer, 2004).

3.3. Kaizen implementation, waste minimization and organizational Productivity

Productivity growth is frequently lauded by the business community, media commentators, and politicians as the solution to improving living standards, yet there is little agreement on what productivity is (Burkitt, et al., 2009; Aoki, 2008; Burkitt, et al., 2009). To economists, productivity is the efficiency with which firms, organizations, industry, and the economy as a whole, convert inputs (labor, capital, and raw materials) into output. Productivity grows when output grows faster than inputs, which makes the existing inputs more productively efficient. Productivity does not reflect how much we value the outputs it only measures how efficiently we use our resources to produce them (Hines & Rich, 1997; Rahmanian & Rahmatinejad, 2013). Finding indicated that technological progress and organizational change can expand output by more than any additional inputs that might be required (performance) (Hallgren & Olhager, 2009; Erdhianto, 2016; García, Rivera, & Iniesta, 2013).

Kaizen costing is one of a cost reduction system that helps firms to increase performance and minimizes wastes (Aoki, 2008; Goyal A. , Agrawal, Chokhani, & Saha, 2019). Maintenance of present cost levels for products currently being manufactured via systematic efforts to achieve the desired cost level helps firms to be competitive (Aoki, 2008; Leksic, Stefanic, & Veza, 2020).

Finding also indicated that every decision made in product cost structure affects organizational productivity by either reducing waste and proposal disposal of wastes Cost reduction is the process used by companies to reduce their costs and increase their profits (Assefa, 2016; Biege, Smith, & Shenk, 2001; Erdhianto, 2016; García, Rivera, & Iniesta, 2013; Pampanelli, Found, & Bernardes, 2011). Depending on a company's services or product, the strategies can vary (Erdhianto, 2016).

One of the aims of Kaizen is decreasing waste by eliminating overproduction, improving quality, being more efficient, having less idle time, and reducing unnecessary activities (Alukal, 2007; Assefa, 2016; Mureithi, 2013; onzalez-Aleu & Aken, 2016; Anumba, 2006; Yusoff, Peng, Abd Razak, & Mustafa, 2020; Rahmanian & Rahmatinejad, 2014). All these translate to money savings and turn potential losses into profits (Getachew, 2017). The kaizen philosophy was developed to improve manufacturing processes thereby increasing productivity of respective firms (Burkitt, et al., 2009; Erdhianto, 2016).

Different quality control tools Kaizen is done to remove these defects and continuously improve products and production processes and implementing just in time delivery through time management (Erdhianto, 2016; Biege, Smith, & Shenk, 2001). Kaizen helps in making manufacturing process leaner, simple and fitter (Glover, Farris, van Aken, & Doolen, 2011; Hines & Rich, 1997) that affects overall performance irrespective of the sector as indicated in different studies i.e. (Getachew, 2017; Assefa, 2016; Cheser, 1998; Erdhianto, 2016).

Finding indicated that, of kaizen succusses factor i.e., the application of 5S that considered as work culture helps to reduce defect, waiting, motion, transport and inventory (Rizkya, Syahputri, Sari, & Siregar, 2019; Mulenga, 2018; Dimitrescu, Babiş, Niculae, Chivu, & Dascălu, 2019). Similarly, a number of finding also indicated that kaizen, awareness, management commitment, culture, and kaizen team help to reduce waste and increase productivity of organizational labor, material, personnel and machine (Maarof & Mahmud, 2016; Cherrafi, et al., 2019; SHEMEALASH, 2019).

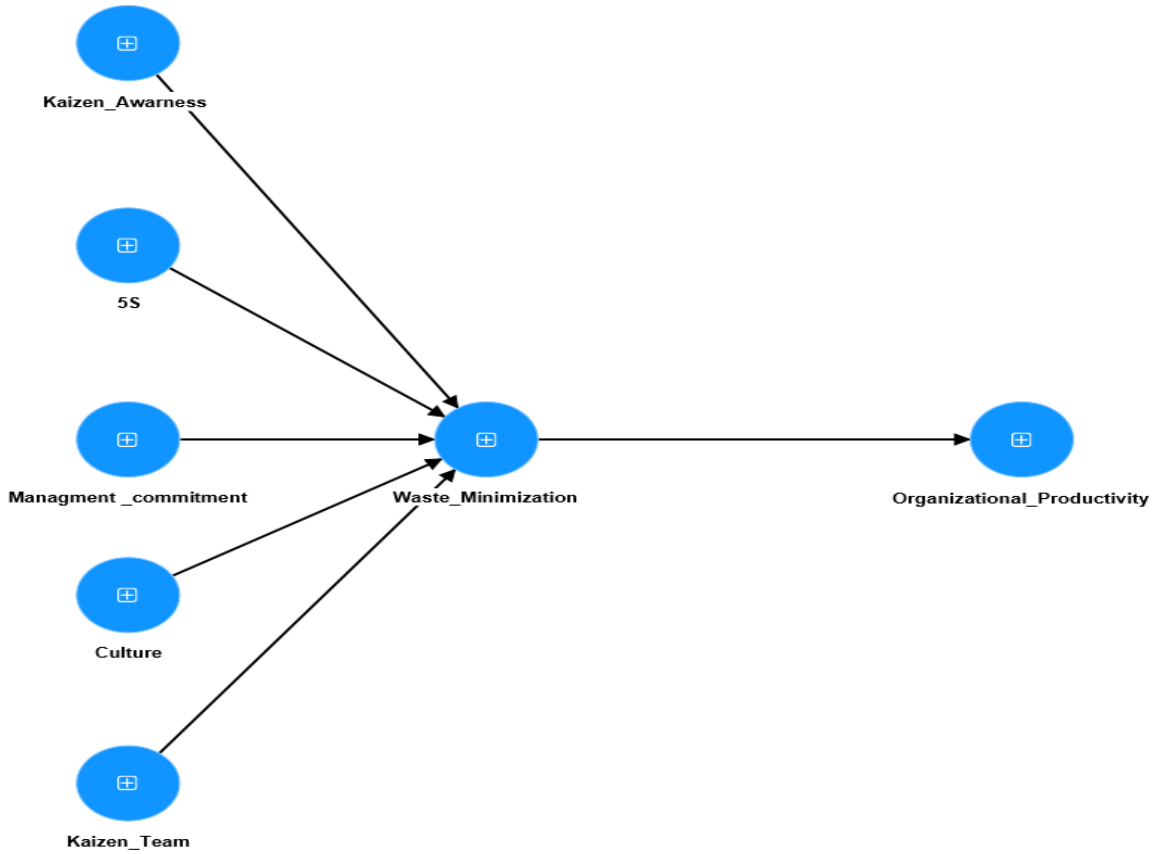

Figure 1: Conceptual frame work

3. Material and Method

3.1. Research Design

The researcher designed a quantitative based explanatory, empirical and cross-sectional research, based on a literature review focused on the following variables: kaizen implementation (kaizen Awareness, 5s, management commitment, kaizen team and culture), waste minimization, and the impact on organizational productivity. The study employ, multistage sampling on a cement company with a lean-kaizen manufacturing environment. The selected cement companies perform Kaizen events in accordance with requirements related to the solution of specific issues. The companies were chosen because they had performed Kaizen activities for more than three years in a systematic manner, and had practiced Kaizen events in a frequent manner.

