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Research paper

Industrial revolution 4.0 and the development of accounting information system: an imaginary dialogue

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Abstract

The paper is an imaginary dialogue on industrial revolution 4.0 (IR4.0) and the development of accounting information system. It explicates a thought of changing on accounting information system in the era of industry 4.0. The imaginary dialogue is between Accountant and Industrialist, both are concerned on the movement of industry 4.0 and accounting information system approach. Its aim is to explore the connection between IR4.0 and the development of AIS. IR4.0 characterized by Interoperability, Virtualization, Decentralization, Real Time Capability, Service Orientation, and Modularity significantly contributes the accuracy and timeliness of accounting information and the quality of AIS.

Keywords: *Accountant; AIS; Imaginary Dialogue; Industrialist; IR4.0.*

1. Prologue: industrial revolution in a history

An imaginary dialogue is chosen to explore a discussion between Accountant and Industrialist to have better understanding on the radical change of industry 4.0 and the development of accounting information system.

Accountant : Hello everyone you are now engaged in postmodern accounting research

Industrialist : Welcome to postmodern.

The paper was written to fulfill a request of Dr. Ida Wahidahwati STIESIA, she sent me Whatsapp notifying me to be invited at the Stiesia Seminar on 15 March 2018, and it is NOT easy to prepare a paper in a hectic time. Several days later, then a letter signed by Dr. Nur Fadjrih Asyik. Finally, I had to spend after I was thinking to continue my thought of industrial revolution 4.0 and the development of accounting information system. I eager to write a mode of dialogue or trialogue as I used to it in the previous writings. Of course, it will be not in monologue or even not in quadalogue. Trialogue, to some extents, is an interchange and discussion of ideas among three persons and groups having different origins, philosophies, principles, or backgrounds. At an end, I decided to use a dialogue for this paper. It is I could claim as Postmodernist writing on accounting.

The dialogue is an imaginary thought. The dialogue is between two persons which are Accountant and Industrialist. Both is engaged to share an accounting knowledge in particular of the radical movement so called Industrial Revolution 4.0 and the Development of Accounting Information System. This is, for me, a big thought being a researcher knowing bit beyond a theory of accounting in practice, rather it is a combination between philosophical thought in nature and accounting in practice. I believe it is interesting to readers understanding current issues on Industry 4.0 and accounting information system.

Industrialist : Accountant, … do you know what is Industrial Revolution 4.0? To some extent, even though I am Industrialist but I am not sure what is it?

Accountant : I think you are the right person to explain, not as it is me. Industrial Revolution belongs to you, actually.

Accountant : Any way, … let us discuss the essence of it.

Industrialist : That is good.

Accountant : Based on my knowledge, before we discuss Industrial Revolution 4.0, it is better to discuss the history of Industrial Revolution at first.

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The Industrial Revolution 1.0 was the transition to new manufacturing processes in the period from about 1760 to sometime between 1820 and 1840. This transition included going from hand production methods, called manual to machines, new chemical manufacturing and iron production processes, the increasing use of steam power, the development of machine tools and the rise of the factory system.

Textiles were the dominant industry of the Industrial Revolution in terms of employment, value of output and capital invested. The textile industry was also the first to use modern production methods

Industrialist : Very interesting to hear you. I remember it was begun in Britain, mainly. Not only Textiles, but it was also Iron manufacture. Textiles were the leading industry of the Industrial Revolution and mechanized factories, powered by a central water wheel or steam engine, were the new workplace.

Accountant : This was the turning point of Britain. By the mid-18th century Britain was the world's leading commercial nation[3], controlling a global trading empire with colonies in North America and Africa, and with some political influence on the Indian subcontinent, through the activities of the East India Company. They changed the world.

Accountant : Now is the 2nd Industrial Revolution … It took place between 1870 and 1914, just before World War I. It was a period of growth for pre-existing industries and expansion of new ones, such as steel, oil and electricity, and used electric power to create mass production. Major technological advances during this period included the telephone, light bulb, phonograph and the internal combustion engine. The development has changed the behavior of people lives and businesses.

Industrialist : How was Indonesia, at that time? …. Well it was Indonesia which was struggle for its independence and under Dutch colonization.

Accountant : Quickly, we move to the 3rd Industrial Revolution.
The 3rd Industrial Revolution, or the Digital Revolution or Computerized Revolution, refers to the advancement of technology from analog electronic and mechanical devices to the digital technology available today. The era started during the 1980s and is ongoing. Advancements during the Third Industrial Revolution include the personal computer, the internet, and information and communications technology (ICT).

