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## Research Article

### The Shifting Role of Accountants in the Era of Digital Disruption

Mia Novinda Mujiono\*

Postgraduate Faculty of Business and Economics UBAYA Surabaya 60293, Indonesia

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#### \*Corresponding author:

E-mail:

[mia.novinda@gmail.com](mailto:mia.novinda@gmail.com)

#### ABSTRACT

The industrial revolution 4.0 started with the idea of the German government to create a roadmap on the implementation of the digital economy in 2011. The era of digital disruption made the fundamental role of the accountant taken over by system or software. This phenomenon raises anxiety for a number of accountants, because their jobs are replaced by system, so companies can reduce the number of workers which classified as accountants. Whether the accountant will die along with the development of technological innovation? Certainly not. The purpose of this research is giving insight that accountants are required to be agile-learners who enrich skills with the aim of managing creativity and reasoning so that they are able to create infrastructure, platforms, and digital software that can control the automation in business. Using qualitative explanatory research method with literature review, observation, and interview, researcher found that the functional role of accountants is increasing, not only in financial reporting system proficiency, but especially in strategic business analysts with the help of business intelligence as the basis of decision making for business. Likewise technological innovation gave birth to another scientific field of business and accountant which enlarge job opportunities and threats as the results and implications. Keeping financial data and confidential information safe and secure should be the top priority for any business.

**Keywords:** Accountant, innovation, technology, digital, disruption

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#### Background

The industrial revolution 4.0 started with the idea of the German government to create a roadmap on the implementation of the digital economy in 2011. The industrial era 4.0 was marked by an increase in manufacturing digitization driven by four factors, namely (1) an

increase in data volume, computing power, and connectivity; (2) the emergence of business analysis, capabilities, and intelligence; (3) the occurrence of new forms of interaction between humans and machines; and (4) improvement of digital transfer instructions to the physical world, such as robotic and 3D printing

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(Lee J et al., 2013). This phenomenon can be regarded as a revolution because it has a major impact on the world's ecosystems and can significantly improve the quality of life. According to report study of forty-six countries by the McKinsey Global Institute, predicted that the industrial revolution 4.0 will eliminate eight hundred million jobs worldwide from now to 2030 because they are replaced by robots (Manyika J et al., 2017). It can be a big threat to Indonesia, which has a relatively high productive age population. This is the main problem to be discussed on this paper.

Many challenges arise in the era of the industrial revolution 4.0, as well as opportunities. These challenges include (1) industrial readiness, (2) reliable workforce, (3) ease of socio-cultural arrangements and (4) diversification and job creation. Meanwhile the opportunities are (1) ecosystem innovation, (2) competitive industrial base, (3) investment in technology, and (4) integration of Small and Medium Enterprises (SMEs) and entrepreneurship. Responding to these challenges and opportunities, the fifth Basic Plan of Science and Technology adopted by the Japanese cabinet has already been released an anti-thesis known as "**super-smart society**" or society 5.0 in April 2016. In the digital era, humans try to simplify the problems that arise and make things more meaningful through systems and technology. As written in the Keidanren (**Japanese Business Federation**) report, the concept of society 5.0 is a continuation of the previous four stages of society, namely hunting and gathering (society 1.0), agricultural (society 2.0), industrial (society 3.0), and information (society 4.0). Through society 5.0, artificial intelligence will transform big data collected through the internet network from all aspects of life (Internet of Things/IoT) into a new wisdom concept resulting from the convergence between the physical and virtual world. The practice of industrial revolution 4.0 is considered to have big potential to degrade human roles. Society 5.0 is expected to be able to solve social challenges and problems by utilizing various innovations born from the industrial revolution (Keidanren, 2021) The development of innovation in the future digital world will be implemented in all business sectors and various professions,

including accountants which will be discussed in depth by researchers.

Since the corona pandemic has spread throughout the world, there were a lot of changes and adjustments in overall country policy. It forced the public, especially people who were doing business to change their business system towards digital for the uncertain condition which known as digital disruption. Quoted from CNBC Indonesia in June 2020, the Minister of Communication and Informatics, Johnny G. Plate stated that Indonesia is currently facing the challenge of a "**digital skills gap**", such as a condition where the need for skilled workers in the digital field is still not fulfilled. In fact, digital talent, both hard skills and soft skills are needed to support business development today and in the future. The combination of hard skills, such as Artificial Intelligence, Internet of Things, Big Data Analytics, Cybersecurity, Cloud Computing, Machine Learning, and so on cannot be separated from soft skills known as 4C, they are Critical Thinking, Creativity, Collaboration, and Communication. Therefore, starting on 2018 the Ministry of Communication and Informatics collaborated with global technology company, local start-ups, professional and academics associations to provide training programs to facilitate these talents in upskilling (improvement of existing skills) and reskilling (new skills training) (Kominfo, 2021).

Based on Oesterreich and Teuteberg, the rise of big data has led to an obvious shift in the competence profile expected from the controller and management accountant (MA). Business analytics competences and information technology skills are considered a "must have" capability for the management accountant (Oesterreich & Teuteberg, 2019). Likewise, Mulyadi wrote that the shifting role of management accounting profession has demanded a radical change on the core competence of the profession (Mulyadi, 2001). It has responded strategically to change, in order for accountant profession adapted to the new environment. They stated the same opinion in line with the focus interest point of this research. In this study, researcher was intense to discuss the shifting roles of accountant which affected by technological innovation. It gave new birth to

field of work, so did accountant need to expand their capabilities in order to fulfilled their work roles.

### Methodology

According to Horngren, accounting is part of an information system that function to measure business activities, process data into reports and communicate the results to decision makers (Horngren, 2017). From this understanding, it can be concluded that accounting produces important information for users to read reports on the results of business activities so that they can provide good advice for the development of a business. Accounting science will continue to innovate along with new theories that emerge and develop from research results. According to Ries, innovation accounting is the process of defining and measuring innovation in an organization, especially when we're still creating and testing ideas, we need non-financial indicators to reach success. That is the reason why every modern organization needs innovative accounting in addition to traditional financial accounting (Ries, 2001).

