



UNIVERSITI
TEKNOLOGI
PETRONAS

FINAL EXAMINATION MAY 2024 SEMESTER

COURSE : TAM5053 – RESEARCH METHOD IN IT
DATE : 10 AUGUST 2024 (SATURDAY)
TIME : 2:30 PM – 6:30 PM (4 HOURS)

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in the Answer Booklet.
2. Begin **EACH** answer on a new page in the Answer Booklet.
3. Indicate clearly answers that are cancelled, if any.
4. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.
5. **DO NOT** open this Question Booklet until instructed.

Note :

- i. There are **TWELVE(12)** printed pages in this **double-sided** Question Booklet including the cover page and appendices .

Answer **ALL** the following questions based on the article "S. Khatun and N. Salleh, "An Empirical Study on the Role of Work Ethics and Emotional Intelligence on Software Engineers' Work Performance and Job Satisfaction," 2022 IEEE 8th International Conference on Computing, Engineering and Design (ICCED), Sukabumi, Indonesia, 2022, pp. 1-6, doi: 10.1109/ICCED56140.2022.10010615" as appended.

- 1 a. Explain whether the study has been reported based on research.
[5 marks]
- b. Identify the problem statement addressed by Khatun and Salleh in their study.
[5 marks]
- c. Outline the research objectives in the study.
[5 marks]
- d. Analyze the clarity and significance of the problem statement and research objectives.
[5 marks]

- 2 a. Analyze why was this research design chosen to investigate the role of work ethics and emotional intelligence on software engineers' work performance and job satisfaction.

[7 marks]

- b. Analyze what sampling method was used to ensure a representative sample of software engineers.

[7 marks]

- c. Examine how were data collection methods implemented to gather reliable and valid data on work ethics, emotional intelligence, work performance, and job satisfaction.

[6 marks]

- 3 a. Examine how were the variables used to measure work ethics operationalized in the study.
[6 marks]
- b. Analyze how was emotional intelligence measured in the study.
[2 marks]
- c. Examine what tools or scales were used to ensure the reliability and validity of these measurements in **part 3(b)**.
[6 marks]
- d. Examine what control variables were selected and measured in the study to account for potential confounding factors.
[6 marks]

- 4 a. Discuss the key findings of the study regarding the impact of work ethics on software engineers' work performance and job satisfaction.
[6 marks]
- b. Evaluate how the study interprets the relationship between emotional intelligence and job performance among software engineers.
[8 marks]
- c. Evaluate how the study interprets the relationship between emotional intelligence and job performance among software engineers.
[6 marks]

- 5 a. Discuss how the limitations of the study as acknowledged by the authors might affect the generalizability of the study's findings.

[6 marks]

- b. Discuss in what ways could future research expand on the findings of this study to further explore the relationship between work ethics, emotional intelligence, and job performance in software engineers.

[8 marks]

- c. Discuss how can future studies address the potential biases or external factors not accounted for in this research that could influence software engineers' work performance and job satisfaction.

[6 marks]

-END OF PAPER-

An Empirical Study on the Role of Work Ethics and Emotional Intelligence on Software Engineers' Work Performance and Job Satisfaction

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Abstract— Advancement in Information and Communication Technology have led to society utilizing software in every sector including healthcare, and transport. As software engineers impact society significantly, they have a duty to behave ethically in their work. Otherwise, it could cause great harm, such as the Facebook-Cambridge Analytica scandal. Although calls for reform are made after such incidents, sufficient action is not being taken in research, education and industries. Hence, this study aims to investigate the relationship between the work ethics of software engineers and their emotional intelligence (EQ), work performance and job satisfaction. Using the survey method, we collected data from 170 software engineers. Significant findings of the study are: there is a strong significant positive correlation between work ethics and work performance; a moderate positive correlation between work ethics and job satisfaction, however, EQ does not significantly moderate the relationship between work ethics and job satisfaction.

Keywords—software engineers, work ethics, work performance, job satisfaction.

