ARTIFICIAL INTELLIGENCE (AI) DEVELOPMENT AND THE READINESS OF ACCOUNTING STUDENTS IN INDONESIA

Undergraduate Thesis

By

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FACULTY OF ECONOMICS AND BUSINESS

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ABSTRACT

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The development of artificial intelligence (AI) in accounting as the impact of industrial revolution 4.0 has raised various concerns regarding the future of accountants and the possibility that accountants will be replaced by AI. As lots of business are continuously adopting AI, both globally and particularly in Indonesia, this adoption of AI raises concerns that the role of accountants will be replaced with AI due to the lack of competence of accountants to work with AI. Therefore, this research will be focused on how is the AI-based curriculum provided by university is having a relation to the competency of prospective accountants and the readiness of accounting students to adapt and work with AI so that their roles are not completely replaced by AI, especially for Indonesian accounting students as prospective accountants. The end of this research will underline that the development of AI therefore should not be a concern for the future of accountants and accounting students in Indonesia, however the accounting students still need to enhance their competencies and the accounting educators therefore also need to improve their curricula to prepare the accounting students to work with AI.

Keywords: artificial intelligence, industry 4.0, accounting students, accountant competency.

ABSTRAK

ARTIFICIAL INTELLIGENCE (AI) DEVELOPMENT AND THE READINESS OF ACCOUNTING STUDENTS IN INDONESIA

Oleh

GINA ANDANI

Perkembangan kecerdasan buatan (AI) di bidang akuntansi sebagai dampak dari revolusi industri 4.0 telah menimbulkan berbagai kekhawatiran mengenai masa depan akuntan dan kemungkinan bahwa akuntan akan tergantikan oleh AI. Dengan banyaknya bisnis yang terus mengadopsi AI, baik secara global maupun khususnya di Indonesia, pengadopsian AI ini menimbulkan kekhawatiran bahwa peran akuntan akan digantikan oleh AI karena kurangnya kompetensi akuntan untuk dapat bekerja dengan AI. Oleh karena itu, penelitian ini akan difokuskan pada bagaimana kurikulum berbasis AI yang diberikan oleh universitas memilki hubungan dengan kompetensi calon akuntan dan kesiapan mahasiswa akuntansi untuk beradaptasi dan bekerja dengan AI sehingga peran mereka tidak sepenuhnya tergantikan oleh AI, khususnya bagi para mahasiswa akuntansi Indonesia sebagai calon akuntan. Akhir dari penelitian ini akan menggarisbawahi bahwa perkembangan AI lebih lanjutnya seharusnya tidak menjadi kekhawatiran bagi masa depan akuntan dan mahasiswa akuntansi di Indonesia, namun mahasiswa akuntansi masih perlu meningkatkan kompetensinya dan oleh karena itu para tenaga pendidik akuntansi juga perlu meningkatkan kurikulumnya untuk mempersiapkan mahasiswa akuntansi untuk bekerja dengan AI.

Kata Kunci: kecerdasan buatan, industri 4.0, mahasiswa akuntansi, kompetensi akuntan.

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BACHELOR OF ACCOUNTING

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Hereby declare that the thesis entitled "Artificial Intelligence (AI) Development and The Readiness of Accounting Students in Indonesia" is truly my own work without taking, replacing, or claiming as mine on the whole or in part of other people's writings in the form of sentences or symbols that show ideas or opinions without giving recognition of the original author. If proven in the future that my statement is not true, then I am ready to receive sanctions in accordance with the applicable regulations.

Bandarlampung, September 16, 2021

Researcher,

Gina Andani

BIOGRAPHY

The researcher was born in the city of Liwa, West Lampung on June 16th 1999 to a loving family of Mr. Yanuar Efendi and Mrs. Masbitun. The researcher is the third daughter of three and has an elder sister named Melia Eka Putri and an elder brother named Julian Milardi Hiroshi. The researcher started formal school at TK Persit Kartika Chandra Kirana Liwa and finished in 2005. Researcher started elementary school at SD Persit Kartika Chandra Kirana Liwa (2005-2008) and finished at SD Al-Kautsar Bandarlampung (2008-2011). Researcher continued to junior high school at SMPN 2 Bandarlampung (2011-2014) and senior high school at SMAN 7 Bandarlampung (2014-2017). Throughout senior high school, researcher was actively participating in several English and economic competitions and was awarded as the overall champion of the social sciences 12^{th} grader.

The researcher was enrolled as student in Faculty of Economic and Business of University of Lampung through SBMPTN. The researcher was majoring in Accounting and concentrating on financial accounting and was a student of the International Class. During the study in the university, the researcher also listed as the member of HIMAKTA and Economic's English Club.

The researcher was honored to be appointed as the Ambassador of Economic's English Club 2017/2018 for 1 year and PIC of speech regular training of Economic's English Club 2018/2019. The researcher also actively participating in regional, national, and international program. The researcher was the 1st Runner-up of Speech Competition in EEC's Intercomp 2018 Semifinalist of Speech Competition in LOVE-Comp 2018, Semifinalist of Speech Competition in EIA 2018 The National English Competition, and was a part of Short Course Program held in Aoyama Gakuin University in Tokyo, Japan as an exchange student in 2019.

DEDICATION

Alhamdulillahirabbil'alamin

All my gratitude and praises to the almighty Allah SWT for His mercy and blessings so that i can complete this thesis well. Shalawat and greetings are also always praised to our beloved Prophet Muhammad SAW.

With a humble heart and sincerity, I hereby present this thesis to:

My beloved parents, Papa Yanuar Efendi and Mama Masbitun who have given all the love and affection, support, and endless prayers for my success. Million words cannot express how grateful I am to have Papa and Mama caring, raising, and educating me tirelessly. May Allah protect you in this world and the hereafter, and May Allah give me the chance to make you happy and proud, Aamiin.

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My alma mater, University of Lampung

MOTTO

"*Allah does not burden a soul beyond that it can bear...*"

(Q.S. Al Baqarah 2:286)

"I'm the only one who can achieve my dream, it's not the end until I say so."

