

The Role of Information Technology in Supporting Accountant Profession in the Era of Industrial Revolution 4.0

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Abstract. The purpose of this study is to identify the role of information technology in supporting the accountant profession in the era of Industry 4.0. The method used in this study is a descriptive analysis. The results of this study indicate that information technology through the application of digital data technologies such as the Internet of Things, AI, Cyber-Physical Systems in the industry helps accountants in carrying out their work in the Industrial 4.0 era. The study provides an understanding, advice, and recommendations to the accountant profession about how information technology in Industry 4.0 works, helps the tasks undertaken by accountants, and directs the capabilities that accountants should have in facing the Industry 4.0 era. The research enhances the prior works in the area of accountant's tasks, not a job by discussing ways of how information technology could support tasks of accountants in the era of industry 4.0. Since the world is moving towards the industry revolution 4.0 (IR 4.0), many technological infrastructures have been developed. Hence, a new study discussing these new states of the art is needed to ensure the competence of accountant's to-do their jobs. This is important to satisfy the new needs of the industry due to the emerging IR 4.0. This study only discusses the role of information technology as a supporting tool for the accountant. Our next research will further discuss the role of the accountant in industry 4.0.

Keywords: *industry 4.0, information technology, digital technology, digital economy, big data, cloud computing*

1 Introduction

The presence of the fourth Industrial Revolution (often referred to as Industry 4.0) is predicted to be the most powerful driver of innovation over the next few decades, which triggers the next wave of innovation. Various applied technologies in Industry 4.0 emerged, including advanced robotics, artificial intelligence, internet of things, virtual and augmented reality, cyber-physical systems, additive manufacturing, and distributed manufacturing. The use of this technology is changing business processes and business models that are applied in various industries (Ibarra et al., 2018). Basically, the main concepts of Industry 4.0 are digitalization, optimization, and personalization of production, automation and adaptation, human-machine interaction, value-added services, and automatic data exchange and communication. The full integration of information, communication technology, and automation technology in future factories in Industry 4.0 is implemented with the aim of increasing productivity, efficiency, and effectiveness of operations in each value chain and production process. The concept of Industry 4.0 is an industrial process for adding value and knowledge management (Ślusarczyk, 2018) (Weyer et al., 2015) (Paprocki, 2016).

In the Industrial 4.0 era, the development of digital technology increased and penetrated various fields of industry. This development provides opportunities as well as challenges in the economic, social, technical, environmental, political, and regulatory fields (Hecklau et al., 2016). The world economy has changed because of the great development and application of this technology. The integration of information and communication technology in this era creates opportunities for the growth of the digital economy. How economic values are created changes fundamentally in the digital economy. In the digital economy and business activities are carried out digitally through the internet and web-based markets (Zimmermann, 2000) (Berisha-Shaqiri, 2015)

The Indonesian Ministry of Research, Technology, and Higher Education states that the 4.0 industrial revolution brought changes to the adjustment of work done by humans, machines, technology, and processes in various fields of the profession, including accountants. Gerd Leonhard, a futurist, stated that the threat of the digital era is that the globalization era will eliminate around 1 - 1.5 billion jobs during 2015-2025. This loss of work is due to the replacement of work that was originally done by humans with automatic machines. Therefore the way of working and accounting practices must be changed to improve service quality and global expansion through online communication and the use of cloud computing. Cloud computing and big data for accounting

data are needed in the era of the digital economy. In the era of the digital economy, the volume of information will continue to grow and require cloud computing as its infrastructure (Farianto, 2015).

The role of accountants in the era of the digital economy will change. In the era of the digital economy, the role of accountants has shifted from recording transactions to financial analysis. Accountants must be aware of the development of emerging information technology and strive to continue to improve capabilities through the development of information technology. They can continue to survive in this digital economy era. Accountants must be able to understand the support of information technology in supporting their profession in the digital age. This understanding will direct accountants in learning the technology needed.

Based on the problems as mentioned above, the researchers are interested in investigating the role of information technology in supporting the accounting profession in the industrial era 4.0. The discussion about the role of information technology in supporting the accounting profession in the Industrial era 4.0 in this article formulates the question: what is the influence of the industrial revolution on the accounting profession? What is the role of information technology in supporting the accounting profession in the industrial era 4.0? What skills should accountants learn about the support provided by information technology in the industrial era 4.0?

