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Determinants of the Artificial Intelligence Capabilities of Accountants in Indonesia

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Abstract

This study aims to determine some of the determinations that affect the ability to work with information technology (artificial intelligence) in accountants in Indonesia. The determinations used in this study consist of gender, age (millennials), education level, years of service, and university origin. The number of final respondents that can be observed is 594. The statistical tool used to test the hypothesis is multiple regression. The results of this study found that age and education level had an influence on the AI ability of accountants in Indonesia. Millennial accountants are found to be more adaptable to changes in information technology and have better AI skills than senior accountants. Meanwhile, accountants with postgraduate education have AI capabilities more than accountants with undergraduate education.

Keywords*:* Capability, Artificial Intelligence, Millennial, Education Level, University Origin, Gender, Length of Work.

1. BACKGROUND

The accounting profession is experiencing a transition period when the use of information technology is increasingly massive. The transition occurs in actors, tasks, and roles in accounting, which will transform towards an artificial intelligence based (Leitner-Hanetseder, Lehner, Eisl, and Forstenlechner, 2021) A recent study explains that continued progress in IT, will have an impact on accountants future, especially in accounting processes that will tend to be cloud-based, as well as communicating with and through Artificial Intelligence (AI) engines (Imene and Imhanzenobe, 2020). Therefore, accountants and accounting offices are advised to embrace new IT skills and tools, and all the trends of information technology development including AI. The question is, how are accountants prepared to work with AI? Whether accountants are those who will provide assurance or not, the ability of accountants toAI is needed to answer the

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challenges of the profession today and in the future.

This study aims to investigate several determinations that affect the ability of accountants in Indonesia. The determinations are gender, age (millennials), education level, length of work, and university origin. The results of statistical tests found that millennial accountants and education level had better AI capabilities than senior accountants. These findings indicate that young accountants are more adaptable to changes in information technology. Likewise, the level of education has succeeded in creating a learning environment for accountants. The implication of this research is to give a signal to regulators in preparing regulations for developing accountant capabilities in Indonesia, especially for senior accountants and accountants with relatively low levels of education.

2. Literature Review and Hypothesis Development

Artificial Intelligence (AI)

AI is a technology in which computers or other types of devices are programmed to beable to do the work of reasoning that is usually done by humans, through reasoning to a particular device. The term AI was coined by John McCarthy in 1956 (McCarthy, Minsky, Rochester, and Shannon, 2006). McCarthy defines AI as the science and technique of making machines or technologies intelligent. AI can also be used as a tool to make decisions based oncertain priorities and overcome complexity and ambiguity (Singh, Mishra, and Sagar, 2013).

One form of the 4.0 industrial revolution in Indonesia is marked by significant technological advances, one of which is the widespread use of AI in business processes of various industries. This has changed the pattern of life activities in industry, including eliminating many activities that are usually done manually by humans. AI not only minimizes errors that may be made by humans in carrying out a field of work but is also an achievement of effectiveness and efficiency in the operations of a company.

Gender and AI Capabilities

In previous studies, researchers and academics have studied how to understand and expose the existence of stereotypes of femininity in artificial intelligence (AI) which will ultimately affect how gender works in AI. The study used the analysis of digital assistants such as Alexa, Cortana, Google Assistant and Siri as AI proxies (Costa & Ribas, 2019). This study also raises a phenomenon related to the way AI is perceived in popular culture, because the depiction of AI in science fiction often corresponds to gender biased views that associate femininity with submissive, caring, or even slave roles and masculinity with aggressive or even threatening scenarios. The results of this study suggest that common stereotypes and gender assumptions about artificial intelligence (AI) ironically reflect social and cultural views that categorize gender behavior patterns, normalizing what is perceived as feminine or masculine behavior, leading to 'prescriptive gender stereotypes' (Costa & Ribas, 2019). To dismantle the politics of gender-based technology and create critical intersections between therepresentation and design of an AI, calling for the need for techno-feminists in genderschemes in high-tech

adopting work (Sutko, 2020).

Ha_1: Gender influences AI capabilities.