The development of technology and automation brought by the current of the 4.0 industrial revolution gave birth to continuous innovation. Innovation that occurs on a large scale is like an explosion that will suddenly make a lot of fundamental changes occur in the system, namely switching to using new ways. In his book, *Great Disruption*, Francis Fukuyama writes that the radical development of information technology is seen as a disruption (Fukuyama, 1999). Merriam Webster defines disruption as the process of disrupting something such as an interruption in the normal course of or the continuation of some particular activity. The era of disruption can certainly bring opportunities as well as challenges for every existing institution and individual ([www.merriam-webster.com/dictionary/disruption](http://www.merriam-webster.com/dictionary/disruption)).

Based on US Bureau of Labor Statistics (BLS), jobs as accountants and auditors are projected to increase by 10% between 2016 and 2026. The future of accounting profession is very promising and is growing rapidly with the rise of technology. Forbes wrote that many companies are already using basic automated

accounting processes. The performance of the accounting system is assessed as the completion of a repetitive work system and is now capable of being simplified by machines. In the future humans will handle more critical data analysis to meet client needs. Lazanis wrote eight things regarding the future of accounting, namely as follows (1) automation is front and center, (2) new skills required, (3) emerging business models in accounting, (4) jump on the client accounting services train, (5) google reigns supreme for client acquisition, (6) changing client experiences, (7) decreases stress in accounting life, and (8) compliance services far from dead (Lazanis, 2020). In addition, IFAC (International Federation of Accountants) also wrote in its publication articles about Future Fit-Accountant Roles, namely (1) Adaptive Cycle is a way to learn complex adaptive systems, regarding professional accounting and finance, to be able to adapt to a changing environment that can eventually transform for future relevance; (2) Eliminate the role of manual-based accounting to new value-added things. This role can be in the form of a "growth" area that is built on an important area in the present, a "germination" area that is critical, and a "conservation" area that involves the fundamental foundation role to become a professional accountant. (3) The adaptive cycle led IFAC to identify seven key roles as a professional accountant to maintain relevance and increase contribution to becoming a strong, sustainable organization in the economy and financial markets. (4) Professional accountants in smaller organizations may be able to perform many roles that are not always exclusive (IFAC, 2019). The examples of shifting in the role of future accountants, such as moving in business as Co-Pilot, Navigator, Brand Protector, Storyteller, Digital and Technology Enabler, Process and Control Expert, also as a Trusted Professional.

Neuman divides the concept of research methodology into three research objectives, namely descriptive, exploratory, and explanatory purposes (Neuman, 2014). Researcher used the qualitative approach with explanatory method to analyze this study. Qualitative methods can be best understood as "data enhancers". When data is enhanced, key aspects of a

case can be seen more clearly. Explanatory research has the main objective to explain why a phenomenon occurs and to build, describe, expand or test the theory. This research has the potential to give birth to an antithesis or a finding that may contradict a previously existing theory. It aims to explore the phenomenon in depth to find the source point. Because this research is an explanatory snowball in its data collection, researchers need to be wise in determining the scope of research.

The main research questions of this study are as follows, **“How is the process of shifting the role of accountants in the era of digital disruption?”** Research data is collected from a lot of literature reviews, some observations and daring interview to find more objective data and insightful opinion. Referring to the main research question, the writer elaborates it into several mini research questions which serve as supporting tools to complete the answer as follows, (1) how does the practice of industry 4.0 affect the shifting of profession and competencies of accountants? (2) How do accountants respond to changes in their professional roles so that they can become adaptive individuals in the era of digital disruption? (3) What are the implications of the future accountant roles after experiencing digital disruption? It's a futuristic research design about the scope of business and profession, especially accountant, which is led to a significant change in its fundamental and functional roles.

Based on central bureau of statistics data in first semester of 2020, several observed business fields still be experiencing positive growth in this pandemic era, such as information and communication sector by 10.35 percent, health services and social activities by 7.01 percent, also financial services and insurance by 5.87 percent. But another business sectors in Indonesia experienced a drastic decline in income as a result of the corona outbreak. However, the impact of the pandemic has made the scope of business and profession undergo many changes and adjustments due to the closer collaboration with technology. This phenomenon finally forces business people to evaluate and anticipate their business in order to survive in the market.

The focus of research object is several different accounting professions, namely management accountants, public accountants and educator accountants. It is assumed that the role of accountants will largely be replaced by increasingly sophisticated software and digital technology. Therefore, it important for accountants to continue to innovate and add new insights about the integration between accounting practices and technology so that they can survive in the era of digital economy. The purpose of this research is wanted to know the extent to which the accounting profession is able to adapt to future technological developments in the era of digital disruption and how to prepare these resources in business. Just as companies that are unable to adapt to the industrial revolution 4.0 will be constrained in their operations and relationships with customers, in terms of optimizing profits and the continuity of their performance going forward, so the accountants required to be agile-learners so that they can survive to face the changing business climate and technological developments in the digital era.

Opportunities and challenges emerge for the accounting profession and the development of accounting science as a business in the future. Most of the accounting functions will be taken over by digital technology in the era of information society with various accounting software development and big data processing that is carried out automatically with the help of Artificial Intelligence. Thus, in the future, whether the accounting profession will disappear or continue to exist is a big question that is interesting to study. Like several professional fields during the pandemic which were trimmed to reduce the operational costs of the company, will the accounting profession also disappear or vice versa can still exist in a new way. This phenomenon is the cause of the emergence of continuous innovation which is directly experienced by many professional business including accountants.

Several data collection methods commonly used by researchers are document analysis, observation and interviews (Soeherman, 2019). The literature study method is used by researchers to observe more deeply about the development of the latest accounting innovations.