Industrialist : We are the witness of this advancement technology. Multipurpose computers, mainframes and PCs marked the 3rd industrial revolution.

Industrialist : Hi Accountant, thus … we are now coming to Industrial Revolution 4.0. What is that actually?

Accountant : Yes, Industrial Revolution 4.0 or the 4IR is a period where digital technology revolutionized numbers of fields. These are examples of robotics, artificial intelligence, nanotechnology, quantum computing, biotechnology, The Internet of Things, 3D printing and autonomous vehicles.

The purpose of the paper is imaginarily dialogue between Accountant and Industrialist. Both are discussing their understanding on the nature of Industrial Revolution 4.0 and the development of accounting information system (AIS). The dialogue is distinct where both are anti-foundational pragmatism and both is like to have postmodernism movement. Why it is connected to AIS, it is because the role of AIS is of great importance for business decision making by management in any levels. That is why, with the 4IR, AIS will revolutionized in relation to the current revolution which is 4IR.

2. Method of explication

The paper is postmodernism in nature. It explicates some understandings of the phenomena of IR4.0 and the development of AIS by using an imaginary dialogue. Postmodernism is used for bringing up ideas in minds based on observed and unobserved phenomena (Sukoharsono, 2016). Two professionals are made up to explore their minds imaginarily. They are with the names of Accountant and Industrialist. Accountant is representing a scholar who has good knowledge on AIS, whereas Industrialist is as a professional who has a competence in information technology.

Accountant : Industrialist… The idea using postmodernism is because it gives much choices of the ways we do to write and explore our minds.

Industrialist : Yes, you are right, Accountant, for me, postmodernism is unstructured mode of writing. That is why, an imaginary dialogue is one of objectives to explore some strategies that could be understood by readers.

Accountant : Some references are collected as sources, and experiences are also as sources of knowledge.

Industrialist : Definitely this is a research too.

Industrialist : Why it is not. Yes, it is. Imagination is energizing your thoughts and lives.

3. Industrial revolution 4.0 in nature

Accountant : I remember when I read an article of Sukoharsono (2010) where …
"Postmodernisme adalah ungkapan yang sangat kontroversial. Hadir dengan ungkapan-ungkapan yang serba penuh reaksioner. Sebut saja antara lain dekonstruksisme', nihilisme', lokalisme', dan spiritualisme'. Kehadirannya mewarnai banyak disiplin ilmu dalam telaah mode intelektual dalam merubah paradigm berfikir tentang ontology, epistemology dan methodology. Sering pula difahami postmodernisme' melakukan usaha merubah tradisi intelektual yang sudah mapan." ("Postmodernism is a phrase that is very controversial. It comes with the all expressions full of reactionaries. Mention for example 'deconstructionism' 'nihilism' localism', and spiritualism'. Presence coloring many disciplines in the study of intellectual fashion in changing the paradigm of thinking about ontology, epistemology and methodology. Often understood postmodernism 'make an effort to change the intellectual tradition that has been established. "(Sukoharsono, 2010:1)

Accountant : It is believed that Industrial Revolution 4.0 is categorized as postmodernism in nature.
Industrialist: Yes, Accountant, He is the same as you, as an accounting discipline. I have read too. It is controversial … but it enlightens the people's thoughts on our way of approaching.

Accountant : Not everyone has the same idea and … read this …

"Intelektual yang secara tradisi mengedepankan rasionalitas dan objektivitas, mulai dirubah dengan melibatkan spiritualitas dan subjektivitas. Tradisi justifikasi signifikansi kebenaran dengan alat matematis dan statistika, diungkit dengan diskursus, partisipasi kontektual, naratif dan transendental. Satu lagi yaitu tradisi justifikasi generalisasi, dibantah dengan mengedepankan kearifan local (Intellectual tradition which emphasizes rationality and objectivity, began to be changed by the involvement of spirituality and subjectivity. Significant justification tradition of truth with mathematical and statistical tools is challenged by a discourse, participation, contextual, narrative and transcendental. One more generalization justified tradition is denied by promoting a local wisdom" (Sukoharsono, 2010:1).

Research Student : Thinker, I confused to understand what is postmodernism?

Accounting Thinker: Here is Postmodernism in a philosophy.