Age and AI Capability

In recent years, retailers have prepared various digital touchpoints that their consumers use (Hagberg, Sundstrom, and Egels-Zanden, 2016). This digital technology is mostly prepared using chatbots that are part of a marketing communication strategy (De Cicco, Silva,Alparone, 2020). The findings of another study also show that millennials have a higher level of engagement in online environments where new technologies have complex processes (Cyr, Hassanein, Head, and Ivanov, 2007) and use much more interactive media than the younger generation. X (Moore, 2012). Millennials tend to dominate the use of communication technology prepared by retailers, enjoy the technology system that is prepared, have high confidence, and behave responsively to the technology (De Cicco et al., 2020). In the banking industry, millennial customers are more active in checking balances, paying bills, and transferring money, using digital banking facilities (Haralayya, 2021). In addition, millennialsare also more enthusiastic in educating themselves in mastering high technology to further connect with the digital world (Chopra and Bhilare, 2020).

Ha_2: Millennials have a positive effect on AI capabilities

Education level and AI Capability

When Massive Open Online Courses (MOOCs) are actively used in the learning processin higher education and are increasing, the electronic and distance learning methodologies are appreciated by the community (Chassignola, Khoroshavin, Klimova, Bilyatdinova. 2018). Therefore, the higher a person's education, the stronger the interaction of the individual with information technology so that it will be easier to learn machine language. There are two types of computer tutors that are currently commonly used, namely Computer-Based Instruction (CBI) and Intelligent Tutoring System (ITS) (VanLehn, 2011). In CBI, students only need to write answers and then get feedback from the lecturer. However, ITS allows students to expand their ideas and enter the information for each step of the process as if they were working on a problem on paper. The system will provide feedback based on all student answers. ITS has the ability to dialogue with students at every step and will provide learning for students to interact with machine language (Ma, Adesope, Nesbit, and Liu, 2014). On the other hand, there are groups who seek and educate themselves to master high technology (Chopra and Bhilare, 2020) and have high confidence, and are responsive to technological changes (De Cicco et al., 2020). So that the higher a person's education level, the higher their capability in working with high technology.

Ha_3: Education level has a positive effect on AI capabilities.

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Length of work and AI Capability

If during the education period someone can seek and educate themselves to master high technology (Chopra and Bhilare, 2020) then in work someone will do the same thing. The longer you stay in a certain environment, the learning process of the technology used in that environment will also be adapted and eventually become an expert. The existence of high confidence, as well as being responsive to technological changes (De Cicco et al., 2020) will further strengthen one's capabilities in technology. The more practice on the subject that is done and the higher the frequency of the work, the more capable the person will be in his work. (Dierdorff and Surface, 2008).

Likewise, AI capabilities are undoubtedly very much needed by the industry at this time. Especially accountants, AI capabilities will greatly affect the speed and accuracy of the company's financial data and will ultimately affect the company's overall performance. The ability to apply AI requires a long procedure. The need for time to train, calibrate, and refine, considering new data sources and adapting the models used to develop them is the reason that tenure will greatly affect one's AI capabilities (Mikalef and Gupta, 2021). In addition, work experience greatly affects the ability to process information (Jilke, 2021). Previous research has shown that AI capabilities result in increased creativity and organizational performance (Mikalef and Gupta, 2021).

Ha_4: Length of work has a positive effect on AI capabilities.