This study used descriptive-analytical methods to identify the role of information technology in supporting the accounting profession in the Industrial 4.0 era. The results are expected to provide scientific references for accountants to prepare themselves to learn the skills needed to deal with the industrial era 4.0. This research is also likely to be a reference for further research on the role of information technology in supporting the accounting profession in the digital age.

2. Theoretical Review

2.1. Industrial Revolution 4.0

The Industrial Revolution 4.0 is a term that emerged at the Hannover trade fair in Germany in 2011. This term emerged as an initiative of the German government to promote Germany as a global leader in technological innovation. Subsequently, several publications that defined Industry 4.0 emerged and became popular. The concept of industry 4.0 in several countries generally has the same goal, which is to increase competitiveness in global markets due to the development of digital technology in various industrial fields (Bartodziej, 2017).

The industrial revolution 4.0 was marked by the emergence of five main technologies to be implemented as a new business model solution and had a significant impact on the supply chain, namely internet of things (IoT), artificial intelligence, advanced robotics, enterprise wearables, and additive manufacturing (Li et al., 2017).

2.2 Information Technology

Information technology is the hardware and software needed to process data and other information. Information technology includes all technologies used to create, process, transmit, store, exchange and use information in all forms. Accountants who have different roles depending on the functions performed must always be up to date with technological changes and must comply with recognized international standards (Zenuni et al., 2014).

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2.3 Digital Technology

Digital technology is a technology that emerged and developed as a result of the presence of the fourth industrial revolution. Digital technologies include the Internet of Things, Big Data and Data Analytics, and Artificial Intelligence (Korčok, 2016). The concept of the Internet of Things allows all devices to communicate with each other and trigger further action. IoT can be used to order goods or products, which will trigger the process of production, implementation, and delivery of products without human participation during the process. All electronic and physical devices that have an IoT module can be monitored and controlled remotely via the Internet. All electronic transactions that occur will result in transaction data collected as big data that can later be processed and analyzed further. The development of digital technology eliminates the dangerous tasks carried out by humans and replaces them with smart robotics and artificial intelligence (Ślusarczyk, 2018).

2.4 Digital Economy

The term digital economy refers to various economic activities that use digital information and knowledge as the main factors of production. The Internet, cloud computing, big data, financial technology, and other new digital technologies are used to collect, store, analyse, and share information digitally and to change existing social interactions. The concept of the digital economy was first introduced by Tapscott in 1998, which is a socio-political and economic system that has the characteristics of an intellectual space, including information, various information access instruments, information capacity, and information processing. The components of the digital economy that were identified for the first time were the ICT industry, e-commerce activities, digital distribution of goods, and services.

2.5 Big Data

Gartner defines big data as data that has three attributes, namely volume, variety, and velocity. Volume is related to the size by which data growth reaches volumes of tens of terabytes to several petabytes. Variety means the type or type of data, which includes various types of data, both data that have been structured in a database or unorganized data in a database such as text data on web pages, voice data, video, click streams, log files, and etcetera. Velocity is the speed at which data is generated and how fast the data must be processed in order to meet user requests.

2.6 Cloud Computing

Cloud Computing is a combination of the use of computer technology and cloud-based Internet Storage development. Cloud Storage is a metaphor of the Internet, as storage media are often depicted on computer network diagrams. Cloud Computing applies a computational method; namely, capabilities related to information technology are presented as a service. Users can access cloud computing via the Internet without knowing what's inside, expert with it, or have control over technological infrastructure (Santiko et al., 2017).

3. Methodology

The research design used in this study is a descriptive analysis method. The descriptive analysis describes the world or phenomenon. Descriptive analysis is used to answer questions about who, what, where, when, and to what extent. The purpose of descriptive analysis is to identify and describe trends and variations in populations, make new measurements of key phenomena, or describe samples in studies aimed at identifying causal effects. Descriptions play a vital role in the scientific process in general and educational research in particular.