From document analysis, researchers can find out the development of accounting science and the direction of its innovation towards the future of digital economy era. Then the author adds data from several sources through the Q&A method for several accounting professions. The author also tries to complete the research data by observing several companies that apply digital technology developments in their business performance and also organizations where certified accountants and institutions use accounting practices and technology in their operations.

Initiated by the German government in 2011, the idea of the fourth industrial revolution emerged for the first time at the 2011 Hannover Messe industrial trade fair. Written by Pfeiffer, this discourse on the vision of the future was finally raised by public awareness at the World Economic Forum meeting in Davos which was held with the motto "Mastering Fourth Industrial Revolution". The industrial revolution 4.0 is a combination of intelligent technology that blurs the boundaries between the physical, digital, and biological fields that support the computerization of manufacturing (Pfeiffer, 2017). Herman et al. describe four design principles of Industry 4.0. First, interconnection is the ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of Things (IoT). The first principle requires standards, collaboration and security. Second, information transparency, which is the ability of information systems to create virtual copies of the physical world, namely enriching digital models with sensor data, including data analysis and information provision. Third, technical assistance which includes (a) the ability of the assistance system to support humans by combining and evaluating information consciously to make the right decisions and solve urgent problems in a short time; (b) the ability of the system to support humans by performing tasks that are unpleasant, overly exhausting or unsafe; (c) includes visual and physical assistance. Fourth, decentralized decisions which is the ability of virtual physical systems to make their own decisions and carry out tasks as effectively as possible (Hermann et al., 2016). The main pillar of implementing the Industrial Revolution 4.0, of

course, digital-based technology that helps accelerate industrial performance in various fields. The pillars of technological innovation discussed are Internet of Things (IoT), Big Data/Data Analytics, Virtual/Augmented Reality, Cyber Security, Artificial Intelligence, Robotic Process Automation, Machine to Machine (Integrated System), Additive Manufacturing (3D Printing), and Cloud Computing. The World Economic Forum articles also stated that the industrial revolution 4.0 also has the potential to increase global income levels and improve the quality of life for people around the world. Digital technology makes it easier for long-distance selling and buying transactions, making payments, playing games, and so on. Future technological innovations will also be able to reduce transportation and communication costs, global logistic and supply chains will become more effective, trade costs will be reduced, and many new markets will emerge that can drive economic growth. But at the other hand globally, Andrew McAfee and Erik Brynjolfsson in the era of digital industrialization eroded the number of available jobs because of the replacement of humans with machines (Brynjolfsson, McAfee, 2014). Automation displaces almost the entire workforce, thereby exacerbating the gap between returns on capital and returns on labor. But shifting of the workforce to digital technology will result in a net increase in safe and rewarding work. The challenge faced by society is how human resources can adapt and cooperate with the help of technology.

After the industrial revolution 4.0 brought the digital transformation to the industrial market with a smart manufacturing system, the next concept of society 5.0 emerged which was initiated by Japan. As Shinzo Abe's speech, former prime minister of Japan, at The World Economic Forum in January 2019, defined society 5.0 as a vision to create a future society that humanizes humans through economic and technological progress by solving social problems using the system that integrates physical space and cyberspace ([www.weforum.org/agenda/2019/01/abe-speech-transcript/](http://www.weforum.org/agenda/2019/01/abe-speech-transcript/)). In the last proposal of Keidanren (Japan Business Federation) redefined society 5.0

as an “Imagination Society” where digital transformation combines creativity to realize problem solving and new value creation ([www.weforum.org/agenda/2019/01/modern-society-has-reached-its-limits-society-5-0-will-liberate-us/](http://www.weforum.org/agenda/2019/01/modern-society-has-reached-its-limits-society-5-0-will-liberate-us/)). This concept can contribute to the achievement of the Sustainable Development Goals (SDGs) adopted by the United Nations. The community is expected to be able to exercise a rich imagination to identify various needs and challenges in society, as well as creativity to realize solutions using technological and digital developments. **If the focus of industry 4.0 is on industrial development, the focus of the concept of society 5.0 is on changing the way of human life.** The presence of anti-thesis concept of society 5.0 is expected to change this perception and shift the function of technology to assist human performance in various fields including accounting profession. Humans, objects and systems are all connected in cyberspace, then the optimal processing of AI that exceed human capabilities is

given feedback to the physical space. In facing the era of society 5.0, education plays an important role in improving the quality of human resources because humans are required to produce faster solutions to meet their needs. Therefore, students are required to behave and have a forward mindset following the times, dig up information and create new innovations to support their survival in the future. Readiness and thinking ability HOTS (Higher Order Thinking Skills) is very useful to minimize the gap between mindset and the development of digital technology orientation later. This trend shows a change in mindset where every change that occurs will bring new opportunities. If these opportunities can be executed properly, a better society will be created. Industry 4.0 and society 5.0 at this first glance look the same but there are some fundamental differences. The difference between these two concepts will show in Figure 1.

Industry 4.0 (Germany)	Society 5.0 (Japan)
2011	2016
Smart Factory	Super Smart Society
Focuses on manufacturing	Focus on society as a whole
Emphasizes and focuses on how work can be done automatically	Emphasize how to optimize responsibilities for working hours
Highlights the effectiveness of using automatic machines	Highlights the effectiveness of optimizing human labor for advanced machines and technology
Communication can be computerized in various ways	Focused on making works easier with smart and sophisticated machines or technology

Figure 1. The Difference between Industry 4.0 and Society 5.0

## Results and Discussion

The researcher tries to explain the research data obtained in the form of primary and secondary data. Primary data is the original data collected by researcher specifically in answering research questions, while secondary data is data sourced from company records or other sources. The two main focus points of this research are how industry 4.0 practices affect business, especially the shift in the profession and competence of accountants. The next

researcher's highlight is how accountants are able to become adaptive individuals to face the era of digital disruption.

