

# Workplace safety, Employee safety attitudes and employee productivity of manufacturing firms



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**Orientation:** The manufacturing sector in Kenya has been experiencing employee safety and productivity issues despite adopting safety programmes and laws regulating employee safety. Employee safety attitudes significantly worsen workplace safety and productivity problems.

**Research purpose:** The study determined the intervening effect of workplace safety attitudes on the relationship between workplace safety and employee productivity in manufacturing firms in Kenya.

**Motivation for the study:** Manufacturing firms adopt new technologies that expose employees to new safety risks, while globalisation has led to a diverse workforce with diverse safety attitudes.

**Research approach/design and method:** This study is grounded on the risk homeostasis theory; it adopted a cross-sectional survey research design guided by a positivist research philosophy. The target population comprised 853 manufacturing firms registered with the Kenya Association of Manufacturers. A sample of 124 firms distributed across the 14 sub-sectors in the manufacturing sector was obtained using a statistical formula to ensure all sectors were represented. Regression analysis was carried out in four steps to assess the intervening effect of workplace safety attitude on the relationship between workplace safety attitude and employee productivity.

**Main findings:** The coefficients were significant in each step, therefore leading to the conclusion that employee safety attitude significantly intervened in the relationship between workplace safety and employee productivity.

**Practical/managerial implications:** The study offers managerial insights into the situational position of workplace safety, employee safety attitudes and employee productivity.

**Contribution/value-add:** The study provides epistemological insights on the impact of employee safety attitudes on workplace safety and employee productivity.

**Keywords:** workplace safety; employee safety attitudes; employee productivity, manufacturing firms, productive time.

## Introduction

### Orientation

Organisations rely on employees to function and meet the set objectives. Organisations use significant resources to sustain and maintain a productive workforce. Safety challenges may inhibit employee productivity (European Employee Productivity Institute, 2019). Globalisation and technological revolution have significant implications for human resource management; changing nature of work, workforce and workplaces, safety concerns, and consequently greater workforce expectations from the changes. New technologies expose employees to new safety risks while globalisation has led to a diverse workforce with diverse safety attitudes. Furthermore, organisations face new regulations on safety and quality of work life. The human resource practitioner now deals with a more complex and safety-prone workplace (Byarset, 2014). These changes may affect the productivity of the employees.

Manufacturing firms worldwide have increasingly mechanised their production processes; this mechanisation has increased workplace safety risks (Laura, 2019). The firms therefore have adopted workplace safety programmes meant to protect workers effectively from workplace job hazards (Li et al., 2020). Rosa (2019) observed that an organisation may have safety programmes

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but they may fail to guarantee workplace safety and productivity if employees have undesirable attitudes towards safety. For instance, Aswathappa (2015) noted that employees are not involved in the design and execution of workplace safety programmes and hence exhibit no investment in them, take unnecessary risks and ignore the safety procedures. Schultz (2017) further added that the programmes are not adequate and are only commissioned when there is a major safety incident. Lencioni (2019) suggested that inadequate safety ergonomics, safety training and safety transfer to insurance and consultants lead to undesirable safety attitudes such as phobias and overconfidence that lead to employees taking unnecessary risks or avoiding work that is perceived to be risky.

All firms face safety challenges, which could have adverse productivity effects on their workforce (Society for Human Resource Management Report, 2017). The workplace safety problem is so severe that the International Labour Organization (ILO) adopted a new mission that indicates that reducing the risk of occupational injuries is its top priority (ILO, 2018). Employees require optimal safety to be optimally productive; therefore, organisations require appropriate programmes to cover all possible contingencies without interrupting regular work operations. Goetzel (2018) noted that when Cigna insurance company and Acco Corp in the United States of America offered safety programmes, their employees became more productive. When Norwegian business schools in Europe offered accident compensation package, protective clothing, working postures training, safety consulting and onsite medical attention, their employees became more productive; there were no lost workday cases, no cases of restricted work only and employees depicted desirable risk attitudes. In September 2017, Volvo manufacturing stopped production after 20 employees were injured because of a lack of safety equipment. In February 2018, Toyota closed down 18 plants for 2 weeks because of a fire that led to a loss of US \$195 million (Goetzel, 2018). These incidents in Toyota and Volvo led to increased absenteeism, decreased bids for more work, and workers were less motivated. Therefore, these workplace safety incidents reduced work productivity, which could have been prevented by a good employee safety programme.

African companies are no exception to significant safety problems. OSHA Africans Report (2019) indicated that the worst recorded workplace disasters have occurred in African firms: a ruptured heat exchanger in Tedoro Refining Company in 2014 killed seven workers, fire explosion and defective fire extinguishers in Amtech Corporation in 2017 killed 13 workers, in 2019 seven workers in Top Cleaners LLC died of carbon monoxide poisoning, and inadequate ventilation contributed to the deaths. These incidents would have been prevented by proper safety interventions. World Economic Forum Report (2018) on global manufacturing competitiveness noted that some manufacturing companies in South Africa (Sasol Chemicals), Egypt (Air Cairo), Ethiopia (Ethio Telecom), Morocco (Acio), Rwanda (Terracom) and

Nigeria (Dangote Cement) have outperformed developed countries firms in terms of workplace safety. These companies have recorded a positive effect on employee productivity. World Economic Forum Report (2018) on global manufacturing competitiveness further noted that most companies in the African continent have recently adopted policies to boost workplace safety and enable employee productivity.

