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Employees' perceptions of safety control mechanisms and production cost at a mine

Abstract

The purpose of this study is to determine whether the requirements of safety legislation are observed and complied with by a single colliery in South Africa and its employees to ensure safety and maintain an accident-free working environment. From the literature, a framework including the following four main components is identified: (1) organizational adherence or compliance to safety legislation, (2) employees' compliance regarding the application of safety control mechanisms, (3) employees' attitude towards safety control, and (4) production cost's relation to safety control mechanisms. An analysis of organizational safety control mechanisms and production cost is conducted through the use of a structured questionnaire, completed by 151 participants. Descriptive statistics, exploratory factor analysis (EFA) and one-way analysis of variance (ANOVA) are utilized to analyze the perceptions of participants. The contribution of the study is that an enhanced safety control questionnaire is developed with a greater emphasis on production costs; the above-mentioned four-component framework is refined into nine managerial factors; and statistically significant differences between the perceptions of different classes of labor (departments) are revealed.

Keywords: colliery, mine, production, production costs, safety, safety controls.
JEL Classification: M11, M49.

Introduction

In South Africa, mine workers' 'skeletons' litter the mines due to accidents. The bodies of some of the miners who have died underground have never been retrieved and buried according to African traditions. This is because, in the course of meeting customer demands and managing unpredictable daily business operations, safety controls are often overlooked (Noe, Hollenbeck, Gerhart & Wright, 2014).

Safety controls are the methods, procedures or standards used to ensure the safety of employees, which can be achieved through the elimination of hazards (Lu, Zhang, Tang & Gong, 2015). To ensure safety especially in the mines, the government provides guidelines through the legislative framework that includes the Mine Health and Safety Act and Regulations Act No. 29 of 1996, Occupational Health and Safety Act No. 85 of 1993 as amended by the Occupational Health and Safety Act No. 81 of 1993, Labour Relations Act No. 66 of 1995 and the Constitution of the Republic of South Africa, which requires a hazard-free environment for every individual including mine workers.

Although the government provides safety guidelines, fatality and injury rates in the South African mining industry are relatively high. Statistics indicate that between 2003 and 2013, 1 932 miners died and 41 244 miners were injured while at work (South African Government, 2013). Even though there was a 72 percent decrease in all mine fatalities, from 332 in 2003 to 93 in 2013, these numbers are still high – to present these numbers in a comparative perspective, indexed numbers show that the South African fatality rate is 0.09, while the combined rate for Australia, Canada and USA is currently 0.05 (Mining weekly, 2015). This is confirmed by Liu, Xiao, Li and Wang (2015) that the fatality rate in coal mines has been significantly reduced with some developed countries reaching the target of zero deaths while other countries still experience fatalities resulting in increased production cost for the mining industry. Therefore, the South African Government and its social partners still have a long way to go 'to ensure that every mineworker ultimately returns from work unharmed every day' (South African Government, 2015).

Production cost is the combination of direct material, direct manufacturing labor and indirect manufacturing costs. Direct costs can be traced in an economically feasible way to a product, while indirect manufacturing costs, e.g. indirect manufacturing labor, are related to the product, but cannot be traced in an economically feasible way. Furthermore, non-manufacturing costs are not part of the costs of the product, for example administrative salaries (Horngren, Datar & Rajan, 2015). It is believed that safety legislation increases the production cost and as a result businesses close down, fewer businesses enter the industry and competitiveness is affected. Trienekens and Zuurbier (2008) maintain that the costs of meeting safety standards are enormous and increase the production cost. Yet, they fail to realize that lack of safety results in accidents and accidents also accumulate costs. This is evident in the case of Impala Platinum in 2009, a mine based in Rustenburg in the North West Province of South Africa. There were ten fatalities due to non-

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compliance with safety standards, while 126 days lost time were due to safety stoppage. As a result, production declined by 12 percent and refined platinum declined by nine percent. These lower volumes unfavorably affected the unit production cost (Impala Platinum, 2009).