The firms are a large-scale manufacturing company focused on the manufacturing of different types of cements used for construction industry. A self-conducted poll was used to collect information in a work context. The sample consisted of workers that had participated in Kaizen events. Samples were calculated using online sample determination formula considering the total pollution of the cluster industry 2000 currently working in the kaizen related tasks in the eastern part of the country taking national cement, Pioneer and Tore cement factories. The poll included items with a Likert-type format. A total of had 300 participants were included in the study as determined by the study and finally used 284 usable sample.

The kaizen implementation variables were measured with scales used by (Omotayo, Kulatunga, & Bjeirmi, 2018; Omotayo, Awuzie, Egbelakin, & Ogunnusi, 2020; Janjić, Todorović, & Jovanović, 2020), composed of 8 and 3 items. scales were constructed by considering content validity through experts in several disciplines, exploratory factorial analysis and internal consistency.

4. Method of analysis

The study used structural equation modeling employing Partial Least Squares (PLS) as a technique of statistical analysis, considered useful for path models employing indirectly measured latent variables by investigating the effect of kaizen awareness, 5s, management commitment, culture and kaizen team on productivity (Ramayah, Cheah, Chuah, Ting, & Memon, 2018). The technique is a multivariate statistical analysis method that allows for the establishment of an effect between exogenous and endogenous variables whose causal relationships are established with a theoretical basis (Hair Jr, et al., 2021). The employed statistical software is Smart PLS 4.0 and performed the structural modeling process in three stages. As the measurement of latent variables is a prerequisite to the analysis of causal relationships between theoretical constructs (Janjić, Todorović, & Jovanović, 2020), the researcher revised the external measurement model to ensure reliability and validity in the first stage and in the second stage, and validated the internal structural model.

5. Data analysis and discussion

4.1. Introduction

Reliability and validity of the measurement model was tested Initially, the measurement model had 38 items. Based on the PLS algorithm's results, two items were removed (AW 4 and AW _5). These variables resulted in issues of discriminant validity. Thus, the final measurement model had 28 observable variables. In the model, the employee Kaizen Awareness is measured with 3 items (AW _1, AW_2, AW _31); 5s is measured by 5 items, management commitment was measured by (MC_1, MC_2 and MC_3); culture was measured by (C_1; C_2 and C_3) , kaizen Team was Measured by (KT_1, KT_2 and KT_3) in waste minimization was measured by 5 items (transport, waiting, motion , inventory, and defect). Finally, impact on organizational productivity is measured by 5 items (labor, material, personnel and machine).

Table 1: -Indicator Outer Loading, T Test, P Value and VIF

Indictors		Outer loadings	T statistics (|O/STDEV|)	P values	VIF
AW_1 <- Kaizen_Awarness		0.881	48.288	0.000	2.139
AW_2 <- Kaizen_Awarness		0.894	43.516	0.000	2.417
AW_3 <- Kaizen_Awarness		0.903	58.871	0.000	2.513
C_1 <- Culture		0.847	32.817	0.000	2.107
C_2 <- Culture		0.837	27.674	0.000	2.083
C_6 <- Culture		0.673	13.090	0.000	1.101
Defect waste <- Waste_Minimization		0.811	27.792	0.000	2.041
Inventory waste <- Waste_Minimization		0.588	11.044	0.000	1.220
KT_1 <- Kaizen_Team		0.940	96.628	0.000	5.080
KT_2 <- Kaizen_Team		0.959	144.875	0.000	6.015
KT_3 <- Kaizen_Team		0.882	42.076	0.000	2.419
MC_1 <- Managment _commitment		0.892	51.115	0.000	2.356
MC_2 <- Managment _commitment		0.911	65.953	0.000	2.775
MC_3 <- Managment _commitment		0.908	61.383	0.000	2.655
Motion waste <- Waste_Minimization		0.788	23.906	0.000	1.822
PR1 <- Organizational_Productivity		0.864	44.541	0.000	2.338
PR2 <- Organizational_Productivity		0.853	42.157	0.000	2.249
PR3 <- Organizational_Productivity		0.875	46.282	0.000	2.531
PR4 <- Organizational_Productivity		0.768	23.600	0.000	1.540
Set in Order <- 5S		0.682	16.572	0.000	1.773
Shine <- 5S		0.720	17.040	0.000	1.582
Sort <- 5S		0.722	18.568	0.000	1.897
Standardize <- 5S		0.827	29.665	0.000	2.119
Sustain <- 5S		0.763	21.755	0.000	1.688
Transport_Waste <- Waste_Minimization		0.832	34.190	0.000	2.102
Waiting waste <- Waste_Minimization		0.810	26.882	0.000	2.125

Sources: - Survey, 2023

The items' factorial loads range between 0.588 and 0.959, with a t-value of more than 1.96 for all cases (resulting in statistical relevance with a confidence interval of 95%). Besides, the p-value for all contract were significant and the variance inflation factor was less than 10. Indicating it well measure the intended objectives of the study.

6. Construct Reliability and Validly

THE magnitude of both the loads and the Average Variance Extracted (AVE) is more than the critical point (0.50). it can affirm that 50% or more of the indicator's variance is included in the corresponding construct (Alarcón, Sánchez, & De Olavide, 2015). Finally, the internal consistency indexes of all latent variables presented acceptable indicators. In all cases, these indexes exceed the recommended values (0.70 for Cronbach's alpha, and 0.60 for the composite reliability (CR) index) (Valentini & Damasio, 2016)(see Table 2).