I. INTRODUCTION

In every profession, there are work ethics that are required to be followed in order for the work to be carried out in an ethical manner [1]. Not following these work ethics would cause chaos, disruption and harm. This has happened several times in the past in the profession of software engineers. The Volkswagen emissions scandal, and the Facebook-Cambridge Analytica scandal are examples of this.

In 2018, Cambridge Analytica, a data analytics company based in the UK, utilized the personal data of millions of Facebook users' profiles, without their permission, to influence several political campaigns. The public were outraged. There was a huge fall in Facebook's stock price, and calls were made for tighter regulations on the usage of data by software companies [2].

Within any profession, ethical behaviour means that the staff fulfils their work responsibly with integrity and

honesty, that their work is beneficial and not harmful, and that they "adhere to policies and rules while working to meet the aims" of the organization (Belyh, 2016, pg. 1) [1]. Ferrario et al. (2017) [3] said that "anything digital is inevitably affected by values: the organizational values of the project sponsor, the values of the research partners, and the values of each developer and designer" (p. 1).

According to Rogerson et al. (2017), ethics in the Information Technology (IT) industry is often neglected until scandals such as those mentioned earlier occur. After they occur, the public restarts the discussion on the ethics of IT companies [4]. They demand that tighter regulations be laid on them. However, even with these demands, not enough is done.

With the recurring unethical incidents happening in the IT/SE world, there is a necessity to investigate the ethics of software engineers themselves and the relationships it has with other interpersonal characteristics [5]. Investigating the relationships between the ethics of software engineers and their interpersonal characteristics would contribute in understanding the undercurrents encircling the ethics of software engineers and what action should be taken to improve the situation. Therefore, we are motivated to investigate the relationship between the ethics of software engineers and their interpersonal characteristics.

Specifically, we will investigate the relationships between work ethics of software engineers and their work performance, and job satisfaction. Also, the moderation effect of emotional intelligence (EQ) between work ethics of software engineers and their job satisfaction will be investigated.

II. RELATED WORK

Gogora and Debnár (2018) studied on the ethical concerns of different members in a software team (stakeholders, project manager, software engineers, programmers) who play important roles in developing the design of systems aimed to be used as affective companion technologies (ACT) [6]. They are interested in analysing the ethical

issues relevant to “working processes, moral professional dilemmas, way of thinking about ethical issues related to the development of such technologies, way of decision-making of morally ambiguous work assignments, as well as way of communicating on these ethical/moral issues in the work team and to the public” (p. 1). They concluded that made-to-measure ethical analysis of the particular software team developing the ACT would be more effective in understanding the ethical consequences of these technologies for users and the society.

Kumar and Kremer-Herman (2019) discussed about incorporating ethics and societal impact in computing education. They mentioned that changes need to occur at the education level for more effective consciousness of ethics in ICT. Their study indicated that it was not hard to include ethics and societal impact in the courses. Using methods such as role playing, case studies, ethics scenario development and service learning, they found that it helped students to consider how the technology would affect society, and felt more ownership of their ethical responsibility [7].

Rezvani and Khosravi (2019) investigated the impact of software engineers’ EQ on their stress, trust, and performance. They highlighted that the demanding environments and difficulties in completing software projects increase the levels of stress among software engineers. Their study aims to explore whether EQ can reduce stress and instead increase trust among software engineers, which can improve their performance. Their findings showed that EQ reduces the negative influence of stress and increases trust in other team members which then improves team performance [8].

According to the review of past literature, EQ of software engineers has not been investigated before in relation to their work ethics, work performance and job satisfaction. Therefore, the relationships among these variables will be investigated in this study. The findings are expected to give valuable information for improving the ethical behaviour of software engineers.

III. RESEARCH METHOD

This research aims to achieve the following research objectives:

- 1) To empirically investigate the relationship between work ethics of software engineers and their work performance (RO#1).
- 2) To empirically investigate the relationship between work ethics of software engineers and their job satisfaction (RO#2).
- 3) To empirically investigate how emotional intelligence moderates the relationship between work ethics of software engineers and their job satisfaction (RO#3).