Questionnaires are used to collect formal data from accountants via Google form. Samples were chosen based on purposive sampling with the criteria graduated from Accounting major and works as educator accountants, internal accountants, public accountants, government accountants/auditors, management accountants, business analysts, entrepreneurs, and corporate finance. Data collected from the final survey were analyzed.

4. Results and Discussion

Results

Respondents are accountants who work as educator accountants, internal accountants, public accountants, government accountants / auditors, management accountants, business analysts, entrepreneurs and corporate finance. Questionnaires were sent to more than 5 Whats Up Accountant Groups. The number of accountants who became respondents was as many as 286 people.

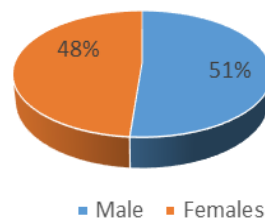


Fig. 1. Sex of Respondents

Figure 2 shows that of 286 accountants invited to participate, 59 submitted surveys for a response rate of 20,6%. Of the 59 respondents, 29 (48%) reported their gender as female and 30 (51%) as males.

Table 1. Gender and Type of Accountant

	% Total	% Male	% Female
Educator Accountant	56%	19%	37%
Internal Accountant	2%	2%	0%
Public Accountant	7%	3%	3%
Government Accountants / Auditors	19%	17%	2%
Management Accountant	0%	0%	0%
Business Analyst	2%	2%	0%
Entrepreneurs	5%	5%	0%
Corporate Finance	10%	3%	7%

Table 1 shows that the majority of respondents in this study were accountant educators consisting of 19% men and 37% women. The least respondents were business analysts and internal accountants. Each consists of only 7% men and 0 women.

Table 2. Gender and Age of Responden

Age of Responden	% Total	% Male	% Female
20 - 30 tahun	25%	8%	17%
31 - 40 tahun	19%	5%	14%
41 - 50 tahun	47%	31%	17%
51 - 60 tahun	8%	7%	2%
> 60 tahun	0%	0%	0%

Table 2 shows that the most respondents in this study were in the age 41-51 years old. Of 31% men and 17% women. The fewest respondents were in the age 51-60 years old. It consists of 7% men and 2% women.

The Effects of the Industrial Revolution on Accountants

Based on the data obtained from the questionnaires, the outline can be presented major findings obtained are:

1. Approximately 45,76% and 49,15% of respondents agreed and strongly agreed respectively due to the emergence of the industrial revolution 4.0, the workings and practices of accountants need to be changed to improve service quality and global expansion through online communication and the use of cloud computing (figure 2).

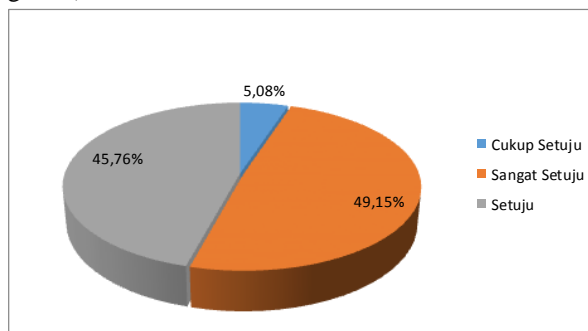


Fig. 2. Changes in Accountants' Work Methods and Practices

Figure 2 also shows that 5.08% of respondents quite agree that the workings and practices of accountants need to be changed to improve service quality and global expansion through online communication and the use of cloud computing.

2. Aproximately 61% and 35% of respondents agreed and strongly agreed respectively that in the Industrial 4.0 era, information technology which was defined as hardware and software now turned into digital data technology (figure 3).

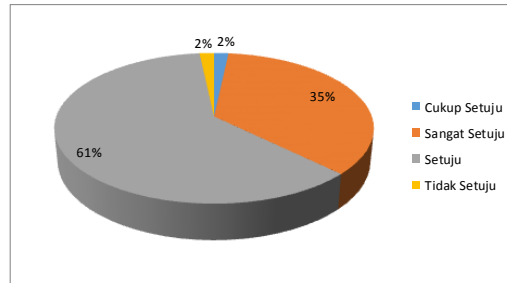


Fig. 3. Changes in information technology from hardware And software to digital data technology

Figure 3 also shows that 2% of respondents quite agree with the statement that information technology has changed from hardware and software to digital data technology and the other 2% of respondents disagree.

