

**THE INFLUENCE OF PROFESSIONAL ETHICS, EMOTIONAL INTELLIGENCE AND PROFESSIONALISM ON THE DECISION MAKING OF GIVING AUDITOR OPINION**  
(Case Study at KAP Registered in the Ministry of Finance and Located in Tangerang City)

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**Abstract**

*In the current business landscape, the credibility of financial reporting relies heavily on the integrity of auditors and their decision-making processes. This study aims to examine and analyze about the effect of professional ethics, emotional intelligence and professionalism on the decision making of giving auditor opinion. The type of research used in this study is multiple linear regression analysis. The research was conducted using primary data obtained through distributing questionnaires to independent auditors who work at Public Accounting Firms registered with the Ministry of Finance and having an address in Tangerang City. The sampling method in this study used convenience sampling with the sample result obtained in this study as many as 4 Public Accounting Firms. Data analyze using descriptive statistics, classical assumption test and hypothesis testing. Based on the testing result was found professional ethics, emotional intelligence and professionalism simultaneously influence the decision making of giving auditor opinion. Calculation of R<sup>2</sup> yields 75,4%, it means there are 24,6% who explain by other variables outside this study. Based on the partial test result, it was found independent variable (professional ethics, emotional intelligence and professionalism) had an effect on the dependent variable, the decision making of giving auditor opinion.*

**Keywords:** Auditor Opinion, Decision Making, Emotional Intelligence, Professional Ethics, Professionalism

## 1. INTRODUCTION

In June 2019, the annual financial report of PT. Garuda Indonesia for the year 2018 was declared flawed by the Ministry of Finance (Kemenkeu) due to the discovery of the fact that PT. Garuda Indonesia recognized revenue related to its collaboration with PT. Mahata Aero Teknologi for payments to be received after the signing of the agreement. The financial report of PT. Garuda Indonesia for the fiscal year 2018, published on the Indonesia Stock Exchange (BEI), showed a net profit of US\$809 thousand, a significant increase compared to the financial report for the year 2017, which incurred a loss of US\$216.58 million. In 2018, the previously mentioned revenue should have been recognized as accounts receivable, not as revenue. It should not have generated profits and should have remained in a position similar to the previous year. The Ministry of Finance summoned and conducted an examination of Public Accountant Kanser Sirumapea and the management auditor of KAP. Subsequently, the Ministry of Finance found violations of the Professional Standards of Public Accountants (SPAP), Karen et al. (2022).

Based on the case that occurred in the financial report of PT. Garuda Indonesia, the public accountant violated the obligation to adhere to the ethical code of the

auditing profession. The violated ethical principles of the auditing profession include integrity, objectivity, professional behavior, and competence. An auditor should consider and understand the importance of professional ethics. An auditor with high professional ethics will be more compliant in adhering to professional ethics and codes of conduct while working, resulting in better decision-making, as stated by (Nurhafika & Tiara, 2022).

In the auditor's work environment, they collaborate and interact with other auditors in performing assigned tasks and addressing issues that arise during their tasks. Therefore, an auditor must possess not only intellectual and spiritual intelligence but also high emotional intelligence. (Nadila et al., 2022) revealed that emotional intelligence is an auditor's ability to manage their own emotions, respond to existing issues, solve problems, and maintain self-control.

With good emotional intelligence, an auditor is expected to regulate their emotions effectively, show empathy when dealing with emotional turmoil within themselves and others, exhibit flexibility in changing situations and conditions, and manage pressures and disturbances that could affect their independence. As a result, the conducted audits remain impartial. Emotional intelligence significantly influences the decision-making process of giving opinions. Under pressure from internal or external sources, auditors might lose focus, leading to less accurate decisions, as discussed by (MARYAM, n.d.).

Sastrodiharjo & Suraji (2021) stated that the implementation of professional ethics significantly affects decision-making, while emotional intelligence has a positive and significant impact on decision-making. The higher an individual's emotional intelligence, the better the auditor's decision-making will be. This finding aligns with the research of (Sari, 2019), which shows that the simultaneous implementation of professional ethics and emotional intelligence has a positive and significant impact on decision-making, with a determination coefficient of 89.9%. The remaining 10.1% is influenced by other variables such as professionalism, spiritual intelligence, and intellectual intelligence.