The World Economic Forum wrote the three main areas affected by the 4.0 industrial revolution are business, government, and human resources. (1) The digital technology produced by the 4.0 industrial revolution does have a big impact on business, but the acceleration of innovation and the speed of disruption that is difficult to anticipate due to the creation

of new technology is a big surprise for companies. For both businesses and end-users, the customer becomes the epi-centre so that all factors will be related to customer satisfaction. Customers achieve satisfaction when the value of a product and service can be increased by the presence of digital services. New technologies make assets durable and resilient, while data and analytics change the way they are maintained. Meanwhile, customer testimonials, database services, and asset performance through analytics, require new forms of collaboration, especially considering the speed with which innovation and other disruptions occur also the emergence of global platforms and other business models that ultimately make talent, culture and organizational form worth rethinking. Overall, the inevitable shift from simple digitization towards innovation based on a combination of technologies is forcing companies to re-examine the way they do business. Leaders need to understand the changing environment around them, challenge assumptions that might limit their operations and continuously innovate. (2) Government is gaining new technological power to increase control over populations based on widespread surveillance systems and the ability to control digital infrastructure. Overall, governments will face pressure to change their approach to public and policy-making engagement, as their central role in policy-making is diminished by new competition, redistribution and decentralization of power made possible by new technologies. The ability of government systems and public authorities to adapt will determine their survival. If proven to be able to embrace disruption and able to subject their structure to a level of transparency and efficiency, it will enable them to maintain their competitive advantage. However, if regulations do not develop, the problems faced will increase. Decision makers have time to study the specific problem and develop the necessary responses according to the appropriate regulatory framework. The "top down" approach is considered unable to overcome the challenges of the unprecedented pace of changes and impact of the industrial revolution 4.0. Then the government set up agile governance in order to attract cus-

tomers interest, just as the private sector is increasingly agile in adopting software developments and business operations in general. Regulators must be able to continuously adapt to a rapidly changing environment, reinventing their own innovations so that they can truly understand what they are regulating. To do so, governments and other agencies need to work closely with business and civil society. (3) The industrial revolution 4.0 not only changes what we do but also affects various things related to our identity, such as our sense of privacy, ownership of ideas, our consumption patterns, the time we use to work and relax, how to develop our careers and skills, meet people and maintain relationships. It leads us to the endless enlargement of the human being. The inevitable integration of technology in our lives can reduce our classic human capacities such as compassion and cooperation, for example the high intensity of smartphone use can make people lose an important asset in life, such as human interactions. The greatest individual challenge arising from new information technologies is privacy. Instinctively privacy is important, but tracking and sharing information is also an important part of the new connectivity. The revolution with the use of artificial intelligence will redefine what it means to be human by pushing the boundaries of current life span, health, cognition, and abilities, will force us to redefine moral and ethical boundaries ([www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/](http://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/)).

Christensen in the Harvard Business Review article explained about Disruptive Innovation. Disruptive companies distribute new products in a different way due to advances in digital technology. This opportunity is sometimes used by the entrepreneurs to enter the market and meet customer needs with the convenience offered so as to create new markets for a product, lower gross margins, smaller target markets, also simpler products and services. Likewise, the accounting profession must always be up-to-date with the latest business trends and regulations to be able to answer the needs of users in business, especially management accountants. There are four important

points about disruption that are often overlooked by executives, including (1) disruption is a process, (2) disruptors tend to build very different business models than the old business model, (3) not all disruptive innovation models are successful, (4) and the last is choosing between “disrupt or be disrupted” (Christensen, 1997).

The success of digital transformation made by an organization or company is closely related to the decisions made by leaders and has an impact on the success of their employees, customers, and business colleagues. Digital transformation occurs in almost all businesses and professions including the accounting profession because of innovation. Researcher focus on one point to be discussed in more detail, which is technological innovation. In technological innovation, there are several key issues of the latest technological trends developed in the era of digital disruption as the results of industry 4.0 practices, including the nine pillars of technological innovation as below.

### ***Internet of things (IoT)***

IoT surrounds us with intelligent web-connected networks, devices and services that have the ability to sense, connect, infer and act (Siegel et al., 2018). IoT enables sensors and actuators connected to computers to facilitate new products and services by reducing costs, increasing efficiency, and increasing the usability of existing systems. Three important things that become business priorities in building an IoT architecture are privacy and security, resource efficiency, and foundational architectures. IoT connects many private and high-value platforms which in their implementation brings great opportunities and significant risks to privacy and security. Privacy challenges revolve around data ownership and data sharing policies. Data leaks due to data sharing policies are easier to deal with but security vulnerabilities present a potentially more dangerous threat because the devices used are connected to each other. Therefore, it needs data authentication, attack resilience, and access control as security approaches that are applied to conventional networks before IoT is applied. The connected system must be optimized for the efficiency number of input resources in terms of

battery which refers to system power consumption and energy efficiency, bandwidth refers to limiting the data sent to reduce system operating costs, bytes refer to simplifying the amount of data that needs to be stored, and computing describes processing required in a constrained node. Some common architectural approaches that are usually used by connected systems, including (1) direct, (2) hub, and (3) cloud. In direct connectivity, applications connect and control system sensors and actuators directly. Whereas in the use of hub connectivity, data requests and control commands pass through the master node which is able to translate and moderate the flow of information. Then the cloud system architecture reflects one or more devices/systems that store information centrally for many purposes.

### ***Big Data/Data Analytics***

Big data refers to the definition of data volumes that are so large and difficult to manage using traditional methods. Valid data is needed to prepare budget plans, make policies and execute it to obtain effective results. There are several types of data, such as structured data which is a company database which has been organized and can be processed with effective data analysis, unstructured data which is heterogeneous data such as a combination of text files, images, videos, etc., so that it becomes a challenge for companies in data processing, and semi-structured data which is data processed and analyzed with the help of metadata tagging that can capture useful information. The five main steps for optimizing big data work are established a big data strategy, identify sources of big data, access, manage and store data, data analysis, and make decisions based on data. The rise of big data has led to a shifting profile competence of accountant, such as business analytics competences and information technology skills considered a “must have” capability for the accountant and financial controller profession (Oesterreich & Teutenberg, 2019).