NCT 127 (*Superhuman*)

"*Everyone has their own path. So be focus on your own path, prove them you can be success with that.*"

Gina Andani

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Bismillahirrahmanirrahim,

Alhamdulillah, all gratitude and praises to the almighty Allah SWT for His mercy and blessings so that the researcher can complete this thesis titled "Artificial Intelligence (AI) Development and The Readiness of Accounting Students in Indonesia" as one of the requirements to acquire Bachelor of Accounting in Faculty of Economic and Business, University of Lampung.

In writing her undergraduate thesis, the researcher recognize that this achievement could not be done by only herself, yet also supported by a lot of important people who have provided guidance, support and assistance during the preparation and completion of this thesis. Therefore, the researcher would like to express her sincere gratitude to:

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Bandarlampung, September 16th, 2021

Researcher,

Gina Andani

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I. INTRODUCTION

1.1 Background

The fourth industrial revolution or simply known as industry 4.0 is a term introduced by the German federal government which describes the integration of all value-adding business divisions and of the entire value added chain with the aid of digitalisation (KPMG, 2016). In the era of globalization and the age of industrial revolution 4.0, technology is growing rapidly. Various types of technology, one of which is Artificial Intelligence (hereafter mentioned as AI), are increasingly being created to facilitate human works. However, as technology develops to create it easier for humans, there are also concerns that human work can be completely taken over by technology or AI so that it may replace human as the worker (TheJakartaPost, 2018).

The "artificial intelligence vs. human intelligence" dilemma widely debated among academics and practitioners, encompasses many controversial issues associated with the long run prospects of some occupations, the desired new skills set and competencies, the way humans and machines could work efficiently and effectively together (Stancheva-Todorova, 2018). Accountants and auditors are responsible for preparing and examining the financial records of companies. They make sure that the records are accurate, that taxes are paid during a timely manner and for the proper amount. They also analyze financial operations and

take a look at to assist the organizations to run in a very more efficient manner. The sphere of accounting incorporates a long history of AI applications dating back more than 25 years mainly in the areas of financial reporting and auditing tasks. According to research from the University of Oxford in 2015, accountants have a 95 percent chance of losing their jobs as machines take over the role of data analytics and computation. However, according to the same report, it also found that as technology progresses, some jobs are eliminated while others are created (Greenman, 2017). This study is also in line with the research conducted by Frey & Osborne (2017) which resulting that the accountancy profession is one of th occupations with 94 percent probability to be vulnerable to computerization.

As in Indonesia, there are still lots of business people who have not adopt AI in their business (WartaEkonomi, 2019a). According to a survey entitled "Future Ready Business: Assessing Asia Pacific's Growth Potential Through AI" conducted by Microsoft and research firm International Data Corporation (IDC), there are only 14 percents of companies in Indonesia have actually adopted AI (Microsoft, 2019). However, a research conducted by IDC also resulted that 51% of companies Indonesia are planning on adopting AI in the next 2 to 3 years (Bisnis, 2018), yet this adoption also still have obstacles to be applied. According to Harris Izmee, the President Director of Microsoft Indonesia, one of the obstacle for adopting AI in Indonesia is the sufficiency of human resource skills to remain relevant in AI-based business environment (Microsoft, 2019).

The professional accountants work environment is constantly changing and is creating new demands of employer expectations regarding accounting graduates' skills and abilities (Wessels, 2005). In Indonesia itself, the rapid development of

AI is also a concern, especially for accountants. In fact, Indonesia's minister of finance, Sri Mulyani, at the IAI XIII Congress 2018 stated in her speech that current technological advances allow AI to replace accountants (DetikFinance, 2018). Artificial Intelligence (AI) in accounting and auditing also used by companies to reduce risk and save costs. The audit office uses artificial learning to measure the level of risk of their client (Handoko et al., 2019). As reported by CNBC Indonesia (2018), the economic observer Chatib Basri stated that digital technology such as AI has the potential to cause new unemployment of around 5.1 million people in Indonesia. The reason is because many conventional jobs, especially in the financial sector, have been replaced by technology. As an example in the financial market sector such as accountants, they previously did their job conventionally yet they have to change using online technology as the technology continues to develop. In this case, they had to be trained for new skills to use the technology applied in their job in order to have them keep working. Otherwise, it is not impossible that they will become unemployed since they do not have the skills to work with technology (CNBCIndonesia, 2018).

Moreover, a lot of jobs needed since the number of people majoring in accounting at various universities in Indonesia is very large. This becomes a major challenge for accountants in the era of the fourth industrial revolution. Jobs that originally had to be done in conventional way are now replaced by the system who can perform these tasks quicker, less cost, and reduce the risk of errors and fraud (Handoko et al., 2019). In Indonesia, as stated by Prof. Dr. Slamet Sugiri, Chair of the FEB UGM Professional Accountant Education Program, in the workshop entitled "Inovasi Pembelajaran Akuntansi Sekolah Menengah" the Micro, Small

and Medium Enterprises or generally shorted as MSMEs are now being able to provide 97 percent of job opportunities (DDTCnews, 2019; UGM, 2019). This sector has a positive development, but this growth rate is hampered by the lack of professional accountants as Indonesia has the smallest rate of professional accountants in the Southeast Asia region. A study conducted by International Academic Institute for Science and Technology resulted that Indonesia needs more than 200,000 professional accountants, while in fact currently we only have around 10,000 professional accountants in Indonesia (WartaEkonomi, 2019b). With the development of technology and to have the opportunity to fill the vacancy of this professional accountant positions, Sukirno D.S, an accounting lecturer of Yogyakarta State University, stated that it is necessary to have prospective accountants who have the competence to work and collaborate with digital technology such as AI (DDTCnews, 2019). The competencies needed to be sharpened when the prospective accountants still studying in college so that when they graduate, they are ready to face the challenges and compete in industrial revolution 4.0 with sufficient skills (Handoko et al., 2019).

