

# Exploratory Factor Analysis of Safety Culture and Safety Climate in Utility Sector Electrical Accidents of Kerala State in India

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## Abstract

Safety Culture and Safety Climate play an important role in occupational safety, especially in sectors like utility, chemical, petroleum extraction, cement, construction etc. The purpose of this study was to extract the constructs that contribute to safety culture and safety issues in the utility sector which in turn leads to safety issues. The Exploratory factor analysis method was used for extracting constructs. The reliability of data was tested using the Cron-bac alpha value. The sample adequacy and correlation were tested using Kaiser-Meyer- Olkin sample adequacy test (KMO) and correlation were tested using Bartlett's test, chi-square value. Descriptive statistics were used to check the normality of data. Communalities were found to extract data. The Principal component analysis method was used to find the number of factors and it was verified by rotating the data. The total variance explained was found to understand which factor contributes more to safety issues.

**Keywords:** Safety Culture, safety Climate, Exploratory Factor Analysis, Reliability, Factor Loading

## 1. Introduction

Most of the electrical accidents in energy industries are fatal (Parakevi E Batra 2001). Electrical accidents are found to be five times more serious compared to the average accidents in other sectors (Manuel Suarez Cebador 2013). The root cause of electrical fatal accidents is due to technical problems, equipment failure, unauthorized use of electricity etc. (Kalte 2014). Extreme care and planning are necessary while working with electricity. Due to the extreme use of electricity in industries and homes, both fatal and non-fatal accidents are very common. Error in task and equipment leads to electrocution (Ann Williamson 1998). More than 10% of electrical fatal accidents are due to electrical shock (Ichikawa 2016). Human factors are the main reason for electrical accidents in industries (Zarei 2019). Safety training using virtual simulation helps to improve the cognitive ability of workers and hence awareness about safety will be improved (Lucas 2009).

Safety culture supports the value and priority of safety (Hale, 2000). Safety culture contribution to safety incidents in all industries (Cooper 2019, Edkens, 1998). Safety culture is responsible for safety in daily operations in any industry (Cox and Cox, 1991). Culture is more stable and abstract compared to climate (Gludenmund, 2000). The few contributors to safety culture are given in table 1.

Table 1: Safety Culture definitions

Contributor	Safety Culture
Cox & Cox 1991	Safety culture is the sum of attitude, perception, belief and values of employees towards safety
Pidgeon, 1991	Safety culture is the set of belief, attitude, norms, roles and practices concerned with dangerous exposure of manager, employees etc.
Ostrem, 1993	The organizations belief, attitude, policy, procedure and action is responsible for safety culture.

Geller, 1994	Everyone feel responsible for safety in their day to day activities for good safety culture.
Be rends, 1990	Safety culture is mental programming of members towards safety
Lee, 1996	Safety culture is a combination of attitude, competence, perception, values, commitment of organization towards safety.
Hale, 1998	Safety culture refers to the belief, perception and attitude of group which determines the action and reaction towards risk
Cooper, 2000	Safety culture is the effort of members of organization in improvement of safety in daily activities.
Richter & Koch, 2004	Safety culture of an organization is sharing learned experience in work to reduce risk and accident.

Rules and regulations help to improve the safety culture in an organization (Rimal & Real, 2003). Safety attitude contributes to safety performance in an organization (Stansted, 1998). There is a positive correlation between commercial pressure and safety issues (T L Yip, D Jin, W K Talley, 2015). Management commitment helps in achieving organizational safety (Rana M Van Tuyl, 2021).

For guiding management, risk assessment is needed to achieve a safe climate (T Luo, C Wu, L Duan, 2018). A positive safety climate encourages safety action by reward or social exchange (S Clarke 2006, M A. Griffin and A. Neal, 2000). Safety climate is the influencing factor in human perception of risk (D Zohar, 1980). Safety climate is employee perception of policy, procedure and practice related to safety at work (H Tohidi, M M Jabari, 2012). Safety Climate explains the ethics of the organization and the safety beliefs of employees (A M Williamson, A M Feyer, D Cairns, 1997). Employees' belief in safety is an indicator of a safety culture. The details of contributors to safety are given in table 2.

