RELATIONSHIPS BETWEEN FACTORS INFLUENCING ENGINEERS' ADHERENCE TO ETHICAL PRACTICES IN ENGINEERING PROFESSION

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ABSTRACT

The engineering profession is important due to its significant contribution towards the country's development, particularly in the aspects of societal development and well-being. However, issues related to ethics and other forms of misconduct among engineers have been highlighted recently. This paper aims to identify the relationships between factors influencing engineers' adherence to ethical practices in Malaysia. This study was conducted through a research survey involving 376 engineers in various engineering fields, i.e. electrical, mechanical, manufacturing, and civil engineering by using the stratified probability sampling method. Data was analyzed by using descriptive and inferential statistics. The reliability coefficient for each study item, α, was found to be between 0.627 to 0.920. The Pearson correlation analysis showed that there were significant positive relationships between factors influencing engineers' adherence to ethical practices. The relationship between the discipline at the workplace and environmental factors were found to be the most positive and significant (r= 0.606, p= 0.000). The study findings confirmed that there were significant relationships between factors influencing engineers' adherence such as inner self conscience, environment, disciplinary regulations at the work place, religion, and experience which are found to be important in influencing engineers' adherence to ethical practices. It is hoped that this paper can contribute new ideas for academia and policy makers to imbue the appropriate knowledge, religious awareness, and ethical values among engineers in order to uphold the engineering profession.

KEYWORDS: *works ethics, engineering profession*

1.0 INTRODUCTION

Engineering ethics is the study of the moral problems confronted by individuals and organizations involved in engineering profession. Engineering ethics is wider in scope than the ethics of engineers as its involved the profession as a whole. The moral issues surrounding

engineering profession should become an interest for each of us, as we are all affected daily by engineering projects with moral dimensions. Currently, engineering ethics have been in the spotlight perhaps unfortunately as a resulf of some negative effects of technology. Engineering ethics is a discipline that examines the moral import of creative activity. It explore the moral dimensions of technology from the inside.

Engineering is an important and learned profession. The members of the profession recognize that their work has a direct and vital impact on the quality of life of the society. Accordingly, the services provided by engineers require values such as honesty, impartially, fairness and equity, and must be dedicated to the protection of public health, safety and welfare. In practicing their profession, engineers must be guided by a standard of professional behavior which require adherence to the highest principles of ethical conduct on behalf of the public, clients, employers and the profession itself.

2.0 LITERATURE REVIEW

Based on previous studies, there were several factors that could influence engineers' adherence. In this study, the researchers limit the factors to inner conscience, discipline and regulations at the work place, environment, religion, and experience within the engineering's field. The factors which were found to influence an individual's ethical adherence include a high moral value within the individual, family's influences, friends' influences, life experiences, and environmental factors (Riham, 2008). Demographic variables, such as gender, age, and length working period play an important role in the model of engineers' adherence to ethical practices. Many researchers who studied about adherence suggested that demographic variables also have a significant impact on adherence (Jackson & Milliron, 1986; Clotfelter, 1983 & Feinstein, 1991). Baron (1994) stated that working environment plays an important role in shaping an individual's social behavior. There are some theories that could affect an individual's behavior. This includes cognitive theory emphasizing on individual matters and the level of self-development (Aroson, 1999, Kohlberg, 1994 as cited in Kamil Md Idris, 2009).

Apart from that, the religious factor was also found to contribute to adherence. As explained by Thomas F. O'Dea, (1996), religion is an important institution that complements the human's social system. In particular, environmental sustainability has contributed to the rise of a new framework of engineering analysis that is now becomes an essential part of the work of engineers (Abbas El-Zein (2007). The experience factor was also found to influence adherence as explained by Redzuan (2004) who noted that experience can shape an individual's behavior in making actions and decisions.

3.0 METHODOLOGY

The respondent in this study is the population of the total number of engineers in Malaysia, which consists of mechanical, civil, chemical and manufacturing engineering fields. Questionnaires were distributed to 532 engineers, but only a total of 376 questionnaires were returned from 376 respondents. Respondents were required to evaluate their agreement to statements about work ethics using a five-point Likert scale (Majid 2000). The scales were given as 1 "strongly disagree", 2 "disagree", 3 "not sure", 4 "agree", and 5 "strongly agree." Meanwhile, the scales used for measuring correlation were given as 0.000-0.2000 "negligible", 0.201-0.400 "low", 0.401-0.600, "moderate", 0.601-0.800 "high", and 0.801-

1.000 “very high”. The Pearson correlation analysis was used to obtain these correlation results.

