

Assessing Impact of Cultural Values on Global Occupational Accidents across the World; A Secondary Analysis of GLOBE and Hamalainen Studies

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ABSTRACT

The concept of culture has attracted abundant attentions of both scholars and governors during the past decades. During these periods, two outstanding studies (Globe and Hofsted studies reflect national cultural values across the world) had done in cross cultural studies. On the other hand safety management by concentration of decreasing fatality and accident rate is one of the crucial activity in hazardous industries (e.g. petroleum, construction,...). This paper aims at investigating the relationship between the two concepts of "Safety" and "Cultural values" in various countries. In our study, we used multiple regression and bivariate correlations. The statistical population includes 36 countries that shared in GLOBE and Hamalainen et al. (2005) studies. Also, we employed multiple regression analysis and bivariate correlations to investigate contribution of GLOBE's cultural dimensions on occupational accident and fatality rate in studied societies. Our findings reveal that there is a significant relationship between some "cultural values" and "accident and fatality rate".

KEYWORDS: National Culture, Safety assessment, GLOBE, Fatality Rate, Accident Rate, Multiple Regressions, bivariate correlations.

1. INTRODUCTION

Culture consists of the commonly held values within a group of people and it is a set of norms, customs, values, and assumptions that guides the behaviour of a particular group of people. Organisational culture, however defined, is widely acknowledged to be critical to an organisation's success or failure, for example in business. Graves (1986) and Williams et al. (1989) consider that the prime function of culture is to contribute to an organisation's success. Analogously, safety culture is frequently identified, for example by disaster inquiries, as being fundamental to an organisation's ability to manage safety-related aspects of its operations — successfully or otherwise. Implicit within both these views is the notion that culture operates at different levels and through various mechanisms. However, the nature of these mechanisms remains problematic.

Because the notion of safety culture arose from the more inclusive concept of organisational culture, some key features characterising debate about this concept are first considered. Broader issues, including derivation of the notion of culture from social, ethnic or other origins, are excluded here (Gelendon, 2000).

In multi-national organisations there will be a wide range of operations, people will be physically dispersed over a range of time-zones, will operate in different national settings and will also speak a variety of languages. In large organisations there will be a large number of sub-organisations, each with their own history, having a potentially distinct culture and run by managers with their own vision of where to go, and how. The sheer size of the problem and the very nature of such organisations mean that a close range hands-on approach is not feasible. Another factor that has to be considered is the interaction of national with organisational culture. The academic literature has concentrated primarily upon a limited number of types of organisation and studies have been typically carried out in Western environments (Guldenmund, 2000).

The problem of safety culture – What is it and how do you become one? – is probably the main issue in modern thinking about. Since the IAEA report on the Chernobyl disaster, which introduced the concept of a safety culture to a wider world, failures arising from the culture of an organisation have become seen as the reason why major accidents happen, such as the loss of the space shuttle Columbia and many recent railway disasters such as Clapham Junction, Ladbroke Grove (Cullen, 2001) and the Waterfall disaster (Hudson, 2007)

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In this paper we try to assess relationships between concepts of safety and culture. Because of different interpretation and metaphorical nature of mentioned concepts and improve generalizability of research finding across the world, we used secondary data of Globe¹ and Hamalainen *et al.* (2006) studies to extract global cultural values and occupational accident and fatality rate across the world.

2. LITERATURE REVIEW

In this section we had reviewed national culture and safety risk assessment indices. Hofstede and Globe are the main national cultural dimensions.

2.2. Measuring national culture across the world

Culture is a metaphorical concept. There are various definition about it. Culture is also used to mean only the totality of features in other groups, not instead of specific features within the group, as similar features of other groups within the opposition. Our culture to refer to art as a great people's everyday practice or opposes. Our culture means that the 'extraordinary' as opposed to what 'basic'. Our culture means that "symbolic" as opposed to what material (Iravani, and Nazerian, 2012).