In Kenya, workplace safety and employee productivity are significant issues. A report by Government of Kenya – GoK (2017) indicated that back pain resulting from work activity afflicts 6 out of 10 Kenyan workers and 9 out of 10 workers in the manufacturing sector. Additionally, the report indicated that Kenyan workplaces are unsafe because of poor lighting, vibrations, ventilation, hazardous working equipment, noise, repetitive motions, extreme temperatures and lack of employee safety training. These issues may be affecting the productivity of Kenyan workers (Warner, 2016). However, the GoK Report (2018) revealed that Kenyan institutions have come up with various safety management programmes to protect their workers from workplace injuries and boost their work productivity. Adopting workplace safety devices such as heat regulators, dust regulators, protective clothing, safety warnings and proper lighting is on the rise in Kenyan manufacturing firms. These programmes aim to ensure that employees are safe and hence optimally productive in their work (Motorola, 2016).

Several safety management systems guide firms towards standards for successful workplace safety. These guidelines are the National Occupational Safety Association – NOSA (2017), the International Loss Control Institute (ILCI) guidelines (2015), International Safety Rating Institute (2016). Other guidelines include the International Labor Organization's (ILO) guidelines on occupational safety (2018), ISO (2009). safety risk management standard and the three Es of safety (engineering, education and enforcement) advocated by Heinrich (2017). All these international guidelines posit that effective workplace safety should address areas of ergonomics, emergency planning, safety training, safety transfer and enforcement through safety policy and programmes to create positive safety attitudes. If these six areas are addressed, a safe workplace, and consequently better employee productivity, will be accomplished (Heinrich, 2017). The present study aimed to evaluate the relationship between these safety areas, employee safety attitudes and the productivity of employees in manufacturing firms in Kenya.

Previous studies and theoretical frameworks have not adequately addressed the intervening effect of employee safety attitudes on the relationship between workplace safety and employee productivity. The problem of workplace safety and employee productivity persists despite manufacturing firms having promulgated the safety programmes. Previous literature (Baicker, 2018; Li et al., 2020; Pitts et al., 2011; Prinsloo & Hofmeyr, 2022; Rosa, 2019) suggest that the problem could be because of employee safety attitudes. Therefore, the research objective was to evaluate the intervening

effect of employee safety attitudes on the relationship between workplace safety and employee productivity in manufacturing firms in Kenya.

In Kenya, the manufacturing sector comprises 14 sub-sectors mainly oriented towards producing consumer goods. Over 80% of the firms are based in Nairobi, while the rest are located in other major towns in Kenya (Kenya Association of Manufacturers [KAM], 2018). The United Nations Industrial Development Organization (UNIDO) Report (2019) ranks Kenya's manufacturing sector's competitiveness at 112 out of 150 economies globally. Despite the Kenyan manufacturing sector being the largest among the East African countries, growth in the sector has been slow at 4.6% in 2018, 3.1% in 2019 and an average growth of 3.4% in the last 5 years. The sector contributes an average of 10.3% to gross domestic product (GDP) and is considered a critical sector in attaining the country's economic development goals (KNBS, 2019). The sector's employee safety and productivity problem could inhibit the GoK's big four agenda blueprint that seeks to increase the GDP contribution of the sector to 15% by 2022.

## Research purpose and objectives

Although employee safety programmes have been on the rise, employee productivity remains a problem in manufacturing companies in Kenya. The Bureau of Labour Statistics Report (2019) established that Kenyan manufacturing firm workers produce less than workers in other industries, at an average of 130000 work hours per year compared to an average of 168000 work hours per year by other industries. Furthermore, employee productivity in the sector is less than 150000 work hours in an average African manufacturing firm and the internationally accepted standard of 200000 work hours per year (Bureau of Labour Statistics Report, 2019). OSHA African Report (2019) notes that this low worker productivity can be attributed to undesirable employee safety behaviours and attitudes. Therefore, this study aimed to evaluate the intervening effect of employee safety attitude on the relationship between workplace safety and employee productivity in manufacturing firms in Kenya. The hypothesis of the study therefore stated that employee safety attitude has no intervening effect on the relationship between workplace safety and employee productivity in manufacturing firms in Kenya.

## Literature review

### Theoretical review

This study was grounded on the risk homeostasis theory that explains how employee safety attitudes may intervene in the relationship between workplace safety and employee productivity.

### Risk homeostasis theory

This theory was developed by Wilde (1994). This theory maintains that, in any activity, people accept a certain level of subjectively estimated risk (body injury and property

loss) in exchange for the benefits they hope to receive from that activity. If, however, the level of subjectively experienced risk is higher, people adjust their work behaviour, affecting workplace safety and employee productivity. The theory opines that employees adjust their work risk behaviour based on four factors: (1) the expected benefits of risky behaviour, for instance, gaining work time by speeding; (2) the anticipated costs of risky behaviour, for instance, insurance surcharges for increased risk; (3) the anticipated benefits of safe behaviour, such as insurance discounts; and (4) the anticipated expenses of safe behaviour, such as time loss. These four factors took prominence in this study because employee risk behaviours in terms of attitudes and productivity are influenced by the level of workplace protection (Bontis, 2014). This supports the contribution of the independent variable to the dependent variable in the study and explains that safety attitudes intervene in this relationship.