Table 2: Safety climate definitions

Contributor	Safety Climate
Zohar, 1980	Safety climate is shared perception of employees at work
Brown & Holmes, 1986	Safety climate is group or individual perception with an entity
Dedobbeleer & Beland, 1991	Safety climate is the property having two factors namely management involvement and worker participation
Neal, 2000	Safety climate is value of personal safety at work
Coyle, 1995	Safety climate is sum of attitude and perception towards safety issues
Wu, 2004	Safety culture is affected by organizational factors, personal factors and safety behavior of employees
Chen & Fang, 2005	Safety climate is employees perception on security of organization
Thorvaldsen, 2008	Safety climate is working as a team in an organization to achieve safety
Karen, 2009	Safety climate is shared concept of policy, procedure and practice in safety at work
Liu, 2009	Safety climate is persons sense towards organization safety

Negligence, a human behaviour factor contributes to safety issues (Bo wander 1987). The right attitude is necessary for the workplace to reduce accidents (Dillon 1995). Employee participation depends on the priority given to them by management on safety issues. Peer pressure is the main factor that influences the behaviour of others in safety aspects (Brett Larsen, Rene Ventra 2002). Work stress always leads to an accident (Rana M Van Tuyl 2021). The lack of awareness about personal protective equipment and its inadequate usage creates safety issues (Kelm 2013, Reason 1990). The specific behaviour or bad habits of the person like alcoholism, chain-smoking, usage of drugs etc. is having a positive correlation with safety issues (Fa Sloan 2013). For a good safety system in an organization, it is necessary to have a good effective safety work plan (Feyer 1997, Cox 1998).

Studies show that precondition for unsafe acts helps to reduce accidents in the workplace (Ying Yu Zhang 2019). Safety incidents usually happen due to unsafe acts (Mc Kinnon 2013). There is a safety linkage between site safety and accidents (A K Mishra 2002). Monitoring helps to control accidents (Flen 2000). Insufficient inspection is the hidden cause of danger in all accidents (Saeed Givenchy 2017). It is essential to have proper maintenance of equipment, machine and the environment to improve reliability and safety (OSHA 1989). It is necessary to have a

system of reporting and documentation of less threatening events to reduce safety issues (Ran M Van Tuyl 2021). To support safety in an organization safety effort has to be taken into consideration (S Cox, T Cox 1991).

Non-reporting practice has a positive correlation with the accident (Mc Kinnon 2013). A safety audit is necessary to access safety so that future hazards or safety issues can be reduced (Zhou 2011). Physical damage occurring to men or machines influences safety issues at work (Lee 1998). A monitoring system plays a vital role in reducing safety-related issues (Barbaranelli 2015). To reduce the risk of accidents it is necessary to have a good investigation and risk assessment system (Beria 2012). If lessons learned from mistakes are not communicated then there will be a safety concern in future. Any break in the chain of command will harm safety (Ran M Van Tuyl 2021). The type of organization which gives less emphasis on safety-related matters will always have to face challenges to survive (Flin 2000).

Self-motivation and motivation received help to reduce the occupational accident rate (T R Pordanjani, L Ying 2012). Management has to support reporting all incidence to reduce accidents (Ran M Van Tuyl 2012). If safety communication is poor then the chance of safety issues is very high. (Y S Sheen 2019). Poor supervision leads to high accidental issues in the energy sector (Lockley 2007). Safety climate is influenced by perception (Kumar & Bhasi 2009). The self-reported system has a negative correlation with accidents (Zohar 1980, Rundmo 1992). Safety behaviour is directly linked with work performance and safety climate (Griffin & Neal 2000, B Wilpert 1994). The type of job plays an important role in the cause of accidents (Jabari & Ghorbani 2016). Always encourage colleagues to supervise and share information to reduce accidents (J Mullen 2004).

Exploratory factor analysis is a multivariate statistical analysis method to find the number of factors or constructs that explains co-variation among indicators or set of variables measured (Watkins 2018). Exploratory factor analysis was used as the fundamental tool to evaluate theory and validate measurement (Spearman 1904). In Exploratory factor analysis, the data is used to check KMO and Bartlett's test for Sphericity. Data is rotated (Varimax/ Promax) and factors are extracted. Factor loading is checked and variance explained is found (Osborne 2009, Henson 2006, Fabrigar 1999). For factor extraction principal component analysis is usually used (Fabrigar 1999). For ease of interpretation, factor rotation is needed. It helps to produce factors which are correlated or uncorrelated. Varimax rotation is mostly used for orthogonal rotation of data (Hair 2003, Fabrigar 1999) The main aim of Exploratory Factor Analysis is to validate and reduce measured items (Jensen and Randoy 2002) for further analysis. Statistical software tool packages of SPSS, SAS etc. help in easy application of Exploratory Factor Analysis (Child 2006, Prince 2017).