Absence of a unique definition about culture and its features persuade researcher to develop standard instrument to assessing cultural values. Since 1979, Hofstede, GLOBE study and three major cross-cultural research projects carried out in the 1990s. Another is the World Values Survey, expanded from a European Values Survey in the 1980s and now coordinated by US political scientist Ronald Inglehart (Inglehart 2004). Third was Shalom H. Schwartz in Survey of Values, designed and orchestrated. Fifth is Smith *et al.* (2002) study of 'event management', which asked over 7,000 department managers in 47 countries how they handled each of eight common work events that normally occur in any work organization.

Based on Hofstede's dimensions, there are five cultural dimensions that are power distance, uncertainty avoidance, individualism, and masculinity and Time orientation (Hofstede 2006). These five dimensions described in Table 1.

Table 1. Cultural Dimensions of Hofstede Studies

Factor	Description
Power distance	The extent to which people accept unequal distribution of power. In higher power-distance cultures, there is a wider gap between the powerful and powerless.
Uncertainty avoidance	The extent to which the culture tolerates ambiguity and uncertainty. Higher uncertainty avoidance leads how to low tolerance for uncertainty and to a search for absolute truths.
Individualism	The extent to which individuals or closely knit social structure, such as the extended family (Collectivism), are the basis for social systems. Individualism leads to reliance on self and focus on individual achievement.
Masculinity	The extent to which assertiveness and independence from others is value. High masculinity leads to high sex-role differentiation and focus on independence, ambition, and material goods.
Time orientation	The extent to which people focus on past, present, or future. Present orientation leads to a focus on short-term performance.

Globe (Global Leadership and Organizational Behavior Effectiveness) is a research program focusing on culture and leadership in 61 with the participation of approximately 17,300 middle managers from 950 organizations in 62 countries (Chokar *et al.*, 2007). The scale of this project rivals a large multinational corporation. National culture examined in terms of nine dimensions: performance orientation, future orientation, assertiveness, power distance, human orientation, institutional collectivism, in-group collectivism, uncertainty avoidance, and gender egalitarianism. In a survey of thousands of middle manager in food processing finance, and telecommunication industries in these countries, GLOBE compares their culture and attributes of effective leadership (House *et al.*, 2002).

Nine culture dimensions were identified: Assertiveness, Future Orientation, Gender Egalitarianism, Humane Orientation, Institutional Collectivism, In-Group Collectivism, Performance Orientation, Power Distance, and Uncertainty Avoidance. Six of them correspond to the well-known culture dimensions of Hofstede (1980 1997), and the remaining three dimensions are also grounded in previous literature. Future Orientation is related to the Past, Present, Future Orientation dimension of Kluckhohn and Strodtbeck (1961); Performance Orientation corresponds to need for achievement (McClelland, 1961); and Humane Orientation is related to the Human Nature Is Good vs. Human Nature Is Bad dimension of Kluckhohn and Strodtbeck, Putnam's (1993) work on the Civic Society, and McClelland's (1985) conceptualization of the affiliative motive (Chokar *et al.*, 2007).

¹Global Organizational Behavior Effectiveness

Hofstede correlating the Hofstede dimension scores with the result of two factor analyses. The first started from the country scores on GLOBE's twice nine dimensions for 56 countries, as reproduced in the GLOBE book. The second started from the country scores on GLOBE's 78 questionnaire items, made available for this purpose by the GLOBE team (Hofstede 2006).

2.3. Safety Assessment

The difference in accident rates between developed and developing countries is remarkable. While many enterprises in developed countries are taking zero accident policy for their goal, construction of infrastructure and industrialization in developing countries bring new situations to surface. Enterprises in developing countries are unable to identify their hazards. Furthermore, nowadays many enterprises operate in several regions and countries and this often makes accident prevention programmers more challenging and occupational safety and health management systems in corporate context should take into account cultural differences.