Again, accidents that claimed two lives in 2011 at Harmony Gold Unisel, in the Free State and the Northern Platinum mine in Limpopo in South Africa could have been prevented by adopting automated models that stop wagons from running if there is a problem (Biyase, 2011). However, these calls were ignored due to costs involved. Accidents and loss of life in the mines are due to negligence by mining companies. This was confirmed by the Minister of Mineral Resources, Ngoako Ramotlhodi, that the majority of the high number of injuries reported is not new, but repeated accidents (South African Government, 2015). In summary, a paramount concern in South Africa is the large incidence of accidents in the mining industry due to a lack of safety, which has resulted in the country failing to reach its safety target of zero harm in 2013 (South African Government, 2014).

The importance of this study is that light will be shed on the management of these somewhat contradictory issues, organizational safety control mechanisms and production costs. This study consulted a number of previous, related studies to develop a questionnaire that emphasizes these two aspects. The related studies are Hecker and Goldenhar (2014), Laurence (2005) and Glendon and Litherland (2001), who based their research on the Safety Climate Questionnaire, originally developed in 1980 by Zohar. Cox and Cheyne (2000) assessed safety culture in offshore environments; Donald and Canter (1993) developed a questionnaire, referred to as the Safety Attitude Questionnaire (SAQ) (Harvey, Erdos, Bolam, Cox, Kennedy & Gregory, 2002). Finally, Mason, Lawton, Travers, Rycraft, Ackroyd and Collier (1995) developed a questionnaire which studied safety compliance which was also relevant for English and Branaghan (2012). From this literature, a framework including the following four main components was identified: (1) organizational adherence or compliance to safety legislation, (2) employees' compliance with the application of safety control mechanisms, (3) employees' attitude towards safety control, and (4) production cost's relation to safety control mechanisms.

The purpose of this study was to determine whether the requirements of safety legislation are observed and complied with within the above-mentioned framework by a single colliery in South Africa and its employees to ensure safety and maintain an accident-free working environment. The investigation is based on employee perceptions in different departments, with the intention of encouraging mining companies to invest in safety and abide by the legislation in order to reduce fatalities and injuries. Furthermore, to increase awareness that although safety is possibly costly in terms of implementation of safety mechanisms, accidents and production costs can be reduced. This study contributes to the body of knowledge by firstly developing an enhanced questionnaire emphasizing the contradictory issues of safety mechanisms and production costs; secondly, to refine the above-mentioned four-component framework into sensible managerial focus points by means of exploratory factor analysis; and lastly, to determine, by means of a one-way ANOVA how these factors differ between departments, which present different categories of labor types.

1. Conceptual scope

Lei and Yuanyuan (2014) concluded that investments in safety can accelerate reduction in total costs due to accidents. Consequently, the South African government is of the view that safety controls reduce costs and accidents. As a result, the Chamber of Mines remains committed to the ideal of zero harm (Mining Weekly, 2015; Chamber of Mines, 2010). Safety within organizations involves human factors; therefore, the behavior of employees should be considered. If safety measures are put in place, organizations should educate employees, create awareness, ensure understanding and enforce the application of safety rules (Rosen, 2015). In order to make valid conclusions and recommendations pertinent to this article, four theories were applied, which form the conceptual scope of the study:

- The Normal Accident Theory (NAT) by Perrow (1984) indicates that accidents are inevitable and therefore normal. Shrivastava, Sonpar and Pazzaglia (2009) claim that no matter how hard organizations try to prevent accidents, accidents will always occur and they believe that mining can never have zero risk to safety.
- The High Reliability Theory (HRT) by Sagan, (1993) substantiated and, consistent with Weick (2004), declared that if organizations try harder, and apply safety measures, there will virtually be an accident free system despite the complexity of the system.
- The Safety Control Cost Theory by Son, Melchers and Kal (2000) posits that there is a relationship between safety performance and costs. It states that the higher the design and

safety levels to be achieved, the lower the overall costs incurred. Therefore, safety investments should be viewed as a means of reducing accidents and cost (Teo & Feng, 2011).

- The Indirect Cost Theory of Accident Prevention affirms that for every accident that occurs, there are indirect costs incurred. Many employers are not aware of these costs and therefore they are not insured (Brody, Letourneau & Poirier, 1990).