Table 2. Construct Reliability and Validly

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
5S	0.798	0.805	0.861	0.554
Culture	0.690	0.686	0.831	0.623
Kaizen_Awarness	0.872	0.873	0.922	0.797
Kaizen_Team	0.919	0.923	0.949	0.861
Managment _commitment	0.888	0.888	0.930	0.817
Organizational_Productivity	0.861	0.861	0.906	0.708
Waste_Minimization	0.824	0.827	0.878	0.594

Sources: - Survey, 2023

Diverse criteria exist to evaluate discriminant validity. The researcher calculated the AVE and the Heterotrait-Monotrait Ratio (HTMT) indicators. According to the AVE criteria, discriminant validity exists when the square root of the AVE is larger than the correlation of any of the other latent variables included in the model (Alarcón, Sánchez, & De Olavide, 2015) In Table 2, the finding present these values: the diagonal shows the square root of each construct's AVE. The corresponding correlations are shown under the diagonal. As seen in the table, in all cases the value of the diagonal exceeds the value of the correlations between constructs, evidence that discriminant validity exists according to this criterion.

Table 3. Heterotrait-monotrait ratio (HTMT) – Matrix

	5S	C	KA	KT	MC	OP
5S						
Culture	0.906					
Kaizen_Awarness	0.593	1.028				
Kaizen_Team	0.811	0.590	0.545			
Managment _commitment	0.576	1.149	0.943	0.465		
Organizational_Productivity	0.885	0.630	0.502	0.631	0.433	
Waste_Minimization	0.877	0.911	0.708	0.618	0.700	0.759

Sources: - Survey, 2023

the HTMT indicator of the correlations calculates the average of the correlations' heterotrait-heteromethod (correlations between indicators that measure different constructs) (Alarcón, Sánchez, & De Olavide, 2015). This study examines first-choice discriminant validity (as a criterion). We evaluate the Heterotrait-Monotrait ratios to a comparison point (typically 0.85 or 0.95), and discriminant validity exists when the HTMT are lower than the comparison point (in this case, this point was chosen as 0.85). The comparison point exceeds all cases in Table 4, indicating discriminant validity.

Table 4. Fornell-Larcker criterion

	5S	C	KA	KT		MC	OP	WM
5S	0.745							
Culture	0.681	0.790						
Kaizen_Awarness	0.489	0.793	0.893					
Kaizen_Team	0.673	0.471	0.489	0.928				
Managment _commitment	0.481	0.893	0.829	0.421		0.904		
Organizational_Productivity	0.742	0.488	0.435	0.563		0.379	0.841	
Waste_Minimization	0.715	0.682	0.593	0.537		0.588	0.642	0.771

Sources: - Survey, 2023

The second criterion is to assess discriminant validity using Fornell-Lacker criterion (Alarcón, Sánchez, & De Olavide, 2015). This method compares the square root of the average variance extracted (AVE) with the correlation of latent constructs (Rasoolimanesh, 2022; Hilkenmeier, Bohndick, Bohndick, & Hilkenmeier, 2020). A latent construct should explain better the variance of its own indicator rather than the variance of other latent constructs. Therefore, the square root of each construct's AVE should have a greater value than the correlations with other latent constructs (Yusoff, Peng, Abd Razak, & Mustafa, 2020). As the finding shows assumption of discriminant validity is well addressed.

7. Validation of the structural method

To evaluate the prediction quality of a structural PLS model, it is recommended to employ the coefficient of determination (R^2) and path values. With respect to the former, literature indicates this parameter establishes the degree to which the model explains the data (Alarcón, Sánchez, & De Olavide, 2015). With respect to its magnitude, a R^2 value of 0.67 is substantial, a R^2 value of 0.35 is moderate and a R^2 value of 0.19 is weak (Purwanto & Sudargini, 2021). Thus, the obtained results indicate that in a moderate capacity, the kaizen implementation toward waste minimization was (R^2 =0.593) is explained by the 'abilities developed in Kaizen implementation variable. Empirical evidence indicates that 'waste minimization variable was predicted by kaizen implementation (Leksic, Stefanic, & Veza, 2020)..

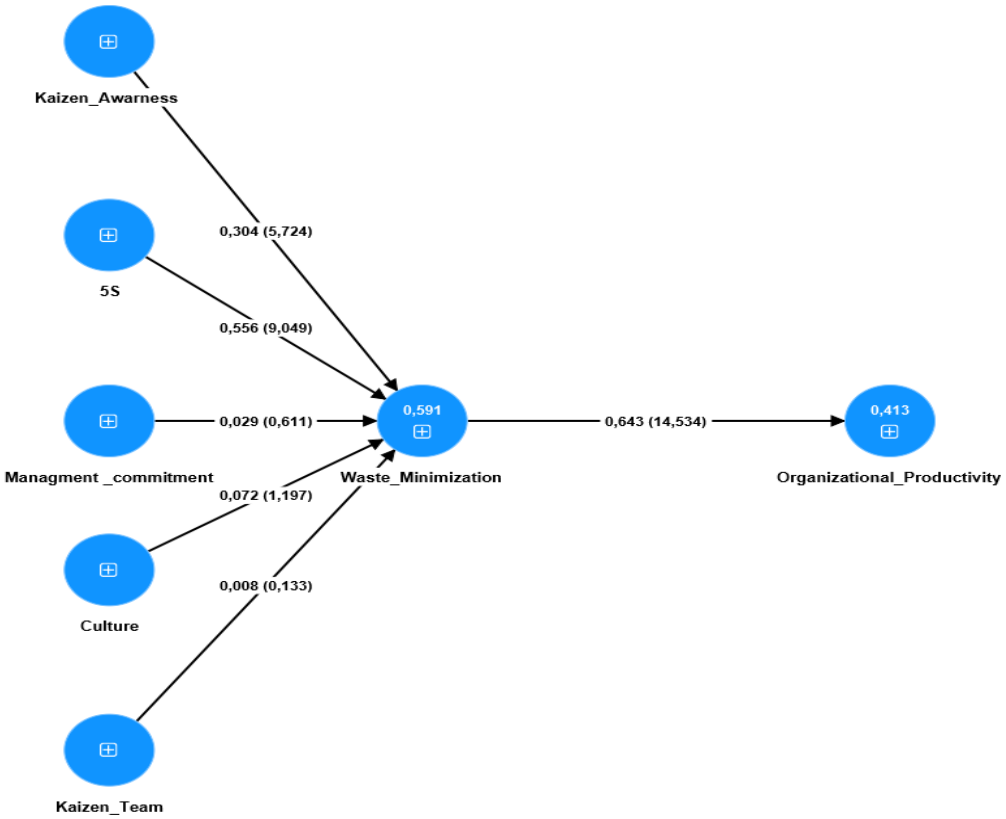

Figure 2: path coefficient between kaizen implementation, waste minimization and organizational productivity

