ERGONOMIC PRACTICES AND WORKER EFFECTIVENESS IN CHINA ROAD AND BRIDGE CORPORATION KENYA LIMITED, NAIROBI CITY COUNTY

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ABSTRACT

This study probed the effect of ergonomic practices on worker effectiveness in the construction section in Kenya's economy. The research specifically determined the effect of safety communication, safety tutorials, safety measure and safety resources on worker effectiveness. The study adopted descriptive research approach and the population targeted was 400 employees of China Road and Bridge Corporation Kenya Limited which included top management, middle level manager and casual labourer's respondents that were selected proportionately from various cadres. Stratified proportionate random sampling techniques was applied to highlight the respondents. The study sampled a total of 200 respondents where Top management (20), Middle management (40), and Casual laborers (140) were sampled. Questionnaires were used as a data collecting tools. Both qualitative and quantitative data was collected which was subjected to thorough pilot test to do away with errors. Content validity was used to check the internal consistency of research instruments. While Cronbach's alpha coefficient of 0.7 was used to test the accuracy of research tools. Descriptive statistics was used to measure of central tendency while inferential statistics used multiple regression to determine link between the dependent and the independent variables. Data was presented in the form of means, percentages, frequencies and standard deviations where tables and charts were utilized. The coefficient of determination indicated that safety tutorials and safety precaution had a positive effect on the level of worker effectiveness while safety communication and safety resources had a negative effect. Nonetheless, the four variables had a combined positive effect on the level of worker effectiveness at the at the China Road and Bridge Corporation Kenya Limited. The study recommended that effective safety communication system should be implemented to help reduce accidents and injuries in the workplace. Also, the study highly recommended the use of tutorials to improve worker effectiveness. Further, the study recommended implementing safety precautions in the workplace as they have been proven to increase worker effectiveness. Finally, the study recommended that CRBC should re-evaluate its investment in safety resources to ensure that they are being translated into safe and effective employee environment to prevent waste of resources.

Key Words: *Safety Communication, Safety Tutorials, Safety Measure, Safety Resources, Worker effectiveness*

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INTRODUCTION

The modern history of ergonomics can be traced back to the world war from 1939 to 1945. From the 1960s to the 1990s, there were many changes made to ergonomics. Some of these were cognitive ergonomics, organizational ergonomics, positive ergonomics, and spiritual ergonomics. Ergonomics is becoming more of an issue in organizations in both developed and developing countries since the rise of occupational safety and health. Today, every company in the world puts more thought into making their workplaces safe.

The construction sector contributed considerably to the economy in South Africa Cumberlege, 2008) since it was able to contribute R59,422m to the GDP in the year 2012 and an amount of R112,631m in 2015This amount is equivalent to 3.5 percent of South Africa's GDP, (Stats, 2013). Furthermore, the sector hired an approximated 433,000 people in September 2012, accounting for around 5.1 percent of the South African total, (Stats, 2012). As a result, the South African government designated the construction sector as a key strategic resource, believing that it could be exploited to boost socioeconomic development people's quality of life (Didiza, 2008). As a result, it was critical that the sector expand and captivate more players.

Most of Kenya's construction projects rely largely on physical labor for their completion. According to Mbiti (2013), the construction sector incorporates approximately 800,000 individuals that are responsible for delivering built structures to customers on schedule, on budget, and to the stipulated quality standards. It would be preferable if involved parties were aware of the set levels of staff efficiency beforehand, such that efficient preparation and sequencing could be accomplished.

Furthermore, Kenya has a plentiful stock of semi-skilled and unskilled workers that must be employed, (Mbiti, 2013). The construction sector has been facing demand to adopt excellent procedures as a strategy of increasing job chances for operators in the job market in order to bring social and economic benefit to the community. Because the construction activity is such an essential part of the economy's labor market, all steps should be taken to enhance workforce efficiency. An increase in workforce efficiency will increase project performance and make it more appealing to shareholders.

Weak safety and health precautions have a significant detrimental impact on workforce productivity on construction sites. Masu (2010) believes that Kenya, as a third world state, is not immune to the patterns in other nations that are at an intersection with construction companies owing to the latter's failure to complete tasks in a timely manner.

Postponements on construction projects have cost the contractors' money, raised the costs to the consumers, and damaged the collaborative environment amongst the project's participants. The shortage of proper documentation on work performance in Kenya's construction sector has caused this, (Wachira, 2009). Interruptions in accomplishment of the project in the construction sector are symptoms of an issue with efficacy, and therefore a major concern for the sector. Enhancing staff efficiency is an essential element of construction service because it is among the primary predictors of project success.

Employees are one of the most important tools of any organization in general (Gabčanová, 2011:2) and project organizations in particular as the quality of output of the organization depends largely the caliber of the people working therein (Golden, 2011; Heskett, 2006; International Labour Organization, 2011). With positive and creative contributions from employees, the quality of the output of an organization can give an immense competitive advantage over their competitors. To achieve this in the present-day competitive environment, management will need to take some strategic decisions to improve the performance of its human assets (Gabčanová, 2011). One of these decisions is to develop a work system that will fit job to an employee, rather than the employee to the job

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(Computer/Electronic Accommodations Program, 2012). This innovative management strategic decision is known as ergonomics (human factors). It involves the scientific use of human data to design a workstation, work center, or working environment to create a job friendly environment for individual employee. This is to improve the wellbeing, safety and efficiency of workers by fitting the environment to them and not the other way around (Ergo Squad, 2012). This may have adverse effects on some of the employees who sometimes have to adjust their sitting position to reduce stress.

Organizations are leveraging ergonomic strategies to create a conducive working environment. Ergonomic strategies are creative workplace designs created to help workers become compatible with underlying tasks. For example, encouragement of fit employees is an example of ergonomic strategies since they help prevent occupational injuries and illness. Notably, advance technology has greatly impacted positively the creation of ergonomic strategies since technology has aided in execution of workplace researches.

According to the Kenya directory of construction companies, there are over two fifty main construction companies in Kenya engaging in construction of roads, bridges, buildings and general works. Out of these, approximately 99 % are privately owned. Construction employees are exposed to several risks, per the Ministry of Labor's OSHA office, including falls from rooftops, unprotected machines, getting hit by construction machinery, electrocutions, silica dust, and asbestos.