### ***Augmented Reality/Virtual Reality***

Generally, both Augmented Reality (AR) and Virtual Reality (VR) technologies aim to stimulate the user's perception and senses so



that they are able to feel they're in an "other world" and interact in it. The difference is VR presents users in a virtual world and AR brings virtual effects to the real world. Because it is a new digital transformation, connected devices for this technology with certain specifications are classified as luxury goods among the people and are only used for certain industries. However, it is possible that in the future in the form of simpler applications, software and devices, the wider community can enjoy this technology to simplify their business and professional performance. Augmented Reality, Virtual Reality, even Mixed Reality are new ways for the digital community to interact, both in business and profession (Kiger, 2020).

### **Cybersecurity**

These fields of cybersecurity are interrelated and has the common goals of protecting the confidentiality, integrity and availability of information, however there are some subtle differences between them, primarily in the approach to the subject, the methodologies used, and the areas of concentration. Protecting confidential information is a business requirement, and in another case also an ethical and legal environment (Okerefor, 2008). The increasing frequency of traffic in the digital world also triggers an increase in digital risks and threats so that it requires vigilance and determination to react to the ever-evolving cycle of risk. Several types of cyber-threats are countered by cybersecurity, such as (1) cybercrime which includes single actors or groups targeting systems for financial gain or causing disruption; (2) cyber-attacks often involve gathering politically motivated information; (3) cyberterrorism is intended to damage electronic systems causing panic or fear. Digital technology innovation is not only developing in terms of software, hardware and applications but also threats. Some of common methods that are usually used to threaten cyber security including malware, SQL injection, phishing attack, man-in-the-middle attacks, denial-of-service attacks. Also, the latest types of cyberthreats that need to be watched out for by both individuals and organizations, including dridex malware, romance scams, and walmare emotet. To protect against cyberthreats, some of the steps

that businesses and individual professions need to take are as follows, (1) update software and operating system to take advantage of the latest security patches, (2) use antivirus software to detect and remove threats and ensure that antivirus software is always updated, (3) use a strong password that is not easy to guess, (4) do not open email attachments from unknown senders as they may be infected with malware, (5) do not click on email links from unknown senders or websites. This is a common way of spreading malware, (6) avoid using wi-fi networks in unsafe public places which can make the device vulnerable to man-in-the-middle attacks.

### **Artificial Intelligence (AI)**

The terms AI and Cognitive Computing are often used interchangeably among people who are new to the technology industry. AI is a simulation of human intelligence processes carried out by machines including studying constantly changing data, reasoning to understand data and self-correction mechanisms to make decisions. Therefore, AI includes (1) simulation of the human senses, namely sight, hearing, smell, taste, and touch, (2) learning and processing simulations, namely deep learning and machine learning, (3) simulation of human responses, namely robotics. AI applications include problem-solving, game playing, natural language processing, speech recognition, image processing, automatic programming, and robotics. While cognitive computing is individual technology to perform specific tasks that facilitate human intelligence. Cognitive computing refers to (1) understanding and simulating reasoning, (2) understand and simulate human behavior, so that the daily use of cognitive computing systems can make better decisions at work. Cognitive Computing applications include speech recognition, sentiment analysis, face detection, risk assessment, and fraud detection. AI improves human thinking to solve complex problems and focus on reflecting reality and delivering accurate results. But cognitive computing focuses on imitating human behavior and reasoning to solve complex problems (Wu J, 2019 & towardsdatascience.com).

### ***Autonomous Robot/Robotic Process Automation (RPA)***

RPA technology is changing the way of the world does work. RPA is a software technology that makes it easy to create, deploy, and manage software robots that mimic human actions to interact with digital systems and software. Just like humans, robotic software can also understand what is on the screen, complete the correct execution of buttons, navigate the system, identify and extract data, and perform various pre-programmed actions. Robot software performs repetitive and low-value work such as logging into applications and systems, moving files, folders, extracting, copying, inserting data, filling out forms and completing report analysis on a regular basis. Advanced robots are even capable of performing cognitive processes such as interpreting text, engaging in chat and conversation, understanding unstructured data, and applying advanced machine learning models to make complex decisions. When robots perform these types of repetitive, high-volume tasks, humans focus on what needs to be done better, namely innovating, collaborating, creating and interacting with customers. Companies are also getting a boost to higher productivity, efficiency, and resilience. Many business benefits can be obtained from optimizing the overall use of RPA in industrial areas, including the following (1) accelerated transformation, (2) major cost saving, (3) greater resilience, (4) higher accuracy, (5) improved compliance, (6) boosted productivity, (7) more value from personnel, (8) happy employees. Walker, a CEO of and co-founder of Waypoint Robotics wrote about the key components of autonomous robot that crucially includes three main concepts, namely perception which for robots means sensors, then decision which means decision making structure on the information received, and actuation which is based on information received, and actuation which is based on information received, and actuation is an actuator that converts energy into motion (Walker, 2021). RPA helps to increase the efficiency of the business process and to reduce human errors and costs (Cohen et al., 2019). RPA refers to the automation of repetitive, structured, rule-based tasks and can be considered as a type of software that mimics

the activity of human being in performing tasks within process. RPA made repetitive operations faster and more accurate, managing to free people from a large volume of work. It's usually very useful in audit term (Osman, 2019).

