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Original Article

Blockchain as a New Disruption in Industry 4.0: A Challenge or an Opportunity for the Accounting Profession? (A Comparative Study Between Indonesia and China)

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Abstract: *The introduction of supercomputers, intelligent robotics, cloud computing, big data systems, and the advancement of neurotechnology—which allows people to optimize brain function better—mark the advent of the fourth industrial revolution. The existence of Industrial Revolution 4.0 requires accountants to be more aware of current technological developments, especially those related to accounting. One of the impacts of such revolutions is blockchain technology. This could bring some challenges or opportunities to the accounting profession. This study aims to explore student's blockchain awareness and technology knowledge in Indonesia and China. This study also will confirm whether there is a significant difference between the blockchain knowledge of students in both countries. There are various effects of blockchain on the accounting profession. However, considering its significant impact, there is still a limited study about this subject. This study will fill this gap. This study uses a comparative study with a questionnaire to collect data. The result of this study shows that there is a difference in blockchain knowledge between Indonesian and Chinese students. The result also shows that blockchain technology has many advantages for the accountant; therefore, academics who are involved in designing the accounting curriculum should seriously consider the inclusion of blockchain technology in the accounting curriculum.*

Keywords: *Accountant, Accounting Curriculum, Blockchain, Industry Revolution 4.0.*

I. INTRODUCTION

The advent of supercomputers, intelligent robotics, autonomous cars, cloud computing, and big data systems that help people better maximize brain function are the hallmarks of the fourth industrial revolution. (World Economic Forum, 2016). One of the impacts of Industrial Revolution 4.0 is blockchain technology. Blockchain is the system that powers Bitcoin, Ethereum, and other cryptocurrencies. Blockchain has several advantages for accountants and auditors. First, all transactions and records are digitized. Second, all transactions and records are consensus-based. Third, there has to be a consensus for transactions to occur. (Kouzbit, 2019).

Industry 4.0 revolution changes accounting in the future, such as accounting data that will be cloud-based, the power of using big data influences accounting, accounting integrating non-traditional financial information in modern systems, accounting work is efficient and mobile, and the role of accounting changes radically (Martani, 2018). Blockchain has many advantages for accountants because it's important for an accounting student to learn about blockchain technology. The contribution of researchers in this study is to add blockchain technology to the learning curriculum so that accounting students can compete in the era of Industrial Revolution 4.0. Based on the background mentioned above, there are increasing requests from organizations for graduate accounting students to have higher-level qualifications. One alternative to achieving a higher qualification is through improving the curriculum by adding blockchain technology. Therefore, this study aims to 1) To find empirical evidence about a student's blockchain technology knowledge, 2) To find empirical evidence whether there is a significant difference between blockchain knowledge in Indonesia and China, 3) To find empirical evidence about some opportunities for an accounting student to face and compete in the industrial revolution 4.0 era.

This study is expected to enrich research related to accounting education. Accounting education aims to help students become professional accountants. A good level of professional accountants requires accounting students to understand the recent issues and technology. One way to achieve this is through adding blockchain technology to the learning curriculum so that accounting students can compete in the era of Industrial Revolution 4.0. This study can contribute to improving the skills and knowledge of accounting students in Indonesia in general, and more especially in Udayana and can improve the quality of graduated accounting students.

II. LITERATURE REVIEW

A) Overview Industrial Revolution 4.0

The stages of the development of the Industrial Revolution are as follows (Iswanto & Wahjono, 2019). The industrial revolution's principal objective is divided into three (Martani, 2018). Reduce Time to Market First. Increased data volumes, longer innovation cycles, and more sophisticated products. Second, be more adaptable. Higher productivity, a dynamic market, and more customized mass production. Lastly, increases inefficiency. One important aspect of competition is the efficiency of energy and resources.