Herawati et al. (2020) stated that professionalism entails being responsible for behavior beyond fulfilling assigned responsibilities. The required professionalism from auditors includes having education and practical experience as auditors. To enhance professionalism, auditors must first understand themselves, the tasks they will undertake, and continuously improve and control themselves in their interactions with audit service users. For auditors, it is essential to assure clients and financial statement users of the quality of audits and other services. Professionalism is a fundamental requirement for auditors in making decisions. With high professionalism, the auditor's independence is better ensured, as discussed by (MARYAM, n.d.).

Research conducted by (Herawati et al., 2020) concluded that professionalism has a positive impact on auditor decision-making because auditors believe that greater professionalism leads to better decision-making. However, the research by (Suci, 2019) yielded different results. The study by (Suci, 2019) stated that there is no influence of professionalism on decision-making for auditors of the Indonesian Supreme Audit Board (BPK RI) Regional Representative Office for South Sumatra.

Based on the above presentation, professional ethics, emotional intelligence, and professionalism are crucial for auditors in performing their duties as independent and

trusted entities by many parties. This has motivated the author to address this issue in the form of research.

## **2. LITERATURE REVIEW**

### **2.1. Theory of Attitude and Behavior**

Attitude is a form of someone's feelings that reflect their reactions to an object, person, or event. Meanwhile, behavior is the manifestation of an individual's characteristics in adapting to their environment. The theory of attitude and behavior is important for an auditor because it can influence the auditor to act honestly, fairly, and firmly without being influenced by pressure or requests from specific parties or personal interests, as stated by (Fitrio et al., 2019).

### **2.2. Attribution Theory**

Attribution theory, according to (Michael & Dixon, 2019), is about how to assess a person's nature differently. Attribution theory generally suggests that when someone observes an individual's behavior, they try to determine whether that behavior is caused by internal factors, originating from within the individual, or external factors, originating from outside, such as work difficulties. Attribution theory is used to explain auditor judgment, performance assessment, and decision-making by auditors.

### **2.3. Audit**

According to (Mulyadi, 2016), an audit is a systematic process to obtain and objectively evaluate evidence about statements regarding economic activities and events. The primary objective is to assess the degree of coherence between the presented statements and the predetermined standards, and subsequently convey the outcomes to stakeholders who hold an interest. Audits serve the purpose of confirming the adherence of a company to a meticulously documented record-keeping system. These audit undertakings play a pivotal role in bolstering a company's viability both in the current and forthcoming periods, while also serving as a vigilant mechanism to unearth and preclude potential instances of fraudulent activities that may arise.

## **3. RESEARCH METHOD**

The type of research conducted in this thesis is quantitative research. According to (Sugiyono, 2016), quantitative research is a method based on concrete data, used to study a specific population or sample that is measured using statistics or other methods as calculation tools to draw conclusions. While this research was conducted at Public Accountant Offices registered with the Ministry of Finance and located in Tangerang City. The research was carried out in the year 2023.

The population of this study, as explained by (Sugiyono, 2016), refers to a generalized area consisting of objects or subjects with specific qualities and characteristics determined by the researcher to draw conclusions. The population in this research consists of independent auditors working at Public Accountant Offices in Tangerang City. The sample, as a subset of the population, comprises 4 (four) active Public Accountant Offices registered with the Ministry of Finance and located in

Tangerang City. Sampling was done using convenience sampling technique, where the sample is selected based on whoever coincidentally interacts with the researcher and is suitable as a data source.

The data collection technique in this research involved distributing questionnaires containing a list of questions or statements to respondents, which were then collected and processed. The data used in this research is primary data, obtained or collected directly by the researcher. This primary data consists of responses from independent auditors working at Public Accountant Offices located in Tangerang City.