China Road and Bridge Corporation Kenya's ergonomic strategies unveil Kenya construction industry's poor measures for creating a conducive working environment. Specifically, the companies have poor safety provisions- one of the employed ergonomic strategy. Recently, its workers complained about the company's use of open Lorries to transport them to construction sites (GCR, 2022). While complaining bitterly, one of the worker confessed risks exposed to them as they are transported using open lorries; to reduce risks such as accident and health complication, the worker chose the use of buses transportation. Additionally, the company's fails to enforcement wearing of protective equipment, thus lowering the effectiveness of personal protective equipment ergonomic strategy. Consecutively, some of its employees on 18 December last year died following the collapsing of culvert lines as they had not worn protective gear namely helmets.

There exists an inverse relationship between improper ergonomic strategies and worker effectiveness. Supportively, the worker effectiveness at China Road and Bridge Corporation Kenya is low since ergonomic strategies are poor. For example, The Company lacks proper safety provisions and fails to enforce personal protective equipment ergonomic strategy, thus greatly lowering the employees' productivity. Low employees' productivity is witnessed by workers regularly holding industrial strikes to explicitly fight against future relatable accidents that are caused by the employer's negligence (GCR, 2022). Pay discrimination is another factor lowing China Bridge Corporation Kenya's worker effectiveness as employees likewise strike so as to demand higher wages; particularly, its employees claim that there exists a pay difference its local subsidiaries. For example, its workers in Nairobi are paid wages above 5$, while workers in Narok are paid lowly for instance 2.5$.

Statement of the Problem

Despite construction sector being an important part of any country's economic advancement, it encounters incidents of employees' effectiveness problems. As a result, it continues to remain among the most dangerous and disaster-prone workplaces, together with one of the risky industries in terms of its operations. Because personnel are subjected to severe circumstances and handle risky machines, the construction sector is linked with high-risk situations, labor-intensive employment, heavy workloads, and substandard health and safety (James, Rust & Kingma, 2012).

Along with the premise that the authorities and appropriate authorities stress on workplace safety (Nyakego, 2014), the matter remains a concern in the case of China Road and Bridge Corporation Kenya Limited. As seen, the companies continue to report workplace injuries since its safety provision is poor; employees are transported to construction site using open Lorries and workers attend their jobs without wearing protective gears. Additionally, the company's safety awareness procedures haven't enhanced safety levels as staffs are neither kept aware on occupational health and safety policies nor on safety tutorials. As a result, workers have become more ignorant, resulting in an upsurge in accidents. Employees effectiveness problems remains a threat in construction sector since sufficient resources have not been reserved to address issues of safety and health.

Therefore, construction sector's employees' effectiveness problems have remained a great concerned in the society. For example, Rihana & Hossan's 2015 study concentrated on major practices that determine employee efficiency in the construction sector on Egyptian building grounds. On the other hand, Peter & John's 2016 study focused on safety precautions and worker performance in a Nigerian construction company. Lastly, but not exhausting the list, whilst Alfred & Naim 's 2015 study majored on instructional procedures followed by Malaysia construction sector as he believed it was critical to make sure the rational procedure used aligns with those indoctrinated by Occupational Safety and Health Association (OSHA). Affirmatively, these mentioned above researchers looked at situations beyond Kenyan borders.

As a result, the goal of this study is to look into the outcomes of ergonomic exercises on worker performance in construction sector. For empirical review, China Bridge Corporation Kenya Limited has been used to determine the outcomes of ergonomic exercise in Kenya's construction sector. Particularly, ergonomic practices employed by China Road Bridge and Corporation Kenya Limited namely safety instructions, information, resources, and precautionary procedures have been used to study worker effectiveness in the construction industry. Therefore, this study determined if there exist a positive relationship between ergonomic exercises and worker effectiveness in construction sector.

Objectives of the Study

The purpose of this study was to investigate the effect of ergonomic practices on worker effectiveness at China Road and Bridge Corporation Kenya Limited, Nairobi City County. The study was guided by the below specific Objectives;

- To determine the effect of safety communication on worker effectiveness in China Road and Bridge Corporation Kenya Limited.
- To assess the effect of safety tutorials on employee's performance in China Road and Bridge Corporation Kenya Limited.
- To determine effect of safety precaution measure on employee's performance in China Road and Bridge Corporation Kenya Limited.
- To determine the effect of safety resources on worker effectiveness in China Road and Bridge Corporation Kenya Limited.

LITERATURE REVIEW

Theoretical Literature

Behavior Engineering Model

The research was driven by Behavior Engineering Model (BEM) proposed by Thomas Gilbert, which is an element of the Human Performance Technology model that focuses on the environmental factors that affect production at work (Gilbert, 1978). The Behavioral Engineering Model was employed to discover impediments to organizational effectiveness, together with staff efficiency, in a structured manner.

The BEM differentiates between an individual's behavioral repertoire and the circumstances in the workplace setting that help or hinder productivity, (Katherine, et al, 2013). Gilbert's HPT model, as per Cox, Frank, and Philibert (2006), demonstrates that effectiveness is a negation of both behavior and

outcome. Furthermore, Gilbert argued that the environmental enhancements, which are primarily the duty of employers because they are responsible for the recruiting, coaching, and terminating people in a sector, provide the most power for improving effectiveness, (Katherine, 2013).

The model also emphasizes the difference between personal and environmental aspects that influence quality and productivity. Environmental issues are the beginning point for investigation because they are the most significant impediments to excellent organizational success and employee productivity, (Chevalier, 2003). In addition, according to Chevalier, (2003) "when the environmental supports are strong, then employees are better able to do what they are expected of them."

Gilbert's HEM concept opines that there are six items that can help people, groups, and organizations perform better (Katherine, 3013). The model provides the framework for evaluating all of the six aspects that determine personal and collective work productivity: data, supplies, motivations, intentions, capability, and experience and expertise (Pershing, 2006). Furthermore, as per Katherine (2006), the assistance provided by the workplace setting is classified into three components that determine achievement: information, resources, and incentives.

According to Katherine (2006), Gilbert splits productivity issues into two categories: environment and individual, with the latter listing three additional variables that are inside the individual and the former listing three additional aspects that are within the workplace setting. The concept subsequently divides causative factors into three categories, each of which has an impact on effectiveness. Information, instrumentation, and motivation are some of these components.