B) Neoliberalism and Agency Theory

Under neoliberalism, accounting must take the future into consideration, putting less emphasis on the importance of previous deals, caution, and costs and more on fair value and non-entity-specific market values. (Whittington, 2008). Agency theory addresses the interactions among principals and agents and has been defined as a theory of the company's ownership structure. (Song & Cavusgil, 2015). In the agency relationship, each party is motivated by different motivations following their interests. The difference in interests between the principal and agent can cause the agency problem. The differences in interests and information asymmetry caused by agency theory led to a reduction in principal trust.

C) Blockchain

Blockchain is the system that powers Bitcoin, Ethereum, and other cryptocurrencies. Blockchain has made it possible to purchase and sell goods and services with cryptocurrencies; however, blockchain can do so much more than just power cryptocurrency transactions. The uses of blockchain are growing daily. Blockchain is different from other systems because it uses distributed ledger technology. Blockchain produces a digitized record of all cryptocurrency transactions and can then prove who possesses what at any time (Kouzbit, 2019). Blockchain has several advantages for accountants and auditors. First, all transactions and records are digitized, which allows transactions to be conducted in real-time. Second, all transactions and records are consensus-based, which means the majority validates them. Third, there has to be a consensus for transactions to occur, meaning each transaction is open to viewing. (Kouzbit, 2019).

Blockchain technology has advantages that make it possible to reduce the issue of principal trust. Blockchain can increase principal trust because blockchain's greatest transaction ledger for public addresses is open to viewing. Hence, it has transparency for all members in that they can see information stored but cannot change anything.

D) Impact of Industrial Revolution 4.0 and Blockchain

Accountants and technology interactions, namely (Martani, 2018), the use of Robotics and data analytics (big data) take over the basic work done by accountants (records transactions, processes transactions, sorts transactions). Changes that have a direct impact that change the accountant's performance (Martani, 2018) include digital business models, consumer access, and the digitization and integration of both horizontal and vertical chains of value as well as the provision of goods and services.

Another impact that is felt in the field of accounting is on the auditor. Financial auditors constitute the reliable experts in today's corporate environment who ensure that transactions actually occur, certify their proof, accuracy, and fullness, and present relevant information in financial statements (Hayes et al., 2014). The auditors must have a solid grasp of the client's operations, IT infrastructure, and IT systems pertinent to financial reporting and procedures in place to accomplish these goals. In addition to lowering the expenses associated with auditing, accounting, and legal compliance, such characteristics can potentially improve and streamline auditors' jobs (Spoke, 2015). The completion of financial audits and more efficient data access are made possible by such technologies.

E) Socio-cultural Comparison Between China and Indonesia

China and Indonesia are big Asian countries sharing the same needs and goals in partnership for peace and prosperity. There are few job prospects for college graduates in China and Indonesia, so scholars and recent graduates need proper advice and support (Kaijun and Sholihah, 2015). Given their size and the fact that their populations have distinct traditions and customs depending on their ethnicity and region, Indonesia and China share many cultural traits (Umagapi, 2017).

III. RESULTS AND DISCUSSION

The research design uses a comparative analysis. Comparative analysis is a form of analysis of variables (data) to determine the differences between two groups of data (variables) or more. This comparative analysis or difference test is often called a different test t-test or a significance test. This comparative analysis is expected to provide guidance for lecturers and educational institutions about implementing blockchain in learning. The population of this research is accounting students with undergraduate and master's degree programs. Students from Indonesia who are from Udayana University. The population of students in China as a whole is the bachelor's and master's degree programs of Nanchang University, which is in the eastern part of China. The study sample consisted of 102 Indonesian students and 102 Chinese students, so there were 204 respondents in total who filled out the questionnaire completely. Data was co

llected in this study through a questionnaire using a Likert scale. The data were analyzed by applying comparative analysis or different tests. This study applies a different test between two samples (two student groups), Indonesia and China. Before the different tests (independent samples t-test) are used to test the hypothesis, the classical assumptions testing is done in advance to know if the data used has been normally distributed.

