Alexandria Journal of Accounting Research
Issued by the Accounting Department, Third Issue, Sep, 2025, Vol. 9

The Effect of Adopting Industry 4.0 Technologies on The Qualitative Characteristics of the Accounting Information

Salma Essam Farouk

Teaching Assistant at the Department of Accounting
Faculty of Business - Alexandria University

Salmaeloty@gmail.com

Abstract

In the era of big data, datasets are large, diverse, rapidly changing and difficult to be processed with the traditional tools. These characteristics form complex datasets for accountants and decision makers. It is difficult to effectively and efficiently collect process, analyze and interpret these complex datasets. That is why several scholars recommended solving these problems by adopting Industry 4.0 technologies. The research discusses the effect of adopting some of Industry 4.0 technologies such as Cloud Computing, Big data analytics (BDA) and Artificial intelligence (AI) on the qualitative characteristics of the accounting information that reflect the accounting information quality through a literature review. After studying various studies in this field, the researcher concluded that adopting Industry 4.0 technologies enhances the qualitative characteristics of the accounting information and therefore improves the accounting information quality. Thus, the researcher recommends to adopt cloud computing along with BDA and AI tools to positively affect the accounting information quality and to rationalize the decision-making process.

Keywords: Cloud Computing, Big data analytics (BDA), Artificial intelligence (AI), qualitative characteristics of the accounting information

Received on 22/7/2025, Accepted on 15/8/2025.

أثر تبنّي تقنيات الثورة الصناعية الرابعة على الخصائص النوعية للمعلومات المحاسبية

ملخص البحث

في عصر البيانات الضخمة، تتميز مجموعات البيانات بضخامتها وتنوعها وسرعة تغيرها، مما يجعل معالجتها باستخدام الأدوات التقليدية أمرًا صعبًا. تشكل هذه الخصائص مجموعات بيانات معقدة بالنسبة للمحاسبين ومتخذي القرار، الأمر الذي يجعل من الصعب جمعها ومعالجتها وتحليلها وتفسيرها بكفاءة وفاعلية. ومن هنا، أوصى العديد من الباحثين بضرورة مواجهة هذه التحديات من خلال تبنّي تقنيات الثورة الصناعية الرابعة. يناقش هذا البحث أثر تبنّي بعض تقنيات الثورة الصناعية الرابعة، مثل الحوسبة السحابية، وتحليلات البيانات الضخمة، والذكاء الاصطناعي، على الخصائص النوعية للمعلومات المحاسبية التي تعكس جودة المعلومات المحاسبية، وذلك من خلال استعراض الأدبيات ذات الصلة. وبعد دراسة العديد من الأبحاث في هذا المجال، خلص الباحث إلى أن تبنّي تقنيات الثورة الصناعية الرابعة يعزز الخصائص النوعية للمعلومات المحاسبية، وبالتالي يحسن من جودة المعلومات المحاسبية. وبناءً على ذلك، يوصي الباحث بضرورة تبنّي الحوسبة السحابية جنبًا إلى جنب مع أدوات تحليلات البيانات الضخمة والذكاء الاصطناعي لما لها من أثر إيجابي على جودة المعلومات المحاسبية وترشيد عملية اتخاذ القرار.

الكلمات الدالة: الحوسبة السحابية، تحليلات البيانات الضخمة، الذكاء الاصطناعي، الخصائص النوعية للمعلومات المحاسبية.

1. Introduction

In the era of digitalization, having high accounting information quality has been considered as a challenge to accountants and decision makers (Okeke & Eze, 2025; Ahmed & Sameh, 2021). Nowadays, the world is technology-oriented, data is huge in volume, various, rapidly changing and difficult to process with traditional IT tools (Okeke & Eze, 2025; Shahbaz, Gao, Zhai, Shahzad & Arshad, 2020). Everything now is connected to the internet and this is due to "Internet of Things" (IoT).

IoT refers to the notion that many different 'things' are connected to the internet and thus can be connected to each other, this generates "Big Data" (O'Leary, 2013). Big data is defined as a large complex dataset that could not be managed by traditional database due to its unique characteristics, namely, Volume[1], Velocity[2] and Variety[3] (Liu, 2025; Kehinde, Raymonda & Akindele, 2023; Baig, Shuib & Yadegaridehkordi, 2019).