Katherine (2006), goes on to say that articulating reasonable goals, offering required standards in the workstation, and delivering timely, cognitively relevant evaluation are all factors that influence staff productivity. To complete the assignment, ensure that the necessary supplies, instruments, timeframe, and methods are available. Incentives guarantee that the right mix of financial and non-financial rewards are in place to motivate employees.

The model will be significance to the study since it will guide industries to consider all the six factors that may affect worker effectiveness and address the accordingly. Managers or supervisors should identify various barriers that may hinder employees from working effectively thus low productivity.

Compensating Wage Differentials (CWD)

The study further was guided by Adam Smith**'s** Compensating Wage Differentials (CWD) model. The (CWD) model suggests that tasks with disagreeable properties will require higher wages than tasks with pleasant characteristics (Smith, 1976). It also argues that staff must be paid for unfavorable workplace surroundings, with workplace safety being one of the most significant qualities (Black, *et al.,* 2003). As a result, economists are concerned in the connection between occupational risk and wage rates since it provides insight into how the work force functions (Kniesner *et al.,* 2012), whilst the legislators are focused since the concept is employed to approximate how much individuals appreciate work environment and their wellness.

Compensating wage differentials is therefore, meant to compensate employees for nonwage characteristics of the task. This means that if the work to be accomplished is unpleasant, the organization then, must possibly offer a higher wage to attract and retain workers and otherwise (Thaler & Rosen, 2009).

The theory further, stresses that workers who work in a risk or unsafe areas should be paid highly as compared to those working at safe areas (Rosen, 2009). According to this idea, the presence of economic dynamics assures that enterprises with a terrible workplace environment incur wage surcharges as a mechanism of recruiting and maintaining important human resources.

Workers who are hazard apprehensive will seek positions in firms that guarantee a safe workplace

environment, whereas workers who are less averse to hazard will be more inclined to work on activities where the expense of providing safety is higher. According to such an allelic pairing technique, occupations with a greater risk of accidents or diseases should, in isostacy, give compensatory rents beyond the economic optimum pay rate (Rosen, 2009).

The higher the employees detest for risk, the higher the bonus required for moving from a safe to a risky task, and the higher the retainer price (Kniesner *et al*., 2012). It is proven that risks will minimize worker effectiveness unless he or she is paid for working at a risk environment. Therefore, resources allocated for the same will definitely improve performance, (Rosen, 2009).

Health Belief Model

Furthermore, the study was inspired by the Health Belief Model (HBM), which reveals why individuals find it difficult to develop illness preventive methods or screening tests for timely identification of illness. The concept also shows that a worker's perception in the risk of sickness, together with their confidence in the efficiency of the proposed health practice or action, might forecast whether or not they would embrace it (Linden, 2013).

Linden (2013) goes on to say that the framework is built on two constituents of health-related phenomena: the need to prevent diseases or recovery, and the belief that a specific medical intervention will minimize or eliminate occupational illnesses. According to Kim (2020), an individual's perspective is typically determined by their awareness of the rewards and constraints associated with health habit.

Linden, (2013; Kim, 2020) states that the framework was constructed from the following six constituents; purported vulnerability (an individual's interpretive perception of the likelihood of developing a sickness or illness), expected intensity (one's sentiments about the seriousness of developing a disease or illness), purported gains (an individual's perception of the efficacy of diverse measures accessible to reduce the danger of health issues), purported impediments (an individual's thoughts on the difficulties in carrying out a prescribed health practice), stimulus to reaction (the trigger that kicks off the judgment process to take a prescribed health activity) and finally, self-efficacy (a measure of an individual's credence in his or her capacity to accomplish a task satisfactorily).

Empirical Review

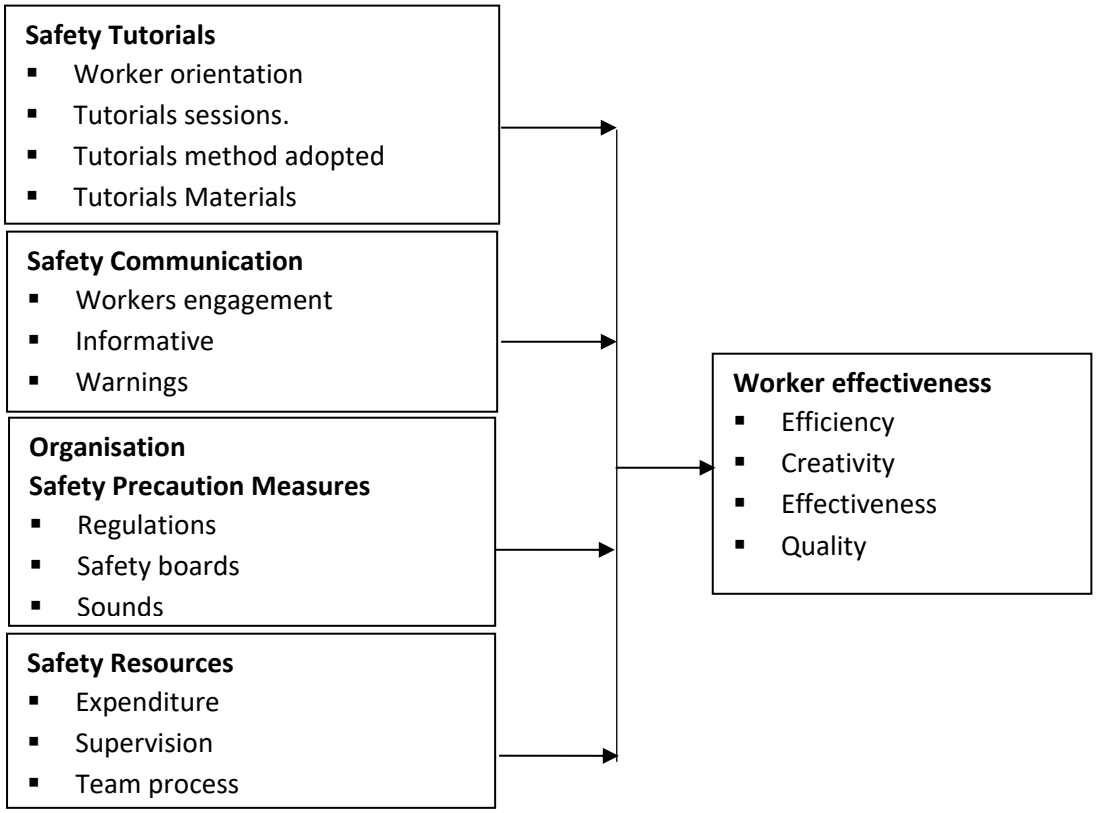
There exists a strong correlation between safety communication and worker effectiveness. A study by Lingard, Pirzadeh, & Oswald confirms this by concluding that existence of proper communication networks facilitates a conducive working environment sustainable for worker's growth. In their study **"**Talking Safety: Health and Safety Communication and Safety Climate in Subcontracted Construction Workgroups," the authors analyzed the relationship between intragroup communication initiatives and creation of workgroup safety environment which directly affects worker effectiveness (Lingard, Pirzadeh, & Oswald, 2019). For their study to be successful, the authors majored on studying relationship between intragroup communication initiatives and creation of workgroup safety environment Australian construction industry. Where they collected data from 39 construction companies by leveraging social network analysis to examine outcomes of intragroup communication on worker effectiveness in construction sector. Successfully, they observed that workers-workers and supervisors-to worker's communication channels highly increased worker effectives in construction industry. In the study, the researchers noted that intragroup communication particularly supervisors-worker's communication channel increased worker effectiveness since employees are engaged in hazards prevention plans, precaution against threatening hazards, and informed on prevailing safety measures. Empirically, the researchers in this study greatly demonstrated how safety communication in construction industry results to a higher worker effectiveness.