### **3. RESULTS AND DISCUSSION**

#### **3.1. Description of Respondents**

**Table 1. Characteristics of Respondents by Age**

<b>Age</b>	<b>Total (People)</b>	<b>Percentage (%)</b>
< 25 Years	19	55,9 %
26 - 35 Years	9	26,5 %
36 - 55 Years	5	14,7 %
>55 Years	1	2,9 %
<b>Total</b>	<b>34</b>	<b>100 %</b>

Based on the table above, it can be seen that most of the respondents in this study were less than 25 years old as many as 19 people or 55.8%, aged 26 to 35 years as many as 9 people or 26.5%, aged 36 to 55 years as many as 5 people or 14.7% and aged more than 55 years as many as 1 person or 2.9%.

**Table 2. Characteristics of Respondents Based on Gender**

<b>Gender</b>	<b>Total (People)</b>	<b>Percentage (%)</b>
Male	14	41,2 %
Female	20	58,8 %
<b>Total</b>	<b>34</b>	<b>100 %</b>

Based on the data above, it can be seen that the majority of respondents in this study were women as many as 20 people or 58.8% and men as many as 14 people or 41.2%.

**Table 3. Characteristics of Respondents Based on Education Level**

<b>Education Level</b>	<b>Total (People)</b>	<b>Percentage (%)</b>
Master	2	5,9%
Bachelor	28	82,4%
Diploma	4	11,8%
<b>Total</b>	<b>34</b>	<b>100%</b>

Based on the table above, it can be seen that the majority of respondents in this study had a bachelor's degree as many as 28 people (82.4%), 2 people (5.9%) had a master's degree and the remaining 4 people (11.8%) had a DIII education.

**Table 4. Characteristics of Respondents Based on Position**

Position	Total (People)	Percentage (%)
Junior Auditor	14	41,2 %
Senior Auditor	17	50 %
Audit Manager	3	8,8 %
Total	34	100 %

Based on the table above, it can be seen that the majority of respondents in this study served as senior auditors as many as 17 people (50%), junior auditor positions as many as 14 people (41.2%) and the remaining 3 people (8.8%) had positions as audit managers.

**Table 5. Characteristics of Respondents Based on Tenure**

Tenure	Total (People)	Percentage (%)
< 1 Year	5	14,7 %
1 - 3 Years	27	79,4 %
3 - 6 Years	0	0 %
Unknown	2	5,9 %
Total	34	100 %

Based on table 5 above, it can be seen that the majority of respondents based on their tenure in this study as many as 27 people or 79.4% have worked in the period of one to three years, as many as 5 people or 14.7% have worked for less than 1 year, and respondents whose tenure is unknown are 2 people or 5.9%.

## 3.2. Analysis Result

### 3.2.1. Descriptive Statistics

**Table 6. Descriptive Statistical Test Results**

Variable	Min Value	Max Value	Average	Std. Deviation
Professional Ethics	24	60	48,47	9,570
Emotional Intelligence	18	35	28,59	6,051
Professionalism	43	75	60,97	11,199
Opinion Decision Making	14	35	27,74	5,712

Based on the table above, it can be seen that the object under study (N) is 34 data with a description of each variable as follows:

- Descriptive analysis for the Professional Ethics variable, which has a minimum of 24 with a maximum value of 60, while the average value is 48.47 and the standard deviation is 9.570.
- The descriptive statistical results of the Emotional Intelligence variable have a minimum of 18 with a maximum value of 35, while the average value is 28.59 and the standard deviation value is 6.051. Furthermore, for the

Professionalism variable, the descriptive statistical results are the minimum value of 43 with a maximum of 75, while the average value is 60.97 and the standard deviation is 11.199.

- c. The descriptive statistical results for the Auditor Opinion Decision Making variable are the minimum value of 14 while the maximum value is 35, the average value is 27.74 and the standard deviation is 5.712.