Risk homeostasis theory was significant to this study because it pointed out that a lack of safety programmes such as workplace safety ergonomics, safety training, emergency management and transfer to insurance firms and consultants may limit workers' full potential, making them unable to perform their duties appropriately. Furthermore, employees develop undesirable behaviour towards safety and work productivity when their safety at work is not guaranteed. In the context of the manufacturing industry, employees will only do the bare minimum when they feel that they are not protected from workplace incidents. Reese (2018) critiqued the homeostasis theory for not fully explaining the effect of safety mechanisms on employee productivity and for not indicating how employee productivity behaviour is boosted in cases where there are enough safety protections. This research is expected to contribute to the development of this theory by filling this theoretical gap.

## Empirical literature

This section reviews relevant literature on workplace safety, employee safety attitude and employee productivity.

### Employee safety attitude, workplace safety and employee productivity

Existing Human resource Management (HRM) literature identifies dimensions of employee safety attitudes and also attempts to link employee safety attitudes to workplace safety and employee productivity. The literature has, however, not empirically determined the intervening effect of workplace safety attitudes on the relationship between workplace safety and employee productivity. For instance, Aswathappa (2015) noted that employees with positive safety attitudes pay attention to safety training, know and urge their co-workers to follow safety procedures. Li et al. (2020) observed that employees with negative safety attitudes take unnecessary risks and ignore safety procedures. Laura (2019) added that despite the commitment of employers to create safe workplaces and boost employee productivity, accidents and employee productivity problems may persist

because of negative employee safety attitudes. Kundu (2016) opined that negative safety attitudes can be addressed by developing safety programmes, such as safety training and safety control.

Lencioni (2019) suggested that inadequate safety ergonomics, safety training and safety transfer to insurance and consultants lead to undesirable safety attitudes such as phobias and overconfidence that lead to employees taking unnecessary risks or avoiding work that is perceived to be risky. This may lead to increased accidents and less productivity time and may affect employees' degree of accomplishment of tasks. Huang et al. (2022) opined that safety training programmes such as training audits, safety drills, safety rules, talks and seminars among others may eliminate negative safety attitudes, reduce chances of accidents and influence the productivity of employees. Dessler and Varrkey (2015) asserted that employees' safety attitude determines whether employees follow existing safety procedures and rules; this determines their safety and productivity. Therefore, previous HRM literature suggests that positive safety attitudes may reduce work interruptions, increase employees' degree of accomplishment of tasks and value added.

Despite HRM literature pointing out to the potential intervening effect of employee safety attitudes on the relationship between workplace safety and employee productivity, previous empirical evidence is not conclusive on these assertions. For instance, Kao (2019) investigated the link between safety knowledge, safety attitudes and safety behaviour. The study collected data from supervisors and workers in construction firms in the United States of America. The study did not show how it conceptualised its constructs. The study found that safety knowledge mediated the relationship between safety attitudes and safety behaviours. The study failed to link workplace safety in terms of safety ergonomics, emergency management, safety training and safety transfer to workplace safety attitudes and employee productivity outcomes as conceptualised in the current study. Laura (2019) studied the mediation effect of safety climate and safety motivation on the relationship between organisational climate and safety performance. The study used questionnaires to collect data from nurses in two hospitals in Italy. The study conceptualised safety in terms of managerial values and participation in safety training which are partial measures of workplace safety, while the current study measured workplace safety in terms of programmes put in place for safety. The study hypothesis which was evaluated using regression models found that safety climate (attitudes) did not mediate the relationship between organisational climate (work performance) and safety participation (training attendance). The study was conceptualised in a sector different from the current study. The current study however adopted the measure of workplace safety attitude (safety behaviour in terms of response to safety programmes) as applied by the study of Laura (2019) and as suggested by Wilde (1994), Fine (2017),

Lencioni (2019), Gao et al. (2019) and NOSA Safety Management System (2017).

A study by Rosa (2019) investigated safety attitude and its relationship with safety training and generalised work efficacy. The study conceptualised work efficacy as the belief in one's ability to perform a given task, while the current study measures work productivity using three measures (value-added, degree of accomplishment of tasks and productive time). Safety attitudes were conceptualised in terms of perceptions of safety climate, while the current study conceptualised safety attitudes in terms of response to safety programmes. The study failed to show how safety training was conceptualised. The sample was made up of 140 workers from three tile manufacturing firms and one in the public sector in Spain. The regression results found that safety training was positively associated with safety attitude and work efficacy. The study was faulted for collecting data from employees who might have been biased when asked to rank their work efficacy and attitude, while the current study collected data from supervisors and focused on the intervening effect of safety attitude on the relationship between workplace safety and employee productivity.

A similar study by Rahiman and Kodikal (2017) investigated the relationship between employee work-related attitudes (safety attitudes, work commitment and job involvement) and job performance (commitment and involvement). The independent and dependent variables for the study seemed to be related and therefore the study suffered from a multicollinearity problem. The study sampled 110 respondents in some selected hospitals in Kerala state, India. Data analysis conducted using correlation and regression methods showed a significant relationship between employees' attitudes and performances. Furthermore, the study found that the levels of productivity in hospitals that posted better work attitudes were better than in those industries where employees had poor employee attitudes. The study was not clear on how employee productivity and job-related attitudes were measured and failed to assess the intervening effect of employee safety attitudes on the relationship between workplace safety and employee productivity.