3.1 RESEARCH HIPOTHESES

In general, the hypotheses of this study are:

3.1 There is a significant relationships between inner self factors with adherences

3.2. There is a significant relationship between discipline and regulations at the work place factors with adherences

3.3 There is a significant relationship between environment factors with adherences

3.4. There is a significant relationship between religious factors with adherences

3.5 There is a significant relationship between experience factors with adherences

4.0 FINDINGS

4.1 Profile of Respondents

Table 5.1: Profile of the respondents

Gender	**Frequency**	**Percentage (%)**
Male	241	64.1
Female	135	35.9
Age		
20-30	178	47.3
3-40	111	29.5
41-50	44	11.7
51 and above	40	10.6
No response	3	0.8
Ethnic		
Malay	340	90.4
Chinese	23	6.1
Indian	8	2.1
Others	5	1.3
Level of Education		
Bachelor	322	85.6
Masters	40	10.6
PhD	2	0.5
Others	7	1.9
No response	5	1.4
Field of Profession		
Mechanical	89	23.7
Electrical	56	14.9
Civil	167	44.4
Manufacturing	12	3.2
Others	51	13.6
No response	1	0.3
Years of Experience	83	
1-2	67	
2-4	58	

4-6	168	
More than 6 years		
Total	**376**	**100**

Table 5.1 summarizes the demographic profile of the respondents. The respondents were made up of male and female with different ethnicity and religious background. In addition, they were drawn from various professional engineering fields with different years of experiences in their professional works as shown in Table 5.1. The purpose of the diversification in gathering respondents from different fields of engineering background is to cover a wide range of ethical and behavioral intentions and perceptions on the ethical issues raised in each scenario.

4.2 Relationships between Factors Influencing Engineers' Adherence to Ethical Practices

This study also investigated the relationships between factors that could influence engineers' adherence to ethical practices including inner self-conscience, discipline at workplace, environment, religion, and experience in the engineering profession. In this study, the researchers used the Pearson correlation analysis to study the relationships between all six factors as mentioned above. In this Pearson correlation analysis, the significant level of 0.05 was used as a reference to accept or reject null hypotheses. As illustrated in the following table, when the significant level (p-value) was found to be less than 0.05, the study findings indicate a significant relationship between independent variables and dependent variable:

Table 5.2: Correlation between the Factors of Engineers Work Ethics Compliance

		Inner-self	Discipline at work place	Environment	Religion	Experience
Inner-self	Pearson Correlation	1	.486**	.317**	.465**	.441**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	376	376	376	376	375
Discipline at wo place	Pearson Correlation		1	.606**	.373**	.557**
	Sig. (2-tailed)			.000	.000	.000
	N		376	376	376	375
Environment	Pearson Correlation			1	.286**	.500**
	Sig. (2-tailed)				.000	.000
	N			376	376	375
Religion	Pearson Correlation				1	.458**
	Sig. (2-tailed)					.000
	N				376	375
Experience	Pearson Correlation					1
	Sig. (2-tailed)					
	N					375

Based on the results summarized in Table 5.2, there are significant relationships between adherence and factors influencing engineers' adherence. The table illustrates that discipline at workplace factor has a significant relationship with the environment factor with the highest correlation value (r=0.606, p=0.000). Meanwhile, the relationship with the lowest correlation

value is found to be between the environment factor and the religious factor (r=0.286, p=0.000). From the analysis shown in Table 4.2, it was found that there is a significant relationship between adherence and factors that affect engineers' adherence. Based on the study, the researcher details the relationship as follows;

4.2.1 Relationship between Adherences with Inner Self Factors

Table 4 above shows that inner self factors contribute to engineers' compliance. Based on Pearson correlation analysis, inner self factors have relationship with adherence (r=0.493, p=0.000). With p value smaller than 0.05 significance level, the null hypothesis is rejected. Therefore, we can conclude here that there is a link between adherence and inner self factors. In conclusion, higher level of self-consciousness led towards adherence to ethical practices.

Table 5.3 Relationship between Adherences with Self-factors

Correlation Coefficient	P Value
.493	.000

4.2.2 Relationship between Adherence with Discipline and Regulations at the work place Factors

Table 5.4 Relationship between Adherence with Discipline and Regulations at the work place Factors

Correlation Coefficient	P Value
.557	.000

In addition, there is also a significant relationship between adherence with discipline and regulations in the work place (r=0.557, p=0.000). With p values smaller than 0.05 significant level, the null hypothesis is rejected. Therefore, we can conclude that there is relationship between adherence with discipline and regulations in the workplace.

4.2.3 Relationship between Adherence with Environment

Table 5.5 Relationship between Adherence with Environment

Correlation Coefficient	P Value
.537	.000

There is also a significant correlation between adherence with environment (r=0.537, p=0.000). With p values smaller than 0.05 significance level, the null hypothesis is rejected. We can conclude that there is a relationship between adherence with discipline and the environment.