3. Aproximately 97% of respondents agreed and strongly agreed that in the Industrial 4.0 era, In the Industrial 4.0 era, accountants should have the ability in terms of data analysis, information technology development, and leadership skills. (figure 4).

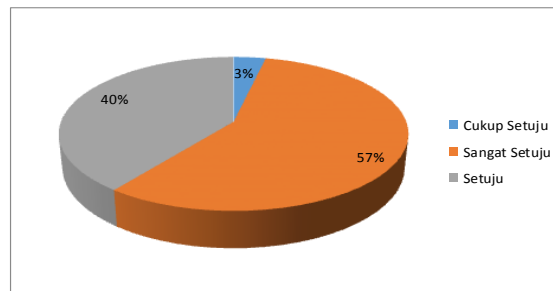


Fig. 4. Accountant's ability in data analysis, data analysis, information technology development, and leadership skills.

Figure 4 also shows that 3% of respondents quite agree that the accountants should have the ability to data analysis, information technology development, and leadership skills.

4. Aproximately 94% of respondents agreed and strongly agreed that the Industrial Revolution 4.0 resulted in the full integration of information, communication and automation technology in future factories (figure 5).

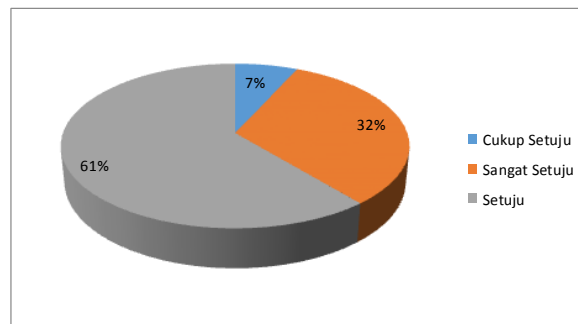


Fig. 5. Industry 4.0 led to full integration of information technology, Communication and automation in the future factory

Figure 5 also shows that 3% of respondents quite agree that Industry 4.0 is causing full integration of information, communication and automation technology in future factories.

5. Approximately 96.6% of respondents agreed and strongly agreed that as technology became more sophisticated and present in all aspects of the business, the role of accountants shifted towards a more strategic and analytical role (figure 6).

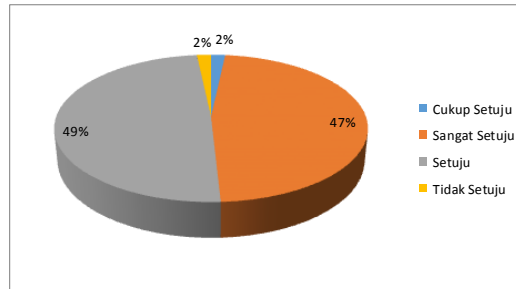


Fig. 6. The role of accountants shifted towards a more strategic and analytical role

Figure 6 also shows that 2% of respondents quite agree the role of accountants shifted towards a more strategic and analytical role and the other 2% of respondents disagree.

6. Approximately 99% of respondents agreed and strongly agreed that accountants must have the expertise needed in the industrial era 4.0 such as the use of AI-based and Big Data technology, the ability to analyze data, understanding of customer needs, the ability to use data forms, interpret data to produce information which is more meaningful for decision making (figure 7).

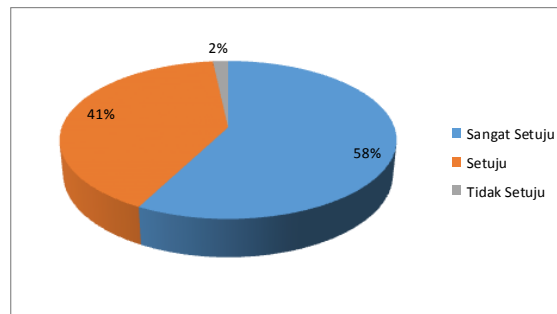


Fig. 7. Accountants must have the expertise needed in the industrial era 4.0

Figure 7 also shows that 2% of respondents disagree that accountants must have the expertise needed in the industrial era 4.0.