These characteristics are considered as challenges for the traditional data analytical tools. These challenges hinder the accountants and decision makers from managing the data in an effective and efficient way to make a proper and rational decisions (Sohail Khan & Siddiqui, 2023; Koziol-Nadolna & Beyer, 2021). That's why organizations must find out new ways to store, deal with, manage, analyze and interpret these complex datasets correctly (Trunk, Birkel & Hartmann, 2020; Elgendy & Elragal, 2016).

This can be done through integrating the industry 4.0 technologies such as cloud computing, big data analytics (BDA) or artificial intelligence (AI) tools to improve the accounting information quality and to rationalize the decision-making process (Okeke & Eze, 2025; Karmańska, 2021; Ahmed & Sameh, 2021).

[1] Volume refers that big data is generated in massive amount of data. It requires huge storage to be stored and huge analytical capabilities to be processed and analyzed (Abdelrazeik, 2022).

[2] Velocity refers to the high speed and frequency at which the data is generated (Abdelrazeik, 2022).

[3] Variety refers that data is collected from different sources and are represented in different format (structured, semi-stractured, unstructured) (Abdelrazeik, 2022).

The rest of the research includes the following sections: the research problem, research objective, research importance and motives, research scope and limitation, research methodology as literature review, conclusion and recommendations.

2. Research Problem

In the era of big data, data is generated fast, in a massive amount, in different types and from different sources that the traditional systems cannot process and analyze. This is because that the complex datasets are beyond the traditional systems capabilities. Having complex datasets arises several problems such inaccessibility of the needed data in a timely manner, misanalysing or misinterpretation of data. Moreover, companies face a problem while storing the huge amount of data (Ahmed & Sameh, 2021). Moreover, the decision makers can't process these complex datasets due to their bounded rationality, limited cognitive capabilities, cognitive biases and cognitive overload (Kozioł-Nadolna & Beyer, 2021). Because of the new characteristics of the datasets, the limited mental capacities of human suffer from difficulties in gathering, managing, analyzing and interpreting such complex datasets (Janssen, Van Der Voor & Wahyudi, 2017). They may feel overloaded and overwhelmed which creates noise, disruptions, and errors during the decision-making process (Frisk & Bannister, 2017; Janssen et al., 2017). These problems negatively affect the decision-making and planning process (Ahmed & Sameh, 2021).

Accordingly, the researcher aims to answer the following main question:

What is the effect of adopting cloud computing, big data analytics, and artificial intelligence on the primary and enhancing qualitative characteristics of the accounting information?

Research objective

The objective of the research is to enrich the knowledge regarding the effect of adopting Industry 4.0 technologies such as Cloud computing, BDA and AI on the qualitative characteristic of the accounting information and review the literature related to this effect.

3. Research Importance and Motive

The academic importance: The study spots the light on the importance of adopting the industry 4.0 technologies to improve the accounting information quality in terms of improving the qualitative characteristics of accounting information, namely, the primary and enhancing characteristics. This helps the policy makers and researchers to set regulations and guidelines needed regarding the adoption of Industry 4.0 technologies to enhance the accounting information quality. Hence improving the decision-making process to enable the organization to reach its goals, improve its performance and competitive advantages.

The empirical importance: The study lists the advantages of adopting Industry 4.0 technologies regarding the improvement of accounting information quality to motivate the organization's managers to adopt the Industry 4.0 technologies to improve the accounting information quality and thus enhancing the decision-making process and decision quality which positively affect the future of the organization, its value, its competitive advantage and its success.

Research motive: Data is growing exponentially across various industries globally due to the extensive use of internet and its related technologies. That's why there is a need to adopt the Industry 4.0 technologies to enhance the quality of the accounting information and thus the quality of the decision making. Despite the several advantages of adopting Industry 4.0 technologies, several organizations, especially in the developing countries, are still struggling to integrate these new technologies. This is represented by the slow adoption rate of these new technologies. (Al-Qirim, Tarhini & Rouibah, 2017). Up to the knowledge of the researcher, there is a scarcity in studying the effect of

multiple Industry 4.0 technologies on all the primary and enhancing qualitative characteristics of the accounting information simultaneously.

4. Research Scope and Limitation

The findings of this research have to be seen in the light of some limitations. The study focuses only on some of the Industry 4.0 technologies, namely, Cloud, AI and BDA while ignoring other Industry 4.0 technologies such as Blockchain, advanced robotics, 3D printing and cybersecurity technologies since the formers are the most commonly used Industry 4.0 technologies.