To summarize: This study applied the four theories, which mainly assume a relationship between the contradictory issue between safety control mechanisms and production costs, as a conceptual scope to measure its results against. Furthermore, the four-component frame (1) Colliery's safety compliance, (2) employee safety commitment, (3) attitude towards the safety measures, and (4) production cost is applied as a basis/instrument to determine the perceptions of employees in different departments. To combine these aspects sensibly, the open question is: What lessons can mine managers learn from the perceptions of employees to enhance the management of items included in the four-component frame?

2. Methodology

To fulfill the purpose of the study, a quantitative research paradigm was employed by distributing a structured questionnaire to analyze (using descriptive statistics) the perceptions of employees of different departments regarding to the items included in the four-component framework. This is followed by an exploratory factor analysis to break these four components up into sensible factors, i.e. to put items together that belong together according to participants' perceptions, as well as to provide the management of the Colliery with a model to assist in the operating of safety control mechanisms and production costs. The results of the exploratory factor analysis were further analyzed by a one-way ANOVA to determine whether there are any significant perception differences between different departments. The participants were firstly divided into seven strata using proportional stratification. To simplify the results of the study, these strata were grouped together, ((1) Mining + Plant, (2) Engineering + Technical services and (3) Administration that comprises administration/finance, human resources and protection/safety). This is because of the differences regarding risk exposure in different departments and this three-group classification represents direct manufacturing labor, indirect manufacturing labor and non-manufacturing labor, respectively. Firstly, mining and plant personnel are directly involved in the physical extraction and processing of coal; secondly, engineers and technical services are not directly involved, but only support the extraction and processing; and thirdly, administration personnel are by no means involved in the extracting and processing of coal.

2.1. Target population and sampling procedure. The population was restricted to a single colliery in South Africa and its employees. The database at the colliery reflected 1 023 employees including top management from where the sample was drawn. From this population, a sample of 218 employees (based on 20%) was selected using proportional stratified random sampling. The appropriate number was selected from each stratum to ensure that the sample reflects each group in different proportions with a minimum of 30 participants in smaller strata, which resulted in slightly more than 20 percent in total being selected.

2.2. Data collection. Data were collected using a structured questionnaire with five sections (A-E) as indicated in the attachment. Section A requested the participants' general information. Sections B to D represent the four components in the framework that employed 56 five-point Likert scale questions/items, examining perceptions between 1, strongly disagree and 5, strongly agree. It contained modified questions adapted from the questionnaire by Laurence in 2005 – four questions, and the questionnaire by Glendon and Litherland (2001) – five questions. Eleven questions were obtained from the questionnaire used by Cox and Cheyne (2000) to assess the safety culture in offshore environments. The study also adapted five questions from the questionnaire by Donald and Canter (1993). This questionnaire is referred to as the Safety Attitude Questionnaire (Harvey, Erdos, Bolam, Cox, Kennedy & Gregory, 2002). The remaining seven questions in sections B, C and D were obtained from the questionnaire used in the study conducted by Mason, Lawton, Travers, Rycraft, Ackroyd and Collier (1995). The rest of the questions in section E were developed by the researcher to place a greater emphasis on production costs.

In Table 1, the reliability of the scale was determined by computing Cronbach's alpha and reflected acceptable (> 0.7) scores ranging from 0.77 to 0.87 (Institute for Digital Research and Education, 2015). Content and construct validity were established by experts in Accounting and Safety fields to ensure that the questionnaire contains the concepts it intended to cover by enabling the researcher to identify and eliminate problematic questions in relation to wording and the arrangement of questions. Of the 218 questionnaires distributed, 151 usable questionnaires were collected at the end of 2014.

