THE FUTURE OF ACCOUNTING WITH ARTIFICIAL INTELLIGENCE: OPPORTUNITIES AND CHALLENGES

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Abstract— **Artificial intelligence (AI) is one of the remarkable discoveries in the twentieth century. AI is a science related to the creation of machine intelligence capable of performing tasks that previously can only be done by people (Simarmata et al, 2021). It can be said that AI is a breakthrough to create machines that have higher intelligence than machines in general. The current development of AI is aimed at improving learning and problem-solving abilities (Dongre et al, 2020). Accounting is a field that is very suitable for utilizing AI in every part of its information system. AI is expected to be able to help accounting practitioners to improve their performance and develop services they provide. During the development of AI, accounting practices that already adopted AI have resulted in more qualified and diverse outcomes. Various problems that become accounting limitations can be solved with the help of AI, so that the accounting profession can work on a wider area of accounting services, including forensic accounting and financial services and digital investments.**

Keywords— **artificial intelligence, accounting, opportunity, challenge**

I.   INTRODUCTION

Accounting is said to be the language of business because the end result of the accounting process is a report on a company's business performance in the form of reporting and financial reports (accounting information). Accounting information is intended to fulfill the needs of stakeholders in the decision-making process. The business stakeholders (management, investors, creditors, potential investors, potential creditors, government, society, and company employees) use accounting information to take decision based on their needs.

Accounting always evolves following the business development to ensure fulfilling the needs of stakeholders. The current accounting information system has developed following the development of business and information technology. Digitalization and automation of accounting processes have helped businesses in streamline accounting processes, so that businesses can present quality, relevant and timely accounting information. Various companies have succeeded in developing accounting software that is relevant to the business and industrial block chain.

Business development is currently in the phase of Industrial Revolution 4.0 focusing on developing digital-based business processes and products. The high growth in demand for technology (especially information and communication technology) by industrial companies can become the fuel of the future of Industry 4.0 and produce more positive effects in different areas (Simamarta et al., 2021). Industry 4.0 enables the transformation of the modern economy to be more innovative and this will definitely increase productivity. Accounting that carries out its role as the language of business must be able to seize opportunities and answer the challenges of Industrial Revolution 4.0. Therefore, all forms of advances in information and communication technology (ICT) will be opportunities and challenges for accounting. ICT developments that are currently popular in changing business concepts are Internet of Think, Blockchain, Big Data, Cloud Computing, and Artificial Intelligence (AI).

AI is getting more attention from academicians and accounting professionals. Various literature and discussions actually raise anxiety about the loss of some work areas of accountant because of being replaced by AI. AI is predicted to be able to replace the work of financial statement preparation with its automation capabilities. However, the use of AI in ICT needs to be observed and studied to be able to see opportunities for expanding services that can be offered by the accounting profession, as well as responding to the challenges of finding solutions to the limitations of accounting.

Although AI techniques, such as machine learning, are not new, and the pace of change is fast, widespread adoption in business and accounting is still in its early stages. In order to build a positive vision of the future, we need to develop a deep understanding of how AI can solve accounting and business problems, the practical challenges and the skills accountants need to work alongside intelligent systems (Leadership, n.d.).

II.   LITERATURE REVIEW

1. Accounting

Accounting is the process of identifying, collecting, and storing data as well as the process of developing, measuring, and communicating information (Romney & Steinbart, 2015). The final result in the accounting process is accounting information

in the form of reports and financial statements. The main objective of accounting is to provide financial information about the reporting entity that is useful to present and potential equity investors, lenders, and other creditors in making decisions about providing resources to the entity (Kieso et al., 2014). According to Dongre et al. (2020), accounting has functional areas as follows:

a. Auditing is the examination or inspection of various books of accounts by an auditor. It is done to ascertain the accuracy of a financial statement. These process three different category of auditors, such as external, internal, and EDP auditors. EDP auditors are either external or internal auditors concerned with the audit of computer-based systems. This type of auditor has appropriate tools and expertise to minimize errors.

b. Accounting Information Systems (AIS) refers to the computerized accounting information systems that are developed to meet management's and external users' requirements. Accordingly, management and external sources are concerned with the expert systems accustomed to developing and implementing the AIS.