Corresponding to each of the research objectives, the research hypotheses of this study are as follows:

- 1) The work ethics of software engineers correlates positively with their work performance (H1).
- 2) The work ethics of software engineers correlates positively with their job satisfaction (H2).
- 3) The EQ of software engineers significantly moderates the relationship between their work ethics and their job satisfaction (H3).

To fulfill research objectives 1 and 2, the correlational research methodology was employed in this research [9]. As can be seen in Figure 1, work ethics is the independent variable (IV), while work performance and job satisfaction are dependent variables (DVs). The IV will be correlated with each DV using Pearson product-moment correlation (r) in SPSS.

To fulfill research objective 3, hierarchical multiple regression analysis will be used [10]. Emotional intelligence (EQ) is a moderating variable (MV) between work ethics (IV), and job satisfaction (DV). The moderation effect of the MV will be checked between the IV and DV using hierarchical multiple regression analysis in SPSS. Note that the effects of software engineers’ EQ on the relationship between their work ethics and work performance have been reported in our previous study [11].

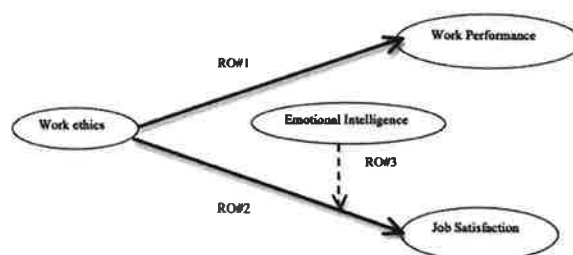


Fig. 1: Research design

A. Survey Instruments and Sample Population

Survey questionnaires were used to gather the data for the four variables of this research. The Islamic Work Ethics (IWE) instrument in [12] was used to measure work ethics. It has 23 questions that measure four dimensions: Effort, Honesty, Teamwork and Accountability. Emotional intelligence (EQ) was measured using the Wong and Law Emotional Intelligence Scale (WLEIS) [13]. It has 16 questions that measure four dimensions: Self-emotions Appraisal, Regulation of Emotions, Use of Emotion, Others-emotion Appraisal.

In order to measure work performance, the Individual Work Performance instrument was used [14]. It contains 18 questions that measure three dimensions: Task Performance, Contextual Performance and Counterproductive Work Behavior. Job satisfaction was measured using the Minnesota Satisfaction Questionnaire [15]. Each instrument utilized Likert-scale items: Work Ethics (10-point Likert-scale); EQ (7-point Likert-scale);

Work Performance (5-point Likert-scale); and Job Satisfaction (5-point Likert-scale).

The population of this research is software engineers working in IT companies. The random sampling method was used in this research. The sample was randomly taken from 500 software engineers working in IT companies via LinkedIn. Each of them was sent a questionnaire containing the four instruments described earlier. A total of 170 software engineers responded to the questionnaire (sample size, $n=170$).

IV. RESULTS

A total of 170 software engineers responded to the questionnaire. The demographics of the sample are as follows: **gender:** 110 (64.7%) of them were male, 60 (35.3%) of them were female.

A. Results from the Data Analysis (RO#1 and RO#2)

The relationship between work ethics and work performance was investigated using Pearson product-moment correlation (r). All the assumptions necessary for conducting Pearson product-moment correlation (r) for RO#1 and RO#2 were met.

The results in Table 1 show that there is a significant positive correlation between work ethics and work performance, $r(168)=.52$, $n=170$, $p<.001$, at the 0.01 level (Cohen, 1988, pp. 79-81). According to Cohen (1988), as the correlation coefficient $r(168) = .52$ (it is above .50), high levels of work ethics are associated with high levels of work performance for this sample. Therefore, based on the sample data obtained in this study, it can be inferred that a software engineer's work ethics has a large relation with their work performance.