5. Research Methodology

The researcher followed the inductive approach to analyze the literature review and previous papers and researches that discussed the effect of Industry 4.0 technologies on the primary and enhancing qualitative characteristics of the accounting information since they reflect the accounting information quality.

6. Literature Review

6.1 Industry 4.0 Technologies

In an era of increasing the digitalization and automation, the new technology adaption is becoming a must for the companies to retain in the market (Marques, Gonçalves, da Costa, Pereira & Dias, 2023). That's why it is important to understand the Industry 4.0 technologies so that managers can adopt them correctly.

The term Industry 4.0 stands for the fourth industrial revolution, it reflects a new technological age that dramatically change the industry into a Smart industry through the digitalization, automation, transparency, mobility, network collaboration and socializing of products and processes (Mohamed, 2018). Industry 4.0 provides several technologies that the researcher will discuss in brief in the following sections:

6.2 Internet of Things (IoT)

IoT is defined as a system that allows smart objects "things" to communicate together (Najafi, Soleimanpur & Morady, 2022). It enables, sensors, database, devices, software, people, processes and anything else to be connected anytime, from anywhere with anything and anyone through networks and internet using wireless sensors and RFID (Radio-Frequency Identification) tags (O'Leary, 2013).

IoT is considered as a system of interrelated computing devices, mechanical and digital machines, objects and people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction (Marques et al., 2023). It aggregates data from a variety of sensors and different sources that's why is considered as an important source of big data. Several industries are using IoT technologies that connect several devices to generate real time and huge amounts of data that need to be analyzed to create value to firms and improve the firm's performance (Côrte-Real, Ruivo & Oliveira, 2020).

6.3 Cloud Computing

Cloud computing is considered as resources and systems that are available when needed through a network to offer several services regardless of the location, timing, storage capacity (Al-Malahmeh, 2023; Alrabei, 2023; Khaliq et al., 2021; Xu, 2020). Cloud computing delivers computing services such as servers, storage, databases, networking, software, analytics and intelligence over the internet (Muniswamaiah, Agerwala & Tappert, 2019).

It is considered as an information technology service model which delivers computing services such as hardware and software based on the demand regardless of time and location (Maelah, AlLAmi & Ghassan, 2019). In this case, programs and applications runs on a connected server or servers rather than on a local computing device such as a personal computer (Akai, Ibok, Akinninyi, 2023).

It is considered as a new technology that aims to deliver processors, operations, and storage to a server device that is accessed via the Internet, so that information technology programs turn into services to facilitate the operation for the users (Kmaleh, 2023).

6.4 Big Data Analytics

Due to the frequent use of internet, smart mobiles, Cloud computing and IoT, social media (Facebook and twitter), sensors, tracking devices, websites and online news articles, emails, text messages, and everything else around us, a huge, heterogeneous, diverse, decentralized, autonomous, distributed, and complex amount of data is generated every day rapidly and consciously.

Big data is defined as a huge amount of data that can't be captured, managed, organized, stored, controlled, processed, examined, interpreted, analyzed through traditional IT hardware and software tools in an acceptable time due its limited capacity (Di Berardin & Vona,2023; Baig et al., 2019; Al-Qirim et al., 2017; Wang, Fujita, Liu, 2016). It is defined as an "ocean of information" (Jeble, Kumari & Patil, 2017).

Big data analytics that are designed to efficiently capture, store, manage, process, analyze and extract value and meaningful information and insights and identify relations form huge, diverse, and complex datasets through quick capturing the analyzing these complex datasets acquired from internal and external sources (Haddad, Ameen & Mukred, 2018).

Big data analytics provide 4 main types of analysis, the **descriptive analysis** to answer the questions of "what happened?", **diagnostic analysis** to answer the questions of "why it happened?", **predictive analysis** to answer the questions of "what will happen in the future?" and prescriptive analysis to answer the questions of "what is recommended to be done in the future?" (Sayah & Badi, 2024).

6.5 Artificial Intelligence

Artificial intelligence (AI) was originally proposed by John McCarthy in 1955 (Jin, Jin, Qu, Fan, Liu & Zhang, 2022). AI is defined as a mix of software and equipment as a substitute for human intelligence to solve complex business problems using reasoning, learning and recognizing patterns same as human expert.