The Role of Professional Accountant Information Technology in the Industrial Age 4.0

7. Approximately 93 % of respondents agreed and strongly agreed that the Industrial Revolution 4.0 was the convergence of information technology into the industrial world. Through the Internet of Things (IoT) and Big Data, technology can be used to collect and process data used by accountants in their function as financial information provider experts (figure 8).

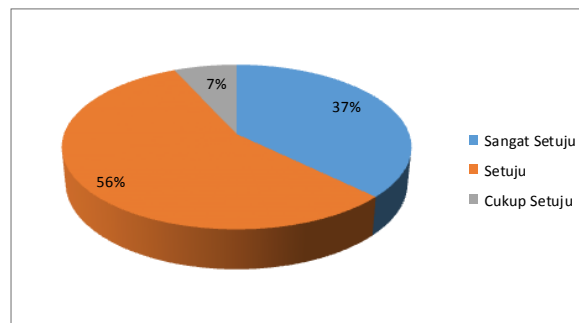


Fig. 8. Industrial Revolution 4.0 was the convergence of information Technology into the industrial world

Figure 8 also shows that 7% of respondents quite agree agreed that the Industrial Revolution 4.0 was the convergence of information technology into the industrial world.

8. Approximately 63% of respondents agreed and strongly agreed that the use of Robotics and data analytics (big data) takes over the basic work done by accountants (records transactions, processes transactions, sorts transactions). This use increases the efficiency and effectiveness of work (figure 9).

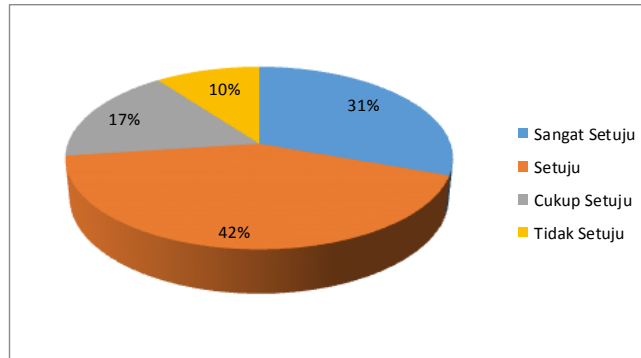


Fig. 9 The use of Robotics and data analytics (big data) increase the efficiency and effectiveness of work

Figure 9 also shows that 3% of respondents quite agree that the use of Robotics and data analytics (big data) increase the efficiency and effectiveness of works while 10% of respondents disagree.

9. Approximately 83% of respondents agreed and strongly agreed that technology in Industry 4.0 allows accountants to obtain data that previously could not be obtained in real time, through embedded sensors (figure 10).

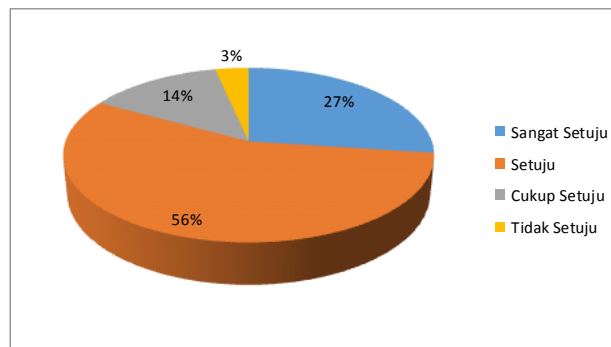


Fig. 10 Technology in Industry 4.0 allows accountants to obtain data that previously could not be obtained in real time, through embedded sensors

Figure 10 also shows that 3% of respondents quite agree the use of Robotics and data analytics (big data) increase the efficiency and effectiveness of work while 3% of respondents disagree.

10. Approximately 90% of respondents agreed and strongly agreed that Technology in Industry 4.0 improves data quality, namely through better timeliness and accuracy and higher detail to improve efficiency, certainty of data and other decision making goals (figure 11).