Table 1. Reliability of the questionnaire (attachment) and results

Constructs	Cronbach's alpha	No. of items	Results	
			Mean	Std. deviation
Organizational compliance or adherence of the colliery to safety legislation (section B)	0.87	12	4.17	0.53
Employees' compliance regarding the application of safety control mechanisms (section C)	0.80	10	2.67	0.69
Employees' perception and attitude towards safety controls (Section D)	0.77	10	2.56	0.69
Production costs' relation to safety control mechanisms (section E)	0.86	24	3.41	0.54

3. Results and discussion

3.1. Descriptive statistics of perceptions based on the four-component framework. Table 1 exhibits the summary of results from the questionnaire (see Appendix) based on the measures of central tendency (mean) and dispersion (standard deviation). A detailed analysis indicated the mean and standard deviation of each item found in the questionnaire. Section B ranked the highest with the mean score of 4.17 on the five-point scale, which indicates that participants' scores were between agree and strongly agree regarding compliance of the colliery with safety legislation. Section E's mean score is between moderately agree and agree (3.41), which indicates the degree (above average on the 5-point scale) that participants experience the production-costs-safety-control relationship. Sections C and D are between moderately agree to disagree (2.67 and 2.56, respectively), implying participants' experience that employees' compliance with and attitude towards safety are less than 3, the midpoint on the five-point scale.

The results of section B can be interpreted that the colliery is perceived to be compliant/adherent with the relevant safety legislation. Some organizations may still be adherent to and consistent with the Normal Accident Theory, but the colliery proved the opposite by implementing safety control mechanisms to prevent accidents. This indicates that the colliery is in harmony with the High Reliability Theory that accidents are preventable and organizations can move from normal accident to high reliability organizations. However, while the colliery (organization) tries its best to be compliant with safety mechanisms, the employees' compliance with and attitude towards safety fall under suspicion (sections C and D). To some, safety is costly; however, they fail to realize the burden created by injury and fatality costs. The results in section E can be interpreted that indirect costs are still incurred at the colliery due to accidents; nonetheless, certain costs have been reduced. This supports the Indirect Cost Theory of Accident Prevention that accidents result in indirect cost yet they are preventable through safety investments that are encouraged by the Safety Control Cost Theory, which believes that the higher the safety investments, the lower the overall cost will be.

3.2. Factor analysis. The data were further analyzed to determine the underlying dimensions under each section using exploratory factor analysis. Kaiser's criteria – eigenvalue >1 rule was utilized to establish the number of factors (Williams, Onsman & Brown, 2010). Items that loaded onto more than one factor, those that loaded below 0.5 and the factors that loaded less than three items were rejected (Field, Miles & Field, 2013). Nonetheless, the questions that loaded onto more than one factor were allowed to represent the factor with the highest loading provided it is >0.5. The nine factors identified and retained are shown in Table 2. Cronbach's alphas for extracted factors were all above the acceptable level of 0.70, except for two factors that were below the benchmark level (0.49 and 0.44). The factors were numbered according to sections, for example: BF1 refers to factor 1 under section B and are interpreted below. The specific questions/items that are grouped into a factor are also indicated in the questionnaire (Appendix).

Table 2. Names of factors, percentage of variance explained and reliability

Factor number	Names of factors	Percentage variance explained	Reliability
BF1	Organizational compliance to safety legislation	49.12	0.92
BF2	Management commitment	12.27	0.49
	Cumulative %	61.46	
CF1	Employees' compliance and commitment to safety	41.91	0.86
CF2	Supportive work environment	17.78	0.44
	Cumulative %	59.69	
DF	Employees' perceptions on safety culture	45.95	0.90
	Cumulative %	45.95	
EF1	Indirect cost of work accidents and injuries	25.36	0.84
EF2	Perceptions in relation to direct cost of unsafe work environment	13.51	0.87
EF3	Work environment in relation to safety	9.63	0.68
EF4	Cost reduction due to adherence to safety	7.89	0.71
	Cumulative %	56.39	

B Factor 1: Organizational compliance with safety legislation (nine items) – Yapp and Fairman (2006) define compliance with safety legislation as activities carried out to maintain a safe workplace by adhering to procedures as required by legislation.

B Factor 2: Management commitment to safety (three items) – Michael, Evans, Jansen and Haight (2005) define management commitment to safety as the dedication of management towards safety and concern for employees' well-being.

C Factor 1: Employees' compliance with and commitment to safety (seven items) – Safety compliance refers to the carrying out of work in a safe manner in accordance with the safety rules and procedures. This requires skills and an understanding of rules to perform work as such.