Loosemore and Malouf's study shows the imperative relationship between safety tutorials and worker effectiveness. In their study, they concluded the safety tutorials increase worker effectiveness with a correlation of 1.2 (Loosemore and Malouf, 2019). To research on their study "Safety training and positive safety attitude formation in the Australian construction industry", they surveyed 228 construction employees in Australia. Keenly, these researchers engaged construction employees who have already undergone safety trainings or tutorials. Despite the study debiting positive relationship between safety tutorials and worker effectiveness, Loosemore and Malouf observed that safety tutorials fails to completely change constructions workers' safety attitudes. Gender, age and education are some the factors that the study's authors observed to interfere with the construction workers' safety attitude despite them being scheduled into relevant safety tutorials. Thus, this study has added vale in the project since it has helped me evaluate China Road and Bridge Construction Company's safety tutorial program against its capacity to feature demographic characteristics; the study researchers noted that failure to feature demographic characteristics, such as age, education, and sex greatly lowers safety tutorials' effectiveness since employees' safety altitude remains low, thus lowering worker effectiveness.

Zacharatos, Barling, & Iverson's 2005 study supported the positive relationship between safety precaution measures and worker effectiveness. In their study, "High-Performance Work Systems and Occupational Safety," they concluded that safety precaution measures used by Malaysia constructions companies need to be more mechanised. Recommending, the authors advised companies to leverage safety precautions namely safety compliance, safety motivation, safety initiatives, and safety knowledge as they facilitate a conducive working environment consecutively increasing worker effectiveness (Zacharatos, Barling, & Iverson's, 2005). To successfully conduct their study, they gathered data, from 138 organizations in Malaysia, explaining safety precautions measures used by companies in different sectors. As far as my study on the relationship between ergonomic exercise and worker effectiveness in Kenya construction industry, this study plays a significant role as it gives insight on how organizations safety precaution initiatives relate positively with worker effectiveness.

Mitropoulos and Memarian's study justify that present of safety resources highly determines worker effectiveness. Specifically, their study on "Team Processes and Safety of Workers: Cognitive, Affective, and Behavioral Processes of Construction Crews", that safety resources namely teamwork and supervisions plans help in accident preventions thus increasing worker effectiveness (Mitropoulos and Memarian, 2012). The need to prove that majority of United State construction company's occupational facilities overlook the role played by team process and supervision resources motivated them to conduct this study. Hence, the researchers conducted this research by studying the relationship between safety resources used by United States' constructions companies and worker effectiveness. And the researchers concluded that most construction companies in United State play a significant role of increasing worker effectiveness as they used safety resources such as expenditure, OSH infrastructure, and human capital. However, the researches emphasized that constructions companies should purpose to increase worker effectiveness by leveraging an additional safety resource i.e. team process. Without doubt, thus study will significantly help me analyse whether China Road and Bridge Construction company's safety resources contribute towards its current worker effectiveness initiatives.

Conceptual Framework



Independent Variables **Dependent Variable**

Figure 1: Conceptual Framework

Source: Researcher, 2022

METHODOLOGY

The research was undertaken through a descriptive research design. The target group was China Road and Bridge Corporation which had both male and female workers in various departments comprising of the following levels; top management, middle level management and casual laborers. According to the China Road and Bridge Corporation Kenya Human Resource Department, (2020), there are 400 employees in Nairobi station thus the target population for the study. The study targeted the Top management, Middle management and Casual laborers from the various construction sites. The sample size used was 200 respondents obtained from the targeted population of the employees operating in China Road and Bridge Corporation Kenya Limited, Nairobi station, 2022. The sample size was obtained through Taro Yamane (1967) sample size formula of a known population of the total target population which is 400 employees.

A semi-structured questionnaire was used in this study because it is simple to create and deliver. As a result, the study employed a questionnaire that included the open and closed-ended questions in order to note quantitative and qualitative data and capture the factual information about the topic. Likert inquiries was included in the instrument to collect data on the effects of ergonomic procedures on staff performance.

RESULTS

Descriptive Statistics

The descriptive statistics summarizes the responses on specific variables that were received in relation to each of the four independent variables and on the dependent variable.

Safety Communication

The researcher sought to determine the effect of safety communication on worker effectiveness by the construction companies. The respondents were to tick the degree to which Strongly Disagree -1; Disagree-2; Neutral-3; Agree-4; Strongly Agree -5 in relation to safety communication by the construction companies.