c. Management Accounting concerns the presentation of professional knowledge and ability to disclose accounting information. In management accounting, AI plays a vital role in maintaining records for the data for making decision, formulating policy, planning, and controlling the business. It mainly helps organization to take relevant decisions for the investment or earn more profit.

d. Financial Accounting is the process of preparing financial statements that companies use to show their financial performance and position to people outside the company, including investors, creditors, suppliers, and customers.

e. Tax Accounting focuses on preparing, analysing, and presenting tax returns and tax payments. Those involve a complex and time-taking process, but nowadays it becomes very easy to file tax returns and tax payments calculation through the use of different accounting software.

2. Accounting Information System

Romney and Steinbart (2015) state that Accounting Information System (AIS) is an intelligence (information provider tool) from the language of business (accounting), which has the following components:

a. People using the system
b. Procedures and instructions used to collect, process, and store data
c. Data about the organization and its business activities
d. Software used to process data
e. Information technology infrastructure
f. Internal controls and security measures that store AIS data

These components enable SIA to fulfill the following business functions:

a. Collecting and storing data about the organization's activities, resources, and personnel.
b. Turning data into information so that management can plan, execute, control, and evaluate activities, resources and personnel.

c. Providing adequate controls to secure the organization's assets and data

3. Accounting Profession and Services

According to Weygandt et al. (2019), the accounting profession is grouped according to the specifications of the services occupied as follows:

a. Public Accountant that offers expert services to the general public, namely:
   1) Auditing as the main part of public accounting, where an independent accountant such as a Chartered Accountant (CA) or Certified Public Accountant (CPA) that provides an opinion on how accurately the financial statements in presenting the results and financial position of the company.
   2) Taxation, including conducting tax planning, preparing annual notification letters, and representing clients in dealing with the tax directorate.
   3) Management consulting that ranges from installing basic accounting software or complex enterprise resource planning systems and providing support services for major marketing projects, mergers, and acquisitions activities.

b. Company Accountant is an accountant working for a company as a corporate accountant or managerial accountant. The scope of work of a company accountant is cost accounting, budgeting, accounting information system design and support, depreciation, tax planning, and internal audit.

c. Government Accountant is an accountant working for government organizations. The work environment of government accountant includes tax authorities, law enforcement agencies, and corporate regulators.

d. Forensic Accountant is an accountant using accounting, auditing, and investigative skills to carry out investigations into theft and fraud. The scope of work of a forensic accountant is tracking money laundering and investigating theft and tax evasion activities.

4. Artificial Intelligent (AI)

According to Simamarta et al. (2021), AI is a science related to the creation of machine intelligence capable of performing tasks that were previously only done by people, where most of this machine intelligence is symbolic and heuristic. AI is based on various disciplines, such as Computer Science, Biology, Psychology, Linguistics, Mathematics and Engineering, etc. The main thrust of AI is in the development of computer functions related to human intelligence, such as reasoning, learning, and problem solving. Delipetrev et al. (2020) mention the commonly known types of AI are as follows:

a. Artificial Narrow Intelligence (ANI), often referred to as "Weak" AI is the type of AI that mostly exists today. ANI systems can perform one or a few specific tasks and operate within a predefined environment, e.g., those exploited by personal assistants Siri, Alexa, language translations, recommendation systems, image recognition systems, face identification, etc.

b. Artificial General Intelligence (AGI) or "Strong" AI refers to machines that exhibit human intelligence. In other words,

AGI aims to perform any intellectual task that a human being can. AGI is often illustrated in science fiction movies with situations where humans interact with machines that are conscious, sentient, and driven by emotion and self-awareness. At this moment, there is nothing like an AGI.

c. Artificial Superintelligence (ASI) is defined as "any intellect that greatly exceeds the cognitive performance of humans in virtually all domains of interest" (Bostrom, 2016). ASI is supposed to surpass human intelligence in all aspects — such as creativity, general wisdom, and problem-solving. ASI is supposed to be capable of exhibiting intelligence that we have not seen in the brightest thinkers amongst us. Many thinkers are worried about ASI. At this moment, ASI belongs to science fiction.

d. Machine Learning (ML), an AI subfield, is the scientific study of algorithms that computer systems learn through experience. ML algorithms build a model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so.

e. AI has entered a number of fields, including: AI in health; AI in business; AI in education; AI in finance; AI in law; and AI in manufacturing (Simamarta et al., 2021).