No	Assumption	Question	'Modern'	'Postmodern'
1	Ontological Assumption	What is the nature of reality?	Reality is objective and singular, apart from the researcher	Reality is subjective and multiple, as seen by participants in a study
2	Epistemological Assumption	What is the relationship of the researcher to that researched?	Researcher is independent from that being researched	Researcher interacts with that being researched
3	Axiological Assumption	What is the role of value?	Value free and unbiased	Value-laden and biased
4	Rhetorical Assumption	What is the language of research?	Formal Based on set of definitions Impersonal voice Use of accepted quantitative words	Informal Evolving decisions Personal voice Accepted qualitative words
5	Methodological Assumption	What is the process of research?	Cause and effect Static design Context-free Generalizations leading to prediction, explanation and understanding Accurate and reliable through validity and reliability	Mutual simultaneous shaping of factors Emerging design Context-bound Patterns, theories developed for understanding Accurate and reliable through verification and logical dis-

The above table is to draw a dichotomy between modern and postmodern. There are 5 (five) philosophical assumptions to place in distinct angles: (1) Ontological, Epistemological, Axiological, Rhetorical and Methodological Assumptions. Each assumption leads to an impact of accounting methodological choice. Of course, one to another has disputable in its essences. Ontologically, postmodern comes

to an idea that reality is objective and singular, having distant from the researcher. The researcher is not embedded to an object of the research. It is so called postmodern is subjective and multiple and being embedded in a study.

Accountant : I am bringing Postmodernism to this analysis, it is because 4IR or IR4.0 is characterized uniquely and it respect to an artistic.

Accountant : Understanding of IR4.0 is by referring the year of 2011 where the German Federal Ministry of Education and research began to explore the various trends that were taking place. The Ministry wanted to identify information system in high level of technology that could help to improve the world in general and boost technology. This includes cyber-physical systems, the Internet of things, cloud computing and cognitive computing

IR4.0 is phenomenal. Principally, the vision of IR4.0 is "the internet of things". Its vision is to connect people, things and machines. This connection is intended to produce a variety of products and services, including the products and services of accounting. The Internet of Things could enable objects and machines to communicate each other. An example is that mobile phones and sensors could "communicate" with each other as well as human beings to work out solutions. The integration of such digital technology could allow objects to work and solve problems independently.

Industrialist : Accountant, I have a clear identification of IR4.0 where it makes it easy to be remember. Here is they are as Martin (2017) described:

Interoperability: Objects, machines and people need to be able to communicate through the Internet of Things and the Internet of People. This is the most essential principle that truly makes an accounting a smart one.
Virtualization: Cyber Physical Systems (CPSs) must be able to simulate and create a virtual copy of the real world. CPSs must also be able to monitor objects existing in the surrounding environment. Simply put, there must be a virtual copy of everything.

Decentralization: The ability of CPSs to work independently. This gives room for customized products and problem solving. This also creates a more flexible environment for production. In cases of failure or having conflicting goals, the issue is delegated to a higher level. However, even with such technologies implemented, the need for quality assurance remains a necessity on the entire process

Real-Time Capability: A smart factory needs to be able to collect real time data, store or analyze it, and make decisions according to new findings. This is not only limited to market research but also to internal processes such as the failure of a machine in production line. Smart objects must be able to identify the defect and re-delegate tasks to other operating machines. This also contributes greatly to the flexibility and the optimization of production.

Service-Orientation: Production must be customer-oriented. People and smart objects/devices must be able to connect efficiently through the Internet of Services to create products based on the customer's specifications. This is where the Internet of Services becomes essential.

Modularity: In a dynamic market, a Smart Factory's ability to adapt to a new market is essential. In a typical case, it would probably take a week for an average company to study the market and change its production accordingly. On the other hand, smart factories must be able to adapt fast and smoothly to seasonal changes and market trends.

4. The development of accounting information system

With the IR4.0, the development of accounting information system is affected. The design of new AIS will be developed in line with how IR4.0 influenced. AIS "is a collection of data and processing procedures that creates needs information for its users"(Bagranoff et. al., 2010, P 5). Another definition is "a unified structure within an entity that employs physical resources and other components to transform economic data into accounting information, with the objective of satisfying the information needs of variety of users." (Wilkinson and Cerullo, 1997, P7-8). Furthermore, AIS is "the whole of the related components that are put together to collect information, raw data or ordinary data and transform them into financial data for the purpose of reporting them to decision makers". (Saleh et. al, 2010, 187).

Accountant : Industrialist, what do you think with the development of IR4.0 for AIS?

Accountant : For me, with the IR4.0, AIS will significantly change its performance. In that sense, AIS can be recognized as accounting through virtual office and as paperless accounting. Accounting through virtual office can speed up the business – conducting process and does not depend on the geographic location of business partners and company. Paperless accounting implies electronic input and output and there is no need for documents' and reports' printouts.

Industrialist : Accountant, please think about the accounting processes must be related to the changing of purchase orders, invoices, cheques and other financial documents which are all with paperless.