### ***Integrated system (Machine to Machine)***

Machine to Machine (M2M) communication is used to describe any technology that allows networked devices to exchange information and perform actions without manual human assistance. AI and ML (machine learning) facilitate communication between systems and allow them to make their own choices. M2M is the foundation of IoT that was first adopted in manufacturing and industrial settings where technology can control data from remote equipment. These M2M applications translate data that can trigger pre-programmed automatic actions. In addition, the key benefits of M2M include (a) a cost reduction by minimizing equipment maintenance and downtime, (b) increase revenue by revealing new business opportunities to serve products in the field, and (c) improve customer service by proactively monitoring and repairing equipment before it breaks down or only when needed. M2M system standard requirements according to ETSI (European Telecommunications Standards Institute) include (a) scalability, (b) anonymity, (c) logging, (d) M2M application communication principle, (e) shipping method, (f) message transmission scheduling, (g) the selection of message communication lines delays when other lines exist and network costs. The M2M application system has been widely applied in digital business and we can find the form of the device/application in our daily life, such as vending machine, smart home systems, remote-control software, etc. Machine-to-machine (M2M) communication is a promising technology for next generation communication systems. M2M communication finds application in wide areas, such as smart home, e-healthcare, intelligent transportation systems, environmental monitoring, smart cities and industrial automation (Verma, 2016).

### **Additive Manufacturing (AM)/3D Printing**

AM also known as 3D printing, is the process of building items by combining layers of material from a CAD file that dramatically changes the face of the industry. In theory, AM and 3D printing describe the same process. In practice, however, there are situations in which one term is preferred over the other, depending on the scale and accuracy of its use. The object is built layer by layer using different materials such as polymers, composites, ceramic pastes, and metals depending on the needs of using digital computer data. Additive Manufacturing is more inclusively associated with industrial applications, such as mass production of components. The term “direct manufacturing” has been used to highlight tool-free AM processes because objects are printed directly from CAD data. CNC (Computer Numerically Controlled) machine tools are revolutionizing many manufacturing processes through digitization. While the understanding of 3D printing is the process of building a one-thin-layer-at-a-time. Basically, it is more additive than subtractive. For many, 3D printing is the single object production that often adorns desktop printers. For 3D printing, initially the market focused more on consumer intentions than industry values. The development of 3D printing has evolved from the creation of new items to rapid prototyping production. Additive manufacturing can be considered as a supplement to conventional production technologies. In some cases, it is the only means through which complex products can be fabricated or a solution to cost-effective upscaling of production capacity at low risk in order to serve new verticals, new geographies, and offer new products which need testing. The AM techniques offers several advantages that optimize and transform both products and processes, and may result in unprecedented and significant business value (de Kok, 2015).

### **Cloud Computing**

Cloud computing is a change from traditional business ways of thinking about technology resources. In simple terms, cloud computing is defined as computing services including servers, storage, databases, networking, software, analytics and intelligence via the internet

(“cloud”) that offer faster innovation, flexible resources, and economies of scale. Users typically only pay for the cloud services they use, helping to lower operating costs, run infrastructure more efficiently, and adapt to the scale of business changes. Microsoft listed several reasons that make business organizations make decisions to use cloud computing, including cost, speed, global scale, productivity, performance, reliability and security. Several types of cloud computing have developed with different services, such as public cloud, private cloud, and hybrid cloud. Public clouds are operated by third-party cloud service providers who send their computing resources, namely servers and storage, over the internet. Private cloud refers to cloud computing resources that are used exclusively by a business or organization whose service resources and infrastructure are managed in a private network. Hybrid clouds combine public and private clouds tied together by technology that allows data and applications to be shared between them. Hybrid clouds provide businesses with greater flexibility, more deployment options, and help optimize infrastructure, security, and compliance. Cloud computing technology is easy to adopt with simple architecture. It drastically lowers capital investment levels for hardware and software in small and medium size companies. The cost of deploying software such as customer relationship management (CRM), enterprise resource planning (ERP), accounting applications on the premises is expensive. It will be more cost-effective if we have these applications in the cloud. The advantage of using cloud for small businesses is they do not pay for the resources they have not used (Attaran & Woods, 2018).

In addition to technological innovation, resources in an organization or company also need to be equipped with five business skills. It must be possessed by organizational resources for career development towards the next level are understanding of economics, data analysis, financial accounting, negotiation, and management. The accounting profession is required to be an adaptive person in building relationships, communicating effectively, having problem solving skills, innovation, and the ability to utilize data and technology. IFAC writes the future-fit accountant roles consisting of four

stages in the form of an adaptive cycle, namely (1) germination, (2) growth, (3) conservation, and (4) creative destruction. The adaptive cycle is a way to explore how complex adaptive systems can adapt to a changing environment and ultimately transform for future relevance. Eliminating the manual-based accounting role provides an opportunity to shift to a value-added role. Using this adaptive cycle, IFAC has identified seven key roles for finance and accounting professionals to maintain relevance and enhance their contribution to strong and

sustainable organizations, financial markets and economies. These roles are divided into leadership, finance, operational and internal audit functions in large-scale organizations, while in smaller organizations professional accountants perform more roles, including co-pilot, navigator, brand protector, storyteller, digital and technology enabler, process and control expert, and also trusted professional. The impact of industry 4.0 to future accountants will show in Figure 2.