A study by Saleh (2015) investigated employees' attitudes and behaviour towards safety in manufacturing industries in Malaysia. The study purposely selected one large manufacturing firm and issued 99 questionnaires to the employees. The study found a significant relationship between employee safety attitudes, employee performance and employee safety. The study investigated the influence of employee attitudes on safety management in the manufacturing sector in Malaysia. The study however was based in a different country and conceptualised employee safety attitudes in terms of personal involvement, communication and physical work environment, while the current study used conceptualised employee safety attitudes in terms of response to safety practices as posited by Fine (2017), Gao et al. (2019) and NOSA Safety Management System (2017). The current study is an attempt to fill those research gaps.

Lastly, the methodological rigour used in other related studies resulted in inconclusive findings. For instance, a study conducted by Schultz (2017) opined that safety training, workplace safety analysis and safety transfer to insurance companies and consultants affect the behaviour of the employees by influencing their response to safety programmes positively. A study by Cox and Cox (2018) found that safety programmes demonstrate organisational commitment to safety and therefore lead to the safety of the work environment which enhances positive safety culture and attitudes among employees. Jahangiri et al. (2017) who did a critical literature review on attitudes that affect employee productivity of construction workers identified safety perception and attitudes of employees as major factors influencing employee productivity. These three studies were critical literature reviews but failed to generate original findings on the subject. To bridge these gaps, this study aimed at investigating the intervening effect of workplace safety attitudes on the relationship between workplace safety and employee productivity in the manufacturing sector in Kenya.

## Conceptual framework

The conceptual framework represents diagrammatically and explains the relationship among independent, intervening and dependent variables. Workplace safety comprising interventions for workplace safety (safety ergonomics, emergency management, safety training and safety transfer) is the independent variable that affects employee productivity, which is the dependent variable. Employee safety attitude is the intervening variable. Based on the reviewed literature, it is postulated that workplace safety would affect employee productivity. Employee safety attitude will intervene in the relationship between workplace safety and employee productivity. Figure 1 depicts the relationships between the pertinent variables.

## Operationalisation of variables

The study variables which arose from the concepts discussed in the reviewed literature were operationalised and measured as shown in Table 1.

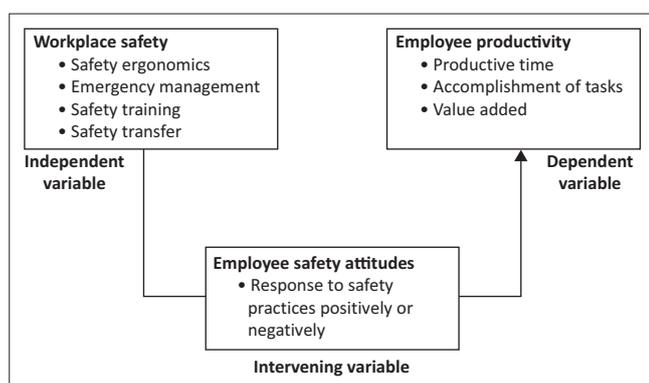


FIGURE 1: Conceptual framework.

## Research approach

### Research philosophy and design

This study adopted a positivist research paradigm because the entire research was based on objectivity and therefore the study only collected and interpreted the data as they were, thereby ensuring that the findings were quantifiable and observable. The study adopted a cross-sectional survey design because of the fact that existing data among the manufacturing companies were collected retrospectively. In other words, data on the research variables were collected at a single point in time from sample units to examine relationships among the variables.

### Target population

The target population comprised the 853 manufacturing firms in Kenya that are registered with KAM and that have been in operation for the last 3 years. Data collection and analysis were carried out at firm level with target respondents being the heads of human resource. The firms were classified into 14 key sectors of manufacturing as classified by KAM based on the products they manufacture.

### Sampling procedure and sample size

Out of a population of 853 manufacturing firms in Kenya, a representative sample of 124 was obtained using a statistical formula suggested by Nasiuma (2010) as depicted in Equation 1:

$$\text{Sample size} = \frac{\text{Population of manufacturing firms} * 17\%^2}{17\%^2 + (\text{Population of manufacturing firms} - 1)0.05^2} \quad [\text{Eqn 1}]$$

where the coefficient of variation was fixed at 17% and standard error was fixed at 5%. The firms were selected randomly. This sampling formula was selected because it involved probabilistic sampling using a fixed coefficient of variation and standard error at each level, ensuring that all sectors were represented.

### Data processing and analysis

The relationship between variables was tested using Pearson's product-moment correlation. Regression analysis was used to estimate the regression coefficients. The analytical models and their interpretation are as follows.

The first step was to show there is a relationship between the independent variable and the dependent variable which may be intervened:

$$Y = \alpha_0 + \beta_1 X_1 + \mathcal{E}_0 \quad [\text{Eqn 2}]$$

where  $Y$  is the dependent variable (employee productivity),  $\alpha_0$  is the  $y$  intercept,  $\beta_1$  is the regression (beta) coefficient,  $X_1$  is the independent variable (workplace safety) and  $\mathcal{E}_0$  is the regression error term.

The second step was to show that the independent variable is related to the potential intervenor:

$$M = \alpha_1 + \beta_2 X_1 + \epsilon_1 \quad [\text{Eqn 3}]$$

where  $M$  is the intervening variable (employee safety attitudes),  $\alpha_1$  is the  $y$  intercept,  $\beta_2$  is the regression (beta) coefficient,  $X_1$  is the independent variable (workplace safety) and  $\epsilon_1$  is the regression error term.