In summary, there is a need of further understanding on how developments in AI are affecting accounting and how are the competencies of accountants in the industrial revolution 4.0 era to work with AI. Therefore, the researcher is interested in taking the title **"Artificial Intelligence (AI) Development And The Readiness Of Accounting Students In Indonesia"** which will examine about how is the curriculum provided by university is having a relation to the competency of prospective accountants and the readiness of accounting students

to adapt and work with AI so that their roles are not completely replaced by AI, especially for Indonesian accounting students as prospective accountants.

This research is a summary of mapping carried out from several journals which examined the adoption of AI towards the accountants and their competencies where there are not many journals that specifically examine the readiness to work with AI through the perspective of accounting students as a whole, not only accounting students who will soon enter the workforce or the perspective of employers only. Chosen variables as the curriculum provided by the university and the competencies of accounting students also need to be examined through the perspective of accounting students as a whole, because the readiness to work is formed since they start becoming accounting students not only when they are going to graduate. Hence, the understanding of on what level are the readiness of accounting students must also be examined on the accounting students as a whole. This research also examining whether the curriculum provided by university has a relationship towards the competencies of the accounting students and whether the competencies of accounting students has a relationship towards the readiness of accounting students to work with AI. Therefore, this research could add wider perspective of the readiness of accounting students to work with AI, especially in Indonesia.

1.2 Problem Statement

Based on the background explained above, the following research questions need to be addressed:

1. Are the curriculums provided by university in Indonesia have positive relationship with competencies of the accounting students?
2. Are the competencies of the accounting students have a relationship to readiness to work with AI?

1.3 Scope of Problem

Based on the background and problem identification, the author will limit the matter within the research that is regarding the impact of AI towards the readiness of accounting students to work with AI by conducting research on undergraduate accounting students in Indonesia.

1.4 Research Objectives and Benefits

1.4.1 Research Objectives

The purpose of this research are:

1. To find out if curriculums provided by university in Indonesia have positive relationship with competencies of the accounting students.
2. To find out if the competencies of the accounting students have a relationship to readiness to work with AI

1.4.2 Research Benefits

This research is expected to provide benefits as follows:

1. Theoretical Benefits

   The results of this research are expected to feature more references to future research, more specifically to research about AI impact on accountant profession.

2. Practical Benefits

   The results of this research are expected to contribute within the development of accounting insights, especially for prospective accountants so as to compete within the workforce.

II. LITERATURE REVIEW

2.1 New Accounting Information System and Industry 4.0

The accounting information system is defined as a system that collects, records, stores, and processes data to produce information for decision makers. Accounting information system includes people, procedures and instructions, data, software, information technology infrastructure, and internal controls and security measures (Romney & Steinbart, 2015, p. 10). The accounting information system also implied as a collection of resources namely people and equipment, designed to transform financial and other data into information to provide them to all administrative levels for the purpose of controlling and planning the various activities of the company and any third party that has common interests with the entities which was determined by information technology development (Huy & Phuc, 2020). Accounting information system has six components which are:

a. The **people** who use the system
b. The **procedures and instructions** used to collect, process, and store data
c. The **data** about the organization and its business activities
d. The **software** used to process the data

e. The **information technology infrastructure**, including the computers, peripheral devices, and network communications devices used in the accounting information system
f. The **internal controls and security measures** that safeguard accounting information system data (Romney & Steinbart, 2015, p. 11).

The accounting information system is also can be referred to a computerized system that is used to perform accounting operations using information technology resources (Damasiotis et al., 2015). The presence of industry 4.0 has had a changing effect on various fields of human activities, including the accounting information system and the accounting profession. The industrial revolution 4.0 is a concept that refers to the next level of development in the manufacturing industry marked by the development of the Internet of Things or generally called as IoT. The development of IoT is followed by new technologies in data science, artificial intelligence, robotics, cloud, three-dimensional printing, and nano-technology. Advances in technology allow automation in almost all fields. New technologies and approaches that combine the physical, digital, and biological worlds will fundamentally change the pattern of human life and interaction (Ghufron, 2018). Organisations have to increase their abilities to harness and profit from technology to capture the expected benefits from technology investments. Workers also need digital culture and skills to feel comfortable performing their job tasks (Stancheva-Todorova, 2019a).

The development of industry 4.0, especially the development of AI, makes a stronger support for accounting information systems, where industry 4.0

develops various technologies that improve the development of data processing, software and information technology infrastructure, which are parts of accounting information systems. This development indeed has shaped a new accounting information system (Yoon, 2020).

2.1.1 Artificial Intelligence (AI)

Nowadays, consciously or not, in our standard of living we can't be separated from the role of AI. AI powers various programs and services like the filter feature in e-mail, social media, mobile banking, online maps, and lots of others we are able to find. AI is a technology during which computers or robots are programmed to be ready to do tasks that are usually done by humans, similar to humans doing their jobs (TheManifest, 2018).

Artificial Intelligence term was introduced by John McCarthy in 1956. McCarthy defined AI as the science and engineering of making intelligent machines. AI is that the branch of computing which deals with the study and style of intelligent agents that perceives its environment and takes actions which maximize its chances of success. AI is also defined as the ability to carry two different ideas in mind at the identical time and still remain the ability to function. But AI must include the training from past experience, reasoning for the choice making, inference power and quick response. Also it must be able to take decisions on the idea of priorities and tackle complexity and ambiguity (Singh et al., 2013).

While the term “Artificial Intelligence” was introduced by John McCarthy in 1956, the history of AI was already started from 1950 where we had a generation of scientists, mathematicians, and philosophers with the concept of

AI culturally assimilated in their minds. One amongst was Alan Turing, a young British scientist who explored the mathematical possibility of artificial intelligence. Turing, in his paper titled "Computing Machinery and Intelligence" in 1950, proposed the logical framework with the question "Can machine think?" which was about the the likelihood for machine to use available information yet as reason so as to unravel problems and make decisions like human (Anyoha, 2017).

The industrial revolution 4.0 is marked by significant technological advances, one in every of which is that the emergence of AI which has changed many things within the field of life, including eliminating many of the activities that humans used to do. The identical thing also penetrated many activities that accustomed require human touch, now it all is reduced by the employment of AI for several purposes. AI not only minimizes the mistakes of activities that were once handled by humans, but for the company is an achievement of effectiveness and efficiency in its operations (Cahyadi, 2019).