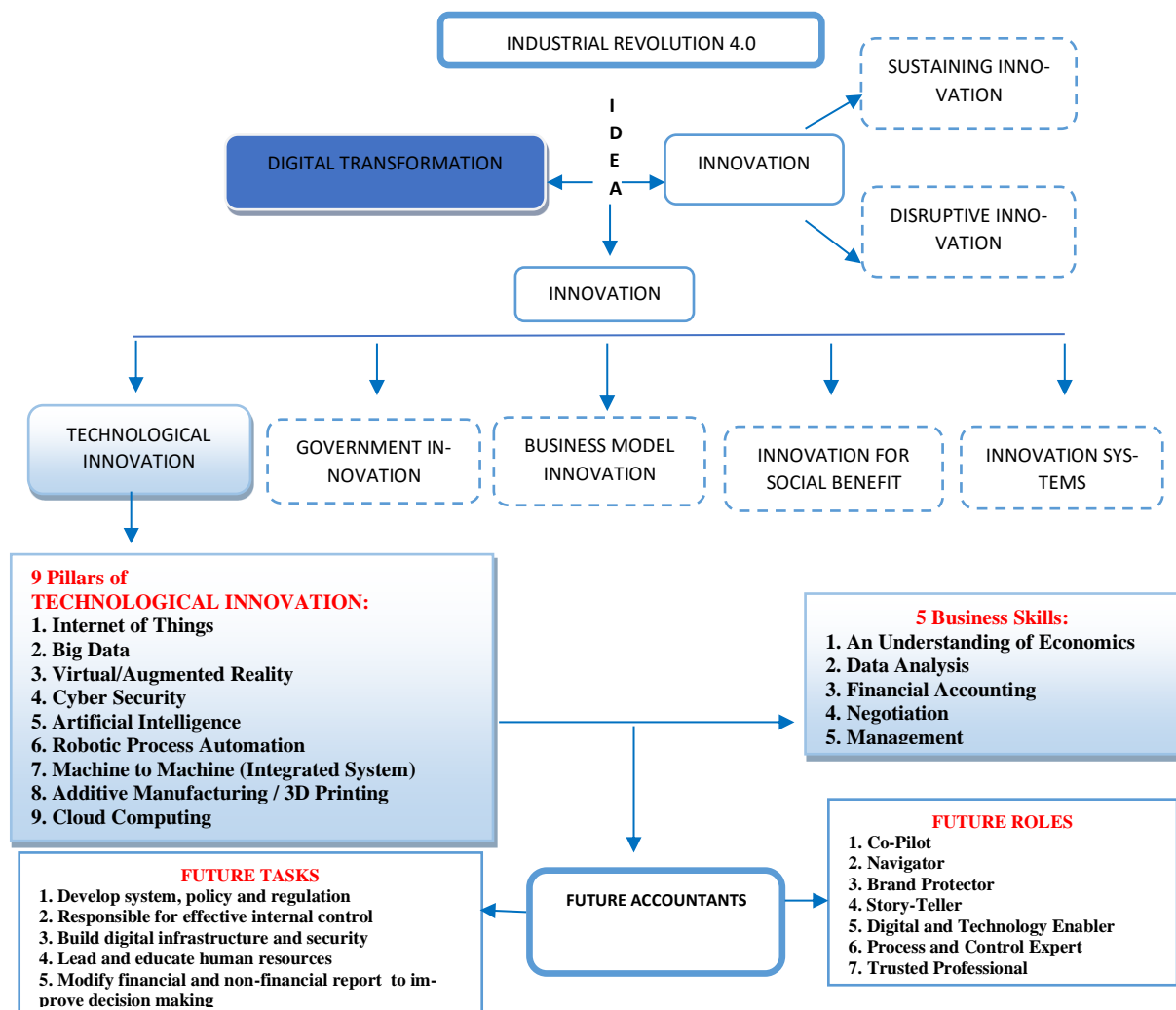


Figure 2. The Impact of Industry 4.0 to Future Accountants

Technological innovation combined with sufficient business skills will assist future accountants in carrying out their duties and functional roles in the era of digital disruption. As written by the researcher in the scheme above,

the description of the shifting in the task responsibilities of the accounting profession in the digital era is described as follows, (1) develop system, policy and regulation, (2) responsible for effective internal control, (3)

build digital infrastructure and security, (4) lead and educate human resource, (5) modify financial and non-financial report to improve decision making. Many innovations have been carried out in assigning accountants from conventional methods to the era of digital disruption, both innovations from the activities of the

accounting profession that have shifted (sustaining innovation) and even drastic changes (disruptive innovation). The era of digital disruption and the future of accountants will show in Figure 3.