In this paper, the influence of safety culture and safety climate in electrical accidents was analyzed using exploratory factor analysis. A questionnaire survey was conducted among three hundred people who are directly connected to electrically safety issues in the utility sector in the state of Kerala state in India. Out of the sixty-five items taken for study only thirty items contributed to safety issues based on exploratory factor analysis.

## 2. Materials and Methods

In the study of safety culture and safety climate, eight indicators are used for safety culture and fifty-seven indicators for safety climate. The safety culture indicators considered are Commercial Pressure, Safety Attitude, Safety organization, Safety Policy, Rules & Regulations, System & Procedure, competence and management commitment. The safety climate indicators considered are negligence, attitude, participation, belief, qualification, age, peer pressure, experience, responsibility, the effectiveness of training, peer support, stress, communication, knowledge, PPE usage, workmate influence, specific behaviour, values, job design, work plan, the precondition for an unsafe act, unsafe act, site safety, lack of monitoring, insufficient inspection, safety device, safety effort, lack of maintenance/repair, sub-standard equipment, poor record keeping, time constraint/work pace, hazard identification, injury/accident rate, reporting system, corrective action, feedback, failure, audit, physical damage, investigation, compensation, monitoring System, management support, perception, labour union, restriction in action, safety meeting, chain of command error, type of organization, motivation, failure, management commitment, communication, reward/recognition/penalty, discipline, supervision, safety rules and policy, type of job.

The steps in Exploratory Factor Analysis are given in figure 1.

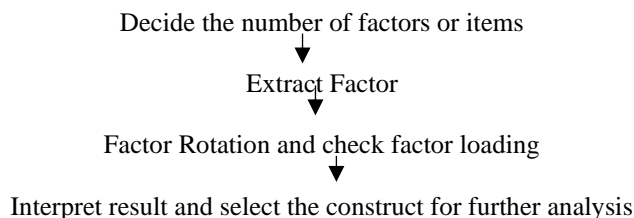


Figure 1: Steps for EFA

The survey was conducted by the face-to-face method. One question for each construct was taken from literature and modified to be apt for the study. Three hundred people who were directly associated with electrical safety issues in the utility sector of Kerala are considered for the study. Only two hundred and ninety-one people were willing to answer all questions. So 291 response was used for exploratory factor analysis.

The type of distribution is tested based on descriptive statistics (Skewness and kurtosis). Reliability was tested using the Cron-bac alpha value. The alpha value indicates how well the item or construct is related to a group or factor. It is the measure of internal consistency. The interpretation of the alpha value is given in table 3.

Table 3: Value of Cron-bac alpha and interpretation

Alpha value	Interpretation based on alpha value
0.9	Excellent
0.8	Good
0.7	Acceptable
0.6	Questionable
0.5	Poor
Less than 0.5	Unacceptable

The sample adequacy is tested by conducting the Kaiser- Meyer- Olkin test and interpreting the sample adequacy based on the KMO value. The interpretation of the KMO value is given in table 4 which indicates how well sample adequacy is. Correlation of item or construct with factor is tested using Bartlett’s test. A value less than 0.05 indicates a good correlation.

Table 4: Value of KMO and interpretation

KMO value	Interpretation based on KMO value for decision making
0.9	Marvelous
0.8	Meritorious
0.7	Middling
0.6	Mediocre
0.5	Miserable
Less than 0.5	Unacceptable

For checking the sample size and loading factor we will be able to categorize the items into factors. The details of the relation between sample size and loading factor for a good model are given in table 5.

Table 5: Minimum sample and corresponding factor loading in decision making

Factor loading	Sample size	Factor loading for excellent model
0.3	350	For sample size more than 100, factor loading more than 0.6
0.35	250	
0.4	200	
0.45	150	
0.5	100	
0.55	85	
0.6	70	

0.65	60	
0.7	50	

Principal component analysis and communalities are used to extract the data, and determine the loading factor and grouping of data. Factor rotation is done to check whether there is any variation in correlated items. Finally, the variance explained by each factor is found.