### 3.1.1. Data Quality Test

#### A. Validity Test

**Tabel 7. Result of Validity Test**

a) Professional Ethics (X1)			
Statement	Correlated Item – Total Correlation	Value of r Table	Description
X1.1	0,881	0,338	Valid
X1.2	0,905	0,338	Valid
X1.3	0,836	0,338	Valid
X1.4	0,907	0,338	Valid
X1.5	0,835	0,338	Valid
X1.6	0,784	0,338	Valid
X1.7	0,926	0,338	Valid
X1.8	0,880	0,338	Valid
X1.9	0,824	0,338	Valid
X1.10	0,776	0,338	Valid
X1.11	0,548	0,338	Valid
X1.12	0,796	0,338	Valid

b) Emotional Intelligence (X2)			
Statement	Correlated Item – Total Correlation	Value of r Table	Description
X2.1	0,823	0,338	Valid
X2.2	0,887	0,338	Valid
X2.3	0,907	0,338	Valid
X2.4	0,662	0,338	Valid
X2.5	0,804	0,338	Valid
X2.6	0,918	0,338	Valid
X2.7	0,820	0,338	Valid

c) Professionalism (X3)			
Statement	Correlated Item – Total Correlation	Value of r Table	Description
X3.1	0,783	0,338	Valid
X3.2	0,832	0,338	Valid
X3.3	0,937	0,338	Valid
X3.4	0,904	0,338	Valid
X3.5	0,914	0,338	Valid

X3.6	0,862	0,338	Valid
X3.7	0,843	0,338	Valid
X3.8	0,825	0,338	Valid
X3.9	0,862	0,338	Valid
X3.10	0,928	0,338	Valid
X3.11	0,959	0,338	Valid
X3.12	0,870	0,338	Valid
X3.13	0,585	0,338	Valid
X3.14	0,444	0,338	Valid
X3.15	0,529	0,338	Valid

d) Opinion Decision Making (Y)

Statement	Correlated Item – Total Correlation	Value of r Table	Description
Y.1	0,847	0,338	Valid
Y.2	0,914	0,338	Valid
Y.3	0,933	0,338	Valid
Y.4	0,927	0,338	Valid
Y.5	0,941	0,338	Valid
Y.6	0,897	0,338	Valid
Y.7	0,883	0,338	Valid

Based on the table above, it can be seen that the correlated item - total correlation value of each statement or statement on the independent or independent variable and the dependent or dependent variable in this study is greater than the critical value of 0.388, so that the indicators of each question or statement can be declared valid.

B. Reliability Test

**Table 8. Reliability Test Results**

Variable	Alpha Cronbach	Value of r Table	Description
Professional Ethics	0,965	0,60	Reliable
Emotional Intelligence	0,950	0,60	Reliable
Professionalism	0,967	0,60	Reliable
Opinion Decision Making	0,974	0,60	Reliable

Based on the table above, it shows that each of the independent variables (professional ethics, emotional intelligence and professionalism) and the dependent variable, decision making on giving auditor opinion, has a Cronbach Alpha value greater than 0.60. Then all variables in this study are declared Reliable or consistent.