Table 1: Safety Communication and Worker Effectiveness

Statement	1	2	3	4	5	N	Mean	Std. Dev
The company safety handbooks are readily accessible	15	12	75	72	16	190	3.3263	0.99674
The use of verbal safety communication is much more effective than written	14	12	35	66	63	190	3.8000	1.18277
The management communicated a clear safety objective	16	19	26	73	56	190	3.7053	1.22905
All the accidents happen are always reported	12	13	61	69	35	190	3.5316	1.07721
The Company encourages suggestions on safety and health improvement	14	13	37	72	54	190	3.7316	1.16226
There is good feedback from management on reported safety Issues	15	19	32	70	54	190	3.6789	1.21153

Source: Author (2022)

From table 1 above, the respondents were neutral on whether the company safety handbooks are readily accessible, as shown by (Mean=3.3263). The respondents accepted that the use of verbal safety communication is much more effective than written, as shown by (Mean=3.8000). The respondents also accepted that the management has communicated a clear objective regarding safety, as shown by (Mean=3.7053). The respondents acknowledged that all the accidents that happen are always reported, as shown by (Mean=3.5316). The respondents accepted that the company encourages suggestions on safety and health improvement, as shown by (Mean=3.7316). The respondents also accepted that there is good feedback from management on reported safety Issues, as shown by (Mean=3.6789). These findings were in line with findings from a study by Abuashour and Hassan (2019) who also established that operational workers in the petrochemical oil and gas exploration sector in Malaysia detect a safety communication at the workplace they concentrate their efforts on performing other tasks rather than on the safety measures.

Safety Tutorials

The researcher sought to determine the effect of safety tutorials on worker effectiveness by the construction companies. The respondents were to tick the degree to which Strongly Disagree -1; Disagree-2; Neutral-3; Agree-4; Strongly Agree -5 in relation to safety tutorials by the construction companies.

Table 2: Safety Tutorials and Worker Effectiveness

Statement	1	2	3	4	5	N	Mean	Std. Dev
Performing safety tutorials has reduced the cost associated with accidents	9	10	49	86	36	190	3.6842	0.99483
Safety concerns are prioritized in tutorials programs	22	16	42	87	23	190	3.3824	1.16145
The Company provide health and safety introductory tutorials to new workers before commencing work	24	29	55	67	15	190	3.1053	1.14987
Safety tutorials given to employees are adequate in assessing hazards in the workplace	15	23	44	101	7	190	3.3263	1.00730
Employees received safety awareness tutorials before being assigned to work on-site	13	63	57	26	31	190	2.9947	1.18410

Source: Researcher (2022)

From table 2 above, the respondents accepted that performing safety tutorials has reduced the cost associated with accidents, as shown by (Mean=3.6842). The respondents were neutral on whether safety concerns are prioritized in tutorials programs, as shown by (Mean=3.3842). The respondents were also neutral on whether the company provide health and safety introductory tutorials to new workers before commencing work, as shown by (Mean=3.1053). The respondents were neutral on whether safety tutorials given to employees are adequate in assessing hazards in the workplace, as shown by (Mean=3.3263). The respondents were neutral on whether employees received safety awareness tutorials before being assigned to work on-site, as shown by (Mean=2.9947). According to David Biggins, Mike Phillips and Peter O'Sullivan (2017) conducting safety tutorials significantly reduces the cost associated with accidents. In their study, the results suggest that the continues safety tutoring, as well as improving health and safety standards, makes a positive contribution to industrial relations.

Safety Precaution Measures

The researcher sought to determine the effect of safety precaution on worker effectiveness Measures by the construction companies. The respondents were to tick the degree to which Strongly Disagree -1; Disagree-2; Neutral-3; Agree-4; Strongly Agree -5 in relation to Safety Precaution Measures by the construction companies.

Table 3: Safety Precaution Measures and Worker Effectiveness

Statement	1	2	3	4	5	N	Mean	Std. Dev
The safety board are well demarcated within the Company	7	8	100	61	14	190	3.3526	.82736
The Company has safety and health rules and procedures	8	53	97	26	6	190	2.8368	.82917
The company safety regulation and approaches are sufficient to prevent accidents from occurring	3	56	99	31	1	190	2.8474	.72219
There is regular safety inspection within the Company	2	65	66	31	26	190	3.0737	1.04665
The Company has a checklist to ensure safety procedures are followed before the start of a job	8	31	76	70	5	190	3.1737	.88272

Source: Author (2022)

From table 3 above, the respondents were neutral on whether the safety board are well demarcated within the Company, as shown by (Mean=3.3526). The respondents were also neutral on whether the company has safety and health rules and procedures, as shown by (Mean=2.8368). The respondents were neutral on whether the company safety regulation and approaches are sufficient to prevent accidents from occurring, as shown by (Mean=2.8474). The respondents were neutral concerning the statement that there is regular safety inspection within the Company, as shown by (Mean=3.0737). The respondents were also neutral on the statement that the company has a checklist to ensure safety procedures are followed before the start of a job, as shown by (Mean=3.1737). These findings were in line with those by David Biggins, Mike Phillips and Peter O'Sullivan (2017) who observed that healthy safety precaution significantly contributed to worker effectiveness therefore reducing the cost associated with accidents.

Safety Resources

The researcher sought to determine the effect of safety resources on worker effectiveness in the construction companies. The respondents were to tick the degree to which Strongly Disagree -1; Disagree-2; Neutral-3; Agree-4; Strongly Agree -5 with the statements in relation to Safety Resources by the construction companies.

Table 4: Safety Resources and Worker Effectiveness

Statement	1	2	3	4	5	Total	Mean	Std. Dev
The contractors keep accident registers at sites	3	3	83	101	0	190	3.4840	.61486
Are there enough resources for safety inspections at your workplace	10	66	73	41	0	190	2.7632	.84934
Employees are sufficiently compensated in case of an accident at work	4	82	96	6	2	190	2.5684	.61123
Safety supervisors are frequently involved in the administration of drug testing	4	54	93	29	10	190	2.9316	.85484
All employees are provided with personal protective equipment	23	18	62	74	13	190	3.1895	1.10118
The contractor has subscribed to WIBA	1	24	71	91	3	190	3.3737	.74347

Source: Author (2022)

From the findings in table 4, the respondents were neutral on the statement that the contractors keep accident registers at sites, as shown by (Mean=3.4840). The respondents were neutral on whether there are enough resources for safety inspections at your workplace, as shown by (Mean=2.7632). The respondents were neutral on whether employees are sufficiently compensated in case of an accident at work, as shown by (Mean=2.5684). The respondents were also neutral on whether the safety supervisors are frequently involved in the administration of drug testing, as shown by (Mean=2.9316). The respondents agreed with the statement that all employees are provided with personal protective equipment, as shown by (Mean=3.1895). The respondents were neutral on whether the contractor has subscribed to WIBA, as shown by (Mean=3.3737). These findings were in agreement with those by Mitropoulos and Memarian (2012) who observed that that safety resources such as teamwork and supervisions plans help in accident preventions thus increasing worker effectiveness.