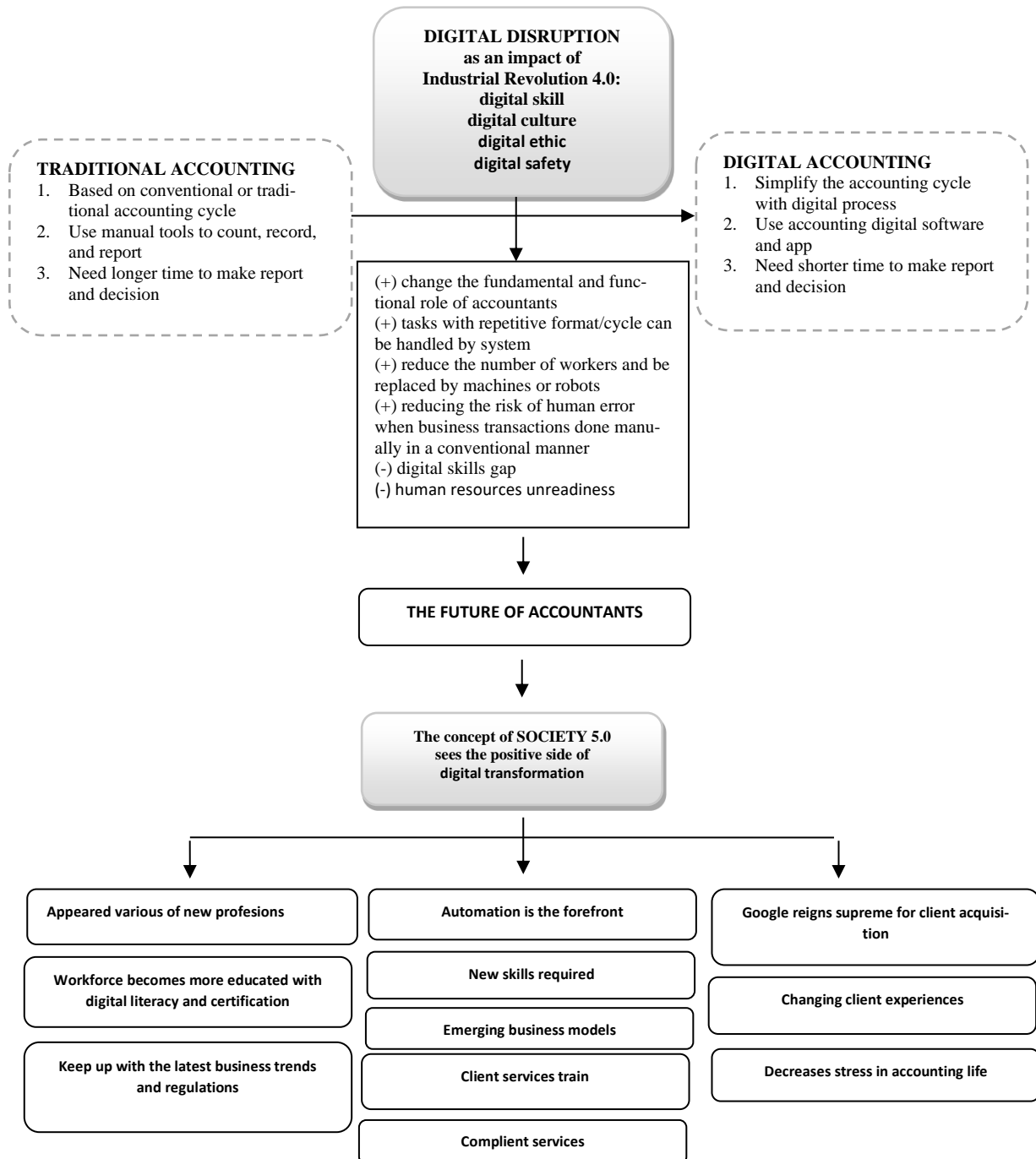


Figure 3. *The Era of Digital Disruption and the Future of Accountants*

The practice of the industrial revolution 4.0 has changed many business concepts towards automation, thereby reducing the frequency of using labour replaced by robots. It has a bad impact because it is inhumane in the opinion of some workers, especially for personnel who have experienced layoffs during the pandemic where businesses are moving to become more digital with various innovations. The antithesis concept of society 5.0, which is a future concept towards an imagination society, is here to see the positive side of digital transformation experienced by industry, business and professions. For example, the emergence of various new professions that can expand employment opportunities, the workforce becomes more educated with digital technology training, and minimizes differences in strata or economic levels because all groups of people should get the same treatment in enjoying products and services. In this case, the researcher discusses that the accounting profession will not lose to the presence of technology, but always has to upgrade itself with new skills and then carry out its professional role along with the creation of digital technology and other innovations. The era of digital disruption occurred as a result of the industrial revolution 4.0 bringing the transformation of the role of the accounting profession from traditional to digital accounting. Then the concept of society 5.0 appeared to take the positive side of digital transformation so that it produced many new things that had an impact on the development of the accounting profession.

The disruption occurs faster than the speed of innovation also allows for an increase in the level of depression of accountants in completing their tasks. It usually happens to management accountants who work in smaller company scales and carry out a wider scope of work. To be able to overcome this matter, accountants must not forget to train themselves with mindfulness skills, namely aligning emotional awareness and thoughts without judging the things that happen around them and acting more carefully and wisely in making decisions. With the development of Artificial Intelligence (AI) in the future, machines and robots begin to interact with human thoughts and emotions, even being able to duplicate the capabilities of

human intelligence. An accountant must be able to have higher order thinking skills that are sufficient in accordance with Bloom's Digital Taxonomy by Benjamin S. Bloom balanced with sufficient emotional and social intelligence to control one-self in all circumstances to produce objective business decisions (Bloom, 1956).

## Conclusion

The industrial revolution 4.0 during the pandemic has made massive innovations and has an impact on digital transformation for the world of professions, business and industry. Various technological innovations have been used to simplify business operational performance as well as existing human resources, including the emergence of many new software and apps designed for business convenience. Armed with four digital principles that are upheld, namely digital skills, digital culture, digital ethics and digital safety, it can help accountants in the resilience of the sustainability of their profession. The presence of the concept of society 5.0 sees the positive side of digital transformation to simplify problems that arise in the era of digital disruption. After going through several previous research processes, the researcher wrote three important points as follows, such as (1) appeared various of new professions, (2) workforce becomes more educated with digital literacy and certification, (3) keep up with the latest business trends and regulations. Then researcher also agreed with Lazanis which stated eight things regarding future accounting and accountants, namely as follows (1) automation is front and center, (2) new skills required, (3) emerging business models in accounting, (4) jump on the client accounting services train, (5) google reigns supreme for client acquisition, (6) changing client experiences, (7) decreases stress in accounting life, and (8) compliance services far from dead (Lazanis, 2020).

The era of digital disruption made the fundamental role of the accounting profession taken over by systems and software, then added new functional roles for accountants. From the results of research that has been carried out, it shows that the accounting

profession is able to work more effectively and efficiently by transferring repetitive tasks to an integrated system, then taking over the functions of technical and analytical roles related to human resources and business clients. The accountant profession is required to be an agile learner who enriches skills with the aim of managing creativity and reasoning so as to be able to create infrastructure, platforms, and digital software that can control automation in business. The functional role of the accounting profession is increasing, not only in terms of proficiency in financial reporting systems, but especially in strategic business analysts with the help of business intelligence as the basis for making business decisions. Likewise protecting the company and the people in it should be a priority. As technology advances, the risk of security breaches also increases. Keeping financial data and confidential information safe and secure should always be a top priority for any business.

This research is limited to the focus of shifting the accounting profession in the era of digital disruption, but does not limit the existence of other professions that have undergone changes due to digital transformation and innovation. This study seeks to provide confidence for accountants that their profession is an important position in business and organization, so that it will not be lost to time. The accountants will only experience adjustments and additions to its fundamental and functional roles related to other branches of science. The author also hopes that this research can give new insight for everyone who reads the results of this research, especially future talent accountants to upgrade skill and equip themselves continually with certification as complement to public confidence in their competencies in carrying out their roles and functions as accountants. Thus, this research can provide insight for science and further research about the future of accountants.

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