Finally, the results show that the 'waste minimization impact on productivity (R^2=0.410) indicating is explained in a moderate-substantial manner by the 'waste minimization and 'abilities developed during Kaizen events' variables. The finding is consistent (Goyal A. , Agrawal, Chokhani, & Saha, 2019; Habte, 2019; Hilkenmeier, Bohndick, Bohndick, & Hilkenmeier, 2020) Besides, based on Cohen (1988) a threshold of 0.02 were assigned as small, 0.15 as moderate and 0.35 as large effect on the model. Hence, the current finding indicated that it ranges from small to large effects between the path used in the study as shown in table 5

Table 5. R square and f square

	R-square	R-square adjusted
Organizational Productivity	0.412	0.410
Waste Minimization	0.600	0.593
f-square		
5S -> Waste Minimization	0.174	
Culture -> Waste Minimization	0.004	
Kaizen_Awarness -> Waste Minimization	0.029	
Kaizen_Team -> Waste Minimization	0.021	
Managment _commitment -> Waste Minimization	0.04	
Waste Minimization -> Organizational Productivity	0.701	

Sources: - Survey, 2023

8. Hypotheses testing

8.2.1. Direct Effect

. They are statistically significant (t-values for 5 paths were more than 1.96 with a confidence interval of 95%) and exceed the minimum established point of 0.20. indicating that the 5S -> Waste Minimization (β=0.468; T= 6.273 and p= 0.00) ; Kaizen Awareness -> Waste Minimization(β=0.163; T= 2.243 and p= 0.025); Waste Minimization -> Organizational Productivity(β=0.642; T= 14.398 and p= 0.00); 5S -> Organizational Productivity(β=0.312; T= 4.992 and p= 0.00) and Kaizen Awareness -> Organizational Productivity (β=0.104; T= 2146 and p= 0.032) were accepted and the rest are rejected as shown in figure 3 and table 6

Table 6: - Hypothesis test

Indicators	Path	T- test	P value	Status
5S -> Waste Minimization	0.486	6.273	0.000	Accepted
Culture -> Waste Minimization	0.114	0.983	0.325	Rejected
Kaizen_Awarness -> Waste_Minimization	0.163	2.240	0.025	Accepted
Kaizen_Team -> Waste_Minimization	0.033	0.578	0.563	Rejected
Managment _commitment -> Waste_Minimization	0.104	0.857	0.391	Rejected
waste Minimization -> Organizational_Productivity	0.642	14.398	0.000	Accepted
5S -> Organizational_Productivity	0.312	4.992	0.000	Accepted
Culture -> Organizational Productivity	0.073	0.981	0.327	Rejected
Kaizen_Awarness -> Organizational_Productivity	0.104	2.146	0.032	Accepted
Kaizen_Team -> Organizational_Productivity	0.021	0.582	0.561	Rejected
Managment _commitment -> Organizational_Productivity	0.066	0.877	0.380	Rejected
Indictor to see indirect effects	Indirect effects			
Kaizen_Awarness -> Waste_Minimization -> Organizational_Productivity	0.104	2.146	0.032	Accepted
5S -> Waste_Minimization -> Organizational_Productivity	0.312	4.999	0.000	Accepted

Sources: - Survey, 2023

8.2.2. Indirect Effect

The analysis indicated that the indirect path coefficient between Kaizen Awareness -> Waste Minimization -> Organizational Productivity (β=0.104; T= 2.146 and p= 0.032) and 5S -> Waste Minimization -> Organizational Productivity (β=0.312; T= 4.999 and p= 0.00) are accepted as t value greater than 1.96. p value <0.005. the current finding is consistent with early research done by (Aoki, 2008; Erdhianto, 2016; Girma, 2016; Getachew, 2017; Ishijima, Miyamoto, Masaule, & John, 2022; Kharub, Gupta, Rana, & McDermott, Employee's performance and Kaizen events' success: does supervisor behaviour play a moderating role, 2023)