Employee Effectiveness

The researcher sought to determine the level of employee effectiveness in relation to ergonomic practices at the China Road and Bridge Corporation Kenya Limited. The respondents were to tick the degree to which Strongly Disagree -1; Disagree-2; Neutral-3; Agree-4; Strongly Agree -5 with the statements in relation to employee effectiveness.

Table 5: Level of Employee Effectiveness

Statement	1	2	3	4	5	N	Mean	Std. Dev
Creativity at construction sites helps to reduce accidents	4	4	3	81	98	190	4.3947	.80801
Effective engagement with employees on safety measures helps to reduce accidents	0	0	24	59	107	190	4.4368	.70201
Elaborate safety communication has helped to minimize fatalities in construction worksites	4	10	14	102	60	190	4.0737	.88786
Work efficiency has helped to minimize fatalities at construction worksites	2	4	11	97	76	190	4.2684	.75351
The company employees are satisfied with the Company's ergonomic practices	0	4	6	114	66	190	4.2737	.62475

Source: Author (2022)

Table 5 above shows the level of employee effectiveness. The findings show that respondents agreed that creativity at construction sites helps to reduce accidents, as shown by (Mean=4.3947). The respondents agreed that effective engagement with employees on safety measures helps to reduce accidents, as shown by (Mean=4.4368). The respondents were in agreement with the statement that elaborate safety communication has helped to minimize fatalities in construction worksites, as shown by (Mean=4.0737). The respondents agreed that work efficiency has helped to minimize fatalities at construction worksites, as shown by (Mean=4.2684). The respondents also agreed that the company employees are satisfied with the company's ergonomic practices, as shown by (Mean=4.2737).

Inferential Statistics

Regression analysis was undertaken to estimate the relationship between ergonomic practices and worker effectiveness. Regression analysis helps to assess the strength of the relationship and also model the future relationship between the variables. Regression analysis also helps to verify the bearing of ergonomic practices on worker effectiveness at China Road and Bridge Corporation Kenya Limited.

Model Summary

Regression analysis entails identifying the relationship between the independent and the dependent variables. The technique is used to find the equation that represents the relationship between the variables. Multiple regressions provide an equation that predicts one variable from two or more independent variables. The study adopted multiple regression as follows;

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.323[a]	.105	.085	.30195

a. Predictors: (Constant), Safety Resources, Safety Tutorials, Safety Precaution, Safety Communication

The regression model summary in table 6 above shows the extent to which the model predicts changes in the dependent variable. The results show that the coefficient of determination is 10.5% which indicates the proportion of the variation in the worker effectiveness at China Road and Bridge Corporation Kenya Limited that is explained by ergonomic practices adopted by the company as shown by adjusted R Square of .105. This means that 10.5% of the observed variation in the worker effectiveness at China Road and Bridge Corporation Kenya Limited can be explained by the ergonomic practices that include, safety communication, safety tutorials safety precaution measures and safety resources. This shows that the model has a low predictive power.

Analysis of Variance

Analysis of Variance was conducted through F test statistics to ascertain whether the relationship between the study variables is significant or not.

Table 7: Summary of ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.972	4	.493	5.406	.000[b]
	Residual	16.867	185	.091		
	Total	18.839	189			

a. Dependent Variable: Worker Effectiveness

b. Predictors: (Constant), Safety Resources, Safety Tutorials, Safety Precaution, Safety Communication

From the findings as shown in table 7, out of the total variance of 18.839, the independent variables (Safety Resources, Safety Tutorials, Safety Precaution, Safety Communication) can only explain 1.972. The F-value is given by the Mean Square Regression (.493) divided by the Mean Square Residual (.091), yielding F=5.406. The p-value associated with the F value of 5.406 is very small (0.000) implying that the independent variables are reliable predictors of the dependent variable.

A comparison of the p value from the table which is 0.000 with the alpha value of 0.05, shows that the alpha value is greater than p value which points out that the effect of ergonomic practices on work effectiveness at the China Road and bridge corporation Kenya Limited is statistically substantial at 95% confidence level. This also means ergonomic practices (Safety Resources, Safety Tutorials, Safety Precaution, Safety Communication) can be used to reliably predict the level of work effectiveness at the China Road and Bridge Corporation Kenya Limited.

The Estimated Model

A regression coefficients review was further carried out to ascertain the relationship between the specific independent variables and the dependent variable at 95% confidence level. The results of the analysis are as shown in Table 8.

Table 8: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.854	.369		10.439	000
	Safety Communication	-.100	.044	-.169	-2.280	.024
	Safety Tutorials	.062	.049	.0.91	1.255	.211
	Safety Precaution	.222	.059	.266	3.777	.000
	Safety Resources	-0.28	.074	-0.28	-.381	.704

Source: Author (2022)

The predicted value of worker effectiveness when all other variables are 0 is 3.854. The findings further show that a unit increase in safety communication will reduce the level of worker effectiveness by 0.100. It is also established that a unit increase in safety tutorials will increase the level of worker effectiveness by 0.062. The findings also establish that the level of worker effectiveness increases by 0.222 with a unit increase in Safety Precaution and that a unit increase in safety resources reduces the level of worker effectiveness by 0.28.

The coefficient for Safety Communication (-.100) is statistically significant since its p-value is .024, which is smaller than 0.05. The coefficient for Safety Tutorials (.062) is not statistically significant at the 0.05 level since the p-value of .211 is greater than .05. The coefficient for Safety Precaution (.222) is statistically significant because its p-value of .000 is smaller than 0.05. The coefficient for Safety Resources (-0.28) is not statistically significant because its p-value of .704 is greater than .05.