C Factor 2: Supportive work environment (three items) – This designates the environment where there is support and encouragement in relation to safety (Brown, Raynor & Lee, 2011).

D Factor: Employees' perceptions of safety culture (seven items) – It signifies learned values, shared attitudes, beliefs and behaviors in the workplace (Hadjimanolis & Boustras, 2013).

E Factor 1: Indirect cost of work accidents and injuries (seven items) – Indirect costs are the costs incurred due to accidents, but cannot be directly attributed to the accident as they are not easily measured (Shalini, 2009).

E Factor 2: Perceptions in relation to direct cost of unsafe work environment (six items) – In an unsafe environment, employees are involved in unsafe acts and risky behavior, which result in accidents and direct costs (Shalini, 2009).

E Factor 3: Work environment in relation to safety (four items) – Kidd, Miner, Walker and Davidson (2007) declare that a safe working environment has employees who are supportive of one another in relation to safety.

E Factor 4: Cost reduction due to adherence to safety (three items) – The adherence to safety rules and procedures and the carrying out of every day duties in a safe manner result in cost reduction (Hadjimanolis & Boustras, 2013).

3.3. Perception differences between departments (ANOVA). A one-way ANOVA was computed to determine whether the group means were equal. If significant differences were found, post hoc comparison, based on Turkey's HSD test, was utilized to establish exactly where the differences were found (Clow & James, 2014). Data for this study were collected using the stratified random sampling due to differences in the employees' exposure to risks, namely (1) Mining + Plant (M+P) (n = 63), (2) Engineering + Technical services (E+T) (n = 33) and Administration (Admin) (n = 55). The differences were considered significant if the p-value was less than or equal to 0.05, while a p-value greater than 0.05 was considered not to be statistically significant. The significant differences between the responses of the employees in different strata based on the nine factors identified and explained above are as follows.

Table 3. Post-hoc results using the Turkey HSD test (means indicated in parentheses)

Departmental variances	Departments	Mean differences	Std. error	Sig.
B Factor 1	M+P (4.05) E+T (4.26)	-0.21	0.118	0.164
	Admin (4.53)	-0.48	0.101	* 0.000
B Factor 2	M+ P (3.66) E+T (4.03)	-0.37	0.153	* 0.042
	Admin (4.04)	-0.38	0.132	* 0.011
C Factor 1	M+P (2.55) E+T (2.31)	0.234	0.186	0.411
	Admin (2.05)	0.50	0.160	* 0.006
D Factor	M+P (2.48) E+T (2.05)	0.43	0.186	0.062
	Admin (1.89)	0.59	0.160	* 0.001
E Factor 2	M+P (3.00) E+T (2.55)	0.45	0.221	0.108
	Admin (2.33)	0.67	0.190	* 0.002
E Factor 3	Admin (4.26) E+T (3.85)	0.41	0.134	* 0.007
	M+P (4.00)	0.26	0.113	* 0.049

* The mean significance at 0.05 level.

Regarding B factor 1 and B factor 2 (Table 3), it is evident that direct manufacturing labor (M+P) experiences organizational compliance to safety legislation and management commitment to safety, respectively, significantly lower than how non-manufacturing labor (Admin) experiences those factors. This is probably due to a misperception of non-manufacturing labor, since the mining and plant personnel are responsible for the physical extracting and converting of coal into sellable product, which exposes them much more to safety risks.

Regarding C factor 1 and D factor, it is evident that direct manufacturing labor rates their own compliance and commitment to safety and the safety culture significantly higher than non-manufacturing labor does. This is an indication that direct manufacturing labor takes responsibility of their own safety as well as the safety of fellow employees. Direct labor's rating of E factor 2 is also significantly higher than non-manufacturing labor, implying that they are very much more aware of the production costs that may be incurred as a result of an unsafe work environment.

Finally, both direct manufacturing labor and indirect manufacturing labor's (E+T) perceptions of the work environment in relation to safety, as measured by E factor 3, are significantly lower than those of non-

manufacturing labor. This is probably the result of operating daily in different environments, e.g. administration offices with fewer safety risks relative to mining tunnels and plants that involve explosives and heavy machinery.