TABLE I. CORRELATION OF WORK ETHICS WITH WORK PERFORMANCE

		Work ethics	Work performance
Work ethics	Pearson Correlation	1	.516**
	Sig. (2-tailed)		.000
	N	170	170
Work performance	Pearson Correlation	.516**	1
	Sig. (2-tailed)	.000	
	N	170	170

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

The relationship between work ethics and job satisfaction was investigated using Pearson product-moment correlation (r). The results in Table 2 show that there is a moderate, significant positive correlation between the two variables, $r(168)=.33$, $n=170$, $p<.001$, at the 0.01 level (Cohen, 1988, pp. 79-81) [16]. According

to Cohen (1988), as the correlation coefficient $r(168)=.33$ (it is between .30 and .49), medium levels of work ethics are associated with medium levels of job satisfaction. Therefore, based on the sample data obtained in this study, it can be inferred that a software engineer's work ethics has a moderate relation with their job satisfaction.

TABLE II. CORRELATIONS OF WORK ETHICS AND JOB SATISFACTION

		Work ethics	Job satisfaction
Work ethics	Pearson Correlation	1	.334**
	Sig. (2-tailed)		.000
	N	170	170
Job satisfaction	Pearson Correlation	.334**	1
	Sig. (2-tailed)	.000	
	N	170	170

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

B. Moderation Effects of EQ between Work Ethics and Job Satisfaction (RO#3)

To investigate the moderation effect of EQ between work ethics and job satisfaction, hierarchical multiple regression analysis was used. The IVs were mean centered first to avoid multicollinearity problems and then the centered interaction term ($c_tworkethicsXeq$) was calculated. There are two models in the analysis (see Table 3). The first model contains the IVs, $c_totalworkethics$ and $c_totaleq$, on their own separately. In the second model, we have added the interaction of the IVs, $c_tworkethicsXeq$. Comparing the results of the first model with the results of the second model will reveal whether EQ moderates the relationship between work ethics and job satisfaction or not.

TABLE III. VARIABLES INCLUDED IN MODEL 1 AND MODEL 2

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	$c_totaleq$, $c_totalworkethics$ ^b		Enter
2	$c_tworkethicsXteq$ ^b		Enter

a. Dependent Variable: total_jobsatisfaction

b. All requested variables entered.

A hierarchical multiple regression analysis was run to determine if the addition of the interaction term obtained from a submaximal test improved the prediction of job satisfaction over and above work ethics and EQ alone. As can be seen from the values of R^2 , in Table 4, that Model 2 with the interaction term accounted for more variance in the dependent variable, job satisfaction, than just work ethics and EQ by themselves. R^2 increased from 0.121 to 0.134, R^2 change = 0.014. However, this increase is not statistically significant as $p = 0.107$ which is greater than

0.05 ($p > 0.05$). Therefore, the addition of the interaction term to the prediction of job satisfaction (Model 2) led to an increase in R^2 of 0.014, $F(1, 166) = 2.632$. However, this increase is not statistically significant as $p = 0.107$

($p > 0.05$). Therefore, the results show that EQ does not moderate the relationship between work ethics and job satisfaction.

TABLE IV. MODEL SUMMARY FOR EQ BETWEEN WORK ETHICS AND JOB SATISFACTION

Model Summary ^c										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.347 ^a	.121	.110	9.02232	.121	11.452	2	167	.000	
2	.367 ^b	.134	.119	8.97857	.014	2.632	1	166	.107	2.091

a. Predictors: (Constant), c_totaleq, c_totalworkethics

b. Predictors: (Constant), c_totaleq, c_totalworkethics, c_workethicsXteq

c. Dependent Variable: total_jobsatisfaction

V. DISCUSSION

A. Relationships between Work Ethics and Work Performance (RO#1)

H1 states that the work ethics of software engineers correlates positively with their work performance. The results showed that there is a strong, significant, positive correlation between work ethics and work performance: $r(168) = 0.52$, $n = 170$, $p < 0.001$, at the 0.01 level (Cohen, 1988, pp. 79-81) [16]. Therefore, H1 is supported and the null hypothesis can be rejected. The sample showed that high levels of work ethics are associated with high levels of work performance. Therefore, it can be inferred that a software engineer's work ethics has a large positive correlation with their work performance.