The coefficient of determination table above shows that safety tutorials and safety precaution variables have a positive effect on the level of worker effectiveness while safety communication and safety resources have a negative effect. Nonetheless, the four variables have a combined positive effect on the level of worker effectiveness at the at the China Road and Bridge Corporation Kenya Limited.

The results can further be summarized in the following model:

$Y= \beta_0 + \beta_1X_1 + \beta2X_2 + \beta3X_3 + \beta4X_4 + \varepsilon$

$Y= 3.854 - 0.100X_1 + 0.062X_2 + 0.222X_3 - 0.280X_4 + \varepsilon$

Where:

Y – Worker Effectiveness (Dependent Variable)

X_1- Safety Communication (Independent Variable)

X_2- Safety Tutorials (Independent Variable)
X_3- Safety Precaution (Independent Variable)
X_4- Safety Resources (Independent Variable)
β_0 - Is the constant of the model
β_1 – β4 Are the regression coefficients
ε – Stochastic error term estimate

The standardized beta coefficients for Ergonomic practices (Safety Communication, Safety Tutorials, Safety Precaution and Safety Resources) are -.100, .062, .222 and -0.28 respectively which shows that the relationship between ergonomic practices and the level of worker effectiveness is weak.

Research Question Review using the Multiple Regression Mode

Considering the results outlined in the regression table above, we can see that the coefficients of safety communication and safety resources negatively affected the dependent variable while those of safety tutorials and safety precautions positively affected the dependent variable. Only safety communication variable and safety precaution had a statistically significant effect on the worker effectiveness in China Bridge Corporation Kenya Limited. The conclusion therefore is that all the four independent variables affected the dependent variable. However, some variable have a positive affect others have a negative effect as discussed below:

How does safety communication influence worker effectiveness in China Bridge Corporation Kenya Limited?

The coefficient of safety communication variable is significant, with a p-value of .024, indicating that a one unit increase in safety communication would result in a -0.100 unit decrease in worker effectiveness in China Road and Bridge Corporation Kenya Limited. The findings are in line with those of Naji, Isha, Alazzani, Saleem and Alzoraiki (2022) who assessed the mediating role of safety communication between safety culture and employee's safety performance and established a partial negative relationship between variables.

The implications of these findings are that if effective safety communication is implemented in the workplace, it leads to reduced worker effectives requiring the organization to reevaluate its safety communication policies. Additionally, this study could provide employers with a better understanding of how to create effective safety communication that can help reduce the risk of workplace accidents, injuries, and other safety risks. Furthermore, the findings from this study inform on safety protocols and regulations, as well as provide employers with guidance on how to effectively communicate safety information to their employees.

ii) How does safety tutorials policy influence worker effectiveness in China Bridge Corporation Kenya Limited?

The coefficient of safety tutorials variable is positive but not significant, with a p-value of .211, indicating that a one unit increase in safety tutorials would result in a .062 unit increase in worker effectiveness in Bridge Corporation Kenya Limited. The findings are in line with those of Segbenya and Yeboah (2022) who examined the effect of occupational health and safety on employee performance in the Ghanaian Construction Sector and establish that the construction sector in Ghanaian lacks regular health and safety induction, orientation and refresher courses for construction workers which causes frequent occupational accidents and diseases affecting workers in the sector.

The implications are that the safety tutorials policy could be used as evidence to support the implementation of more safety tutorials in the organization. Given the finding that the safety tutorials variable is positive but not significant also implies that there is a need to re-evaluate existing safety tutorials policies.

To what extent do safety precaution measures influence worker effectiveness in China Bridge Corporation Kenya Limited?

The coefficient of safety precaution variable is also significant, with a p-value of 0.000, indicating that a one-unit increase in safety precaution would result

in a 0.222-unit increase in in worker effectiveness in China Road and Bridge Corporation Kenya Limited. The findings were in line with those of Onoh (2021) who reviewed the effect of safety practices on job performance and established that those safety precautions have a very good effect on their job performance of health care workers.

The implications for these findings are that employers may be able to reduce workplace accidents and injuries by implementing safety measures and those workers may be more productive and effective when a safe working environment is provided. The results of the study could also lead to better workplace policies, procedures, and practices and help employers create a more efficient, productive, and safe work environment for their employees.

How do safety resources influence worker effectiveness in China Bridge Corporation Kenya Limited?

The coefficient of safety resources variable is not significant, with a p-value of 0.704, indicating that a one unit increase in safety resources would result in a -0.28 units decrease in worker effectiveness in China Road and Bridge Corporation Kenya Limited. The findings differ with those of Yang, Kim and Seongseok (2021) who reviewed the effectiveness of safety cost budgeting for apartment construction in South Korea and established that allocating funds to ensure the health and safety of your employees enhanced their performance.

The implications of these findings are that companies should periodically review their safety resources to ensure that they are being translated into safe and effective employee environment to prevent waste of resources. This could lead to improved productivity, quality of work, and employee morale. Companies should also consider the cost-benefit analysis to determine if the investment in safety resources is worth the potential increase in worker effectiveness. Additionally, companies should ensure that safety resources are regularly updated and maintained to ensure optimal worker effectiveness.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

The study descriptive analysis established that at the China Road and Bridge Corporation Kenya Limited, the safety handbooks are readily accessible moderately and that the use of verbal safety communication is much more effective than written. The research also establishes that the management has communicated a clear objective regarding safety and that all the accidents that happen are always reported. The researcher also establishes that the China Road and Bridge Corporation Kenya Limited encourages suggestions on safety and health improvement and that there is good feedback from management on reported safety Issues.

The study regression analysis shows that safety communication has a negative but significant effect on worker effectiveness at the China Road and Bridge Corporation Kenya Limited as shown by a p-value of 0.024. The findings are similar to those of Abuashour and Hassan (2019) who also established that operational workers in the petrochemical oil and gas exploration sector in Malaysia detect a safety communication at the workplace they concentrate their efforts on performing other tasks rather than on the safety measures. The findings however differ with those of Naji et al (2022) who assessed the mediating role of safety communication between safety culture and employee's safety performance in petrochemical industry in Malaysia and found that safety communication partially mediates the relationship between safety culture and safety performance hence affecting positively the effectiveness of employees. The difference might have resulted from the measurement of the study variables.