Accountant : You are right Industrialist.

Accountant : There are some basic prerequisites for paperless/ digital accounting, which are (Saser and Oluis, 2013):

a) Data entering should generally have the form of electronic inputs,
b) Accounting records should be conducted as electronic records, (today, many parts of accounting records are still conducted manually and they are printed at the end of the period) and should be in accordance with accounting standards, principles, prerequisites, etc.; some parts of accounting records are integrated and allow

fast data transfer (data records should arise at a place and at a time when a business event occurs and have to be automatically forwarded in all corresponding records and reports),

c) Conducting and distributing output (accounting information) in most cases have to be in electronic form in order to duly deliver up-to-date and reliable information to users, saved and continuously updated in an appropriate data base; while printing of accounting information would be performed when needed.

Industrialist : Accountant, please do not forget the 5 pillars of IR4.0 for AIS

Interoperability
Virtualization
Decentralization
Real Time Capability
Service Orientation
Modularity

5. Qualitative characteristics of AIS with IR4.0

Quality of information is important. Its quality will influence the credibility of business decisions. AIS is a tool to provide financial information in making decisions of its businesses.

Accountant : I could understand that the effectiveness of an organization is dependent on the quality of its information, which is provided within the enterprise information system.

Industrialist : Yes, I agree with that, Accountant …

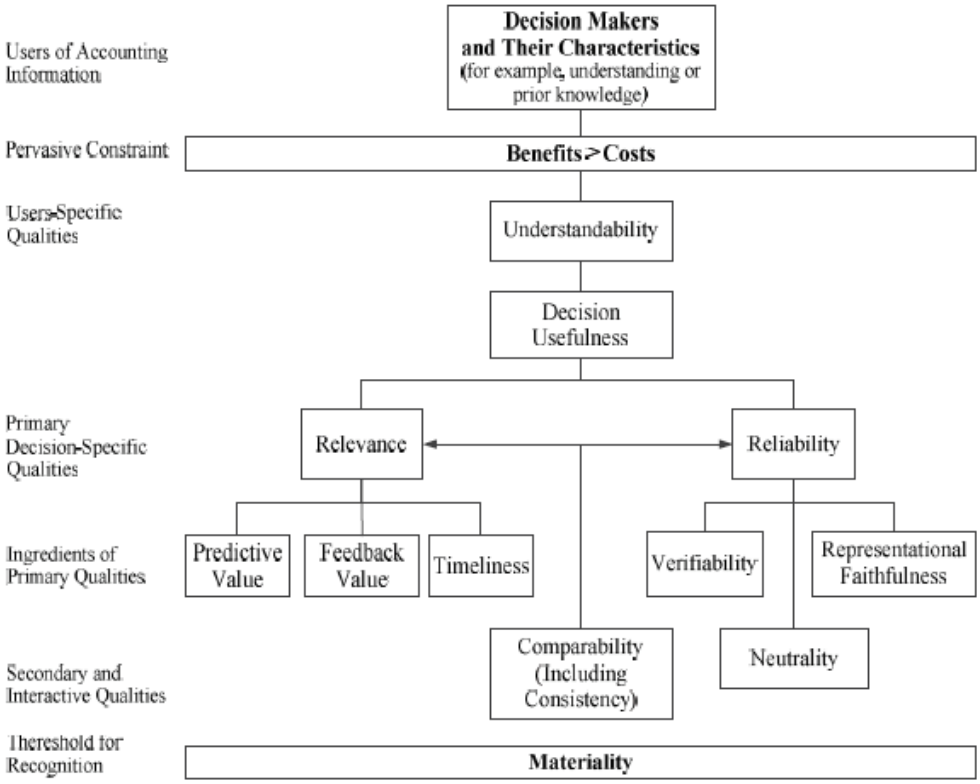
Industrialist : Since we think about IR4.0 into AIS, the quality of AIS results will be much better.

Accountant : Please do not forget, Industrialist …

Accountant : Quality of information in accounting discipline has specific terms. It is called qualitative characteristics.

Accountant : Please see below the model of it:

A Hierarchy of Accounting Qualities (Saser and Oluis, 2013)



Accountant : The Hierarchy of Accounting Qualities is quoted by Saser and Oluis (2013) derived from FASB.

Accountant : FASB hierarchy of accounting qualities quality AIS should generate reliable and relevant information. Today, AIS which is properly supported by IT is able to generate a wide range of information in a short term.

Industrialist : It is very interesting to understand what quality meant …

Accountant : Following the AIS quality, here is given by Saser and Oluis (2013) about the criteria for analysis of AIS quality.