Artificial Intelligence uses expert system instead of expert human and applies machine intelligence instead of human intelligence (Askary, Abu-Ghazahleh & Tahat, 2018). AI deals with methods that enable a computer to perform tasks and solve problems that require intelligence similar to humans (Hangl, Behrens & Krause, 2022).

AI is committed to make machines think and act like humans (Jin et al., 2022, Li, 2020). In other words, AI enables a programmable device to perform activities that can be expected from a human brain. These activities include; knowledge and the capability to acquire it, the ability to judge and understand relationships. Artificial intelligence aims to provide intelligent machines that can act and respond in ways similar to humans (Chukwuani & Egiyi, 2020). So, the main aim of AI is to enable machines to perform complex tasks that usually require human intelligence (Qiu, 2021).

Theoretically, it can mimic the human mind, draw conclusions, and be wise (Jin et al., 2022). This can be done through studying how the human brain works, learns, decides, and thinks to come up with intelligent computer software (Kwafo, 2019). The human brain consists of complex neural network. Artificial intelligence can simulate the neuron activities of the human brain, to be similar to the human brain to be intelligent (Jin et al., 2022; Li, 2020).

Intelligence means that computers can process and collect relevant information, combine their own knowledge and experience with existing experience to gain the ability to solve problems. This can be done through inputs added by humans into a computer and through "machine-based

learning," where the programed systems can learn from the data that is being processed and identify patterns to improve its accuracy [4] and make decisions with minimal human intervention (Shaffer, Gaumer & Bradley,2020). Now, the computer can not only calculate, but can calculate faster and more accurately than the human brain (Qiu, 2021).

6.6 Accounting Information Quality

Information is data that is arranged, processed and transformed into a meaning, valuable form to bring meaning, value and benefits to its users and to enhance the decision-making process (Shaikh, Mustafa, Bishop & Zeb, 2022; 2022; Al Natour). The quality of the output of the decision-making process (decision) depends on the quality of the input of decision-making process, namely the information (Naqvi, Soomro, Alzoubi, Ghazal, & Alshurideh 2021).

Accounting information is the output of an AIS. It is financial and non-financial information that results from the entire processing cycle of a company's business transactions (Puspitawati & Anggadini, 2019). Accounting information decreases the uncertainty about the future and contributes to the success of the decision making, planning, performance enhancement and competitive advantage. That's why accounting information is considered as firm's assets and firm's valuable resources (Bachmid, 2016)

The quality of the accounting information reflects the degree of usefulness of the accounting information in the decision- making process (Puspitawati & Anggadini, 2019). It is a multidimensional concept that reflects the degree to which the information satisfies the user needs. High quality information positively affects the decision-making process since it is considered as input in the decision-making process (Shaikh et al, 2022; Alshikhi & Abdullah, 2018). The accounting information quality depends on

([4]) Accounting information accuracy means that the accounting information represents the actual economic situation of the organization without involving misleading information (Liu, 2025).

the AIS quality. A high-quality accounting information has certain qualitative characteristics.

6.7 The Effect of The Industry 4.0 Technologies on The Qualitative Characteristics of the Accounting Information

The qualitative characteristics of the accounting information are considered as the information features that make it more valuable and improve its utility. They are grouped into 2 groups, these are the "primary characteristics" (Figure 1) and "enhancing characteristics" (Figure 2) (Al Natour, 2021; Lotfy, 2020).