The study descriptive analysis established that performing safety tutorials has reduced the cost associated with accidents at the China Road and Bridge Corporation Kenya Limited. The researcher also established that safety concerns are prioritized in tutorials programs and that the company provides health and safety introductory tutorials to new

workers before commencing work. The study further established that safety tutorials given to employees are adequate in assessing hazards in the workplace and also that, employees at the China Road and Bridge Corporation Kenya Limited received safety awareness tutorials before being assigned to work on-site.

The study regression analysis shows that safety tutorial policy has a positive effect on worker effectiveness but the effect is not significant as shown by a p-value of 0.211. The findings imply that when safety tutorials are increased by one unit, worker effectiveness at the China Road and Bridge Corporation Kenya Limited improves by 0.062. A study by Segbenya and Yeboah (2022) on the effect of occupational health and safety on employee performance in the Ghanaian Construction Sector also found similar results.

The study's descriptive analysis established that at the China Road and Bridge Corporation Kenya Limited, the safety board is well demarcated within the Company. The study also found that the company has safety and health rules and procedures and that the company safety regulation and approaches are sufficient to prevent accidents from occurring. The study also found that there is regular safety inspection at the China Road and Bridge Corporation Kenya Limited and that the company has a checklist to ensure safety procedures are followed before the start of a job.

Further, the regression analysis established that the safety precaution variable is the most influential variable for worker effectiveness. The researcher further established that the safety precaution variable positively and significantly affects worker effectiveness as shown by a p-value of 0.000. A study Onoh (2021) that examined the effect of safety practices on job performance found that safety precautions positively and significantly influenced job performance of health care workers.

The study's descriptive analysis established that the contractors keep accident registers at sites and that there are enough resources for safety inspections at the company workplace. The study established that employees at the company are sufficiently compensated in case of an accident at work. It can also be established from the findings that the safety supervisors are frequently involved in the administration of drug testing. The study established that all employees at the China Road and Bridge Corporation Kenya Limited are provided with personal protective equipment and that the contractor has subscribed to WIBA.

The study's regression analysis revealed that safety resources negatively affected the worker effectiveness at the China Road and Bridge Corporation Kenya Limited as shown by a standardized beta coefficient of -0.28. The researcher further established that the relationship between safety resources and worker effectiveness is not significant as shown by a p-value of 0.704. These findings differ with those of Yang et al. (2021) whose study on apartment construction in South Korea found that allocating funds to ensure the health and safety of your employees enhanced their performance.

The study's descriptive analysis established that the creativity at the construction sites helps to reduce accidents at the China Road and Bridge Corporation Kenya Limited. The study also established that effective engagement with employees on safety measures helps to reduce accidents. It can also be established from the findings that elaborate safety communication has helped to minimize fatalities in construction worksites. It was also established from the findings that work efficiency has helped to minimize fatalities at construction worksites and that the company employees are satisfied with the company's ergonomic practices.

Conclusions

The findings show that safety communication has a negative and significant effect on worker effectiveness at the China Road and bridge corporation Kenya Limited. This implies that a unit increase in safety communication will reduce the level of worker effectiveness.

The study established that safety tutorials policy has a positive effect on worker effectiveness at the China Road and bridge corporation Kenya Limited. The relationship between safety tutorials and worker effectiveness is not significant. This implies that a unit increase in safety tutorials will result to an increase in the level of worker effectiveness.

The study revealed that safety precaution has a positive and significant effect on worker effectiveness at the China Road and Bridge Corporation Kenya Limited. This implies that a unit increase in safety precaution will lead to an increase in the level of worker effectiveness.

The study established that safety resources have a negative effect on the level of on worker effectiveness at the China Road and Bridge Corporation Kenya Limited. The relationship between safety resources and worker effectiveness is not significant. These findings imply that a unit increase in safety resources result to a decrease in the level of worker effectiveness.

Recommendation for Policy and Practice

Given that safety communication has a negative and significant effect on worker effectiveness at the China Road and Bridge Corporation Kenya Limited, the organization needs to re-evaluate its safety communication policies to help create a safe work environment and encourages workers to make smart decisions. The organization should ensure its workers are properly informed about potential hazards so that they can take appropriate action to protect themselves and their colleagues. Additionally, having an effective safety communication system in place will help reduce accidents and injuries in the workplace.

The study highly recommends the use of tutorials to improve worker effectiveness. Tutorials are an excellent way to train and orient workers on how to use new systems or processes, as well as to refresh their understanding of existing systems or processes. Tutorials can also provide workers with a comprehensive understanding of the overall workflow, allowing them to see how their individual tasks fit into the big picture. This can help workers become more efficient and effective in their roles, as well as help them to identify and address issues quickly. Overall, the use of tutorials can be an invaluable tool for increasing worker effectiveness.

It is highly recommended implementing safety precautions in the workplace as they have been proven to increase worker effectiveness. Safety precautions provide workers with the confidence and knowledge that their safety is being protected, allowing them to focus more on their job tasks. By implementing safety precautions, workers have the opportunity to have a greater level of job satisfaction, as well as improved morale and motivation. Additionally, safety precautions reduce the risk of accidents and injuries, resulting in fewer lost days of work and improved overall productivity.

Given that safety resources negatively affect worker effectiveness at the China Road and Bridge Corporation Kenya Limited, the organization needs to re-evaluate its investment in safety resources to ensure that they are being translated into safe and effective employee environment to prevent waste of resources. The safety resources enable workers to access information on how to stay safe on the job and be aware of potential risks. This allows them to be more proactive in their safety practices, making them more effective in their work. Additionally, Safety Resources can provide workers with the necessary tools and resources to ensure that all safety protocols are followed.

Suggestions for Further Studies

The study recommends that further studies be done on ergonomic practices on worker effectiveness in other construction companies in Kenya, especially private corporations for benchmarking purposes. Since ergonomic practices accounts for 10.5% of changes in worker effectiveness, more research should be done to determine the other factors that account for the rest 89.5%. Another study can also be done to test other Ergonomic strategies such as health safety, workplace arrangement, wellness, and workers' involvement and their effect on the worker effectiveness.

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