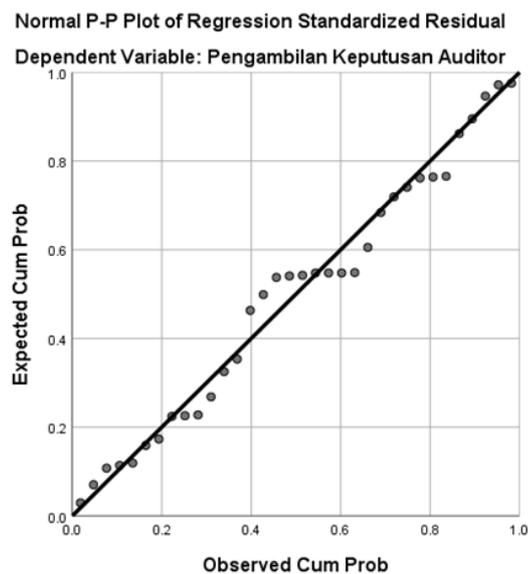
### 3.1.2. Classical Assumption Test

#### A. Normality Test

**Table 9. One Sample K-S Normality Test Result**

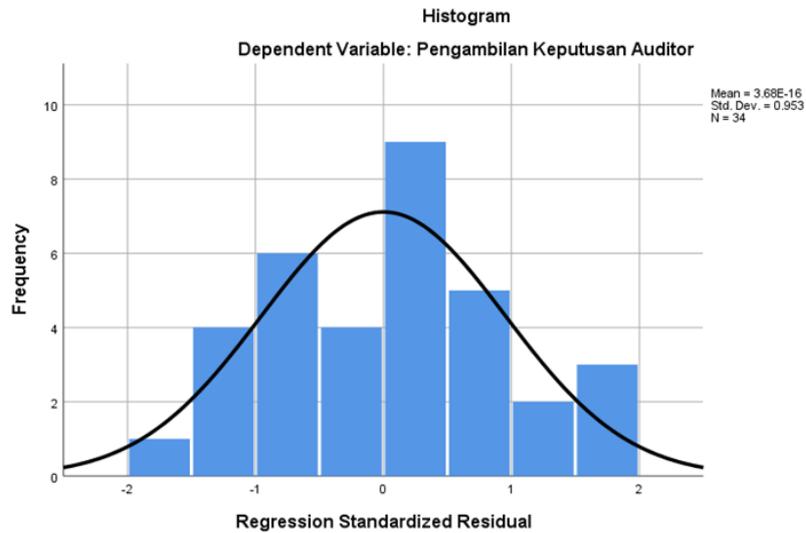
		Unstandardized Residual
N		34
Normal Parameters <sup>a,b</sup>	Mean	.0000000
	Std. Deviation	2.69946494
Most Extreme Differences	Absolute	.098
	Positive	.096
	Negative	-.098
Test Statistic		.098
Asymp. Sig. (2-tailed)		.200 <sup>c,d</sup>

Based on the results of calculations using SPSS 26, it is known that the Kolmogorov-Smirnov value of the dependent or independent variable has a significant value of 0.200 greater than 0.05. In accordance with the basis for decision making, it can be concluded that the variable data is normally distributed.



**Figure 1. P-P Plot Normality Test**

Based on the figure above, it shows that the plotting points always follow and approach the diagonal line, it can be concluded that the residual value of the regression model is normally distributed.



**Figure 2. Histogram Normality Test**

Based on the figure above, it can be concluded that the data used is normally distributed because it has bell-shaped characteristics, polygons tend not to deviate to the left or to the right.

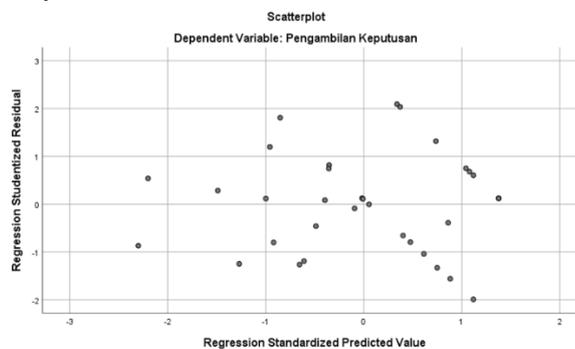
**B. Data Multicollinearity Test**

**Table 10. Multicollinearity Test**

Variable	Tolerance Value	VIF Value	Description
Professional Ethics	0,519	1,927	No multicollinearity
Emotional Intelligence	0,596	2.018	No multicollinearity
Professionalism	0,688	1.454	No multicollinearity

Based on the table above, the results of calculations with the SPSS 26 program show that each independent variable (professional ethics, emotional intelligence and professionalism) has a tolerance value greater than 0.10 and a VIF value of less than 10, so it can be stated that there is no multicollinearity.

**C. Heteroscedasticity Test**



**Figure 3. Scatterplot of Heteroscedasticity Test Result**

The results of the heteroscedasticity test show that none of the independent variables are significantly related to the absolute value of the residuals. This means that the regression model does not have symptoms of heteroscedasticity.