The study sample consisted of 102 Indonesian students and 102 Chinese students, so there were 204 respondents in total who filled out the questionnaire completely. The majority of respondents, both from Indonesia and China, are female. For Indonesia, female respondents are 76%, while male respondents are 24%. Female respondents for Chinese students are 78% and 22% for Chinese male students. The overview of the study sample also shows that the respondents' years of study varied from 2nd-year study, 3rd-year study, and 4th-year study. All respondents, both from Indonesia and China, are in the age range 18-24 years old. For Indonesian students, 19% are from 2nd-year study, 66% are from 3rd year study, and 16% are from 4th year study. Chinese student respondents are 20% from 2nd year study, 75% from 3rd year study and 5% from 4th year study.

For the category of understanding blockchain technology and accounting, Indonesian and Chinese students have different perceptions. The average score from Indonesian students is 3.95, higher than Chinese students, which is 3.73. This indicates that Indonesian students know more about blockchain technology and accounting than Chinese students. Chinese students have a higher average score of 3.95 than Indonesian students, with 3.90 in the category of understanding blockchain technology and the accounting profession. This means Chinese students believe and understand blockchain related to the accounting profession more than Indonesian students. The next category is understanding blockchain technology and auditing; Chinese students have higher average scores than Indonesian students. The average score for Chinese students is 3.92, while the average score for Indonesian students is 3.82. Chinese students understand and believe that blockchain technology is related to auditing more than Indonesian students. Indonesian students have higher average scores of 3.83 points for understanding blockchain and its benefits for companies, while Chinese students have average scores of 3.67 points. This means that Indonesia students believe that blockchain has benefits for companies more than Chinese students.

Table 1: Comparison of Costing and Cost Accounting (Size 10, Bold)

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Blockchain Knowledge	Equal variances are assumed.	8.166	.005	2.203	202	.029	3.873	1.758	.406	7.339
	Equal variances are not assumed.			2.203	187.31	.029	3.873	1.758	.404	7.341

Blockchain technology is one applied technology that is related to the accounting profession. Blockchain development began in the last decade, accompanied by the growth of cryptocurrency and bitcoin in 2009, which affected the cycle or function of accounting and financial reporting (Fuller & Markelevich, 2020; Sinha, 2020). There is a difference in blockchain knowledge between Indonesian students and Chinese students. Indonesian and Chinese students have different perceptions in understanding blockchain technology and accounting. Both Indonesian and Chinese students only have points of 3.95 and 3.73. This indicates that both of them don't have enough knowledge or information about blockchain technology. One finding from this study indicates that a cryptographic process in blockchain technology groups new transactions into blocks and adds them to the chain of every prior transaction; both students from Indonesia and China mostly give point 3, which indicates they are not sure about that statement. Accounting academies should pay attention to the insufficient blockchain knowledge. This can be done by adding blockchain technology to the accounting curriculum.

In this category, Indonesian and Chinese students have quite high points, with 3.90 and 3.95, respectively. This means that both Indonesian and Chinese students collectively agree and understand that blockchain technology has an important role

in the accounting profession. Indonesian and Chinese students give high points for the statement, "Blockchain offers many opportunities for the accounting profession". This shows that they agree that blockchain technology positively impacts the accounting profession.

The next category is understanding blockchain technology and auditing; Chinese students understand and believe that blockchain technology is related to auditing more than Indonesian students. At the application stage, blockchain offers auditors new opportunities to analyze specific transactions, confirm the presence of digital assets, and attest to the consistency of data between a blockchain and the real world. Auditors should use their knowledge of IT system audits to develop new techniques for achieving ownership verification. Blockchain has the potential to drastically alter the auditing procedure. Since a blockchain stores a complete record of all transactions, auditors won't have to ask trading partners for data and documentation and then wait for a response.