Conclusion

The open question was: What lessons can mine managers learn from the perceptions of employees to enhance the management of items included in the four-component frame? The results of the descriptive statistical analysis of the questionnaire show that the colliery is compliant with safety legislation and in harmony with the High Reliability Theory. On the other hand, employees' compliance and attitude towards safety are somewhat under suspicion. Furthermore, the Theory of Accident Prevention and Safety Control Cost Theory are supported, because indirect costs are still incurred at the colliery due to accidents; nonetheless, certain costs have been reduced. In conclusion, costs are still incurred due to a lack of safety, which requires more emphasis on safety, which may involve the retraining of employees. In addition, the continuous awareness of safety mechanisms and their link to production cost reduction should be enhanced by managers to encourage employees to change their attitude and adhere to safety rules and legislation.

The results of the exploratory factor analysis led to an enhanced four-component management framework. The first component, organizational compliance and adherence to safety legislation, should be broken-up into two focus points, i.e. organizational compliance to safety legislation and management commitment to safety. The second component, employees' compliance regarding the application of safety control mechanisms, should be broken up into the following two focus points, employees' compliance with and commitment to their own safety and the supportive work environment. The third component, employees' perception and attitude towards safety, remains a single focus point. The fourth component, production costs' relation to safety control mechanisms, should be refined into four focus points, i.e. indirect costs, direct costs, the work environment and cost reduction due to adherence to safety.

Based on ANOVA results, managers should become aware of significant safety and production cost perception differences that exist between direct manufacturing labor (and to a lesser extent between indirect manufacturing labor, engineering and technical services) and non-manufacturing labor (administration). Due to the results, the study concludes that the company's compliance with safety legislation and management's commitment to safety still have room to improve to change the perceptions of especially the mining and plant's employees and to a lesser extent the engineering and technical employees. It is therefore suggested that they open communication channels in order to determine the reasons for these differences and the concerns of employees in these departments, as this will initiate trust between management and employees.

The contribution of the study is that an enhanced questionnaire was developed with more emphasis on production costs, relative to previous ones, and nine management factors were identified from the results of the questionnaire and differences between the perceptions of different classes of labor (departments) were revealed. The managerial implication of this study is that the results may enable management to manage the indicated nine focus points/factors, instead of all 56 items in the questionnaire, to improve safety mechanisms and simultaneously get rewarded by lowering production costs. Furthermore, the intensity and urgency of managing the nine indicated factors should be differently applied between departments.

The major limitation of this article is that the results are based on one colliery. Although managers in the mining sector can learn from this experience, the results cannot be generalized as other mines may have different dynamics. Due to production problems at the colliery during data collection and to avoid further production disruptions, the questionnaires were distributed and collected by the section heads. This was found to be a limitation as it may have posed a challenge to the participants to fully disclose their perceptions. Nonetheless, the study provides opportunities for further research. The same study can be replicated and conducted at other mines, and a comparison study can be conducted to determine differences between mines and to enable the generalization of findings.

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Appendix

Below are the statements about the adherence or compliance of a Colliery with regard to safety legislation. Indicate the extent to which you agree with the statement by ticking the corresponding number in the 5-point Likert scale below:

Strongly disagree	Disagree	Moderately agree	Agree	Strongly agree
1	2	3	4	5

Section B: Adherence or compliance to safety legislation		Mean	Standard deviation	Factor analysis
B1	The organization is up to date with the safety legislation	4.17	0.707	B1
B2	There is a safety policy regarding the safety of employees	4.26	0.803	B1
B3	There are safety measures to ensure the safety of employees	4.37	0.687	B1
B4	Employees are made aware of possible hazards associated with their jobs	4.27	0.772	B1
B5	There are safety procedures to guide the performance of tasks	4.32	0.742	B1
B6	There are regular safety control meetings	4.27	0.754	B1
B7	Effective documentation ensures the availability of safety procedures	4.21	0.742	B1
B8	Safety representatives are involved in putting together the safety procedures	4.05	0.89	B2
B9	Personal protective equipment (PPE) is provided freely at all times	4.34	0.727	B1
B10	Management learns from past mistakes and implements corrective measures	4.19	0.778	B1
B11	Management considers safety to be equally as important as production	4.02	1.013	B2
B12	Supervisors seldom discipline employees who break the safety rules	3.57	1.188	B2