Although AI actually has been familiar in daily life, there are still lots of business people who have not adopt AI in their business (WartaEkonomi, 2019a). According to a survey entitled "Future Ready Business: Assessing Asia Pacific's Growth Potential Through AI" conducted by Microsoft and research firm International Data Corporation (IDC), there are only 14 percents of companies in Indonesia have actually adopted AI. The low adoption of AI in Indonesia is suspected to be due to the perception between leaders and employees regarding AI implementation. Especially there are still

many workers who are skeptical about the adoption of AI in their companies (Kompas, 2019; Microsoft, 2019). However, a research conducted by IDC also resulted that 51% of companies Indonesia are planning on adopting AI in the next 2 to 3 years (Bisnis, 2018), yet this adoption also still have obstacles to be applied. According to Harris Izmee, the President Director of Microsoft Indonesia, one of the obstacle for adopting AI in Indonesia is the sufficiency of human resource skills to remain relevant in AI-based business environment (Microsoft, 2019).

2.2 AI and Accounting

The accountants and auditors are liable for preparing and examining the company's financial records. They make sure that the records are accurate, that taxes are paid on time and for the proper amount. They also have the role to analyze financial reports and check out to assist the organization run more efficiently and sustainable (CollegeGrad, 2006).

Technology that has developed rapidly is never an obstacle for millennial generation accountants to obtain a job. One technology that is booming is AI. AI Began to become a component of labor activities at the beginning of the Industrial Revolution 4.0. With this advanced technology, all things may be handled well and may be a helper for today's companies in processing large amounts of data. Therefore, many folks assume that the role of accountants are going to be replaced by machines. But if we look further, it is the shortage of skills and knowledge regarding the operation of the technology that causes new accountants such as millennial generation to feel threatened by the presence of technology (Handoko et al., 2019).

In recent years, the rapid development of AI technology has attracted worldwide attention. With the rapid development of AI technology, we may find that artificial intelligence has its impact on almost every corner of the world, from a straightforward replacement of human labor to gradually affect people's daily life. According to a survey, presumably, most jobs are going to be handled to robots within the next 20 years including low-end manufacturing production, sales and accounting. Therefore, basic accounting practitioners are one in all the groups that may be full of artificial intelligence (Li & Zheng, 2018).

The job description of today's accountant looks very different than that of the accountant of 20 years ago. In another 20 years, accountants will again, might play a different role. Their roles will change substantially over the next decade. More emphasis are going to be placed on consulting, business development, advisory services and risk management. Accountants will must embrace specialization and therefore the use of technology (Greenman, 2017).

Prof. Dr. Slamet Sugiri, Chair of the FEB UGM Professional Accountant Education Program, in the workshop entitled "Inovasi Pembelajaran Akuntansi Sekolah Menengah" which was held with IAI Yogyakarta, explained the development of the accounting profession where now Micro, Small and Medium Enterprises (generally shorted as MSMEs) are able to provide 97 percent of job opportunities. Along with the times, MSMEs has several obstacles, such as difficulty in accessing funding sources such as from banks, more dependence on one type of product, inadequate budget control

system, and lack of new technology and equipment. In response to this, the Internet of Things (IoT) provides the solutions that MSMEs can look at in marketing their products, for example through online shopping and marketing platforms, and also online-based payments. Cloud computing can also be adopted in the MSMEs system so that companies do not need to make or buy accounting software. In addition, cloud computing can make it easier for accountants to record business transactions and allow owners to access financial reports in real time (UGM, 2019).

These various technological developments raise a new challenge in accounting learning. Moreover, later the role of accountants in recording more likely to be replaced by AI. Therefore, accounting learning must be able to integrate these issues into the learning material. In other words, schools and universities must be able to integrate education with industrial needs. The previous study conducted by Güney (2014) also mentioned that the curriculums should be made suitable for the integration of technology development in accounting and trained individuals should be open to technology and be able to use it.

With the massive development of information technology, it requires someone to have the competency to work, be entrepreneurial, collaborate, and communicate with digital technology. The industrial revolution 4.0 brings educational challenges ranging from unequal access to education to the ability to integrate the internet and information with low industry lines. This issue also makes a new curriculum needed to support the competency of prospective accountants. Thus, in order to improve human resources skills

especially for the prospective accountants to face the challenges in industry 4.0, investment in human resources must be prioritized, universities can also be used as the basis for technological development as the role of accounting education programs is to prepare the accounting graduates for the workplace and develop their skills to enable them to pursue a career in the accounting profession (Awayiga et al., 2010). The lack of using of accounting software packages during accounting students' study period is also a cause of the identified gap between the skills acquired by accounting graduates and the required level needed by the profession itself (Elsaadani, 2015). This is also in line with the research conducted by Baldwin-Morgan (1995) which resulting that future accountants should begin to learn about AI during their undergraduate studies.

2.3 Previous Researches and Research Hypotheses

2.3.1 Curriculum and the competencies of the accounting students

A research conducted by Khanh (2018) has examined the impact of industry 4.0 and the adoption of industry 4.0 in the accounting professional career by collecting the opinions of the accountant and auditors for their level of interest and level of opportunities regarding the challenges in adoption of industry 4.0. The result revealed that there were few accountant, auditor as well as career association and leaders of accounting and auditing organizations focus on changing to adopt the industry 4.0 in their career. In order to catch up with opportunities from industry 4.0, auditors and audit firms should be aware of industry 4.0 and willing to look for opportunities from it.

Various researches, which examined the skills and attributes that the accounting graduates need to have, resulting that there are some agreements between students and employers in terms of the skills required for success in a career in today's business or accounting world that is analytical or problem solving skills, oral and written communication skills, teamwork and continuous learning. There is however a difference in terms of how each group ranks each skill. Given the expectations of students and the requirements of employers a much higher level of attention needs to be given to the skills and attributes being prioritised and delivered in accounting programs if accounting graduates are to survive in today's global business environment. Without a doubt the skills debate will continue to rage. While in Ghana, both the employers and the accounting graduates of Ghana largely in agreement about the other professional skill requirements though there were some small variations in the ratings of some of these skills. For example, the least important skills as rated by the graduates are technical and functional skills while the employers rated interpersonal skills as being the least important. However the average ratings of the technical and functional skills by the graduates and the average ratings of the interpersonal skills by the employers are still high enough to suggest that these skills are very important. In terms of information technology skills, spreadsheet packages are rated by both groups as being the most important (Awayiga et al., 2010; Kavanagh & Drennan, 2008).