The findings are very important as they show the necessity of having good work ethics in software engineers for them to perform well in their work. In the introduction, it was mentioned that the work ethics in an organization means that the staff complete their work responsibly with integrity and honesty, that their work is beneficial and not harmful, and that they "adhere to policies and rules while working to meet the aims" of the organization [1]. Employees who perform well in an organization would positively affect the organization's success and progress [17]. However, if employees behave unethically, their performance and the organization's performance will be negatively impacted [4]. In the introduction, we explained how unethical incidents keep occurring in the IT/SE industry, and repeated calls for reform are made by the public and yet, not enough action is taken in education, industries and research.

In this research, empirical evidence was found that work ethics of software engineers has a strong positive correlation with their work performance, which positively affects the performance of their organizations. Therefore, ethics should be given more importance in education and industries. Action should be taken to teach, to train and to implement ethics in ICT/SE education and IT/SE

industries. This will help improve the ethical behavior of software engineers in the future, which will improve their work performance and eventually, this will positively affect the organizations they work in.

B. Relationships between Work Ethics and Job Satisfaction (RO#2)

H2 states that the work ethics of software engineers correlates positively with their job satisfaction. The results showed that there is a moderate, significant, positive correlation between the two variables, $r(168) = 0.33$, $n = 170$, $p < 0.001$, at the 0.01 level (Cohen, 1988, pp. 79-81). Therefore, H2 is supported and the null hypothesis can be rejected. The sample showed that medium levels of work ethics are associated with medium levels of job satisfaction. It can therefore be inferred that a software engineer's work ethics has a moderate positive correlation with their job satisfaction.

There are several factors that could affect an employee's job satisfaction. The possible cause for work ethics having a moderate correlation with software engineers' job satisfaction and not a large correlation may be because there are other factors that play a much bigger role in job satisfaction. Optimal working conditions, opportunity for advancements, balanced workload and stress level, and financial rewards are some of them [18]. It can be observed that these factors do not have a direct connection with an employee's level of work ethics. A software engineer may still be satisfied with their job even if their level of work ethics is low because the other factors are positively present.

According to Robbins & Judge (2013), employees who are satisfied with their jobs are more likely to have better work performance, have higher organizational citizenship behavior, bring higher customer satisfaction, have less absenteeism, have lower turnover rates, and less unethical behavior [19]. Therefore, work ethics is still important for a software engineer's job satisfaction; it still contributes to job satisfaction, even if it is less than the other factors.

Since work ethics has a moderate positive correlation with software engineers' job satisfaction, and job satisfaction is important for less unethical behavior, reducing turnover, and increasing work performance, more action should be taken to teach, train and implement work ethics in ICT/SE education and in IT/SE organizations.

C. Moderating effect of EQ between Work Ethics and Job Satisfaction (RO#3)

H3 states that the EQ of software engineers significantly moderates the relationship between their work ethics and their job satisfaction. The results show that the interaction term of work ethics and EQ accounted for more variance in the dependent variable, job satisfaction, than just work ethics and EQ by themselves. R^2 increased from 0.121 to 0.134, R^2 change = 0.014. However, this increase is not statistically significant as $p = 0.107$ ($p > 0.05$). Therefore, the results show that, based on our sample data, EQ does not moderate the relationship between work ethics and job satisfaction of software engineers and H3 cannot be supported. In other words, the EQ of a software engineer is not strongly or directly required for them to feel satisfied with their jobs in relation to their work ethics.