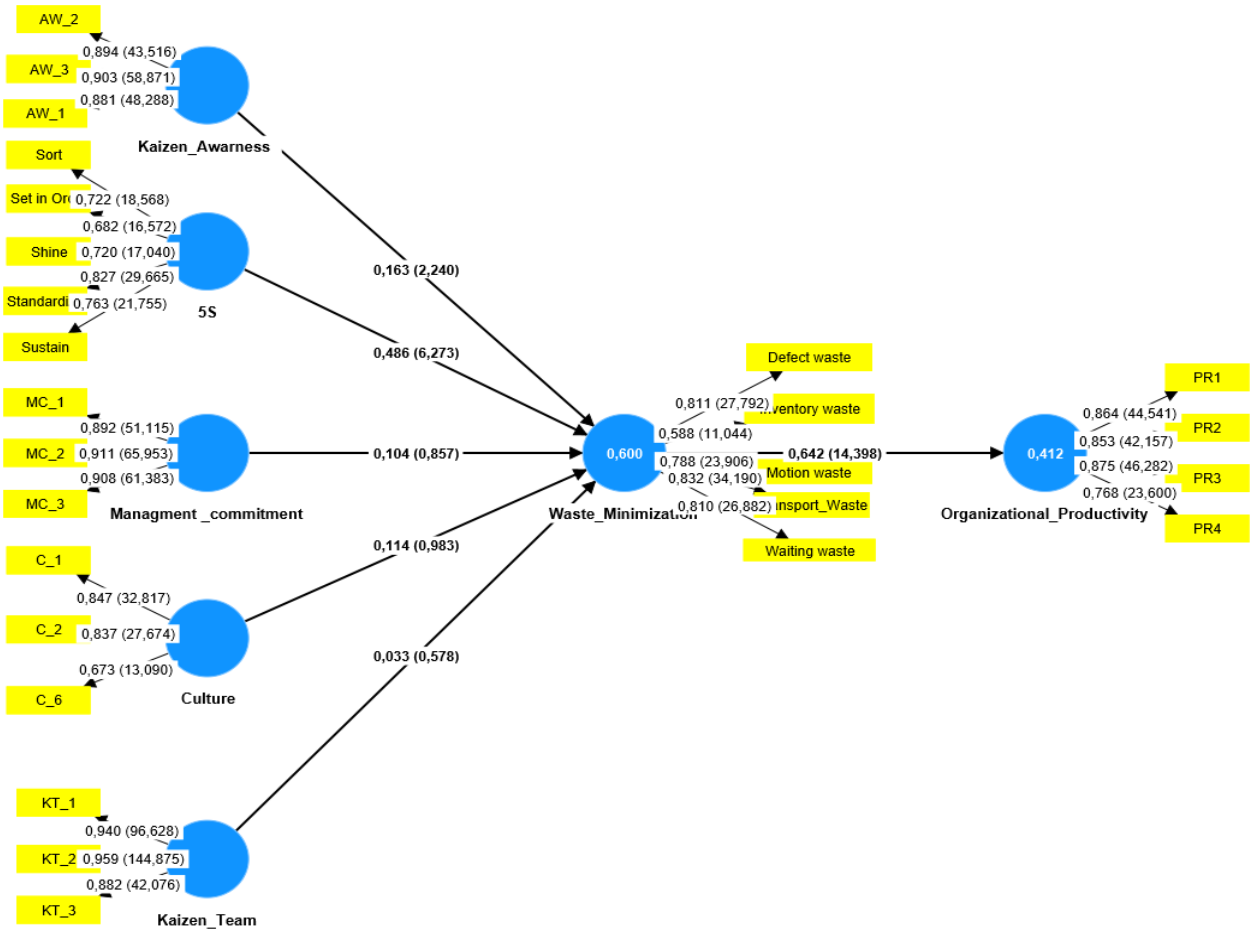

Figure 3: path coefficient and T-test between kaizen implementation, waste minimization and organizational productivity

Sources: - Survey, 2023

9. Conclusion

The study aimed at examine the effect of kaizen implementation on organizational productivities through waste minimization. The findings show that 5S (sorting, set in order and shining, standardizing, and sustain), level of awareness, management commitment affects waste minimization. However, culture and team have less effect on waste minimization. The current finding is consistent (Assefa, 2016; Getachew, 2017; Girma, 2016; García, Rivera, & Iniesta, 2013; Ishijima, Miyamoto, Masaule, & John, 2022) .

Productivity affected by waste minimization where the finding is also consistent with (Biege, Smith, & Shenk, 2001; Burkitt, et al., 2009; Rahmanian & Rahmatinejad, 2013; Juhari, Abidin, & Omar, 2011; García, Rivera, & Iniesta, 2013; onzalez-Aleu & Aken, 2016; Goyal A. , Agrawal, Chokhani, & Saha, 2019). Other finding also indicated that there is a relationship between kaizen implementation, waste minimization and productivity (Rahmanian & Rahmatinejad, 2013; Malloch, 1997; Girma, 2016; Juhari, Abidin, & Omar, 2011; Kharub, Gupta, Rana, & McDermott, Employee's performance and Kaizen events' success: does supervisor behaviour play a moderating role?. , 2023; Androniceanu, Enache, Valter, & Raduica, 2023; Romana & Gestoso, 2023).

Similarly, the finding indicated that Kaizen Awareness -> Waste Minimization -> Organizational Productivity and 5S -> waste Minimization -> Organizational Productivity have direct and indirect affect one another. The finding also consistent with (Berger, 1997; Cheser, 1998; Bhatt, 2000; Malloch, 1997; Shimizu, 2000; Styhre, 2001; Soltero & Waldrip, 2002; Brunet & New, 2003; Inoki & Fukazawa, 2007; Khan, Bali, & Wickramasinghe, 2007). Also finding form other nation i.e. China (Aoki, 2008) and Mexico (García, Rivera, & Iniesta, 2013; Suárez-Barraza & Ramis-Pujol, 2010); Ethiopia (Tadesse, 2018; Getachew, 2017) and other nation (Glover, Farris, van Aken, & Doolen, 2011) was show that kaizen implementation helps to reduce waste and increase productivity despite no finding has used directly that testify using SMART pls.

Productivity that was represented on human, personnel, raw material and machine were affected by waste minimization that will affect profitability and sustainably of the organizations in the study The finding also supported by early result done such as (Aoki, 2008; Erdhianto, 2016; Conroy, 2009; Mureithi, 2013). The current finding also shows that the challenge that hindered kaizen implementation was lack of management commitment to follow up and support that supported by (Assefa, 2016; Habte, 2019; Mureithi, 2013).

Validating and implementation kaizen helps many organizations to maximize organizational profitability (Rahmanian & Rahmatinejad, 2013; Malloch, 1997; Girma, 2016; Juhari, Abidin, & Omar, 2011). Hence, the researcher advisee the selected three companies i.e. National, Touré And Pioneer Cement shall work on the effective implementation of Kaizen secures which will have a log term benefit of building sustainability and bring continuous improvement.

10.References

Ahlström, P., & Karlsson, C. (1996). Change processes towards lean production: the role of the management accounting system. *International Journal of Operations and Production Management,, 16*(11), 42-56.

Alarcón, D., Sánchez, J. A., & De Olavide, U. (2015). Assessing convergent and discriminant validity in the ADHD-R IV rating scale: User-written commands for Average Variance Extracted (AVE), Composite Reliability (CR), and Heterotrait-Monotrait. *In Spanish STATA meeting, 39*, 1-39.

Alukal. (2007). “Lean kaizen in the 21st century”,. *Quality Progress,, 40.*(8), 69-70.

Androniceanu, A., Enache, I. C., Valter, E. N., & Raduica, F. F. (2023). *Increasing Energy Efficiency Based on the Kaizen Approach. Energies, 16*(4), 1930.

Anumba, C. (2006). *“Application of GIS to Labour Market Planning in Construction”, PhD Thesis, Loughborough University, Loughborough.* Loughborough University.

Aoki, K. (2008). Transferring Japanese kaizen activities to overseas plants in China’,. *International Journal of Operations & Production Management, 28*(6), 518–539.

Assefa, G. (2016). *assessment of kaizen implementation of kaizen and its challenges* . addis ababa : addis ababa university.