The accounting educators are also playing a role in shaping the curriculum and the competencies of the accounting students. Therefore, Stancheva-

Todorova (2019) has attempted a research to examine the readiness of the accounting educators to embrace the challenges of industry 4.0 with the variables examined were the accounting educators and the challenges for accounting educators due to the required knowledge and skills from graduates in the Industry 4.0. The research resulted that despite the challenges of the expanding digitalization of businesses and exponentially growing technologies, universities have to begin the road to Industry 4.0 with confidence. The accounting educators could seize the opportunities of the fourth industrial revolution through the constant revision and adaptation of their curriculum and syllabus to the new requirements of the labour market. Bachelor and master programmes in accounting should become interdisciplinary, with an enhanced technological content. Academics are required to prepare students for a successful career of the future accountant. Another research attempted by Güney (2014) which examined the role of technology in accounting and e-accounting also in agreement that the curriculums also should be made suitable for that and trained individuals should be ready for technology and be able to use it.

Based on the previous researches explained above, it can be concluded that the academic curriculum plays a role in shaping the competency of accounting graduates and there is an empirical gap which is to examine this opinion from the perspective of accounting students who are currently studying. Therefore, the researcher propose the following hypothesis:

H_1 : Accounting students' perceive on AI-based curriculum provided by university in Indonesia has positive relationship towards the Accounting students' perceived competencies to work with AI

The novelty of this research that makes it different from the previous researches is that this research examines the curriculum provided by university, the competencies of accounting students, and the readiness to work with AI specifically from the perspective of accounting students as a whole where most of the previous researches examined from the perspective of accounting students who will graduate soon or accounting graduates only, or from the perspective of the employers.

2.3.2 AI development and the readiness of the accounting students

Digitalization of businesses and the exponentially growing technologies are changing the role and functions of the accounting profession, which turns into a hybrid due to the expanding demands of the labor market and employers. The qualification profile of accountant 4.0 encompasses many interdisciplinary knowledge and skills in different areas for both accountants in the finance function and in practice. There are many challenges on the road to the "factory of the future" and a very important factor for the profession to cope with them in the most competitive way is to adapt to the new competence requirements and invest in proper accounting education, training programmes and continuous professional development (Stancheva-Todorova, 2019b). The world will have to revisit on the decision of technological innovations. Technological development and innovations are not limited only for the world of accounting and snatching the jobs of accountant rather jobs

are shrinking as whole in business world and since economy is concentrating in few hands due to automation and it is a matter of concern and it gives light for new area of researches (Khan et al., 2018).

The emergence of AI as a part of the growing technology has caused some accountants to lose their jobs to some extent. With usage of information technology and changes that enterprises will made in their business processes, costs can be reduced significantly. Benefit of establishment of a system for pursuit of books and documents used in accounting in electronic media is not only assist reducing costs of enterprises. But also, it is to enable easier and more effective supervision in the aspects of finance and other judicial issues. Moreover benefiting from technology in accounting education and usage of computers and, package programs in training of individuals to perform this job and teaching how record of all documents used in accounting will be kept in electronic media is extremely important. Accountants should actively adapt to the development of technology, constantly innovate, change themselves, constantly update their knowledge, and become an irreplaceable high-quality accountant in order to not being replaced by AI (Güney, 2014; Li & Zheng, 2018).

Through some literature review, Greenman (2017) explored the impact of AI towards the job of the accountants in her research. From the research, it can be concluded that technological development such as AI in the accounting world will not replace accountants, yet it will simply change the focus. By becoming an accountant who is good in accounting, science in technology and good soft skills, millennial accountants will be able to compete in the

economic world, both with fellow accountants and with sophisticated technology (Handoko et al., 2019). Since information technology such as forensic tools, analytics and data mining, are commonly used in accounting and audit sectors, therefore it is important for accounting students as the future accountants and auditors to receive proper technologies training in their tertiary education, particularly curriculum that supports accounting students to work in the world of accounting that has been integrated with AI. The accounting students need to be ready along with their competencies to face the AI integrated accounting world. Academics, practitioners and professional societies should help accounting students fully understand the importance and usefulness of AI supporting accounting courses in their long term career (Pan & Seow, 2016).

Based on the previous researches explained above, it can be concluded that there is an assumption that accountants and prospective accountants must have sufficient competencies as part of their readiness to be able to compete in the workforce which is affected by the development of AI as part of industry 4.0. Therefore, the researcher propose the following hypothesis:

H_2 : Accounting students' perceived competencies to work with AI have a relationship to self-confidence of accounting students in Indonesia to work with AI.

2.4 Research Framework

The related variables in the hypotheses explained can be drawn in the figure below as proposed research framework.

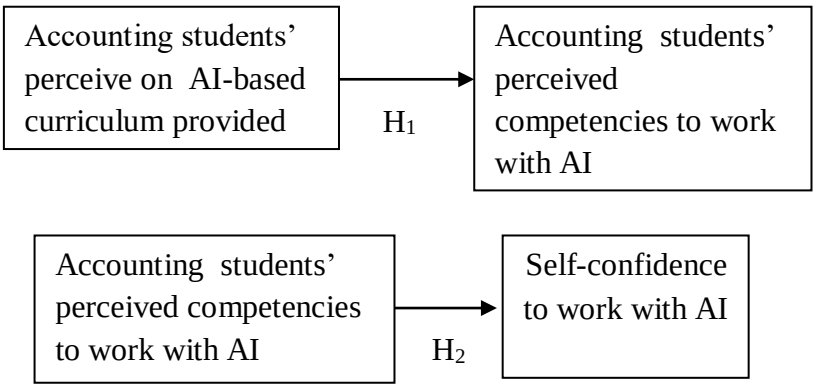

Figure 2.1 Proposed research framework

Although the theories used for the variables are not having much differences, the research is examining two dependent variables since the focus of each dependent variables and each independent variables which affect the dependent variables are different.