6.7.1 The Effect of Industry 4.0 Technologies on the Primary Qualitative Characteristics of the Accounting Information

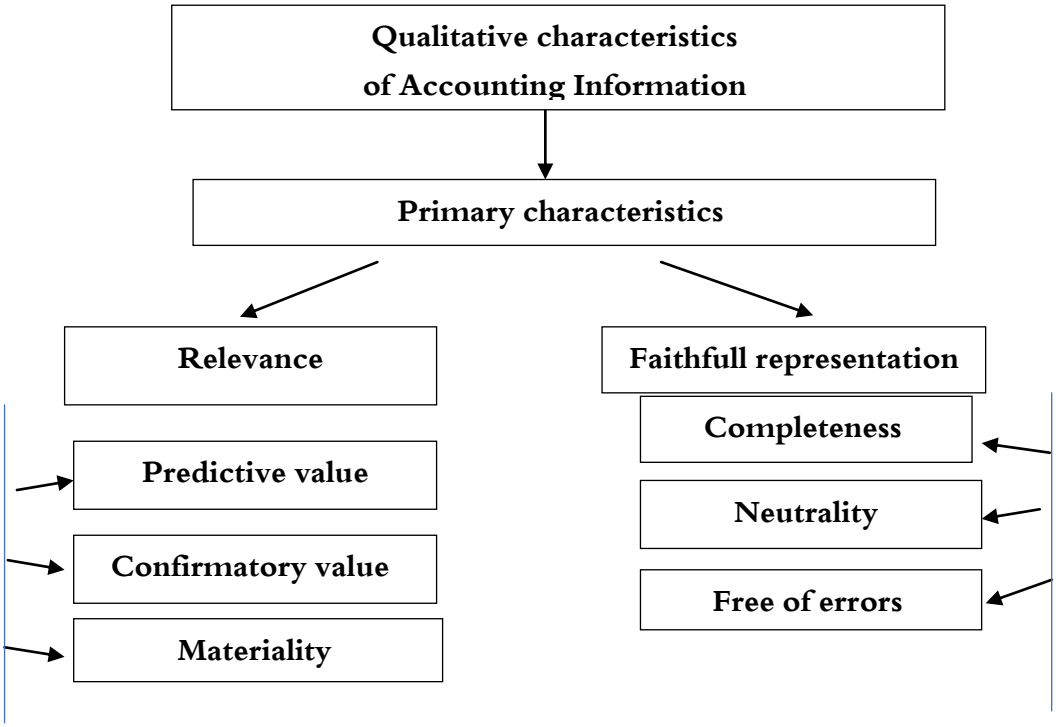

Figure 1: The primary qualitative characteristics of the accounting information

- **The primary characteristics are**:

Relevance: in terms of **predictive value**, **confirmatory value and Materiality**.

Relevance: An information is considered relevant if it can influence and make a different in a decision (Shaikh et al.,2022).

a) ***Predictive value***: Predictive value of the information refers to information that can be used as input to help users to predict future outcome (Al Natour, 2021).

Using IoT and cloud computing generates a huge amount of data that can be used as a base to have a comprehensive view about the future (Balicka, 2023; Ayokanmbi, 2021; Côrte-Real et al., 2020).

Integrating Big data analytics provides accurate predictions and predict risks (Okeke & Eze, 2025; Sayah & Badi, 2024; Baig et al., 2019).

Predictive analytic: It provides estimations and forecasts for the probability of occurrence of a future event. It aims to answer the following question: What will happen in the future? For example, the text, data and web mining techniques analyze past data to generate insights and patterns to predict future. Also, social network analysis can examine patterns of social interactions on social networks e.g. analyzing twitter feeds to predict customer's needs or track customer's purchasing behavior to forecast future buying trends (Naqvi et al., 2021). Big data analytics analyze big data to discover meaningful information and insights that provide forecasts for making accurate decisions regarding the future (Chatterjee, Chaudhuri, Gupta, Sivarajah & Bag, 2023).

Prescriptive analysis of BDA and AI, recommends what should be done in the future and gives the optimal solutions that can be followed in the future (Sayah & Badi, 2024).

b) ***Confirmatory value***: Confirmatory value of information refers to information that can be used to prove or correct and provide feedbacks regarding previous expectations (Al Natour, 2021).

BDA and AI methods are used to evaluate, confirm or contradict the approaches through deep analysis (Vincent, 2021).

c) ***Materiality*** of information refers to information's omitting or misstating will influence the decision (Al Natour, 2021).

IoT and Cloud generate and store large amount of data to have detailed and full information (Haddad, Ameen & Mukred 2018).

AI and Big data analytics can process a vast amount of data from different sources and in different formats, analyzing the whole population not just a sample which guarantee that important information is not omitted (Falana, Igbekoyi & Dagunduro, 2023; Ghaleb, Dominic, Fati, Muneer & Ali, 2021).

Faithful representation in terms of **Completeness**, **Neutrality and free from errors**.

Faithful representation of the information refers that the information reflects what really happened (Al Natour, 2021).

a) ***Completeness***: Completeness of information refers to including all the information that is required and necessary for faithful representation is provided without any omission of important information (Liu, 2025; Al Natour, 2021).