5. Previous Studies

a. *Artificial Intelligence in Accounting: Opportunity and Challenge* (Dongre et al., 2020) discusses how AI plays a vital role in accounting, from the perspective of opportunities and challenges.

b. *Artificial Intelligence and the Future of Accountancy* (Leadership, n.d.) provides an overview of how technology will provide opportunities and answer AI challenges in the accounting field.

c. *AI Watch, Historical Evolution of Artificial Intelligence: Analysis of the three main paradigm shifts in AI* (Delipetrev et al., 2020) reflects on the similarities and differences between AI periods. The first two AI periods share a similar pattern, as they start with a scientific breakthrough, a research paradigm shift, followed by bold predictions, vast media attention, massive investments, disappointments, unfulfilled promises, and the start of an AI winter.

d. *Parsing the Accounting Roadmap for the Industrial Age 4.0* (Tata Rini, 2019) is about the impact caused by industry revolution 4.0 in the which affected the fields of management, finance, and business.

III. RESEARCH METHODOLOGY

The approach used in this research was a qualitative method. According to Creswell & Creswell (2018), qualitative research is research that can be used to understand problems in the form of groups. This is literature study that uses various journals, books, and other studies as research data. The data that has been collected is analyzed so as to make a conclusion of this study.

IV. ANALYSIS AND DISCUSSION

Accounting is a widely documented set of knowledge that can also be said as a service provision activity where it provides financial information beneficial both socially and economically (Suwardjono, 2014). Accounting can change according to the need, and there will be adjustments for the use of accounting in each field and scope. This adjustment can be influenced by various things, such as economic and social conditions, company resources, company scope, and management preferences. Accounting also has a relationship with information systems. According to Romney and Steinbart (2015), accounting is an activity to identify, collect, store, measure data and then the data is collected into information. The accounting component as a system consists of people, procedures, data, software, information technology infrastructure, internal controls, and security measures.

1. Opportunities

AI in the future will be one of the technologies affecting all sectors, including the field of accounting. Bengio (2009) states that AI has been developed by experts with various demands, such as the ability with high complexity, the ability to learn low input, the ability to study big data, the ability to study raw data, the ability to learn synergies across multiple jobs, and the ability to learn independently without supervision. These demands will make AI a powerful technology that makes work more effective and efficient.

It is possible for AI to carry out various jobs with varying degrees of difficulty in electronic work without reducing performance due to human fatigue. However, humans still have an important role in managing and controlling AI as well as to provide input to the AI learning process (Adamssen, 2020). One of the keys to the success of AI is a continuous learning process.

AI needs to learn continuously according to the purpose of AI invention. The accountant's closest role in the current AI process is as a 'coach'. Accountants can prepare various data needs related to AI learning inputs and provide data according to the needs of the AI learning process. Those acts accelerate the AI learning process because it will focus more on dealing with what is needed.

Accountants are closely related to the provision of information as they have a role in providing company financial information. The information is useful if it has an impact on decision making. Aspects needed in providing quality information are relevance, reliability, and timeliness. The existence of AI will make it easier for accountants to provide quality financial information.

AI will be able to sort out the needed data according to the information required by users of accounting information. AI-integrated data processing can also reduce errors due to negligence or fatigue by accountants. Relevant and reliable information will also lose its quality if there is a delay in information. AI can process large amounts of data in a relatively faster time than humans and it is not limited to working hours. In addition, AI can also retrieve data from various sources directly without going through a human-to-human process which may become a bottleneck in the process. Dongre et al. (2020) also states that AI can simplify the work of accountants in managing and providing financial information consulting. Heavy activities of accountants, such as drafting reports, can be done automatically by AI. Information derived from AI can be translated by accountants

to make it easier for users of financial information to use. Also, AI helps in investment activities, as Navale et al. (2016) shows that the use of AI and data machines can also improve accuracy in stock price predictions. Accountants will be more precise in recommending which stocks are better for investors to choose.