III. RESEARCH METHOD

3.1 Type and Source of Data

The type of research used in this research is a descriptive study with quantitative approach. This research is examining the readiness of accounting students to work with AI regarding to the competencies gained from curriculum provided by the university for the implementation of AI. The research will use primary data from questionnaires which will be distributed directly to undergraduate accounting students to obtain the required data. The questionnaires will be using likert scale to obtain the opinion of the respondents and will be distributed to the respondents by using google forms. The data that has been collected will then be analyzed using IBM SPSS Statistics 22.

3.2 Research Population and Sample

3.2.1 Population

The population in this research are the accounting students in Indonesia. The accounting students are chosen because they are the prospective accountants who are at a time when AI is increasingly developing, including in the field of accounting and of course, they are more likely to be affected by the development of AI especially when they graduate and will be working as accountants. The population also chosen because the previous studies examines from the perspective of the accounting graduates and practitioners, thus, the researcher

thinks that there is also a need for a perspective from accounting students to expand research on this topic.

3.2.2 Sample

This research uses purposive judgment sampling to get the sample. Purposive sampling is a sampling technique that can be logically assumed to be representative of the population. While, specifically, the purposive judgment sampling is a sampling method which involves the choice of subjects who are most advantageously placed or in the best position to provide the information required (Sekaran & Bougie, 2016, p. 248). Therefore, the sample used in this research are the undergraduate accounting students in Indonesia. Undergraduate accounting students in Indonesia are chosen as sample because it represents the accounting students as prospective accountants of Indonesia. This sample determination is also based on the research conducted by Awayiga et al. (2010) that examines the knowledge and skills development of accounting graduate in Ghana and the research conducted by Damerji (2019) which examines the impact of technology readiness on AI technology adoption by accounting students at two universities in Southern California. According to the rules of thumb proposed by Roscoe (1975) in the book "Research Methods for Business: a skill-building approach" (Sekaran & Bougie, 2016, p. 264), the appropriate number for sample size for most research is larger than 30 and less than 500 samples. In this research, 476 samples, which are collected from distributing the questionnaire through the WhatsApp Group of the Head of Undergraduate Accounting Department throughout Indonesia, are used.

3.3 Research Variable

3.3.1 Independent Variable

The independent variable is the variable which is manipulated or changed to examine its effect upon the dependent variable (Salkind, 2012, p. 25). The independent variable is a variable which influences the dependent variable. The independent variable in this research is the accounting students' perceive on AI-based curriculum provided by university and the accounting students'perceive competencies to work with AI.

3.3.2 Dependent Variable

The dependent variable is the variable which is examined as the outcome of an experiment or a research project (Salkind, 2012, p. 24). The dependent variable is the variable that is influenced by the independent variable. Therefore, the dependent variable in this research is the self-confidence of the accounting students to work with AI.

3.4 Variable Operational Definition and Variable Measurement

3.4.1 Accounting students' perceive on AI-based curriculum provided

The first independent variable in this research is the accounting students' perceive on AI-based curriculum provided by university in order to prepare the accounting students as prospective accountants to be able to work with AI. This variable is measured based on whether the university has or has not provided courses that support students to prepare to work with AI. Courses that support students to work with AI are adapted from information system based courses from IAESB (2018) and Sledgianowski et al. (2017) are as follows.

Table 3.1 Courses that support students to work with AI

Courses that support students to work with AI	Competencies obtained from taking the courses
• Introductory Accounting	• Be able to understand and apply the basic knowledge of accounting.
• Financial Accounting • Management Accounting • Cost Accounting • Intermediate Financial Accounting • Auditing • Accounting Information System • Taxation	• Be able to provide and analyze company's monetary transactions recorded in financial statements. • Be able to use accounting and present financial reports for internal company parties to facilitate and align decisions made by owners, managers, and employees. • Be able to analyze financial data, create budgets, develop cash flow statements and determine production costs, understanding activity-based costs and related management decision-making process. • Be able to understand and apply the the accounting concepts, policies, and practices for most types of economic transactions of businesses and provide financial information to support decision making. • Be able to collate, check and analyze financial data and examine company accounts, records and financial reporting systems • Be able to understand computer-based information system for processing financial data relating to transaction data in an accounting cycle and presenting it in the form of financial reports • Being able to understand the concepts in taxation and being able to perform tax calculations, recording, reporting and planning for taxpayers

Source: https://www.ifac.org/system/files/publications/files/IAESB-Information-Communications-Technology-Literature-Review.pdf

3.4.2 Accounting students' perceived competencies to work with AI

The independent variable in this research is the accounting students' perceived competencies to work with AI. A set of skills-based competencies needed by all students entering the accounting profession, regardless of the career path or the specific accounting services they choose (Pan & Seow, 2016). This variable is measured by the set of skills-based competencies needed by the accounting students to work with AI. This measurement is adapted from information and communication technology skills required of new accounting graduates in the research conducted by Chen et al. (2009) and IAESB (2018). The variable measurement is also supported by the competency of the accounting students to operate the kind of AI that have been implemented in the accounting field. According to Stancheva-Todorova (2019), the cloud-based accounting softwares are influencing the accounting transformation and skills profile of the accountant 4.0. Therefore, assuming that the accounting softwares is most commonly used in Indonesia, in this research top 5 brand awards accounting softwares in Indonesia for the year 2020 will also be used along with their features to generate the indicator of basic skills needed to operate the software. The measurement of the variables is shown in the tables below.