### 3. Results and Discussions

The accepted indicator variable, representation of variable and question used in the study are given in table 6. The distribution of data is checked by analyzing descriptive statistics, i.e. Value of Skewness and kurtosis. The value of Skewness and kurtosis in table 7 indicates that the data follows normal distribution since the value of Skewness is less than 3 and kurtosis less than 10 (Brown 2006)

Table 6: Details of accepted indicator and questionnaire used to study

No	Indicator (Contributor)	Indicated by	Questionnaire (In five point Likert scale)
1	Rules & Regulations (Kamp & Krause 1997)	ACu1	Safety rules and regulations are always carefully followed
2	Safety Attitude (Stansted 1998)	ACu2	Employees are not worried of injury at work
3	Commercial Pressure (T L Yip, 2015)	ACu3	Sometimes it is necessary to depart from safety for production sake
4	Management commitment (Cox & Cheyne 2000)	ACu4	Management clearly considers safety of employees with great importance
5	Negligence (Bo wander 1987)	ACI5	There is consistent procedure for dealing with employees who violates safety rules
6	Attitude (Zohar 2004)	ACI6	You willingly put extra effort to improve work place safety.
7	Participation (Dedobbeleer & Beland 1991)	ACI7	Most of my co-worker actively support site safety programmers
8	Peer Pressure (Guillaume Alinier 2015)	ACI8	You feel pressure from your co-worker to shortcut safe work practice
9	Stress (Lee 1998)	ACI9	Ability to work safely is affected by stress from outside
10	PPE usage (Reason 1990)	ACI10	I am aware of the need and use of PPE
11	Specific Behaviour (J Mullen 2004, He 2010)	ACI11	Alcohol, misbehavior etc. are problems at work site
12	Work plan (Cox 1998)	ACI12	Supervisor makes proper work plan based on safety issues
13	Precondition for unsafe act/ Risk preparation (Zhang 2009)	ACI13	Employees participate in inspection of potential hazard prior to work
14	Unsafe act (Mc Kinnon 2013)	ACI14	Employees report unsafe act
15	Site safety (Vinod Kumar & Bhasi 2009)	ACI15	Site safety is actively supported by employees
16	Lack of monitoring/ Leadership attention (Kelm 2013)	ACI16	Employees minor work injury is strictly monitored
17	Insufficient inspection (Has an Hoveidi 2017)	ACI17	Employees participate in inspection of hazard at workplace
18	Lack of proper maintenance (OSHA 1989)	ACI18	Maintained system safety prior to safety issues and minor safety hazards are corrected quickly
19	Poor record keeping (Rana M Van Tuyt 2021)	ACI19	Employees are encouraged to report near misses and kept record

20	Reporting system (Zhou 2011, Williamson 1997)	ACI20	Employees are encouraged to give safety suggestions and report near misses
21	Audit/ Risk Assessment (Zhang 2009, Zhou 2011)	ACI21	Employees understand the reason behind safety audit and knows about auditing process
22	Physical Damage/ Risk (Lee 1998)	ACI22	Damage is overlooked to get job done
23	Monitoring system (Flin 2000)	ACI23	Employees shortcut safe work practices
24	Investigation (Barbaranelli 2015)	ACI24	Site management blames injured employees for accident
25	Chain of command error (Ye 2014)	ACI25	Information needed to work safely is available to all employees
26	Type of organization (Lan 2004)	ACI26	I know the work is risky and I am prepared for it
27	Management support (Givechchi 2017)	ACI27	Employees always get support from management and encourages safety behavior
28	Communication (Cynthia 2005)	ACI28	Employees are always communicated about safety need and issues
29	Supervision (Lockley 2007)	ACI29	Supervisor always acknowledge employees for safe behavior
30	Type of job/project (Lan 2004)	ACI30	There are too many safety rules and regulations