**Table 11. Heteroscedasticity Test Result**

<b>Variable</b>	<b>Significance Value</b>	<b>Critical Value</b>	<b>Description</b>
Professional Ethics	Professional Ethics	Professional Ethics	Professional Ethics
Emotional Intelligence	Emotional Intelligence	Emotional Intelligence	Emotional Intelligence
Professionalism	Professionalism	Professionalism	Professionalism

Based on the table above, the results of the SPSS output show that each independent variable (professional ethics, emotional intelligence and professionalism) has a sig value greater than 0.05, so it can be stated that there are no symptoms of heteroscedasticity.

### 3.1.3. Multiple Linear Regression Test

**Table 12. Multiple Linear Regression Models**

<b>Variable</b>	<b>Regression Coefficient Value</b>	<b>Std. Error</b>
Constant	Constant	Constant
Professional Ethics	Professional Ethics	Professional Ethics
Emotional Intelligence	Emotional Intelligence	Emotional Intelligence
Professionalism	Professionalism	Professionalism

From the table above, a multiple linear regression model is obtained as follows:

$$Y = -2.339 + 0.186 X1 + 0.382 X2 + 0.166 X3 + 3.066$$

Based on the multiple linear regression model above, it can be explained that:

- a. The constant value of -2.339 is negative, meaning that the minus sign is read only in the correlation coefficient section which shows an opposite relationship.
- b. The magnitude of the professional ethics regression coefficient (X1) is 0.186 which is positive, this indicates that with an increase in variable X1, it will increase variable Y by 0.186.
- c. The magnitude of the regression coefficient of emotional intelligence (X2) is 0.382, which is positive, this indicates that by increasing the X2 variable, it will increase the Y variable by 0.382.
- d. Based on the regression coefficient of professionalism (X3) is 0.166, which is positive, this indicates that by increasing the X3 variable, it will increase the Y variable by 0.166.

### 3.1.4. Hypothesis Test

#### A. Test Coefficient of Determination ( $R^2$ )

**Table 13. Test Coefficient of Determination Result ( $R^2$ )**

Variable	Value $R^2$	Percentage of $R^2$
Professional Ethics, Emotional Intelligence and Professionalism	0,754	75,4%

The output result of SPSS Adjusted R square is 0.754. The magnitude of the coefficient of determination ( $R^2$ ) is 0.754 or equal to 75.4%. This figure means that the variables of professional ethics (X1), emotional intelligence (X2) and professionalism (X3) simultaneously or together affect the auditor's decision making variable (Y) by 75.4%. While the remaining 24.6% is influenced or explained by other variables outside this study.

#### B. Simultaneous F Test

**Table 14. Simultaneous F Test Result**

Variable	F statistic	F table	Significant Value
Professional Ethics, Emotional Intelligence and Professionalism	34,771	2,922	0,000

Based on the table above, it can be seen that the significance value of 0.000 is smaller than 0.05 and the F-statistic value of 34.771 is greater than the F table 2.922, it can be concluded that professional ethics (X1), emotional intelligence (X2) and professionalism (X3) simultaneously affect auditor decision making (Y) or the hypothesis (H1) is accepted.

#### C. Partial Test (T Test)

**Table 15. Partial T Test Result**

Variable	t-statistic	t-table	Significant Value
Professional Ethics	2,607	2,042	0,014
Emotional Intelligence	3,303	2,042	0,002
Professionalism	3,125	2,042	0,004

Based on the table above, it can be seen that:

- The results of the analysis in table 4.13 obtained the t value of professional ethics of  $2.607 >$  from t table 2.042 with a positive direction and a significant probability value of the variable of 0.014 smaller than 0.05, so the hypothesis stating that professional ethics affects the decision making of giving auditor opinion is accepted.
- The results of the analysis in table 4.13 obtained the t value of emotional intelligence of  $3.303 >$  from t table 2.042 with a positive direction and a significant probability value of the variable of 0.002 smaller than 0.05, so the hypothesis stating that emotional intelligence affects the decision making of giving auditor opinion is accepted.