The third step was to show that the potential intervenor was related to the dependent variable:

$$Y = \alpha_2 + \beta_3 M + \epsilon_2 x \quad [\text{Eqn 4}]$$

where  $Y$  is the dependent variable,  $\alpha_2$  is the  $y$  intercept,  $\beta_3$  is the regression (beta) coefficient,  $M$  is the intervening variable and  $\epsilon_2$  is the regression error term.

In the fourth and final step, the dependent variable was regressed on the independent variable and the potential intervenor in blocks:

$$Y = \alpha_3 + \beta_4 X_1 + \beta_5 M + \epsilon_3 \quad [\text{Eqn 5}]$$

where  $Y$  is the dependent variable (employee productivity),  $\alpha_3$  is the  $y$  intercept,  $\beta_4$  and  $\beta_5$  are regression (beta) coefficients,  $X_1$  is the independent variable (workplace safety),  $M$  is the intervening variable (employee safety attitudes) and  $\epsilon_3$  is the regression error term.

## Main findings

### Correlation of employee safety attitude, workplace safety and employee productivity of manufacturing firms in Kenya

The Pearson's product moment correlation technique was used to determine the direction and strength of the association between the independent variable, intervening variable and dependent variable. The findings are presented in Table 2.

The correlation results in Table 2 show that employee safety attitude, workplace safety and employee productivity are positively and significantly correlated. The correlation between employee safety attitude and workplace safety was 0.180, implying that there existed a strong positive relationship between the two variables. The  $p$ -value of 0.03 was less than 0.05; hence, the correlation of workplace safety attitude was significant at a 5% significance level. This finding implies that a positive increase in workplace safety leads to a significant increase in employee safety attitude. Therefore, firms that have better workplace safety are expected to have employees with positive safety attitudes.

Further, the results revealed that the correlation between employee safety attitude and employee productivity was strong and there existed a positive relationship. The  $p$ -value of 0.036 was less than 0.05; therefore, the relationship between the employee safety attitude and employee productivity was significant at a 5% significance level. These results imply that a positive increase in workplace safety attitude leads to a significant increase in employee productivity in terms of productive time, the accomplishment of tasks and value-added.

**TABLE 2:** Correlation of employee safety attitude, workplace safety and employee productivity of manufacturing firms in Kenya.

Correlations	Employee productivity	Workplace safety	Employee safety attitude
<b>Employee productivity</b>			
Pearson correlation	1	-	-
Sig. (two-tailed)	-	-	-
<i>N</i>	108	-	-
<b>Workplace safety</b>			
Pearson correlation	0.891**	1	-
Sig. (two-tailed)	0.000	-	-
<i>N</i>	108	108	108
<b>Employee safety attitude</b>			
Pearson correlation	0.192*	0.180*	1
Sig. (two-tailed)	0.036	0.003	-
<i>N</i>	108	108	108

\*, Correlation is significant at the 0.05 level (two-tailed).

\*\*, Correlation is significant at the 0.01 level (two-tailed).

**TABLE 1:** Operationalisation of variables.

Variable	Type of the variable	Indicators	Measurement in the questionnaire
Workplace safety ergonomics	Independent	<b>Hazard detectors:</b> Safety audits, hazard and accident reporting, intelligence services, heat, gas and smoke detectors <b>Protective devices:</b> Sound, illumination, noise, vibration absorption, robotics and CCTV cameras, screening, unauthorised entry, alarms, warnings, safe tools, facility planning, sanitary conveniences: changing rooms, water availability <b>Effects analysis:</b> Recognition of symptoms of over exposure	Percentage rate
Emergency management	Independent	Rescue response and evacuation plans Safe assembly and exit points First aid facilities	Percentage rate
Workplace safety training	Independent	Induction training, safety seminars, talks and workshops, safety committee and safety manuals, safety rules, safety drills, regular briefs	Percentage rate
Workplace safety transfer	Independent	Group health insurance, private security, safety consultants, safety liability insurance, personal accident insurance.	Percentage rate
Workplace safety attitude	Intervening	• Response to safety practices either positively or negatively	Percentage rate
Employee productivity	Dependent	• Productive time • Accomplishment of tasks • Value added	Period in days Tasks accomplished out of the standard tasks Total firm revenues over the number of employees in a firm

## Regression analysis evaluating the intervening effect of employee safety attitude on the relationship between workplace safety and employee productivity

To determine the intervening effect of the employee safety attitude on the relationship between work place safety and employee productivity, a linear regression analysis was carried out in four steps. This is presented in the subsequent sections.

In Table 3,  $Y$  is the dependent variable (employee productivity),  $\alpha_0 - \alpha_3$  are the  $y$  intercepts,  $\beta_1 - \beta_5$  are the regression (beta) coefficients,  $X_1$  is the independent variable (workplace safety),  $M$  is the intervening variable (employee safety attitudes) and  $\epsilon_0 - \epsilon_3$  are the regression error terms.

Based on the findings presented in Table 3, the  $R$ -square for model 1 (regression of employee productivity and work safety) was 0.794. This signified that 79.4% of the variation in employee productivity is explained by work safety. Regarding model 2 (regression of employee safety attitude against work safety),  $R$ -square = 0.032 signified that the employee safety attitude explains 3.2% of the variation in workplace safety. Concerning model 3 (regression of employee productivity against employee safety attitude),  $R$ -square = 0.037, implying that 3.7% of the variation in the employee productivity is explained by employee safety attitude. Lastly, regarding model 4 (regression of employee productivity against workplace safety and employee safety attitude),  $R$ -square = 0.762, signifying that 76.2% of the variation in employee productivity is explained by work safety and employee safety attitude holding other factors constant.