Table 7: Descriptive Statistics

Items	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skew ness	Kurtosis
ACu1	291	4	1	5	3.92	.573	.328	-1.002	3.774
ACu2	291	4	1	5	3.91	.546	.298	-1.081	4.317
ACu3	291	4	1	5	3.93	.549	.302	-1.047	4.390
ACu4	291	4	1	5	3.92	.563	.317	-.837	3.403
ACI5	291	2	3	5	4.13	.495	.245	.273	.704
ACI6	291	3	2	5	4.00	.541	.293	-.134	.940
ACI7	291	3	2	5	4.05	.510	.260	-.076	1.535
ACI8	291	3	2	5	4.09	.521	.272	-.184	1.924
ACI9	291	3	2	5	3.98	.572	.327	-.226	.837
ACI10	291	2	3	5	4.07	.490	.241	.155	1.096
ACI11	291	3	2	5	4.06	.590	.348	-.318	1.051
ACI12	291	3	2	5	4.08	.526	.277	-.056	1.186
ACI13	291	2	3	5	4.07	.544	.296	.046	.360
ACI14	291	2	3	5	4.03	.504	.254	.065	.961
ACI15	291	3	2	5	3.99	.551	.303	-.129	.786
ACI16	291	2	3	5	4.05	.522	.273	.071	.654
ACI17	291	2	3	5	4.02	.535	.286	.016	.535
ACI18	291	2	3	5	4.10	.516	.267	.137	.615
ACI19	291	2	3	5	4.08	.525	.276	.097	.547
ACI20	291	2	3	5	4.05	.552	.304	.027	.290
ACI21	291	2	3	5	4.11	.511	.261	.168	.640
ACI22	291	3	2	5	4.09	.540	.291	-.061	.935

ACI23	291	3	2	5	4.05	.542	.294	-.356	2.009
ACI24	291	2	3	5	4.06	.522	.272	.081	.650
ACI25	291	3	2	5	4.02	.635	.403	-.590	1.410
ACI26	291	3	2	5	4.12	.521	.272	.002	1.169
ACI27	291	3	2	5	4.08	.558	.312	-.212	1.181
ACI28	291	3	2	5	4.08	.546	.298	-.079	.867
ACI29	291	3	2	5	4.08	.529	.280	-.056	1.133
ACI30	291	3	2	5	4.05	.554	.307	-.097	.749
ACu1	291	3	0	3	.28	.601	.362	2.184	4.233
ACu2	291	6	0	6	1.21	1.651	2.727	1.113	-.057
ACu3	291	10	0	10	2.11	2.484	6.170	1.006	.007
ACu4	291	5	0	5	1.47	1.634	2.671	.880	-.424

The value of Cron-bac alpha of individual items and the group was found to be more than 0.85 indicating good reliability of data (table 8). The overall reliability of data and standardized item are also greater than 0.85 and 0.9 indicating good and excellent reliability (table 9).

Table 8: Items and their Cron-bac alpha value

Items	Alpha value	Items	Alpha value
ACu1	0.873	ACI16	0.864
ACu2	0.873	ACI17	0.864
ACu3	0.873	ACI18	0.862
ACu4	0.875	ACI19	0.863
ACI5	0.863	ACI20	0.863
ACI6	0.865	ACI21	0.863
ACI7	0.864	ACI22	0.863
ACI8	0.863	ACI23	0.863
ACI9	0.864	ACI24	0.863
ACI10	0.865	ACI25	0.862
ACI11	0.863	ACI26	0.863
ACI12	0.862	ACI27	0.863
ACI13	0.863	ACI28	0.863
ACI14	0.864	ACI29	0.863
ACI15	0.865	ACI30	0.863

Table 9: overall Reliability test (Cron-bac alpha)

Alpha Value	Standardized item alpha value
0.871	0.950

The sample adequacy and correlation are tested using Kaiser-Meyer- Olkin test and Bartlett’s test. For the data, the KMO value was obtained as 0.936 (table 10) and it was found to be marvellous based on table 4. The chi-square test indicates there is a good correlation between safety culture and safety climate with safety issues since the obtained significance is 0.00 (table 10) which is greater than 0.05.

Table 10: Report of KMO & Bartlett’s test of Sphericity

Test for sample adequacy (KMO value )		0.936
Bartlett's Test of Sphericity	Chi square value	8026.550
	Significance	0.000

For data extraction, the value of communalities is considered. For a better explanation, the value of communality (extraction value) should be greater than 0.45 (Costello 2005). The factor having a good correlation has communalities

(extraction value) greater than 0.45. For correlation analysis, the initial value is greater than one (Hair 1998). Table 11 shows the value of communalities of extracted variable which is having a value greater than 0.45.