As described earlier under H2, there are several factors that affect an employee's job satisfaction. Optimal working conditions, opportunity for advancements, balanced workload and stress level, and financial rewards are some of them [18]. The possible cause for EQ not moderating the relationship between work ethics and job satisfaction of software engineers may be because EQ is not strongly/directly required with work ethics for a software engineer to feel satisfied with their job with regards to these factors. A software engineer may still be satisfied with their job even if their level of EQ is low because the other factors are positively present.

There are studies done by previous researchers that have studied the relationship between EQ and job satisfaction. Lee et al. (2017) investigated the relationship between EQ and job satisfaction among IT professionals [20]. Their main motivation is to understand better the turnover of IT professionals. In their study, they found that personal accomplishment mediates the relationship between EQ and job satisfaction. EQ is related to job satisfaction through its indirect relationship with personal accomplishment. With these findings, they suggest that measures of EQ should be used during the staff recruitment process to see who are more likely to experience personal accomplishment. This will then lead to increasing job satisfaction and reducing turnover in IT professionals.

Another study by Uslu and Uslu (2019) investigated the effect of EQ on employees' job satisfaction and intention to leave [21]. In their results, they found that there is a moderate positive relationship between EQ and job satisfaction, and a negative relationship with intention to leave. An employee will be able to handle the various situations at work better if they have good EQ, and this

will then positively affect their job satisfaction, and they will be less inclined to leave their job. They suggested that organizations should provide EQ training for their employees based on these results, and that tests should be included when recruiting new staff. This will lead to employees who are happier with their jobs and reduce employees leaving, and in the long run, this will contribute to improving the performance of organizations.

Based on the two studies above, EQ has either an indirect relationship with job satisfaction, or a moderate positive relationship with job satisfaction. EQ does not have a strong/direct relationship with job satisfaction. It can be said that the findings of these studies are consistent with what was found in this study: the EQ of a software engineer is not strongly or directly required for them to feel satisfied with their jobs. Therefore, based on the findings of this study, EQ is not important for a software engineer's job satisfaction in relation to their work ethics.

VI. CONCLUSIONS

The motivation behind conducting this study is the fact that numerous unethical incidents have occurred in the IT/SE industry and keep occurring. Although calls for reform are made again and again, based on the researchers' review of past literature, not enough action is being taken in education, in industries and in research. Therefore, in this study, we investigated the relationships between software engineers' work ethics and work performance, between software engineers' work ethics and job satisfaction, and the effect of EQ between software engineers' work ethics and job satisfaction. This will help in understanding the undercurrents that encircle software engineers' work ethics and what can be done to improve the situation.

Our results show that the sample data from this study support the research hypothesis H1, H2, while H3 could not be supported. In summary, the results show that there is a strong significant positive correlation between work ethics and work performance; there is a moderate significant positive correlation between work ethics and job satisfaction; EQ does not significantly moderate the relationship between work ethics and job satisfaction.

The findings of this study have important implications for education, IT/SE industries and research. As this study provides empirical evidence of the importance and need of work ethics, it can be used to urge administrators in education and IT/SE industries to take more action to teach and train work ethics.

The results from this study suggested that teaching and training work ethics and EQ will improve the ethics of software engineers, their work performance, and their job satisfaction (based on H2). In the long run, this is expected to lead to reducing unethical behaviour in software engineers and the occurrence of harmful/unethical incidents, which will eventually help to improve the talent/ability capital of IT/SE organizations, improving their positive and beneficial output to the wellbeing and economy of organizations and societies.

For future work, we suggest that further research should be done on the work ethics of software engineers and its relationships with other unexplored variables. For example, future studies could investigate whether other variables such as team climate, team behaviour etc. moderate the relationships between work ethics, and work performance and job satisfaction. This is due to the nature of work of software engineers that commonly involve team work and communication among team members. Additionally, other types of research such as longitudinal studies that investigate work ethics and its relationships with other variables over a period of time, or qualitative studies that utilize interviews, focus groups, case studies, observation etc. as methods of data collection are also recommended. This will all help in increasing our understanding of this crucial area and thus, help in reducing the widespread unethical behavior in the IT/SE world.

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