Bane. (2002). Leading edge quality approaches in non-manufacturing organizations", May 20-22, pp. . *Annual Quality Congress Proceedings,* (pp. 245-9.). ASQ's Denver, CO, .

Bech, C., & Gundtoft, L. (1998). Study of NOx, SOx, and CO mechanisms based on actual plant data . *Cement Industry Technical Conference, 1998. 40th Conference Record. 1998 IEEE/PCA, ,* (pp. 141 – 154.).

Berger, A. (1997). Continuous improvement and kaizen: standardization and organizational designs'. *Integrated Manufacturing Systems, 8*(2), 110–117.

Bhatt, G. (2000). 'A resource-based perspective of developing organizational capabilities for business transformation. *Knowledge and Process Management, 2*(2), 119–129.

Biege, N., Smith, D., & Shenk, R. (2001). Strategies for reducing cement kiln baghouse corrosion problems . *ment Industry Technical Conference, IEEEIAS/PCA,* (pp. 361 – 374.).

bookmatter. (2119). *strategic implementation* . Retrieved from bookmatter.

Brunet, A., & New, S. (2003). 'Kaizen in Japan: an empirical study', International. *Journal of Operations & Production Management, 23*(12), 1426–1446.

Bulletin, T. N. (2017). Organization, 2017.

Burkitt, K., Mor, M. K., Kruszewski, M. S., McCray, E., Moreland, M. E., Muder, R., . . . Fine, M. (2009). "Toyota Production System Quality Improvement Initiative Improves Perioperative AntibiAntibiotic Therapy",. *THE AMERICAN JOURNAL OF MANAGED CARE, 15*(9), 633-642.

Cherrafi, A., Elfezazi, S., Hurley, B., Garza-Reyes, J. A., Kumar, V., Anosike, A., & Batista, L. (2019). Green and lean: a Gemba–Kaizen model for sustainability enhancement. *Production Planning & Control, 30,* 385-399.

Cheser, R. (1998). The effect of Japanese kaizen on employee motivation in U.S. manufacturing'. *The International Journal of Organizational Analysis,, 6*(3), 197–217.

Comrey, A. L., & Lee, H. B. (1992). *A first Course in Factor Analysis.* New Jersey: Hillsdale.

Conroy, G. (2009). " Aumund's mighty feeder. *International Cement Review Magasine , January 2009,* (pp. 10-13.).

de Toledo, J. C., Pinheiro, L. M., Poltronieri, C. F., Barbalho, S., & González, M. O. (2023). Lean development and its impacts on the performance of new product processes: an analysis of innovative Brazilian companies. *Research in Engineering DesigDesign, ,* 1-16.

Dimitrescu, A., Babiş, C., Niculae, E., Chivu, O., & Dascălu, L. (2019). Impact on quality of production using 5S method. . *Journal of Research and Innovation for Sustainable Society, 1(1), ,* 81-86.

Erdhianto, Y. (2016). *Design System for Employee Performance Evaluation Based on.* American Journal of economics,finance and management .

Fisher, C., Buglear, J., Lowry, D., Mutch, A., & Tansley, C. (2007). *Researching and Writing Dissertation: A Guiding Book for Business students.* London: Pearson Education.

Folsberg, J. (1997). The air-swept ring roller mill for clinker grinding", . *In Cement Industry Technical Conference,1997. IEEE-IAS,* (pp. 157-176.).

García, J., Rivera, D., & Iniesta, A. (2013). Critical success factors for kaizen implementation in manufacturing industries in Mexico',. *The International Journal of Advanced Manufacturing Technology,, 68*(1-4), 537–545.

Getachew, G. (2017). *Assessment of kaizen implementation and challenges toward sustainability.* addis abeba : addis abeba universty departement of Mechanical and Industrial Engineering .

Girma, A. (2016). *The implementation of Kaizen theory :Achievements The Case of Sino Ethiop and Awash Tannery ;A Thesis Submitted to Department of Public Administration and Development Management College of Business and Economics in partial fulfillment MA in Public Policy.* A.A: AAU.

Glover, W., Farris, J., van Aken, E., & Doolen, T. (2011). Critical success factors for the sustainability of kaizen event human resource outcomes: an empirical study'. *International Journal of Production Economics, 132*(2), 197–213.

Goyal, A., Agrawal, R., Chokhani, R. K., & Saha, C. (2019). Waste reduction through Kaizen approach: A case study of a company in India. *Waste Management & Research,, 37*(1), 102-107.

Habte, B. G. (2019). *The Effect of Kaizen Implementation on Perceived Waste Minimization: Mugher Cement FactoryA Thesis Submitted to Addis Ababa University School of Commerce in Partial Fulfillment of the Requirements for the Master of Art Degree in Human Resource Manageme.* Addis Ababa : Addis Ababa University School of Commerce .

Hair Jr, J. F., Hult, G. T., Ringle, C. M., Sarstedt, M., Danks, N. P., Ray, S., & Ray, S. (2021). *An introduction to structural equation modeling. Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook, 1-29.*

Hallgren, & Olhager. (2009). Lean and agile manufacturing: external and internal drivires and performance outcomes. *Journal of Operations andproduction Management, 29*(10), 976-999.

Hilkenmeier, F., Bohndick, C., Bohndick, T., & Hilkenmeier, J. (2020). Assessing distinctiveness in multidimensional instruments without access to raw data–a manifest Fornell-Larcker criterion. . *Frontiers in psychology, ,* 11, 223.

Hills, L. M., Johansen, V., & Miller, F. M. (2002). Solving raw material challenges [cement industry]". *Cement Industry Technical Conference,* (pp. 139-150.). FL, USA: EEE-IAS/PCA 44th Jacksonville.

Hines, P., & Rich, N. (1997). The seven value stream mapping tools. *International Journal of Operations and Production Management, 17*(1), 46-64.

Imai, M. (2001). *Gemba Kaizen: A Commonsense, Low Cost Approach to Management, .* Singapore: McGraw-Hill Book Co., .

Inoki, M., & Fukazawa. (2007). *'Software product line evolution method based on kaizen approach', SAC'07, March, pp.11–15 [online] http://people.cs.clemson.edu/~johnmc/courses/ cpsc950/p1207-inoki.pdf (accessed 11 January 2013).*

Ishijima, H., Miyamoto, N., Masaule, F., & John, R. (2022). Improvements to healthcare waste management at regional referral hospitals in Tanzania using the KAIZEN approach. *The TQM Journal, 34*(5), 939-956.