To further investigate the intervening effect of the employee safety attitude on the relationship between workplace safety and employee productivity in manufacturing firms in Kenya, an analysis of variance (ANOVA) was carried out to ascertain the significance of the estimation model. The results are presented in Table 4.

The findings presented in Table 4 show the ANOVA results of the four regression models estimating the intervening effect of the employee safety attitude on the relationship between the work place safety and employee productivity in manufacturing firms in Kenya. In model 1, the study obtained  $F(1, 106) = 407.638$  and  $p = 0.000 < 0.05$ , implying that the model used to link the predictor and the outcome is statistically significant ( $F = 407.638, p < 0.05$ ) at a 5% level.

**TABLE 3:** Summary of the objective three models.

Model	Indicator and interaction terms	$R$	$R$ square	Adjusted $R$ square	Std. error of the estimate
Model 1	$Y = \alpha_0 + \beta_1 X_1 + \epsilon_0$	0.891†	0.794	0.792	0.39117
Model 2	$M = \alpha_1 + \beta_2 X_1 + \epsilon_1$	0.180†	0.032	0.023	0.30456
Model 3	$Y = \alpha_2 + \beta_3 M + \epsilon_2$	0.192†	0.037	0.028	0.84499
Model 4	$Y = \alpha_3 + \beta_4 X_1 + \beta_5 M + \epsilon_3$	0.873†	0.762	0.758	0.42195

†, Predictors: (Constant), work safety.

Regarding model 2, the study obtained  $F(1, 106) = 3.537, p = 0.016 < 0.05$ , implying that the model used to link the independent variable and the potential intervenor is statistically significant. Thus, the null hypothesis that work safety has no statistically significant effect on employee safety attitude is rejected. The conclusion is drawn that work safety affects employee safety attitude significantly.

The results for model 3 obtained  $F(1, 106) = 4.074, p = 0.046 < 0.05$ , implying that the model used to link the dependent variable and the potential intervenor is statistically significant. Lastly, the results for model 4 obtained  $F(1, 105) = 168.223, p = 0.000 < 0.05$ , implying that the model used to link the dependent variable, independent variable and the potential intervenor is statistically significant; thus, the null hypothesis which stated that work safety and employee safety attitude have no statistically significant effect in employee productivity is rejected, and a conclusion is drawn that work safety and employee safety attitude affect employee productivity significantly.

Furthermore, the results determined the coefficient estimates that pointed out the magnitude of each interaction terms on each other. The regression coefficients for each of the models are presented in Table 5.

The findings presented in Table 5 show the coefficient estimates of the models 1, 2, 3 and 4 applied in estimating the intervening effect of employee safety attitude on the relationship between work safety and employee productivity. Model 1 tested the relationship between the independent variable (workplace safety) and dependent variable (employee productivity) which may be intervened. The results for model 1 obtained a coefficient estimate of  $\beta_1 = 1.889$  and  $p = 0.000 < 0.05$ , signifying that an increase in work safety by 1 unit results in an increase in employee productivity by 1.889 units, holding all other factors constant.

Therefore, from the findings, the coefficient estimates for model 1 in step 1 for estimating the intervening effect of

**TABLE 4:** Analysis of variance findings for objective three models.

Model		Sum of squares	df	Mean square	$F$	Sig.
1	Regression	62.375	1	62.375	407.638	0.000
	Residual	16.220	106	0.153	-	-
	Total	78.595	107	-	-	-
2	Regression	0.328	1	0.328	3.537	0.016
	Residual	9.832	106	0.093	-	-
	Total	10.160	107	-	-	-
3	Regression	2.909	1	2.909	4.074	0.046
	Residual	75.686	106	0.714	-	-
	Total	78.595	107	-	-	-
4	Regression	59.900	2	29.950	168.223	0.000
	Residual	18.694	105	0.178	-	-
	Total	78.595	107	-	-	-

df, degrees of freedom; Sig., significance.

**TABLE 5:** Coefficient estimates for the objective three models.

Model	Variable list	Unstandardised coefficients		Standardised coefficients	<i>T</i>	Sig.
		B	Std. error	Beta		
1	(Constant)	14.458	0.085	-	169.389	0.000
	Work safety	1.889	0.094	0.891	20.190	0.000
2	(Constant)	0.505	0.066	-	7.597	0.000
	Work safety	0.137	0.073	0.180	1.881	0.016
3	(Constant)	13.242	0.183	-	72.492	0.000
	Employee attitude	0.535	0.265	0.192	2.018	0.046
4	(Constant)	14.631	0.120	-	122.138	0.000
	Work safety	0.678	0.038	0.868	17.892	0.000
	Employee attitude	0.070	0.135	0.025	0.521	0.004

Sig., significance.

employee safety attitude on the relationship between workplace safety and employee productivity can be presented in the regression equation below:

$$Y = \alpha_0 + 1.889 X_1 + \mathcal{E}_0 \quad [\text{Eqn 6}]$$

where  $Y$  is the dependent variable (employee productivity),  $\alpha_0$  is the  $y$  intercept,  $\beta_1$  is the regression (beta) coefficient,  $X_1$  is the independent variable (workplace safety) and  $\mathcal{E}_0$  is the regression error term. The interpretation drawn from these results therefore is that workplace safety predicts employee productivity in manufacturing firms as  $\beta_1$  is statistically significant.