Table 3.2 Skills-based competencies needed by accounting students to work with AI based on IAESB 2018

Skills-based competencies needed by accounting students to work with AI based on IAESB 2018
• Be able to use following softwares: 1. Financial spreadsheets 2. Business graphics

3. Word processing
4. Presentation
5. Audit
6. Tax preparation
7. Small business systems
8. Database management system
9. Computerized accounting packages
10. Communication software (e-mail, file transfer, web browser)

Source: https://www.ifac.org/system/files/publications/files/IAESB-Information-Communications-Technology-Literature-Review.pdf

Table 3.3 Top 5 brand awards accounting softwares in Indonesia

	Accounting Software Brand	Features	Basic skills needed to operate the software (based on the features)
1.	**SAP**	• Automate the handling of all key accounting processes such as journal entries, accounts receivable, and accounts payable • Manage cash flow, track fixed assets, control budgets, and monitor project costs • Fixed asset management • Banking and reconciliation • Financial reporting and analysis • Warehouse and accounting integration	• Computing skill • Analytical skill • General accounting knowledge • Accounting information system knowledge

		• Streamline procurement processes • Process accounts payable invoices, cancellations, and credit memos with a purchase order reference; plan material needs; and schedule purchases accordingly	
2.	**Accurate**	• Basic accounting processes • Various features to manage sales, purchases, inventory & warehouse, taxation (Indonesian based taxation), ledgers, cash & bank, transactions approval, and fixed assets activities	• Computing skills • Analytical skill • General accounting knowledge • Accounting information system knowledge • Indonesian taxation knowledge
3.	**Omegasoft**	• Structured Chart of Accounts arrangements • Basic accounting processes • Various features to manage sales, purchases, financial, inventory, customer & supplier managing, and reporting activities	• Computing skills • Analytical skill • General accounting knowledge • Accounting information system knowledge

4.	**MBSoft**	• Basic accounting processes • Various features to manage sales, purchases, payables, receivables, dropshipping, and customer & supplier managing activities	• Computing skills • Analytical skill • General accounting knowledge • Accounting information system knowledge
5.	**MYOB**	• Inventory tracking • Bank reconciliation • Cash flow management • Online accounting • Reports and budgets • Create job numbers that assign invoices, expenses and more to each one. • Invoicing • Bills & expenses • Manage payroll • Track tax and GST (Goods & Service Tax)	• Computing skills • Analytical skill • General accounting knowledge • Accounting information system knowledge • Corporate budgeting knowledge • Taxation knowledge

Sources: Various sources

3.4.3 Self-confidence to work with AI

The dependent variable in this research is the self-confidence of accounting students to work with AI. This variable is measured by the Technology Acceptance Model and AI Technology Adoption adapted from the research of Damerji (2019) in order to measure the readiness or the self-confidence of the accounting students to use and work with AI. The measurements of this variable are shown in the table below.

Table 3.4 Technology Acceptance Model and AI Technology Adoption

Technology Acceptance Model		
	Using AI technologies in my future accounting or auditing job would enable me to accomplish tasks more quickly.	Likert 1-5
	Using AI technologies would improve my future job performance in accounting or auditing.	Likert 1-5
	Using AI technologies in my future accounting or auditing job would increase my productivity.	Likert 1-5
	Using AI technologies would enhance my effectiveness on the job in accounting or auditing.	Likert 1-5
	Using AI technologies would make it easier to do my future job in accounting or auditing.	Likert 1-5
	I would find AI technologies useful in my future job in accounting or auditing.	Likert 1-5
	Learning to operate AI systems in accounting or auditing would be easy for me.	Likert 1-5
	I would find it easy to get AI systems to do what I want it to do in accounting or auditing.	Likert 1-5
	My interaction with AI systems in accounting/auditing would be clear/understandable.	Likert 1-5
	I would find AI systems in accounting or auditing to be flexible to interact with.	Likert 1-5
	It would be easy for me to become skillful at using AI systems in accounting or auditing.	Likert 1-5
	I would find AI systems in accounting or auditing easy to use.	Likert 1-5

AI Technology Adoption		
	I consider using AI technologies as an entry-level accountant or auditor.	Likert 1-5
	I will use AI technologies when performing accounting or auditing tasks as an entry-level accountant or auditor.	Likert 1-5

Source: Technology Acceptance Model and AI Technology Adoption adapted from the research of Damerji (2019)

3.5 Research Instrument

The research will be using five-point likert scale in the questionnaires to obtain the opinion of respondents regarding the curriculum provided by the university and skills obtained from learning the courses towards the readiness to work with AI. Likert scale is a scale that has multiple categories from which respondents choose to indicate their opinions, attitudes, or feelings about a particular issue (Nemoto & Beglar, 2014). The questionnaire design is adapted from the research done by Awayiga et al. (2010) and Harris (2010). A good questionnaire must meet two requirements, which are valid and reliable. To find out whether the data generated from the questionnaires can guarantee the quality of the research so that the conclusions on the relationships between variables are reliable, and accurate so that the research results can be accepted, validity and reliability tests are carried out.

3.5.1 Validity Test

Validity establishes how well a technique, instrument, or process measures a particular concept (Sekaran & Bougie, 2016, p. 150). Validity is a measure that shows the levels of validity of an instrument, an instrument that is valid has high validity. An instrument is said to be valid if it can reveal data from the variables

under study appropriately (Sugiyono, 2015, p. 173). The results of the correlation test can be said to be valid if the r value obtained from the calculation results is greater than the r-table with a significance level of 0.05.

3.5.2 Reliability Test

Reliability testing in this study uses the Cronbach's alpha method (Harris, 2010). Reliability is a test of how consistently a measuring instrument measures whatever concept it is measuring. Cronbach's alpha is a reliability coefficient that indicates how well the items in a set are positively correlated to one another. Cronbach's alpha is computed in terms of the average intercorrelations among the items measuring the concept. The closer Cronbach's alpha is to 1, the higher the internal consistency reliability. Testing can be said to be reliable if Cronbach's alpha is >0,6. (Sekaran & Bougie, 2016, p. 227).

3.6 Data Analysis Method

In order to process the data obtained from the questionnaires, IBM SPSS Statistics 22 as the analysis tool will be used so that the results can be analyzed.

3.6.1 Descriptive Statistics

Descriptive statistics are statistics such as frequencies, the mean, and the standard deviation, which provide descriptive information about a set of data (Sekaran & Bougie, 2016, p. 294). The descriptive statistics also present information such as the analysis of the characteristics of the respondents, in this research they are the university and department of the respondents and from what year of class they are.