Izumi, O., Kenichi, & Sayoko, U. (2009). Introducing KAIZEN in Africa.GRIPS. *Development Forum.* Tokyo, Japan.

Janjić, V., Bogićević, J., & Krstić, B. (2019). Kaizen as a global business philosophy for continuous improvement of business performance. *ekonomika,, 65*(2), 13-25.

Janjić, V., Todorović, M., & Jovanović, D. (2020). Key success factors and benefits of Kaizen implementation. *Engineering Management Journal, 32*(2), 98-106.

Juhari, N., Abidin, N., & Omar, M. (2011). Factors Influencing Employees' Motivation in Implementing 5S System. *Human Resources Management*, 4836-4847. .

Khan, Z., Bali, R., & Wickramasinghe, N. (2007). 'Developing a BPI framework and PAM for SMEs'. *Industrial Management & Data Systems,, 107*(3), 345–360.

Kharub, M., Gupta, H., Rana, S., & McDermott, O. (2023). Employee's performance and Kaizen events' success: does supervisor behaviour play a moderating role. *The TQM Journal, (ahead-of-print).*

KREJCIE, R. V., & MORGAN, D. W. (1970). *EDUCATIONAL AND PSYCHOLOGICAL MEASUREMENT* . university of minnesota ;duluth;texas A and M university : , 30, 607-610. DETERMINING SAMPLE SIZE FOR RESEARCH ACTIVITIES from the University of Minnesota, Duluth, and Texas A. & M. University.

Lee, C. (1992). The adoption of Japanese manufacturing management techniques in Korean manufacturing industry. *International Journal of Operations and Production Management*(12), 66–81.

Lee, Y. H., & Lee, B. (2003). Push-pull production planning of the re-entrant process. *Jinternational ournal Advanced Manufacturing Technology*, 922-931.

Leksic, I., Stefanic, N., & Veza, I. (2020). The impact of using different lean manufacturing tools on waste reduction. *Advances in Production Engineering & Management, 15*(1).

Limb, Melanie, Dwyer, & Claire. (2001). *Qualitative Methodologies for Geographers. Issues sand Debates.* . Oxford University Press. .

Maarof, M. G., & Mahmud, F. (2016). A review of contributing factors and challenges in implementing kaizen in small and medium enterprises. *Procedia economics and Finance, , 35*, , 522-531.

Malloch, H. (1997). trategic and HRM aspects of kaizen: a case study',. *New Technology, Work and Employment,, 12*(2), 108–122.

Maurer. (2004). *One Small Step Can Change Your Life: The Kaizen Way, Workman* . New York, NY: Publishing Co, Inc., .

Minda, F. D. (2018). ASSESSMENT OF THE SUCCESS AND FAILUR OF KAIZEN IMPLEMENTATION IN MUGHER CEMENT FACTORY IN RESPECT OF PRODUCTIVITY. ADDIS ABABA, ETHIOPIA: St. MARY UNIVERSITY SCHOOL OF GRAGUATE STUDIES.

Mintus, F., Hamel, S., & Krumm, W. (2006). Wet process rotary cement kilns: modeling and simulation", Clean Technologies and Environmental Policy. *Clean Technologies and Environmental Policy.*, (pp. 112-122.).

Mulenga, M. N. (2018). Towards sustainable construction waste minimization and management in Zambia and beyond. *Rwanda Journal of Engineering, Science, Technology and Environment, 1(1).*

Mureithi, M. A. (2013). *Effects of Kaizen Tool on Organization Effectiveness: a Caseof Davis &Shirtliff LTD. Award of the Degree of Masters of Arts in Project Planning and Management of the University of Nairobi Unpublished.* Nairobi: University of Nairobi.

Nderi, M. M. (2012). THE RELATIONSHIP BETWEEN KAIZEN IMPLEMENTATION AND OPERATIONS PERFORMANCE IMPROVEMENT: THE CASE OF KENYAN MANUFACTURING FIRMS . *A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF*

MASTERS IN BUSINESS ADMINISTRATION OF THE UNIVERSITY OF NAIROBI. NAIROBI: UNIVERSITY OF NAIROBI.

NEWS, PC. (2015, May). *What is productivity and how is it measured from.* Retrieved from www.pc.gov.au.

Norhayati. (2012). Critical Success Factors of Total Quality Management Implementation in Higher Education Institution. Academic Research in. *Business and Social Sciences., 2*(12).

Omotayo, T. S., Kulatunga, U., & Bjeirmi, B. (2018). Critical success factors for Kaizen implementation in the Nigerian construction industry. . *International Journal of Productivity and Performance Management.*

Omotayo, T., Awuzie, B., Egbelakin, T. O., & Ogunnusi, M. (2020). AHP-systems thinking analyses for Kaizen costing implementation in the construction industry. . *Buildings, , 10*(12), 230.

onzalez-Aleu, & Aken, V. (2016). Systematic literature review of critical success factors for continuous improvement projects. *International Journal of Lean Six Sigma, 7*(3), 214-232.

Otsuka, K., Jin, K., & Sonobe, T. (2018). Kaizen as Policy Instrument:The Case of Ethiopia. In g. tadesse, *appliying the kaizen in africa* (p. 151).

Pampanelli, A. B., Found, P., & Bernardes, A. M. (2011). *A lean and green Kaizen model. In POMS annual conference (p. 29).*

Pang, Y., & Lodewijks, G. (2005). Large-scale conveyor belt system maintenance decision-making by using fuzzy causal modeling. *In Intelligent Transportation Systems, 2005. Proceedings. 2005 IEEE,*, (pp. 563 - 567.). Vienna, Austria.

PC News. (2015, may). *what is productivity and how is it measured*. Retrieved from pc news.

Pipilikaki, P., Katsioti, M., & Gallias, J. L. (2009). "Performance of limestone cement mortars in a high sulfates environment",. *Construction and Building Materials,, 23*(3), 1042-1049.

Purwanto, A., & Sudargini, Y. (2021). Partial least squares structural squation modeling (PLS-SEM) analysis for social and management research: a literature review. *Journal of Industrial Engineering & Management Research, 2*(4), 114-123.

Rahmanian, F., & Rahmatinejad, Z. (2013). Impact of Kaizen implementation on performance of manufacturing companies' staff. In E. O. Sciences.