The figures of occupational accidents are published annually in many countries but reliable data is available only in a limited number of countries, and the information is not standardized. Figures of accidents in developing countries are not based on proper accident recording and notification systems. Global figures for occupational accidents are missing while some regions such as the European Union have successfully combined accident figures of member states of EU. In 1999 the International Labor Organization (ILO) published estimates of occupational accidents that were based on the figures gathered from selected ILO member states. These estimates were based on year 1994 figures. The average estimated fatal occupational accident rate was 14.0/100 000 workers and the number of fatal accidents was 335000 [8]. On the contrary, recent studies by the ILO based on information from the World Economic Forum (2002) and the Lausanne Institute of Management IMD demonstrate that the most competitive countries are also the safest. Selecting a low-safety, low-health and low-income survival strategy is not likely to lead to high competitiveness or sustainability (ILO, 2003).

2.4. Multiple regressions Analysis (MRA)

In this research to assess the relation of safety indices (e.g. accident rate and fatality rate) and cultural dimensions we had used multiple regression analysis. Multiple regressions are one of the fussier of the statistical techniques. It makes a number of assumptions about the data, and it is not all that forgiving if they are violated. It is not the technique to use on small samples, where the distribution of scores is very skewed! The following summary of the major assumptions.

2.4.1. sample size: If your results do not generalize to other samples, they are of little scientific value. So how many cases or subjects do you need? Different authors tend to give different guidelines concerning the number of cases required for multiple regressions.

2.4.2. Multicollinearity: This refers to the relationship among the independent variables. Multicollinearity exists when the independent variables are highly correlated ($r = .9$ and above).

2.4.3. Outliers: Multiple regression is very sensitive to outliers (very high or very low scores). Extreme scores that part of the initial data screening process were checked.

2.4.4. Normality, linearity, homoscedasticity, independence of residuals: These all refer to various aspects of the distribution of scores and the nature of the underlying relationship between the variables. These assumptions can be checked from the residuals scatter plots which are generated as part of the multiple regression procedure. Residuals are the differences between the obtained and the predicted dependent variable (DV) scores. The residuals scatterplots allow you to check:

- **Normality:** the residuals should be normally distributed about the predicted DV scores;
- **Linearity:** the residuals should have a straight-line relationship with predicted DV scores;
- **homoscedasticity:** the variance of the residuals about predicted DV scores should be the same for all predicted scores (Tabacknic and Fidell, 2007).

SPSS 19 prepare some statistics to assess these criteria.

Accident rate and fatality rate have the role of dependent variables and cultural dimension are independent variables. The summary for one multiple regressions is presented in Table 3.

3. Proposed model

This Proposed model is composed of two kinds of variables: "Higher education and training" and "Business sophistication" as in the following figure 1.

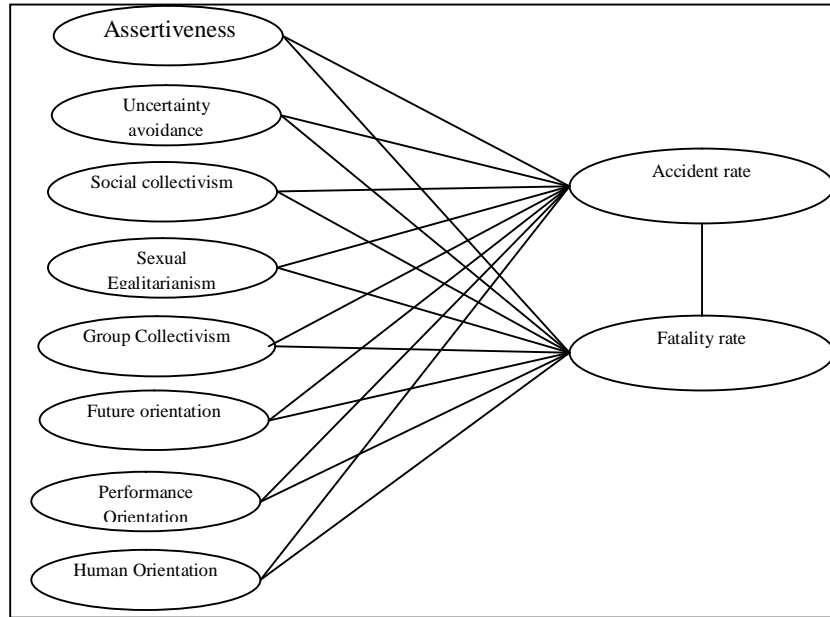


Figure1. Research proposed model

According to the above-mentioned figure research question is:

1. Is there any relationship between “cultural values “and “accident rate””?
2. Is there any relationship between “cultural values “and “fatality rate””?

4. RESEARCH METHODOLOGY

4.1. Research Method

Research method used for this study is multiple regressions. Secondary analysis method was also used for analyzing secondary data source. First, we studied literature of safety assessment indices as dependent variables these indices were collected by Hamalainenet. al. 2004 . Then, we used the GLOBE report data in 2002 for doing our secondary analysis. The Statistical population in this study was 36 countries whose data was included in Hamalainenet. Al and GLOBE studies. Finally, we utilized multiple regression analysis by SPSS19 software; thereafter, analysis output was obtained.

5. DATA ANALYSIS

Secondary data was collected using GLOBE and Hamalainenet. al.(2006) studies. In analyzing the data collected, Statistical Package for the Social Sciences (SPSS) technique has been employed. This section also introduced the sampling techniques used in order to collect information from target population using questionnaire in scale rating manner to be implemented into the SPSS program to process the reliability test and subsequent empirical analysis.

As it mentioned before these studies are related to estimation of studding national cultural dimensions in 61 societies and accident and fatality rate across the world. 39 courtiers were shared in two studies. So the statistical sample contains these 39 courtiers. The extracted data were gathered in 1999 to 2002 concurrently (Figure 2) (Bakacsi, et. al. 2002;Gapta et. al. 2002; Jesuino 2002; Kabasakal and Muzzafar 2002; Szabo2002).