3.6.2 Simple Linear Regression Analysis

Simple linear regression analysis shows the correlation between the independent

variable and the dependent variable. Simple linear regression is used when one independent variable is hypothesized to affect a dependent variable (Sekaran & Bougie, 2016, p. 312). The error term that is represented by ε contained in the linear regression model is used to define the variability in the dependent variable that cannot be explained by the independent variable (TheBalanceSMB, 2020). Based on the problem statements and theoretical framework previously described, the research model equations formed is as follows:

$$\mathbf{Y_1 = \alpha + \beta_1 X_1 + \varepsilon}$$

$$\mathbf{Y_2 = \alpha + \beta_1 X_2 + \varepsilon}$$

Where:

Y_1 : Accounting students' perceived competencies to work with AI

Y_2 : The self-confidence of the accounting students to work with AI

α : Constant

β_n : Regression coefficient

X_1 : Accounting students' perceive on AI-based curriculum provided by university

X_2 : Accounting students' perceived competencies to work with AI

ε : error rate

3.7 Hypothesis Testing

Hypothesis testing aims to test the hypotheses that have been made and to determine the linear positive or negative effects of the independent variables on the dependent variable. Statistically, the hypothesis test can be measured from the the t statistical value and coefficient of determination (R^2).

3.7.1 Significance Test of Individual Parameters (t-test)

The significance test of individual parameters or usually called partial tests is useful to determine the effect of each independent variable individually on the dependent variable. Significant test of individual parameters is done by finding the t-value first and making a comparison between the t-calculated and t-table values. The significance of the regression coefficient as a whole is tested by using the t-test degrees of freedom (df) = n - k - 1, at a 95% confidence level and α = 0.05.

The decision making criteria are as follows:

If t-calculated > t-table, then the hypothesis is accepted.

If t-calculated < t-table, then the hypothesis is denied.

3.7.2 Coefficient of Determination (R^2)

The coefficient of determination test is carried out to determine the percentage of independent variables that can explain variations in the dependent variable. These results will tell how much the independent variable explains the dependent variable, while the rest is explained by other variables outside the model that are not included in this study. The resulting coefficient of determination must be between zero and one. The closer the coefficient of determination is to the number 1 or 100%, the higher the level of the independent variable taken or researched has provided all the information needed to test the dependent variable.

V. CONCLUSION AND SUGGESTION

5.1 Conclusion

Due to the development of technology specifically the development of AI in accounting as the impact of industrial revolution 4.0, many concerns have arisen regarding the future of accountants and the possibility that accountants will be replaced by AI. As lots of business people are adopting AI in their business, both globally and particularly in Indonesia, this development of AI adoption is raising concerns that the role of accountants will be replaced with AI due to the lack of compentence of accountants to work with AI. Seeing that many research conducted have examined the topic from the perspective of accounting graduates and employers, this research therefore examined the topic from the perspective of the accounting students to expand the research related to the topic of AI development and the readiness of accounting students as prospective accountants. Based on several analysis done in this research, some points of conclusions can be taken are as follows:

- As the accounting students' perceive on AI-based curriculum provided by university in Indonesia positively and directly affects the accounting students' perceived competencies to work with AI, and the accounting students' perceived competencies to work with AI positively and directly affects the self-confidence of accounting students in Indonesia to work

with AI, it can be concluded that the development of AI will not replacing human as accountants, yet it will simply shift the role of the accountants as the analytical skills of human accountants are still needed to operate the AI-based accounting softwares and analyzing the financial reports as the results to help the decision making process which cannot be done by only AI itself. The conclusion also supported with the results which shows that the accounting students, as prospective accountants who are assumed to be at a time where AI increasingly developed, are mostly confident and ready to adapt and work with AI.

- Based on the descriptive statistics analysis, the results show that the universities along with the accounting educators in Indonesia are helping in shaping the skills or competencies of the accounting students and prospective Indonesian accountants to work with AI and make sure the accounting students fully understand the importance and usefulness of AI supporting accounting courses in their future career in the era of industry 4.0 by providing the proper curriculums. From the perspective of the accounting students, it is also concluded that the students can learn to operate accounting softwares independently outside the classroom, yet they are still unsure that they are capable to operate all the softwares that they need to be able to operate in order to work with AI and they also might not be familiar or only familiar to some of the top 5 accounting softwares in Indonesia. This uncertainty might be more or less influenced by the perspective of majority of the respondents who are currently in the early stage of college that they may have not experienced

most of the curriculum at the university and gain more competencies for them to be ready to work.

- Though the uncertainty of the accounting students in Indonesia regarding their capability and knowledge of several accounting softwares that they will likely use when they work as accountants or auditors, the development of AI therefore should not be a concern for the future of accountants and accounting students in Indonesia since based on the analysis the accounting students as prospective Indonesian accountants are mostly confident about adopting and considering to use AI technologies and nearly sure that they will be ready to use AI technologies when they are working in accounting or auditing**.**

5.2 Suggestion

Based on the result of this research, the author provides several suggestions both for universities and academics for future research, which are:

- **For Universities**

  From this study it can be found that the universities and accounting educators in Indonesia have provided proper curriculums to support the shaping of skills and competencies of the accounting students as future accountants to work with AI, yet the students were still unsure about their capability to operate the accounting softwares as part of working with AI. Thus, the author suggests the university to provide more practice-related curricula to enhance the capability of accounting students to operate

accounting softwares so that they will be much more ready to work with AI and compete in industry 4.0 workforce after they graduate.

- **For Future Researchers**

  This study has taken a sample of undergraduate accounting students in Indonesia. Future researcher could take another specifical sample to be examined such as the undergraduate accounting students of Top 10 universities in Indonesia, examining the topic from the perspective of accounting students of another education level, or another specifical ways can be used. Future researches are also encouraged to find out another variables which are affecting the perceived competencies of accounting students and self-confidence of the accounting students to work with AI.

5.3 Research Limitation

During the process of the research, the author discovers a limitation that the sample used is relatively big yet not having very specific criteria due to the limited time and limited data of the sample profile required for the variables studied.

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