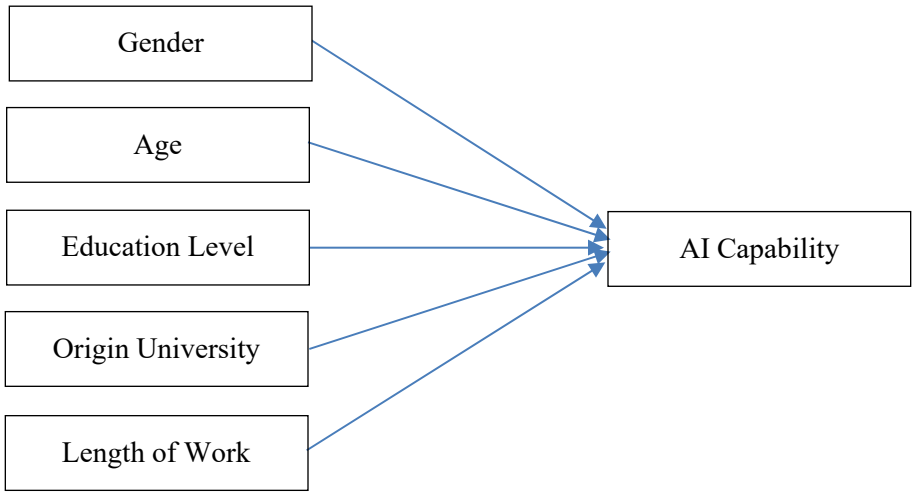
University Origin and AI Capabilities

Research that aims to identify trends and topics related to AI applications in education generally uses bibliometric-based analysis. The results of previous research revealed that the academic community had a high interest in the use of AI for educational purposes (Chen, Zou,Xie, Cheng, & Liu, 2021) and to determine and direct educational paths, selecting students according to plans (Gray & Kucirkova, 2021). This condition will encourage competition for graduates from universities who adopt AI technology in their learning. Empirical evidence shows that the use of an infinite neural network has a higher recognition impact than using an ordinary neural network or neural network, with an accurate rate of more than 95% for recognizing intranet data (Liu, 2022). The development of innovations carried out by universities to increase student enthusiasm for ideological and political education learning by using large-scale data collection, followed by analysis related to existing issues, using machine learning technology has been proven to improve the quality of learning data-based wireless network on campus.

Currently, big data technology has penetrated various fields of economy, society, and culture and has had a major impact in various industrial fields. Currently, there has been a major change in the curriculum that adopts various AI technologies in various learningapplications, such as robots, mobile devices, and digital games to facilitate the teaching and learning process (Chen, Zou, Xie, Cheng, & Liu, 2021), virtual artificial intelligence Reality technology which is the basis for meeting the needs of art learning in contemporary vocational high schools (Cao,

2022), as well as physical education curriculum with big data technology have been milestones to improve the quality of physical education (Zhang & Wang, 2022). Furthermore, this study assumes that the rating carried out by the Higher Education at higher education institutions in Indonesia adequately reflects the strength of corporate governance, including the quality of learning and its outcomes. Due to the effective use of the filling method considered in the budget of scientific and educational organizations included in the marketing component, it has succeeded in forming a positive image of the organization (Bykova, et al., 2022). The findings of these studies show that millennials are looking for strong mentors in both their education and work environment in terms of technology and want a roadmap to help them grow and adapt to technological change (Chopraand Bhilare, 2020).

Ha$_5$: University origin has a positive effect on AI capabilities.



Picture 1. Research Model

3. RESEARCH METHODS

This research uses a questionnaire survey method. The target respondents of this research are accountants who work in all institutions. The questionnaire uses a google form (electronic questionnaire) to obtain a higher response rate. The questionnaire uses the instrument used inprevious studies, adopting measurement indicators from the research of Zhang et al. (2020).

No.	Variable	Technology	AI Application
1.	**Artificial Intelligence(AI) Capability** (Zhang et.al. 2020)	*1. Natural language Processing* *2. Machine Deep Learning* *3. Artificial General Intelligence*	*1) Nuance security suite* *2) Cortana* *3) Alexa* *4) AlphaSense* *5) TensorFlow* *6) Kensho* *7) Microsoft Cognitive Services* *8) Skymind* *9) IBM Watson* *10) Accenture myWizard* *11) Clarify*
No.	**Variables**	**Dimension**	**Indicators**
2	Gender	– Female – Male	Male = 2 Female = 1
3	Age	– s/d 40 = millennial – > 40 = othersBPS, 2020	s/d 40 = millennial = 2 > 40 = others = 1
4	Educational Level	– S1 – S2 – S3	S1 = 1 S2 = 2 S3 = 3
5	Origin University	*Rating* by directorate general of higher education - Ministry of education, 2021	Top 10 = 2 Non-top 10 = 1
6	Length of Work	Long working experience in accounting and finance	Length of work experience (inyears).