IoT and Cloud computing are important sources of big data. They provide massive amount of data. They combine huge amount of detailed data in different types from several internal and external sources that can be conveniently accessed from anywhere and in any time. This provides a huge dataset that facilitates the data collection process which is costly and time-consuming (Liu, 2025; Balicka, 2023; Kehinde et al., 2023; Ayokanmbi, 2021; Karmańska, 2021; Côrte-Real et al., 2020). Having a massive amount of data has a positive effect on the completeness of the accounting information (Kehinde et al., 2023).

Big data analytics can process a vast amount of data from different sources and in different formats (structured, semi-structured, unstructured, text, audio, video), analyzing the whole population not just a sample which increases the completeness of the accounting information (Okeke & Eze, 2025; Falana et al., 2023; Ghaleb et al., 2021). It enables a multi-dimensional data analysis that provide a comprehensive and actual view (Karmańska, 2021; Ahmed & Sameh, 2021).

*b) **Neutrality***: Neutrality of information refers to information that does not include any bias and is provided regardless of the favor of one party over another (Al Natour, 2021).

IoT and Cloud provide neutral access to all the data without a certain selection (Okeke & Eze, 2025).

AI and BDA provide analysis without human biases, since decisions are made by computers based on known knowledge instead of human's imaginations, biases and preferences. It relies on rules, guidelines and previous experiences and data (Li et al., 2022; Trunk et al., 2020). They are objective and are not influenced by emotions and thus they are not biased (Vincent, 2021).

*c) **Free from errors***: Free from error refers to information that is accurate without any mistakes (Al Natour, 2021).

Using **big data analytics and AI** tools decreases errors and mistakes which increase the **accuracy and reliability** of the accounting information (Li, 2025; Liu, 2025; Okeke & Eze, 2025; Kabir, Rana & Rahman, 2025; Hermansyah, 2023; Balicka, 2023).

So, we can conclude that integrating Industry 4.0 technologies enhances most the primary qualitative characteristics of accounting information. Table1 summarizes the effect of integrating Industry 4.0 technologies on the primary characteristics of the accounting information.

Table 1: The effect of integrating Industry 4.0 technologies on the primary qualitative characteristics of accounting information

Industry 4.0 technologies	Qualitative characteristics of accounting information					
	Primary characteristics					
	Relevance			Faithfull representation		
	Predictive	Confirmatory	Material	Completeness	Neutral	Free from error
IoT & Cloud	+		+	+	+	
BDA	+	+	+	+	+	+
AI	+	+	+	+	+	+

+ represents direct positive effect.

6.7.2 The Effect of Industry 4.0 Technologies on The Enhancing Qualitative Characteristics of the Accounting Information:

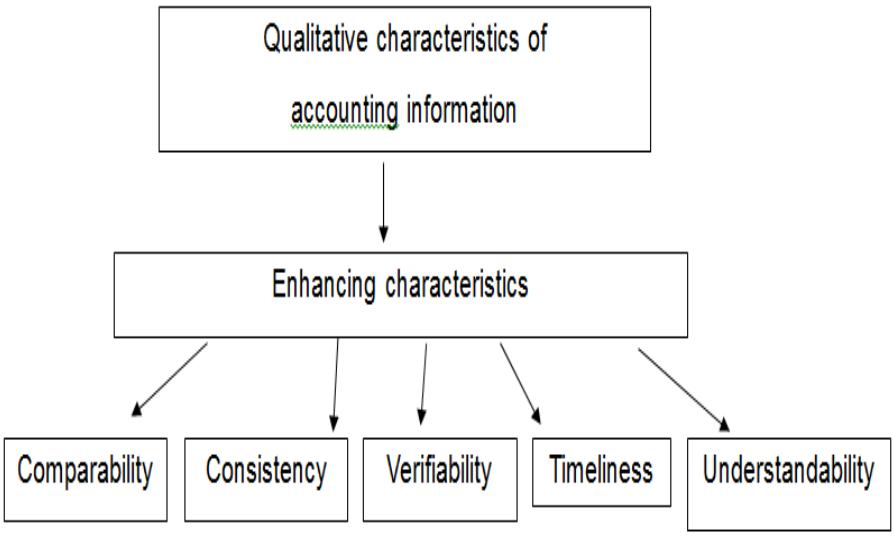

Figure 2: The Enhancing Qualitative Characteristics of the Accounting Information

The Enhancing characteristics are Comparability, **Consistency**, **Verifiability**, **Timeliness and Understandability**.

a) Comparability: Comparability is that the information is measured and reported in a similar manner for different companies in the same period which enable the users to determine the similarities and differences and compare between the items (Liu, 2025; Al Natour, 2021).