Another profession that is facilitated by AI is auditor, both internally and externally. In this position, someone has a role to evaluate the quality of financial information. According to PWC (2015), AI, as an auditor, will assist in the audit process by performing substantive and controlling tests automatically. The routine of collecting audit evidence can be reduced as most transaction evidence is in digital form and AI can take it to evaluate through the system directly. In addition, AI can also be used to trace fraud that has occurred in financial reporting. This convenience also facilitates the work of forensic auditors when looking for evidence related to fraud that has been carried out by management. The auditors can focus more on analyzing the logic and rationalization of the connection between data, and also other aspects, such as business processes. The audit clients are also being facilitated in the audit process as they do not need to spend a lot of time providing the evidence needed in the audit process.

2. Challenges

a. There are accounting limitations, and one of them is that the benefits provided by accounting information must outweigh the costs. While there is a lot of free and open-source software in accounting, the use of established software suppliers may be required for legal or regulatory reasons. AI should benefit people and the planet by driving inclusive growth, sustainable development and wellbeing (Delipretrev et al., 2020). Accounting that is part of the business process will be faster and able to meet full disclosure when using AI. AI applications in accounting information systems in companies will require sophisticated tools to process massive volumes of data to build an AI system and to utilize deep learning techniques. However, not all companies are able to allocate large funds for AI applications, especially small companies or home industries (Dongre et al., 2020).

b. There are trust issues as not everyone understands how AI-enabled devices work. When people do not understand how a device/system works, it is difficult to predict and manage inherent risk. This causes some people to distrust AI. In addition, there is a lot of information or propaganda that presents the possibility of AI being harmful to humans because it will have its own consciousness. When something has consciousness, it will desire freedom. Currently, many companies have used AI in their business processes, including accounting. Then there will be a risk of stakeholders doubting accounting information whose process uses AI. There should be transparency and responsible disclosure around AI systems to ensure that people understand AI-based outcomes and can challenge them (Delipetrev et al., 2020).

c. AI design to date has only done one job. This means that the AI will only do the work it has been programmed to do. There is a risk that AI will not be able to make judgments, adjustments, and even cancellations when conditions change. This will have negative impact when AI continues to do what it is told. AI systems should be designed in a way that respects the rule of law, human rights, democratic values, and diversity, and they should include appropriate safeguards, such as enabling human intervention where necessary, to ensure a fair and just society (Delipetrev et al., 2020).

d. Accounting inputs a lot of data to process it into information that can be utilized by stakeholders. The data may be confidential or limited for internal use, but the risk that data leaks can occur when AI is fully involved in the accounting process. The risk of data hacking is very likely to happen when all data is already in digital storage such as the cloud.

e. In addition to data security risks, there are risks to the quality and volume of data in the accounting process. The success of accounting in presenting information that meets the qualitative characteristics of accounting information requires good volume and quality of data. Without the availability of good data, AI would not fulfill its maximum benefits. Small organizations may not have a lot of data, while large organizations have massive but not necessarily quality data. In a survey conducted by MIT in 2018 on executive seniors, it was found that over 85% of respondents consider data as the primary resource for optimal business decisions, delivering better results to customers, and growing their business. So, data quality as a condition to get the maximum benefit from AI becomes absolute.

f. In forensic accounting, auditors will use AI to search for evidence in all areas where AI may be accessible. A lot of personal data that can be reached by AI, such as private emails, messages on personal devices, personal data on online applications, conversations on the phone, and even personal account balances. This is vulnerable to violations of privacy and human rights. The ethical principles that must be upheld in the development and use of AI are respect for human autonomy, prevention of harm, fairness and explainability (Delipetrev et al., 2020). Enforcement of ethics will always be a challenge that the developers and users of AI must respond to. So, the policy to prioritize the greater interest will be a conflict, especially on the use of AI in the search for evidence of criminal cases, including forensic accounting.

g. Currently, companies have adopted at least one AI-based technology, which indicates that the business world has benefited from AI in running a more efficient business. Accountants, as presenters of business information, must change the way they work according to the development of AI in business. The quality of accounting information will require significant improvement to meet stakeholder needs. Therefore, accountants are not only needed to present business information, but also provide added value to business information (Tata Rini, 2019). Competence in preparing financial and tax reports will be the basis that must be mastered. Accountants must revolutionize their competencies and how they work. They have to master the

use and development of information technology, including AI. Then, they must sharpen the ability to analyze data or information relevant to business, considering the technological developments and various perspectives that affect business. This must be immediately responded by the accounting profession and education.