The second step for testing the intervening effect of employee safety attitudes on the relationship between employee safety and employee productivity involved regressing employee safety attitude against the workplace safety to show that the independent variable is related to the potential intervenor. The results for model 2 obtained a coefficient estimate of  $\beta_2 = 0.137$ ,  $p = 0.016 < 0.05$ , which implied that an increase in work safety by 1 unit leads to an increase in employee safety attitude by 0.137 units, holding all other factors constant. Therefore, from the findings, the coefficient estimates for model 2 in step 2 for estimating the intervening effect of employee safety attitude on the relationship between workplace safety and employee productivity can be presented in the regression equation below:

$$M = \alpha_1 + 0.505 X_1 + \mathcal{E}_1 \quad [\text{Eqn 7}]$$

where  $M$  is the intervening variable (employee safety attitudes),  $\alpha_1$  is the  $y$  intercept,  $\beta_2$  is the regression (beta) coefficient,  $X_1$  is the independent variable (workplace safety) and  $\mathcal{E}_1$  is the regression error term.

The interpretation drawn from these results is that workplace safety predicts employee safety attitude in manufacturing firms as  $\beta_2$  is statistically significant. Therefore, as the firm invests more on workplace safety, employees' safety attitudes improve positively. This finding is in agreement with the postulates of Schultz (2017) that workplace safety programmes such as safety training, workplace safety analysis, safety transfer to insurance companies and consultants affect the behaviour of the employees by

influencing their response to safety programmes positively. Similarly, Cox and Cox (2018) studied the structure of employee attitudes to safety in selected firms in Europe and found that safety programmes demonstrate organisational commitment to safety and therefore lead to safeness of the work environment which enhances positive safety culture and attitudes among employees.

The third step for testing the intervening effect of employee safety attitudes on the relationship between employee safety and employee productivity involved regressing potential intervenor against the dependent variable. The results for model 3 obtained a coefficient estimate of  $\beta_1 = 0.535$ ,  $p = 0.046 < 0.05$ , signifying that an increase in employee safety attitude by 1 unit leads to an increase of employee productivity by 0.535 units, holding all other factors constant. Therefore, from these findings, the coefficient estimates for model 3 in step 3 for estimating the intervening effect of employee safety attitude on the relationship between workplace safety and employee productivity can be presented in the regression equation below:

$$Y = \alpha_2 + 0.535 M + \mathcal{E}_2 \quad [\text{Eqn 8}]$$

where  $Y$  is the dependent variable,  $\alpha_2$  is the  $y$  intercept,  $\beta_3$  is the regression (beta) coefficient,  $M$  is the intervening variable and  $\mathcal{E}_2$  is the regression error term.

The interpretation drawn from these results is that employee safety attitude predicts employee productivity in manufacturing firms because  $\beta_3$  is statistically significant. Therefore, as the employees' safety attitudes improve, employee productivity improves, holding other factors constant.

These results are similar to the findings of Rahiman and Kodikal (2017) who studied the relationship between employee work-related attitudes (safety attitudes, work commitment and job involvement) and job performance. The study found that the level of productivity in industries that posted better work-related attitudes was better than those industries where employees had poor employee attitudes. These findings also support the findings of Jahangiri et al. (2017) who conducted a critical literature review on attitudes that affect employee productivity of construction workers and identified safety perception and attitudes of employees

as major factors influencing employee productivity. These results can also be explained by the postulates of the tip of the iceberg theory developed by McClelland (2000) that some factors which allowed employees to excel in their work were not appearing on the surface and lead to huge employee productivity losses in terms of error rates, worktime and unaccomplished tasks. This has been confirmed by the findings of the current study that workplace safety attitudes influence employee productivity in terms of productive time, accomplishment of tasks and value added.

The fourth step for testing the intervening effect of employee safety attitudes on the relationship between employee safety and employee productivity involved regressing employee productivity on workplace safety and employee safety attitudes in blocks to check whether workplace safety still predicts employee productivity in manufacturing firms when employee safety attitude is in the model. The results for model 4 obtained a coefficient estimate of work safety,  $\beta_4 = 0.678$ ,  $p = 0.000 < 0.05$ , implying that an increase in work safety by 1 unit leads to an increase in employee productivity by 0.678 units, holding employee safety attitude and other factors constant in model 4. Furthermore, the coefficient estimate of employee safety attitude obtained was  $\beta_5 = 0.070$ ,  $p = 0.004 < 0.05$ , implying that an increase in employee safety attitude by 1 unit leads to an increase in employee productivity by 0.070 units, holding work safety and other factors constant in model 4.

Therefore, from these findings, the coefficient estimates for model 4 in step 4 can be presented in the regression equation below:

$$Y = \alpha_3 + 0.678X_1 + 0.070M + \epsilon_3 \quad [\text{Eqn 9}]$$

where  $Y$  is the dependent variable (employee productivity),  $\alpha_3$  is the  $y$  intercept,  $\beta_4$  and  $\beta_5$  are regression (beta) coefficients,  $X_1$  is the independent variable (workplace safety),  $M$  is the intervening variable (employee safety attitudes) and  $\epsilon_3$  is the regression error term.