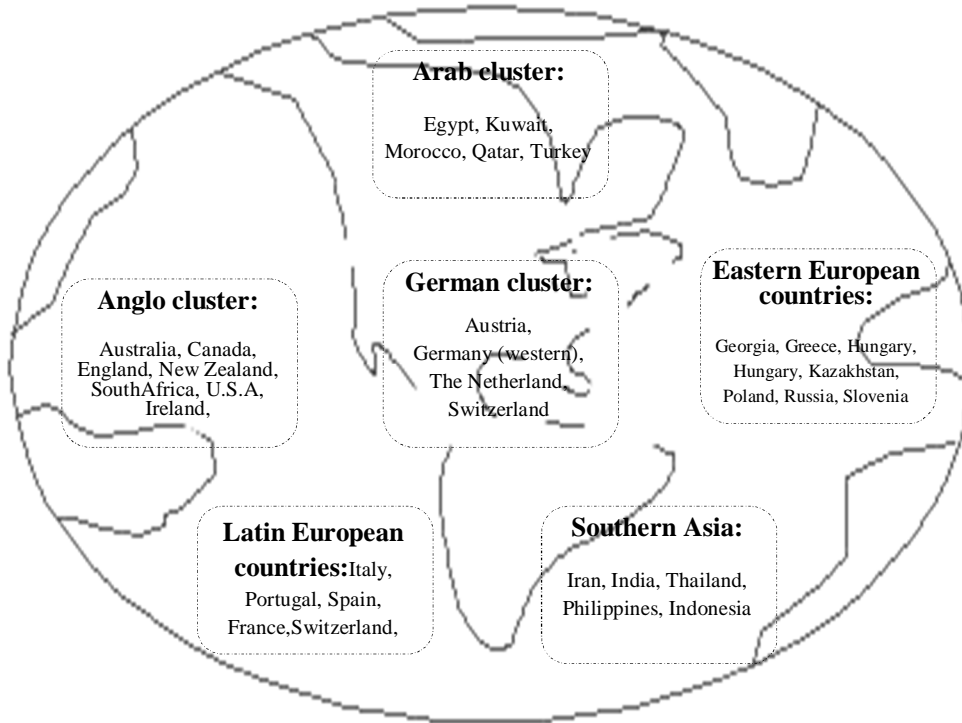


Figure 2. Statistical sample of research in each cultural cluster

Table 2. Descriptive statistic of variables summary

variables	Mean	Std. Deviation	N	Significance of One-Sample Kolmogorov-Smirnov Test	Distribution of variable
Accident rate	8534.43	7047.63	36	0.932	Normal
Fatality	11.1694	9.21883	36	0.928	Normal
uncertainty	4.1392	.57728	36	0.837	Normal
future	3.7981	.45086	36	0.643	Normal
power	5.1664	.35941	36	0.986	Normal
Institutional collectivism	4.2044	.38331	36	0.911	Normal
human	4.0650	.53025	36	0.442	Normal
performance	4.1117	.44744	36	0.986	Normal
Group collectivism	5.0911	.76062	36	0.979	Normal
gender	3.3731	.39495	36	0.564	Normal
Assertiveness	3.9733	.44825	36	0.982	Normal

51. Fatality rate and cultural dimensions:

R square (Table 3) tells you how much of the variance in the dependent variable (perceived stress) is explained by the model. In this case R Square is 0.582. Expressed as a percentage (multiply by 100, by shifting the decimal point two places to the right), this means that our model (which includes 8 cultural dimensions) explains 58.2 per cent of the variance in accident rate.

Table 3. Fatality rate and cultural dimensions (Model Summary^b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.763 ^a	.582	.437	6.91469	2.019
a. Predictors: (Constant), Assertiveness, power, human, gender, performance, future, institutional Collectivism, Group collectivism, uncertainty					
b. Dependent Variable: FATALITY					

The Adjusted R square statistic 'corrects' this value to provide a better estimate of the true population value. If you have a small sample, you may wish to consider reporting this value, rather than the normal R Square value. To

assess the statistical significance of the result, it is necessary to look in the table labeled ANOVA (Table 4). This tests the null hypothesis that multiple R in the population equals 0. In other words F Statistics assess overall significant linear relationship between dependent variable (Fatality rate) and independent variables (Assertiveness, power, human, sexual egalitarian, performance, future, institutional Collectivism, Group collectivism, uncertainty). The model in this example reaches statistical significance (Sig. = .003; this really means $p < .05$).

Table 4. ANOVA table over regression (Fatality rate and cultural dimensions)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1731.402	9	192.378	4.024	.003 ^a
	Residual	1243.135	26	47.813		
	Total	2974.536	35			

a. Predictors: (Constant), Assertiveness, power, human, sexual egalitarian, performance, future, institutional Collectivism, Group collectivism, uncertainty
 b. Dependent Variable: FATALITY

Table 5. Fatality rate and cultural dimensions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B			Correlations			Co linearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	VIF	Part	Tolerance		
														1
	uncertainty	-3.247	4.894	-.203	-.663	.513	-13.306	6.812	-.381	-.129	-.084	.171	5.842	
	future	-1.579	4.491	-.077	-.352	.728	-10.810	7.652	-.249	-.069	-.045	.333	3.001	
	power	4.068	5.264	.159	.773	.447	-6.752	14.887	.401	.150	.098	.382	2.620	
	Inst- collectivism	2.990	4.714	.124	.634	.531	-6.699	12.679	.090	.123	.080	.418	2.390	
	human	5.399	3.670	.311	1.471	.153	-2.146	12.943	.380	.277	.186	.361	2.773	
	performance	-2.916	4.899	-.142	-.595	.557	-12.986	7.153	-.126	-.116	-.075	.284	3.517	
	Group collectivism	3.025	2.693	.250	1.123	.272	-2.510	8.560	.591	.215	.142	.326	3.071	
	gender	-6.313	3.920	-.270	-1.610	.119	-14.371	1.746	-.338	-.301	-.204	.570	1.755	
	Assertiveness	5.726	3.562	.278	1.608	.120	-1.595	13.047	.128	.301	.204	.536	1.866	