The dependent variable used in this study is the accountant's capability regarding AI (Y), while the independent variables are Gender, Age, Educational Level, Origin University, Length of Work. This assessment uses 7 (seven) Likert scales to measure AI capabilities. The middle value was omitted to provide confidence in each respondent's understanding of AI. Multiple regression was used to process the data collected from the e-questionnaire. The econometric model used is like the following equation.

$$Y = \alpha + \beta_1 Gender + \beta_2 Age + \beta_3 EduLevel + \beta_4 OriUniv + \beta_5 L\_Work + e_i$$

Where:

Y	=	AI Capability
α	=	Constant
β_1; β_2; β_3; β_4; β_5	=	Regression Coefficient
Gender	=	Male (2); Female (1)
Age	=	Millennial Age (2); others (1)
EduLevel	=	Level Educational
OriUniv	=	Origin University
L_Work	=	Length of Work
e_i	=	error term

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4. ANALYSIS AND DISCUSSION

Descriptive statistics

Descriptive statistics show the mean and standard deviation, of the total respondents who can be observed, which is 594. The average AI capability is 26.76, and a standard deviation is 10.24648. The average score for their gender, age, education level, university origin, and length of service (as accountant) was 1.57; 1.57; 1.50; 1.19; and 6.931 with a standard deviation respectively are 0.50; 0.50; 0.59; 0.40; and 7.10. Description of the respondent's characteristics data according to gender identity, age, education level, university origin, and their length of work according to the research sample that has been determined in the questionitems in the questionnaire. Table 2, table 3, table 4, and table 5 show the personality of the respondents based on each variable.

Table 1 Descriptive statistics

	Gender	Age	Education Level	Origin University	Length of Work	AI Capability
Min	1,00	1,00	1,00	1,00	0	11,00
Max	2,00	2,00	3,00	2,00	52,00	44,36
Average	1,57	1,57	1,50	1,19	6,93	26,76
SD	0,50	0,50	0,59	0,40	7,10	10,25

Source: Survey, 2022.

Table 2 Respondent by Gender

Source: Survey, 2022.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	258	43,4	43,4	43,4
	Male	336	56,6	56,6	100,0
	Total	594	100,0	100,0	

Table 3 Respondent by Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Non Millenial	256	43,1	43,1	43,1
	Millineal	338	56,9	56,9	100,0
	Total	594	100,0	100,0	

Source: Survey, 2022.

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Table 4 Respondent by Education Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	S1	326	54,9	54,9	54,9
	S2	240	40,4	40,4	95,3
	S3	28	4,7	4,7	100,0
	Total	594	100,0	100,0	

Source: Survey, 2022.

Table 5 Respondent by University Origin

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Non-Top 10/ Non-Overseas University	479	80,6	80,6	80,6
	Indonesia Top 10 Univ./ Overseas University	115	19,4	19,4	100,0
	Total	594	100,0	100,0	

Source: Survey, 2022.

Validity and Reliability Test

A set of data is declared valid if the calculated r coefficient is greater than the r table coefficient (significance value of 0.05). This can be seen in the table below, where r table is 0.080 which is calculated from the sample test distributed to 594 respondents. The results of the validity test show that of the 12 AI capability indicators used, the value of r-test > r-table on all indicators is obtained. This result means that all indicators used are valid to be measurements of AI capabilities. Meanwhile, reliability tests were conducted to assess the quality of the data used in this study. The results of the reliability test obtained a Cronbach's Alpha value of 0.994 which indicated that the research data collected using the instruments used in this study were reliable.

Classic assumption test

Classical assumption tests are also applied to this study. The classical assumption elements tested are multicollinearity, autocorrelation, and heteroscedasticity tests. Multicollinearity test is a test carried out to ascertain whether in a regression model there is intercorrelation or collinearity between independent variables. Multicollinearity can be seen from the value of tolerance and variance inflation factor (VIF). If the tolerance value is greater than 0.100 and the VIF is less than 10.00, it can be concluded that there is no

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multicollinearity symptom. The results of the multicollinearity test on gender, age, level, education, university origin, and length of work have a tolerance value greater than 0.100 and a VIF value less than 10.00 so it can be concluded that the independent variable does not show symptoms of multicollinearity.

Autocorrelation test is a test that is used with the aim of knowing whether in the linear regression model there is a correlation between the confounding error (residual) in period t with errors in period t-1 (previous). If there is a correlation, it is called an autocorrelation problem, because a good regression model is a regression model that is free from autocorrelation. The criteria for determining the absence of autocorrelation with the Durbin Watson test is if the value lies between due to (4-du), meaning that the data is free from autocorrelation. The value of du in the Durbin Watson table value distribution is based onk(5) N(594) with a significance of 0.05. The value of dw = 1.932 is greater than the value of du = 1.8760 and less than 2.124 or du (1.8760) < dw (1.932) < 4-du (2.124). Thus, it can be concluded that the regression model is free from autocorrelation problems. The last classical assumption test that is applied is the heteroscedasticity test, which is a test carried out with theaim of testing whether in the linear regression model there is an inequality of variance from the residuals from one observation to another. In this study, heteroscedasticity testing uses the glejser method where if the significance value between the absolute residual and the independent variable is greater than 0.05, then there is no heteroscedasticity problem. The results of the glejser test showed that all the significant values of the independent variables were greater than 0.05. So, it can be concluded that there is no heteroscedasticity problem.