Rahmanian, F., & Rahmatinejad, Z. (2014). Impact of Kaizen implementation on performance of manufacturing companies' staff. . *European Online Journal of Natural and Social Sciences: Proceedings*, 1094.

Ramayah, T. J., Cheah, J., Chuah, F., Ting, H., & Memon, M. A. (2018). Partial least squares structural equation modeling (PLS-SEM) using smartPLS 3.0. An updated guide and practical guide to statistical analysis.

Rasoolimanesh, S. M. (2022). Discriminant validity assessment in PLS-SEM: A comprehensive composite-based approach. *Data Analysis Perspectives Journal, 3*(2), 1-8.

Renfrew, S., & Perkins, D. (2004). Utilization of steel slag in a California cement plant", . *Cement Industry Technical Conference, 2004. IEEE-IAS/PCA*, (pp. 111 – 119).

Rizkya, I., Syahputri, K., Sari, R. M., & Siregar, I. (2019). 5S implementation in welding workshop–a lean tool in waste minimization. *In IOP conference series: materials science and engineering (Vol. 505, No. 1* (p. 012018). IOP Publishing.

ROBERT V. KREJCIE, D. W. (1970,). *EDUCATIONAL AND PSYCHOLOGICAL MEASUREMENT, DETERMINING SAMPLE SIZE FOR RESEARCH ACTIVITIES.* Duluth, and Texas A. & M. University: University of Minnesota.

Romana, F. A., & Gestoso, C. G. (2023). ECONOMIC PERFORMANCE AND THE IMPLEMENTATION OF LEAN MANAGEMENT MODEL. *Economics and Finance, 11*(1), 13-23.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students. 5th edt.* Harlow: Financial Times Prentice Hall.

Seid, N. (2012). The role of Ethiopian Government in Kaizen Implementation as a Modern Management Tool for quality and productivity. . *Proceeding the 4th International conference Leadership institute with the collaboration of University.* Unpublished. research.

Shah, & Ward. (2007). "Defining and developing measures of lean production. *Journal of Operations Management, 25*(4), 785-805.

SHEMEALASH, S. (2019). ASSESSMENT OF EFFECTIVENESS OF KAIZEN IMPLEMENTATION: THE CASE OF NA METAL INDUSTRY & ENGINEERING . *(Doctoral dissertation, St. Mary's University).*

Shimizu, K. (2000). *Transforming Kaizen at Toyota, Working Paper, .* Okayama University.

Soltani, H., & Elham. (2019). The Mediating Role of Kaizen in the Relationship between Total Quality Management and Organization's Performance. *Journal of System Management, 5*(1).

Soltero, C., & Waldrip, G. (2002). 'Using kaizen to reduce waste and prevent pollution. *Environmental Quality Management,, 11*(3), 23–38.

Styhre, A. (2001). 'Kaizen, ethics, and care of the operations: management after empowerment'. *Journal of Management Studies, 38*(6), 795–810.

Suárez-Barraza, M., & Ramis-Pujol, J. (2010). 'Implementation of lean-kaizen in the human resource service process: a case study in a Mexican public service organisation. *Journal of Manufacturing Technology Management,, 21*(3), 388–410.

Sugimoto, S. (2018). Kaizen in Practice. In J. I. (JICA), *APPLYING THE KAIZEN IN AFRICA* (pp. 69-110).

Szabó, L., Hidalgo, I., Ciscar, J. C., & Soria, A. (2006). CO2 emission trading within the European Union and Annex B countries: the cement industry case", Energy Policy. *The International Journal of the Political, Economic, Planning, Environmental and and Social Aspects of Energy, 34*(1), 72-87.

Tadesse, G. (2018). Kaizen as Policy Instrument,The Case of Ethiopia. In J. I. (JICA), *Applying the Kaizen in Africa-* (p. pp 151).

Tezel, A., Koskela, L., & Tzortzopoulos, P. (2023). Implementation of continuous improvement cells: a case study from the civil infrastructure sector in the UK. . *Production Planning & Control, 34*(1), 68-90.

Thessaloniki. (2006). *Kaizen Definition & Principles in Brief: A Concept & Tool forEmployees Involvement.* . London: Sage publication.

Tiwari, P. (2017). sessment of the Practices and Challenges of Kaizen Implementation in Micro and Small Enterprises: The Case of Manufacturing Enterprises. *International Journal of Engineering and Management Research, 7*(4), 313-322.

Toshihiko, & Wimal. (2011). Change Management for Hospitals. Through Stepwise Approach, 5S-KAIZEN-TQM.

Treloar, G. J., Owen, C., & Fay, R. (2001). Environmental assessment of rammed earth construction systems". *Structural Survey Journal, 19*(2), 99-106.

Trochim. (2006). *Research methods Knowledge base, web center for Social research methods .*

UNIDO. (2017). *Driving Inclusive and Sustainable Industrial Development, Industrial Development Report 2018.* Retrieved from Demand for Manufacturing.

united nations industrial development. (2018). driving inclusive and sustainable industrial development . *demand for manufacturing* .

V.M., J. (2003). On the sustainability of the concrete", UNEP. *Journal of Industry and Environment, 1*(1), 2-7.

Valentini, F., & Damasio, B. F. (2016). Average Variance Extracted and Composite Reliability: Reliability Coefficients/Variancia Media Extraida e Confiabilidade Composta: Indicadores de Precisao. *Psicologia: Teoria e Pesquisa,, 32*(2).

Womack, J. P., & Jones, D. T. (2003). *"Lean thinking: Banish waste and create wealth in your corporation", 2nd edition.* London, UK: Simon and Schuster Inc.

Worrell, E., Martin, N., & Price, L. (2000). Potentials for energy efficiency improvement in the US cement industry", Energy. *The International Journal, 25*(12), 1189-1214.

Yokozawa. (2010). *The influence of national culture on Kaizen transfer:An exploratory study of Japanese subsidiaries in the Netherlands.*

Yusoff, A. S., Peng, F. S., Abd Razak, F. Z., & Mustafa, W. A. (2020). Discriminant validity assessment of religious teacher acceptance: The use of HTMT criterion. In Journal of Physics: . *Conference Series (Vol. 1529, No. 4, p. 042045). IOP Publi*.

Zailani, S., Shaharudin, M. R., & Saw, B. (2015). Impact of kaizen on firm's competitive advantage in a Japanese owned company in Malaysia. *Int. J. Productivity and Quality Management, 16*(2).