a. Dependent Variable: FATALITY

As it mentioned in before assessing MRA we must assessing some presumptions (2-4). the VIF (Variance inflation factor), which is just the inverse of the Tolerance value (1 divided by Tolerance). VIF values above 10 would be a concern here, indicating multicollinearity (Pallant, 2007). Tolerance is an indicator of how much of the variability of the specified independent is not explained by the other independent variables in the model and is calculated by R squared variable. If this value is very small (less than .10), it indicates that the multiple correlation with other variables is high, suggesting the possibility of multicollinearity. The other value given is

The next thing we want to know is which of the variables included in the model contributed to the prediction of the dependent variable (Table 5). We find this information in the output box labeled Coefficients. Look in the column labeled Beta under Standardized Coefficients. To compare the different variables, it is important that you look at the standardized coefficients, not the unstandardized ones. 'Standardized' means that these values for each of the different variables have been converted to the same scale so that you can compare them. If you were interested in constructing a regression equation, you would use the unstandardized coefficient values listed as B. In this case, we are interested in comparing the contribution of each independent variable; therefore we will use the beta values. Look down the Beta column and find which beta value is the largest. So human orientation has the main contribution in fatality rate in this case.

The next column is t statistics and significance (p-values). Since the significance value more than 0.05, there aren't any evidence to conclude contribution of predicting variable (cultural dimensions on dependent variable). On other word null hypothesis were accepted (1).

$$\begin{cases} H_0: \beta = 0 \\ H_1: \beta \neq 0 \end{cases} \quad (1)$$

By the same procedure relationship between fatality rate and cultural dimensions was rejected. In aspect of authors Theses result are relatively doubtful. So in the next step we had a bivariate correlation between each cultural dimension and fatality rate and accident rate. Null hypothesis says there aren't any linear relationship between two variables (2).

$$\begin{cases} H_0: \rho = 0 \\ H_1: \rho \neq 0 \end{cases} \quad (2)$$

The results of relationships were summarized in Table 6. This table reveals that there are negative and significant relationship among fatality and accident rate and uncertainty avoidance and Sexual Egalitarianism. By the way, power distance, human orientation and Group collectivism have significant and positive relationship; and finally there aren't any linear relationships among future view, performance orientation and assertiveness and fatality and accident rate.

Table 6. bivariate correlation between Fatality rate and cultural dimensions

		Correlations								
		Uncertainty	future	power	instCollect	human	performance	Groupcollectivism	Sexual	Assertiveness
N		36	36	36	36	36	36	36	36	36
FATALITY	Pearson Correlation	-.381*	-.249	.401*	.090	.380*	-.126	.591**	-.338*	.128
	Sig. (2-tailed)	.022	.144	.015	.601	.022	.463	.000	.044	.456
	N	36	36	36	36	36	36	36	36	36
Type of Relation		-		+		+		+	-	
ACCIDENT	Pearson Correlation	-.361*	-.220	.408*	.097	.367*	-.131	.560**	-.320*	.141
	Sig. (2-tailed)	.031	.197	.013	.575	.027	.445	.000	.057	.411
	N	36	36	36	36	36	36	36	36	36
Type of Relation		-		+		+		+	-	

** . Correlation is significant at the 0.01 level (2-tailed).
 * . Correlation is significant at the 0.05 level (2-tailed).

Another important result of Table 6 is assessing internal consistency of research result. As you know accident rate and fatality rate are two related concepts. So increase accident rate consequently increase fatality rate. So concordances of correlation hypothesis reveal the internal consistency of results. The degree of correlation result agreement is 100%.