Hypothesis test

Using the analysis of the coefficient of determination, this study examines the suitabilityof the research model. The purpose of this analysis is to find out how much influence is given by gender, age, education level, university origin, and length of work on the AI capabilities of accountants in Indonesia. The calculation results shown in table 6 show that the coefficient of determination R is 20.5%. This value means that this research model can predict AI capabilities by 20.5% and the rest is determined by other variables outside of this study. This model shows its fit, with a significance value of 0.000 (see table 7), so it can be continued to the stage of testing the hypothesis of this research.

Table 6 Coefficient of Determination Test

ANOVA[a]						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2620,415	5	524,083	5,167	0,000[b]
	Residual	59638,910	589	101,427		
	Total	62259,324	594			

a. Dependent Variable: AI Capability
b. Predictors: (Constant): gender, age, education level, university origin, and length of work.

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Table 7 Model Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,205[a]	0,042	0,034	10,07108

a. Predictors (Constant): Predictors: (Constant): gender, age, education level, universityorigin, and length of work.

Source: Survey, 2022.

To test the hypothesis, this study used linear regression analysis. This test is intended to measure whether or not there is an influence between gender, age, education level, university origin, and length of work, on the artificial intelligence capability as the dependent variable. Table 8 shows the results of hypothesis testing using multiple regression.

Table 8
Multiple Linear Regression Analysis

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	22,983	2,716		8,463	0,000
	Gender	-0,189	0,844	-0,009	-0,224	0,823
	Age	3,310	0,902	0,160	3,670	0,000
	Education level	1,695	0,727	0,097	2,331	0,020
	University origin	-3,376	1,076	-0,130	-3,137	0,002
	Length of work	0,054	0,063	0,038	0,861	0,389

a. Dependent Variable: AI Capability

Source: Survey, 2022.

The value of the regression coefficient on gender is -0.189. indicates a change in the opposite from prediction. It means that female accountants have better capabilities than male accountants assuming the other independent variables in the study are constant. However,with a significance value of 0.823 (>0.05) it shows that there is no effect of gender on the capability of accountants in mastering AI.

The age regression coefficient value of 3.310 indicates that young accountants in the millennial have better AI skills than senior accountants. This prediction is corroborated by a significance value of 0.000. For the level of education, the value of the regression coefficient and the significance of the results of the regression test are 1.695 and 0.020, respectively. Thisvalue indicates that the higher the level of education of accountants, the better their AI capabilities.

The origin of the university has a constant value of -3.376 with a significance of 0.002. This value indicates that accountants from the top ten universities have relatively better AI capabilities than accountants from the top ten. This result is quite interesting and

needs to be reviewed, why is it that accountants from non-top ten universities have better AI capabilities. The regression coefficient value for working as an accountant is 0.054 with a significant value of 0.389. This value indicates that the length of work as an accountant has a learning impact on the technology used in the accountant's work.

5. Conclusions, Limitations and Suggestions

This research produces very interesting findings related to the determination of AI capabilities in accountants in Indonesia. The test results on the answers of 594 respondents show that millennial accountants have better AI capabilities than senior accountants. The levelof education is also an important determinant that affects the AI capabilities of accountants in Indonesia. These two variables, millennial age and education level provide a logical explanation for accountants' ability to work with AI. Meanwhile, gender, university origin,and length of work as an accountant have not been able to provide reasons to strengthen predictions on AI capabilities.

The limitation of this study lies in the instruments used to measure the AI capabilities ofaccountants. This research is indeed beginner research that examines the AI capabilities of accountants in Indonesia. Further research will explore other measures that might be better to use in measuring AI capabilities. In addition, it is interesting to conduct further research on why accountants from ten non-top universities have better AI skills. Is it possible that the length of work as an accountant becomes a moderating variable, not an independent variable? Future research is expected to find more interesting findings.

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