Table 11: Details of communalities (items extracted)

Items	Initial	Extraction	Items	Initial	Extraction
ACu1	1.00	0.551	ACI16	1.00	0.553
ACu2	1.00	0.608	ACI17	1.00	0.585
ACu3	1.00	0.595	ACI18	1.00	0.738
ACu4	1.00	0.566	ACI19	1.00	0.670
ACI5	1.00	0.739	ACI20	1.00	0.646
ACI6	1.00	0.500	ACI21	1.00	0.702
ACI7	1.00	0.587	ACI22	1.00	0.642
ACI8	1.00	0.669	ACI23	1.00	0.699
ACI9	1.00	0.549	ACI24	1.00	0.723
ACI10	1.00	0.558	ACI25	1.00	0.603
ACI11	1.00	0.605	ACI26	1.00	0.663
ACI12	1.00	0.726	ACI27	1.00	0.603
ACI13	1.00	0.678	ACI28	1.00	0.666
ACI14	1.00	0.584	ACI29	1.00	0.693
ACI15	1.00	0.484	ACI30	1.00	0.613

Principal factor analysis was performed using SPSS to extract data based on factors explained. Table 12 indicates that there are two factors namely safety culture and safety climate and the extracted item has a loading factor of more than 0.6 (table 5) which shows that the items can very well explain the factor.

Table 12: Component Matrix (Extraction by principal component analysis)

Item	Component 1 (Safety Climate)	Component 2 (Safety Culture)
ACu1		0.742
ACu2		0.779
ACu3		0.771
ACu4		0.743
ACI5	0.858	
ACI6	0.706	
ACI7	0.765	
ACI8	0.816	
ACI9	0.741	
ACI10	0.742	
ACI11	0.777	
ACI12	0.852	
ACI13	0.822	
ACI14	0.760	
ACI15	0.690	
ACI16	0.741	
ACI17	0.758	
ACI18	0.859	
ACI19	0.818	
ACI20	0.804	
ACI21	0.838	
ACI22	0.801	
ACI23	0.829	
ACI24	0.848	
ACI25	0.774	
ACI26	0.814	
ACI27	0.777	
ACI28	0.815	

ACI29	0.832	
ACI30	0.780	

The data is rotated orthogonally using varimax rotation (since normal distribution data), and verified whether there is any change in data extraction (table 13). The value of factor loading of the extracted item is also greater than 0.7, which indicates item or construct could explain the factor very well.

Table 13: Rotated component Matrix (Extraction by principal component analysis)

Item	Component 1 (Safety Climate)	Component 2 (Safety Culture)
ACu1		0.742
ACu2		0.779
ACu3		0.770
ACu4		0.739
ACI5	0.856	
ACI6	0.704	
ACI7	0.763	
ACI8	0.818	
ACI9	0.740	
ACI10	0.739	
ACI11	0.778	
ACI12	0.852	
ACI13	0.823	
ACI14	0.757	
ACI15	0.689	
ACI16	0.739	
ACI17	0.755	
ACI18	0.858	
ACI19	0.818	
ACI20	0.803	
ACI21	0.838	
ACI22	0.801	
ACI23	0.832	
ACI24	0.849	
ACI25	0.772	
ACI26	0.814	
ACI27	0.777	
ACI28	0.816	
ACI29	0.833	
ACI30	0.782	

The total variance explained by two variables was also obtained (table 14). This table indicates that the four items of safety culture could explain 48.316% of safety issues and twenty-eight items of safety climate factor could explain 55.534 % of safety issues. So in-order to reduce safety issues we have to focus more on safety climate factors compared to safety issues.

Table 14: Total variance explained

Component	Initial Eigen Value (%)	Rotated sum of squared loading
1	48.362	48.316
2	55.534	55.534

#### 4. Conclusions

The exploratory factor analysis method was used to find the constructs and factors that contribute to electrical safety issues. The eight items of safety culture and fifty-seven items of safety climate were used for analysis. The questionnaire was taken from the literature and modified slightly for this study. Five points Likert scale was used here. The data obtained from 291 respondents who were directly exposed to electrical accidents in the utility sector was tabulated and the normality of data was confirmed based on Skewness and kurtosis value obtained from descriptive

statistics. The data was found to be reliable since the Cronbach's alpha value of each item was greater than 0.8 and the overall data was 0.950. The sample was found to be adequate since the KMO value was 0.936. Bartlett's test of Sphericity (correlation test) gave a significance value less than 0.05 indicating there is a correlation between constructs and safety issues. Constructs that contribute more to safety issues were found based on communalities. The four constructs of safety culture and twenty-six constructs of safety climate have communalities greater than 0.45, hence the thirty constructs were found to contribute to safety issues. The loading factor obtained from principal Component Analysis and Rotated Component analysis (varimax rotation) indicates that the construct could explain safety issues very well since the loading factor is more than 0.6. The total variance explained by safety culture was found to be 48.3% while safety climate was 55.5% of safety issues. The safety climate was found to contribute more to safety issues compared to safety culture.

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