CRITERIA FOR ANALYSIS OF AIS' QUALITY				
Principles of AIS' operation	Accounting process' quality	AIS coverage	AIS development	Opinion of Croatian accountants
THE FEATURES OF QUALITY 1. connection AIS and a business decision system 2. unique information system for the whole business system 3. consideration of benefit and cost of information 4. uniqueness of an access and classification of information 5. information feedback 6. information documentary evidence 7. information quality 8. AIS's rationality	1. input quality 2. data processing quality 3. output quality	1. accounting software quality 2. hardware quality 3. communication support quality 4. quality of work and satisfaction of users 5. organization solutions quality 6. data base quality	1. accounting systems planning quality 2. accounting systems analysis quality 3. accounting systems design quality 4. accounting systems testing and implementation quality 5. quality of postimplemen- tation phase	1. multifunctionality 2. universality 3. control mechanism 4. being up-to-date, 5. compatibility to other software 6. ability to upgrade 7. simplicity 8. universality 9. grade of adaptation to business process 10. employees' skill 11. security and reliability

Accountant : Basically, quality of AIS is the accounting system which meets internal and external users' needs.

Industrialist : Considering IR4.0, the criteria of the above quality will be much better, especially in the implementation of AIS coverage.

Accountant : This means to include the following IR4.0:
Interoperability
Virtualization
Decentralization
Real Time Capability
Service Orientation
Modularity

6. Epilogue: go with IR4.0 for AIS

Accountant : The development of AIS is influenced by many factors. Postmodern AIS is almost unimaginable without the use of IR4.0

Industrialist : I believe it …

Accountant : IR4.0 influences the way how AIS operates, contributes a preparing, processing, presenting and delivering accounting information.

Industrialist : IR4.0 significantly contributes the accuracy and timeliness of accounting information and the quality of AIS.

Accountant : Finally, the criteria of IR4.0: Interoperability, Virtualization, Decentralization, Real Time Capability, Service Orientation, and Modularity is really needed by AIS for better performance.

References

[1] Bagranoff N. A., Simkin M. G. and Norman C. S., (2010), Core Concepts of Accounting Information Systems,11 Ed., John Wiley & Sons, Inc., United States of America.

[2] Martin. 2017. Industry 4.0: Definition, Design Principles, Challenges, and the Future of Employment. Cleverism.

[3] Saleh M., Rostami V. and Mogadam A., (2010), Usefulness of Accounting Information System in Emerging Economy: Empirical Evidence of Iran, International Journal of Economics and Finance, Vol. 2, No. 2, PP 186-195 https://doi.org/10.5539/ijef.v2n2p186.

[4] Saser, Ivana M and Ana Oluis. 2013. Information Technology and Accounting Information Systems' Quality in Croatian Middle and Large Companies. Journal of Information and Organization Sciences. Vol 37, No 2.

[5] Sukoharsono, Eko Ganis. 2000. Bookkeeping to Professional Accounting: A University Power in Indonesia. *The International Journal of Accounting and Business Society*. Volume 8. Number 1. August.

[6] Sukoharsono, Eko Ganis. 2008. *Sistem Informasi Manajemen*. (Management Information System). Malang: Surya Pena Gemilang.

[7] Sukoharsono, Eko Ganis. 2010. Metamorfosis Akuntansi Sosial dan Lingkungan: Mengkonstruksi Akuntansi Sustainabilitas Berdimensi Spiritual. (Metamorphosis of Social and Environmental Accounting: Constructing Sustainability Accounting With Spiritual Dimension). Unpublished Professorship Inauguration Speech. Faculty of Economics. University of Brawijaya. 13 Desember.

[8] Sukoharsono, Eko Ganis. 2012. Peran Pengembangan Aplikasi Teknologi Informasi Dalam Membangun Karakter Bangsa (The Role of Information Technology Application Development in Building Nation Character). *Seminar Nasional Peran Pengembangan Aplikasi Teknologi Informasi (TI) dalam Membangun Karakter Bangsa (National Seminar on the Role of Information Technology (IT) Application Development in Building Nation Character), Politeknik Negeri Malang*, 26-27 April

[9] Sukoharsono, Eko Ganis and Nur Nafiastuti Ristianti. 2015. Web-Based Enterprise Resource Planning (ERP) System in Action at the Case of A Catering Industry Company in Indonesia. *The International Conference on Accounting and Finance, Bali 11-12 June*

[10] Wilkinson J. W., Cerullo M. J. 1997. Accounting Information Systems "Essential Conceptes and Applications", 3 Ed., John Wiley & Sons, Inc., United States of America.