Furthermore, blockchain technology will outperform the conventional audit sample procedure by enabling ongoing audits for all "on-chain" transactions within a given timeframe. The use of blockchain technology will set up funds that had previously been utilized for gathering and confirming evidence. Both Chinese students and Indonesian students in this research believe that blockchain has applications in external auditing, and blockchain technology gives auditors more time to focus on audit questions related to the cause of a transaction. Every member of an organization implementing blockchain can track all previous transactions in the ledger, thus enabling increased transparency. This means that blockchain technology has an important role in auditing based on Chinese and Indonesian students.

In the category of understanding blockchain benefits for companies, Indonesia students believe that blockchain has benefits for companies more than Chinese students. This category has the lowest average points from Indonesian and Chinese students, with 3.83 and 3.67. This indicates that both Indonesian and Chinese students don't have sufficient knowledge about blockchain's impact or benefits for companies. This could happen because they aren't involved in a real business environment, leading accounting academies to pay some attention to this case. Accounting academies can add some blockchain knowledge to their curriculum.

The accounting industry is crucial to the period of the Industrial Revolution 4.0. Accountants must improve at handling large amounts of data, using sophisticated problem-solving techniques, leadership, and interpersonal skills to make data-driven judgments (Setiawan et al., 2019).

Blockchain technology can potentially transform the accounting industry since PwC ranks it the third of ten technological forces that will impact 2020 and beyond. With the responsibilities and rights more clearly defined, there will be less need for reconciliation and dispute resolution, which will free up more time to concentrate on accounting for and analyzing the transactions and broaden the scope of what can be accounted for. Blockchain technology, together with other cutting-edge tools like data analytics and machine learning, can optimize a number of present accounting department procedures. This will raise the accounting function's value and effectiveness.

The accounting industry is adapting quickly to technology developments in corporate operations. According to Rezaee et al. (2018), there is a disconnect between accounting education and the industry's use of applied technology. This disparity causes two primary issues: (1) graduates with significantly less expertise in market technologies than predicted and (2) the continued sluggish and difficult adoption of these technologies. This disproportionate reaction from academics and industry will negatively impact accounting graduates' employment and, consequently, their quality of education. The danger is that if this conundrum persists in the future, recruiting IT graduates with technical knowledge in blockchain, data analytics, and AI may replace hiring graduates from accounting in the accounting field. The Pennsylvania Institute of Certificated Public Accountants argues, "Effectively introducing blockchain into the curriculum will ensure that accounting education maintains relevancy and prepares students for the future" (PICPA, 2019).

IV. CONCLUSION

Blockchain is one of the technologies in the industrial 4.0 era. Blockchain technology presents potential and difficulties for accounting professionals to transform the corporate environment in addition to providing a new method of recording, processing, and storing financial information and transactions. Blockchain lessens the burden for auditors and accountants, enabling instantaneous accounting cycles and empowering auditors to oversee daily activities rather than just annual units. In order to create more thorough and integrated accounting records for their organization, accountants need to make use of the opportunities presented by this technology. Specifically, the blockchain can offer more detailed data on the company's past transactions.

The difference in blockchain knowledge between Indonesian and Chinese students in this study is quite significant. For the category of understanding blockchain technology and accounting, Indonesian students know more about blockchain

technology and accounting than Chinese students. In the category of understanding blockchain technology and the accountant profession, Chinese students believe and understand blockchain related to the accounting profession more than Indonesian students. For the category of understanding blockchain technology and auditing, Chinese students understand and believe that blockchain technology is related to auditing more than Indonesian students. For the category of understanding blockchain and its benefits for companies, Indonesian students believe that blockchain benefits companies more than Chinese students.

Academics involved in designing the accounting curriculum should seriously consider including recent technologies in the accounting curriculum. The job of accountants has changed as a result of RI 4.0, and higher education institutions must act swiftly and appropriately to ensure that graduates have the skills employer's demand. All the opportunities that accounting students get from learning blockchain lead accounting academies to add blockchain knowledge to their curriculum to compete in the Industrial 4.0 era. There are two ways to modify the curriculum: adding new topics to existing courses or starting from scratch.

Interest Conflicts

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