- c. The results of the analysis in table 4.13 obtained the t value of professionalism of  $3.125 >$  from t table 2.042 with a positive direction and a significant probability value of the variable of 0.004 smaller than 0.05, so the hypothesis stating that professionalism affects the decision making of giving auditor opinion is accepted.

#### **4. CONCLUSION**

Overall, this research reveals that crucial factors involving professional ethics, emotional intelligence, and professionalism play a significant role in auditor's decision-making process regarding opinion issuance. The simultaneous test results affirm that collectively, these three factors substantially influence an auditor's decision-making process concerning opinions on financial statements. This finding illustrates that the alignment of moral integrity, emotional maturity, and a high level of professionalism positively impacts more accurate and reliable decision-making within the context of auditing.

Through partial tests, we can also verify that each variable, namely professional ethics, emotional intelligence, and professionalism, individually exerts a significant influence on auditor's decision-making regarding opinion issuance. This demonstrates that the enhancement and reinforcement of these aspects within an auditor has the potential to elevate the quality and accuracy of the opinions provided. As a result, this research provides a valuable contribution to the understanding of key factors in audit decision-making, which in turn can impact the overall quality of audits and emphasizes the importance of incorporating ethical, emotional, and professional aspects throughout every stage of the auditing process.

#### **REFERENCES**

- Fitrio, T., Apriansyah, R., Utami, S., & Yaspita, H. (2019). The effect of job satisfaction to organizational citizenship behavior (OCB) mediated by organizational commitment. *International Journal of Scientific Research and Management*, 7(09), 1300–1310.
- Herawati, N., Agussalim, M., & Darmi, T. (2020). Pengaruh Kecerdasan Emosional, Independensi, Dan Profesionalisme Terhadap Pengambilan Keputusan Auditor Pada Kantor Akuntan Publik Padang. *JOPPAS: Journal of Public Policy and Administration Silampari*, 2(1), 18–31.
- Maryam, A. (N.D.). *Pengaruh Pelaksanaan Etika Profesi Dan Kecerdasan Emosional Terhadap Pengambilan Keputusan Bagi Auditor Inspektorat*.
- Michael, A., & Dixon, R. (2019). Audit data analytics of unregulated voluntary disclosures and auditing expectations gap. *International Journal of Disclosure and Governance*, 16, 188–205.
- Mulyadi, R. (2016). Pengaruh Corporate Governance terhadap kinerja keuangan. *JAK (Jurnal Akuntansi) Kajian Ilmiah Akuntansi*, 3(1).
- Nadila, A., Fithria, F., & Hidayati, H. (2022). Kecerdasan Emosional Pelajar Di MTsN 2 Banda Aceh. *Jurnal Ilmiah Mahasiswa Fakultas Keperawatan*, 6(1).
- Nurhafika, N., & Tiara, S. (2022). Pengaruh Etika Profesi, Pengalaman dan Opini Publik Terhadap Pengambilan Keputusan bagi Auditor di BPK RI Perwakilan

- 
- Provinsi Sumatera Utara. *All Fields of Science Journal Liaison Academia and Society*, 2(2), 63–77.
- Sari, N. (2019). *Pengaruh Pelaksanaan Etika Profesi dan Kecerdasan Emosional Terhadap Pengambilan Keputusan Bagi Auditor (studi Empiris Pada Kantor BPKP Perwakilan Provinsi Riau)*. Universitas Islam Riau.
- Sastrodiharjo, I., & Suraji, R. (2021). Pengaruh Pelaksanaan Etika Profesi Dan Kecerdasan Emosional Terhadap Pengambilan Keputusan Auditor. *Jurnal Ilmiah Akuntansi Dan Manajemen*, 17(2), 153–164.
- Suci, S. S. (2019). *Pengaruh Pelaksanaan Etika Profesi, Independensi, Profesionalisme dan Kecerdasan Emosional Terhadap Pengambilan Keputusan Bagi Auditor (Studi Empiris Pada Kantor Akuntan Publik (KAP) di Surakarta dan Yogyakarta)*. Universitas Muhammadiyah Surakarta.
- Sugiyono. (2016). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, kualitatif dan R&D)*. Alfabeta.

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