4.2.4 Relationship between Adherences with Religious Factors

Table 5.6 Relationship between Adherence with Religious Factors

Correlation Coefficient	P Value
.515	.000

It was also found that there is significant relationship between adherence and religion (r=0.557, p=0.000). With p values less than 0.515 significance level, the null hypothesis is rejected. Therefore, we can conclude that there is a link between adherence and religion.

5.2.5 Relationship between Adherences with Experience Factor

Table 5.7 Relationship between Adherence with Experience Factor

Correlation Coefficient	P Value
.568	.000

There is also a significant correlation between compliance and experience factor (r=0.568, p=0.000). With p values smaller than 0.05 significance level, the null hypothesis is rejected. Therefore, we can conclude that there is a link between compliance and experience factor

Based on Pearson correlation analysis, the results in the table above (table 5.2), shows that factors influencing adherence such as inner self, discipline at work place, environment, religion, and experience are found to be significantly related. The study findings also indicate that there are significant relationships between all variables (inner self, discipline at work place, environment, religion, and experience) with the significant level of less than 0.05 as summarized in the following table:

Table 5.8 Summary of Correlation between the Factors of Engineers Work Ethics Compliance

Construct / Factors	Inner-Self	Discipline at work	Environment	Religion	Experience
Inner self		exist	exist	exist	exist
Discipline at work			exist	exist	exist
Environment				exist	exist

Religion		exist
Experience		

Table 5.8 indicates that significant relationships exist between variables that contribute to the study findings. As discussed above, this study also answers the research question in which there are relationships between all variables. Results obtained in this study confirmed that there were significant positive relationships between all variables that could influence engineers' adherence to ethical practices.

5.0 DISCUSSION AND IMPLICATIONS

Pearson correlation analysis results shown that there is relationship between adherence with factors such as inner self, discipline and regulatory in the workplace, environmental, religion and experience. The study result showed that there are significant and positive relationship between independent variables, namely adherence to factors that affect engineer's adherence to the ethical practices.

The results of this study indicate that inner self factors also contributed to compliance. These finding is supported by Rozman (2000), which explains that inner self factors consisting of self-identity, self-worth and self-belief contribute to individual behavior. Discipline and regulatory aspects at the workplace is very important in shaping engineer's adherence. There are regulations in Malaysia that have been enacted to regulate the engineering profession. Among those regulations are Guidelines for Code of Professional Conduct Circular No. 3/2005 (BEM), Registration of Engineers Act 1967 (revised- 2007), and the Registration of Engineers Regulations 1990 (revised 2003) issued by the Board of Engineers Malaysia. Code of ethics for the profession cover the aspects of public interest, in terms accountability, honesty and fairness (Guidelines for Code of Professional Conduct Circular No. 3/2005 (BEM).

Religion molds engineers' behavior. Engineers must fully adopt the theory of intertwine between the spirit, body and mind in producing high-value employees with high accountability in carrying their duty. Job is categorized as a religious duty, to attain *falah* (success) and prevent damages (Mohd Sahar Sidek, 1996). The results of this study showed that environmental factors have role in influencing individuals' adherence. Researchers found that these factors contribute to compliance as described by Rozman (2000), that mentioned about how environmental factors play their roles in molding behavior. Environment will produce changes in the attitudes and actions of individuals. According to Ma'rof Redzuan (2001), environmental factors influence behavior and this has been demonstrated in studies by Cunningham (1979), Steblay (1987), Amato (1983) and Sears, (1988).

The study's result showed that experience is a contributing factor to individual's compliances to ethical practices. This study was supported by Ma'rof (2004), which explains that learning through experience will form individual's personality. In the context of engineers, experiences through learning between colleagues help to form personality and behavior.

Based on the findings, the policy implication of this study includes: authority such as the governing institutions of engineers need to ensure that ethical practices become the main core

of their profession. This is done by increasing knowledge and awareness about ethical practices within the engineering profession.

6.0 CONCLUSION

Results obtained in this study shows that there are significant relationships between all the variables that contribute towards engineers' adherence to ethical practices. The researchers hope that the study will provide a more accurate and detailed overview of the scenario to all stakeholders, especially to the responsible organization that oversee the engineering profession. As a start, they can evaluate the programs implemented at the workplace and how they are helpful in increasing engineers' ethical awareness. The engineering profession is not only concerned with the quality of the task that they can deliver, but it should also emphasize on ethics and practices in the process of accomplishing the given task. As conclusion, the result of the study shows positive relationship between factors such as inner self conscience, discipline and regulations at the work place, environment, religion, and experience within the engineering's fields in influencing engineers' adherence to ethical practices.

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