V. CONCLUSIONS

Technological developments, such as AI, will have a significant impact on professional accounting services in the future. There is a need for new skills and knowledge needed to deal with these changes. Professional service actors are required in facing future challenges and seizing opportunities that may be obtained. They need a new set of skills related to AI systems in input, process and output. In the input set, the required skills are related to how to train or provide input so that AI can develop in accordance with the direction needed in the field of accounting. In the process, the accounting service actors must possess the ability to monitor and control so that AI runs according to development goals. In the output, the accounting profession actors need skills to translate AI output so that it can be more easily understood by stakeholders.

AI must be well designed to provide benefits that outweigh the costs and risks. The implementation of AI in every activity that has impacts on humans must involve humans in the process. AI developers must be able to create AI systems that are robust and safe to use, and any potential risks must be continuously identified and managed. Accountants must not worry about their existence being replaced by AI, as long as they are able to see the opportunities from AI and respond to challenges by continuously improving their competencies and capabilities. Accountants must also be creative in creating new opportunities for accounting services by utilizing AI.

REFERENCES

[1] Adamssen, J. (2020). *Artificial Intelligence: Machine Learning, Deep Learning, and Automation Processes*. Efalon Acies.

[2] Bengio, Y. (2009). Learning Deep Architectures for AI. now Publishers Inc.

[3] Creswell, J. W., & J. David Creswell. (2018). *Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.

[4] Delipetrev, B., Tsinaraki, C., & Kostic, U. (2020). *Historical Evolution of Artificial Intelligence*. https://doi.org/10.2760/801580

[5] Dongre, N., Pandey, A., & Gupta, O. P. (2020). Artificial Intelligence in Accounting: Opportunities & Challenges. *Journal of Xi'an University of Architecture & Technology*, XII(V), 1858–1864.

[6] Dongre, N., Pandey, A., & Gupta, O. P. (2020). Artificial Intelligence in Accounting: Opportunities & Challenges. *Journal of Xi'an University of Architecture & Technology*, V.

[7] Kieso, D. E., Weygandt, J. J., & Warfield, T. D. (2014). *Intermediate Accounting IFRS 12th Edition*. John Wiley & Sons, Inc.

[8] Leadership, I. T. (n.d.). Artificial Intelligence.

[9] Navale, G. S., Nishant Dudhwala, & Kunal Jadhav. (2016). Prediction of Stock Market using Data Mining and Artificial Intelligence. *International Journal of Computer Applications*, 134.

[10] PWC. (2015). *Data Driven What Students Need to Succeed in s Rapidly Changing Business World*.

[11] Romney, B. M., & Steinbart, P. J. (2015). *Sistem Informasi Akuntansi (Edisi 13)*. Penerbit Salemba Empat.

[12] Romney, M. B., & Steinbart, P. J. (2015). *Accounting Information System*. Pearson.

[13] Simamarta, J., Simbolon, N., Tambunan, A. R., & Simanjuntak, K. G. (2021). *Teknologi Informasi dan Komputer di Era Revolusi Industri 4.0*. CV Andi Offset.

[14] Suwardjono. (2014). *Teori Akuntansi: Perekayasaan Pelaporan Keuangan (Edisi Ketiga)*. BPFE.

[15] Tata Rini, Y. (2019). Parsing the Accounting Roadmap for the Industrial Age 4.0. *Journal of Management and Accounting Sciences*, 7(1), 58.

[16] Weygandt, J. J., Kimmel, P. D., & Kieso, D. E. (2019). *Pengantar Akuntansi 1 Berbasis IFRS (Financial)*. Penerbit Salemba Empat.