The interpretation drawn from these results is that workplace safety predicts employee productivity in manufacturing firms when employee safety attitude is in the model as  $\beta_4$  is statistically significant. The results further indicate that the coefficient of workplace safety on employee productivity reduces from 1.89 in model 1 without employee safety attitudes to 0.678 in model 4 when employee safety attitudes are included in the model. Therefore, inclusion of employee safety attitudes reduces the effect of workplace safety on employee productivity. Furthermore, the results indicate that the coefficient of employee safety attitude when regressed against employee productivity was 0.535, but when workplace safety is included in the model, employee safety attitude coefficient increases to 0.768. These results therefore reveal that employee safety attitude significantly intervenes on the relationship between workplace safety and employee productivity. Therefore, the null hypothesis  $H_{03}$

that employee safety attitude has no intervening effect on the relationship between workplace safety and employee productivity in manufacturing firms in Kenya is not supported and therefore rejected. This means that employee safety attitude has an intervening effect on the relationship between workplace safety and employee productivity in manufacturing firms in Kenya.

The interpretations drawn can be explained on several grounds. Firstly, from the descriptive statistics of the current study, workplace safety attitudes obtained an aggregate score of mean = 2.3472 and standard deviation = 1.1736. These results implied that employees in manufacturing companies in Kenya had bad safety attitudes towards safety in the manufacturing firms. The standard deviation obtained (1.1736) showed that respondents varied on their views. This shows that despite the importance of workplace safety attitudes on workplace safety and employee productivity as demonstrated by the findings of the current study, manufacturing firms still needed to launch programmes to improve workplace safety attitudes of their employees. This will boost workplace safety and employee productivity as demonstrated by the findings of this study.

Secondly, previous literature suggest that workplace safety attitudes are essential for influencing work behaviour. Lencioni (2019) suggested that employee safety attitudes such as overconfidence or phobias affect their judgement and reaction towards safety programmes, which may lead to more or less safety incidents and which may affect their work productivity. Aswathappa (2015) opined that bad work habits, poor work attitudes and poor working conditions lead to carelessness and mistakes. This leads to employee productivity and safety problems. Dessler and Varrkey (2015) asserted that regardless of the type of the organisation, workplace attitudes can have a significant influence on the employee's productivity and safety in the job. The findings of the current study contribute to extant behavioural human resource literature by empirically pointing out that workplace safety attitudes have a significant intervening effect on the relationship between workplace safety and employee productivity.

Thirdly, these findings are similar to the results of Saleh (2015) which found a significant relationship between employee safety attitudes, employee performance and employee safety. The study investigated the influence of employee attitudes on safety management in the manufacturing sector in Malaysia. The study however was based in a different country and conceptualised employee safety attitudes in terms of personal involvement, communication and physical work environment, while the current study used conceptualised employee safety attitudes in terms of; response to safety practices and employee perception of safety risk programmes as posited by Fine (2017), Gao et al. (2019) and NOSA Safety Management System (2017). Furthermore, the current study finding clarifies the contradictory results of Kao (2019) and Laura (2019) on the role of workplace safety attitude on the relationship

between workplace safety and employee productivity. Cox and Cox (2018) studied safety investment optimisation in process industry and found that investments in workplace safety improved risk heuristics in employees and this in turn boosted employee productivity. The study did not test for the empirical relationships between the variables. These research gaps have been addressed by the findings of the current study.

Lastly, from the theoretical literature, the study used the postulates of the domino theory developed by Heinrich (1931) which posited that combining factors that lead to unsafe workplaces; faults of the person (personal and ancestry) and the environment or work-related factors. The theory identified that these causes of accidents can be eliminated using a safety management system. The current study results add that employee safety attitudes not only affect workplace safety but also affect the productivity of employees. To address employee productivity problems therefore, the organisation should have a safety management system that also addresses the safety attitudes of employees. Furthermore, the current study used the postulates of the risk homeostasis theory developed by Wilde (1994) which posited that employees adjust their work risk behaviour based on four factors: (1) the expected benefits of risky behaviour, (2) the expected costs of risky behaviour, (3) the expected benefits of safe behaviour and (4) the expected costs of safe behaviour. All of these factors (work behaviours) were empirically tested by the current study and found to influence safety and productivity issues in the manufacturing sector.

## Practical implications

The implication of these study findings is that negative employee attitudes and employee productivity problems persisted because of inadequate workplace safety interventions. Therefore, organisations that wish to eliminate employee negative safety attitudes and boost employee productivity should launch safety interventions, such as safety ergonomics, emergency management, safety training and transfer to consultants and insurance firms that guarantee employees of their work safety.

## Conclusion

This study concluded that workplace safety is essential for influencing employee safety attitudes and employee productivity. Therefore, a manufacturing firm that invests more in workplace safety improves employee productivity and employees' safety attitudes positively.

## Recommendations for practice

The study recommends that employees should be involved in designing safety programmes and policies to ensure that they feel invested and have a responsibility towards safety. Involvement in such a way that employees are encouraged to offer their contributions would enhance positive

attitudes towards safety and, therefore, would reduce workplace safety and employee productivity problems in the manufacturing sector in Kenya. Further, employees' ideas and contributions should be taken seriously as this will ensure better safety culture and better productivity of employees.

## Recommendations for policy

The study established that employee safety attitudes significantly intervened in the relationship between workplace safety and employee productivity. Therefore, the study recommends that policymakers should consider giving policy directions requiring safety training, safety ergonomics and safety transfer for employees, thus eliminating negative safety attitudes by employees.

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### Authors' contributions

T.M.M. prepared the manuscript, while J.M.K. and P.M.J. supervised the research and co-wrote the article and prepared it for submission.

### Ethical considerations

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### Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

### Disclaimer

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