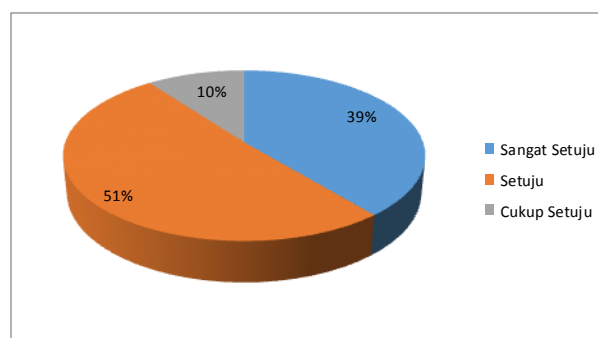


Fig. 11. Technology in Industry 4.0 improves data quality

Figure 11 also shows that 10% of respondents quite agree the use of Robotics and data analytics (big data) increase the efficiency and effectiveness of work while

11. Approximately 90% of respondents agreed and strongly agreed that the use of information technology (IT) in the audit is getting wider, namely with general audit software that is increasingly being used by public accounting firms so as to increase productivity in carrying out audit work (figure 12).

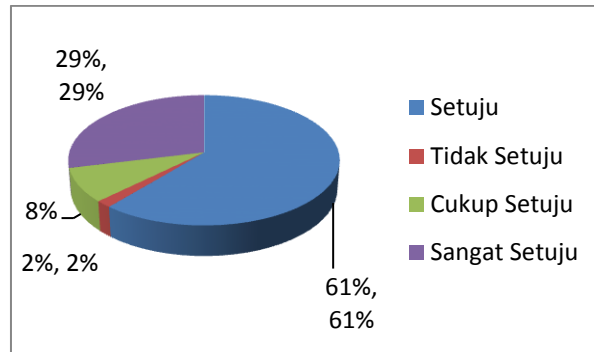


Fig 12 the use of information technology (IT) in the audit is getting wider

Figure 12 also shows that 8% of respondents quite agree that the use of information technology (IT) in the audit is getting wider while 2% of respondents disagree.

12. Approximately 89% of respondents agreed and strongly agreed that non-financial data that can be used to assist specific decisions and provide the big data analytics can provide new sources of assessment and hard evidence needed by management accountants in carrying out their work (figure 13)

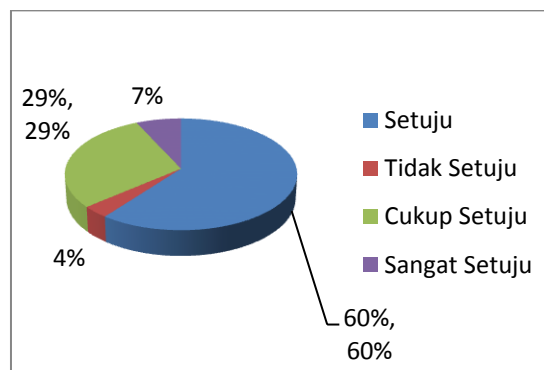


Fig 13 non-financial data that can be used to assist specific decisions and provide the big data analytics

Figure 13 also shows that 4% of respondents disagree that non-financial data that can be used to assist specific decisions and provide the big data analytics while 7% of respondents strongly agree.

Discussion

Based on data obtained from the result section shows that industrial revolution 4.0 is the convergence of information technology to the industrial world. The industrial 4.0 era produced developments in digital technology such as the Internet of Things, Cyber-Physical Systems, Artificial Intelligence, Cloud Computing, and Big Data. Industry 4.0 produces full integration of information and communication technology, resulting in automation technology in future factories. Human work will be largely replaced by smart robots and Artificial Intelligence. All business transactions will be carried out automatically and produce a huge volume of transaction data that grows at high speed (big data). Big data requires cloud computing as an infrastructure to support it. The role of accountants will shift from a bookkeeper to an expert provider of financial data or as a data analyst. Accountants must be able to analyze customer needs, financial data, and interpret data to be more meaningful for decision making. Accountants must be able to understand technology to carry out future tasks.

The result section also shows some capabilities that accountants should have in this industrial era include data science, data analysis, coding/programming, realtime accounting, and understanding the Artificial Intelligence model to adapt to technology applied in the digital era. Also, accountants must have the right attitude and mentality and be critical of technological developments. Accountants should try to learn new technology, attend training to obtain the required competencies and certifications to be able to survive in this industrial era.

5. Conclusion

The result of this study shows that the highest score achieved by several indicators.

Acknowledgment

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