6. SUMMARY AND CONCLUDING REMARKS

The concept of culture has a deep and considerable impact on management studies. Safety culture born in three past decades after Chernobyl disaster in this field. This research tries to understand relation of culture and safety among nations (Mearn and Yule 2009).

The main obstacles of research were a reliable global report in related to safety accident. Since we had used the estimation of global accidents. Culture is metaphorical concept and there aren't any consensus among scholars in related of this. And the other hand Assessing culture across the world is too time consuming and expensive. To solve these problems we had used secondary data extracted from GOLBE Studies. Similarly there is the same problem in safety assessment. In many countries (specially developing or underdeveloped countries) there aren't any reliable and formal report in related of safety performance indices (e.g. accident rate and fatality rate). So in this research we use estimation of Hamalainen et.al.(2006). Results of research reveal that that there are significant relationship between safety (accident rate and fatality rate) and some cultural dimensions in Globe studies(table6 and Figure3).

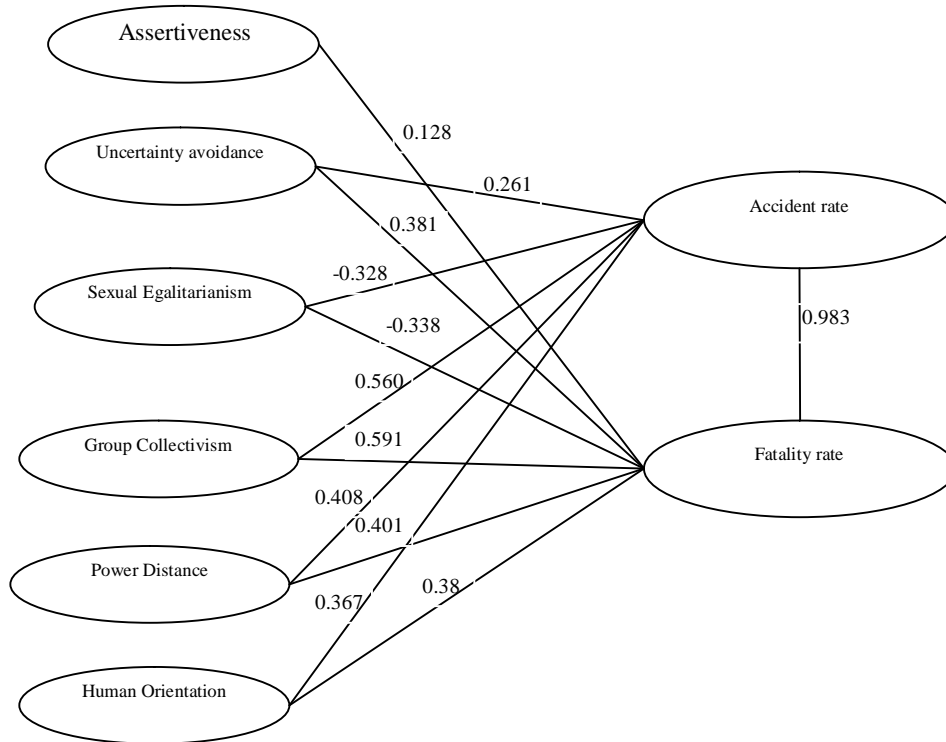


Figure 3. correlation between research variables

It is obvious that accident rate and fatality rate have high correlation. Since fatality rate is a part of accident rate in occupational safety, high correlation between them reveal the reliability of the research. As it shows in table 8 the degree of concordance of result are 88 percent. Result of research shows that group collectivism, power distance and human orientation have positive and significant relationship with accident and fatality rate. So HRM and HSE department of corporation must have a systematic plan to develop normative state of the system by instutualization of these values. For example reducing power distance consequently decrease accident rate, so participative leadership is good strategy for governing the society who suffer the high degree of power distance.

Application of secondary data help scholar to explore relation of effective concept (e.g. cultural dimensions, safety indicator, productivity, profitability). So application of such a method highly recommended to international company and institutes.

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