Section C: Employees' compliance regarding the application of safety control measures		Mean	Standard deviation	Factor analysis
C1	I often deviate from safety rules	2.28	1.135	C1
C2	I have found better ways of doing my job	3.17	1.232	C2
C3	Some safety rules are impossible to apply	2.57	1.171	C1
C4	There are too many safety rules that one cannot remember	2.7	1.173	C1
C5	Safety rules are written in the language that I understand well	3.47	1.249	C2
C6	Employees often give tips on how to work safely	3.47	1.059	C2
C7	I have difficulty getting hold of written safety rules	2.42	1.147	C1
C8	Safety rules are only for inexperienced workers	1.94	1.152	C1
C9	I can get the job done quicker by ignoring the safety rules	2.04	1.190	C1
C10	Sometimes I fail to understand which rules to apply	2.36	1.106	C1

Section D: Employees' perceptions and attitude towards safety controls		Mean	Standard deviation	Factor analysis
D1	Safety rules are used only to protect management's back	2.16	1.110	DF
D2	Acting with common sense is safer than acting within safety rules	2.2	1.074	DF
D3	It is necessary to break the safety rules to get the job done	2.07	1.126	DF
D4	Safety rules make easy tasks complicated	2.44	1.269	DF
D5	Safety is not my role	1.84	1.116	DF
D6	Working safety rules remove skills	1.84	1.154	DF
D7	Safety rules always describe the best way of working	3.77	1.064	
D8	Sometimes I do not understand why I have to follow the safety procedures	2.28	1.112	DF
D9	I feel like my safety matters to the organization	3.74	1.143	
D10	The blame for accident is always placed on the injured employee	2.94	1.267	

SECTION E Safety control measures and production cost		Mean	Standard deviation	Factor analysis
E1	Safety control mechanisms increase production cost	3.38	1.041	
E2	Safety measures at work have reduced the cost of fatalities	3.81	1.072	E4
E3	Safety measures have reduced the costs in relation to accidents	3.86	0.935	E4
E4	There is a high cost of employee replacement/substitution due to dismissals in relation to safety	3.14	1.134	
E5	There is sufficient resource allocation to ensure adequate safety training	3.69	1.005	
E6	Work injuries result in a high absenteeism rate	3.69	1.110	E1
E7	Suspensions/dismissals result in the organization paying overtime to the employees	3.33	1.189	E1
E8	Safety measures have reduced the compensation paid to employees every year due to accidents	3.43	1.125	E1
E9	Adequate safety procedures lead to less damage to property and equipment in the organization	3.87	0.947	E4
E10	Equipment idles due to injuries/suspensions/dismissals	3.14	1.110	E1
E11	Failure to apply safety measures results in employees getting *suspended*	3.66	0.984	E1
E12	Failure to comply with safety controls leads to employee *dismissal* from work	3.58	1.058	E1
E13	Availability and correct use of PPE helps me to avoid work injuries	4.06	0.791	E3
E14	There are safety incentives and bonuses to encourage employees to work safely	4.25	0.814	E3
E15	Work accidents result in the loss of production	3.89	1.033	E1
E16	My productivity has been affected by an injury I sustained at work	2.95	1.402	E2
E17	Competent safety staff ensures a safe working environment for the employees	4.1	0.844	E3
E18	Work accidents affect my morale leading to lower productivity	4.1	1.121	
E19	I was hospitalized due to work injury	2.27	1.455	E2
E20	The organization provides adequate safety facilities	3.84	1.030	E3
E21	The organization was penalized due to lack of safety	2.75	1.308	E2
E22	Employees leave the organization due to lack of safety	2.46	1.321	E2
E23	Small injuries should not be reported as they reduce safety bonuses	2.19	1.375	E2
E24	The organization has received an incentive from the government in relation to safety	3.3	1.361	E2