Big data analytics and AI improve the comparability of the information by providing detailed information in a proper visualization. Big data analytics can present a massive amount of data using graphs, pie charts, bar charts to facilitate the comparisons between different datasets (Sayah & Badi, 2024).

b) Consistency: Consistency is to use similar methods and treatments for the similar events from a period to another (Al Natour, 2021).

AI and BDA automate the data entry, data processing, reducing human errors. They process the data based on predefined rules and models (rule-based processing) which ensure the consistent application of accounting principles. Through the deep analysis, AI and BDA can detect irregular patterns in financial reporting which ensure the consistency of the accounting information and financial statements (Ahmed & Sameh, 2021). The real-time monitoring and analysis of massive datasets enable prompt detection of inconsistencies and correct them to increase the consistency

c) Verifiability: Verifiability occurs when different independent knowledgeable observers and measurers use the same method and reach similar outcomes (Al Natour, 2021).

Cloud computing enables the integration among the systems and departments. Moreover, it provides real time accessibility of the information by various users. This enhances the **transparency** and allows uses to trace the source and transformation of accounting data. This facilities the variability of the accounting information (Ahmed & Sameh, 2021).

d) Timeliness: Timeliness of information refers to information that is available for the users when needed and before it loses its ability to influence their decisions. Old or delayed information is not beneficial for current and future decisions (Liu, 2025; Al Natour, 2021).

Using **Cloud computing and IoT** to quickly access and retrieve timely and real-time accounting information from anywhere and in any time increases the timeliness of the accounting information (Akai et al., 2023; Kehinde et al., 2023; Abutaber, 2023).

Big data analytics and AI possess fast processing tools that transform data into meaningful information easier and faster without any delays. So they provide quick and timely analysis (Kabir et al., 2025; Okeke & Eze, 2025).

e) Understandability: Understandability of information refers to information that is easy to be comprehended by its users (Al Natour, 2021).

IoT and cloud enable several devices to be connected through a network which generate big data and cloud enable the storage of that big data (Balicka, 2023; Ayokanmbi, 2021; Côrte-Real et al., 2020). Having huge amount of data from different sources along with proper analytical skills and tools provides better understanding, better analysis of the situation and produces detailed information and enriches knowledge (Monino, 2021).

Big data analytics and AI discover and extract value and meaningful information and insights from complex, various and huge datasets that enable the decision makers to understand the hidden relation and correlations between the variables in details to create values (Liu, 2025; Okeke & Eze, 2025; Sayah & Badi, 2024; Di Berardino & Vona ,2023; Kehinde et al., 2023).

Analyzing vast and heterogenous amount of data provides rich and detailed information and creates deep understanding which improves the decision quality and enabling the decision makers to make informed decisions through knowledge creation and discovery.

Data mining as one of big data techniques can be used to reveal hidden relationship and patterns using statistical and mathematical models.

Also, Web mining that extract valuable information from the webpages to enrich knowledge.

Visualization techniques provide the information in an understandable way such as tables, charts diagrams that are used to represent information in a ease way to be understood without any bias (Naqvi et al., 2021).

Through the descriptive analysis of BDA the decision maker will understand what happened and through the diagnostic analysis of BDA, the decision maker will understand why this happened to enrich his understanding (Sayah & Badi, 2024).

So, we can conclude that integrating Industry 4.0 technologies enhances most the enhancing qualitative characteristics of accounting information. Table 2 summarizes the effect of integrating Industry 4.0 technologies on the enhancing characteristics of the accounting information.

Table 2: The Effect of Integrating Industry 4.0 Technologies on the Enhancing Qualitative Characteristics of Accounting Information

Industry 4.0 technologies	Qualitative characteristics of accounting information				
	Enhancing characteristics				
	Comparability	Consistency	Verifiability	Timeliness	Understandability
Cloud			+	+	+
BDA	+	+		+	+
AI	+	+		+	+

+ represents direct positive effect

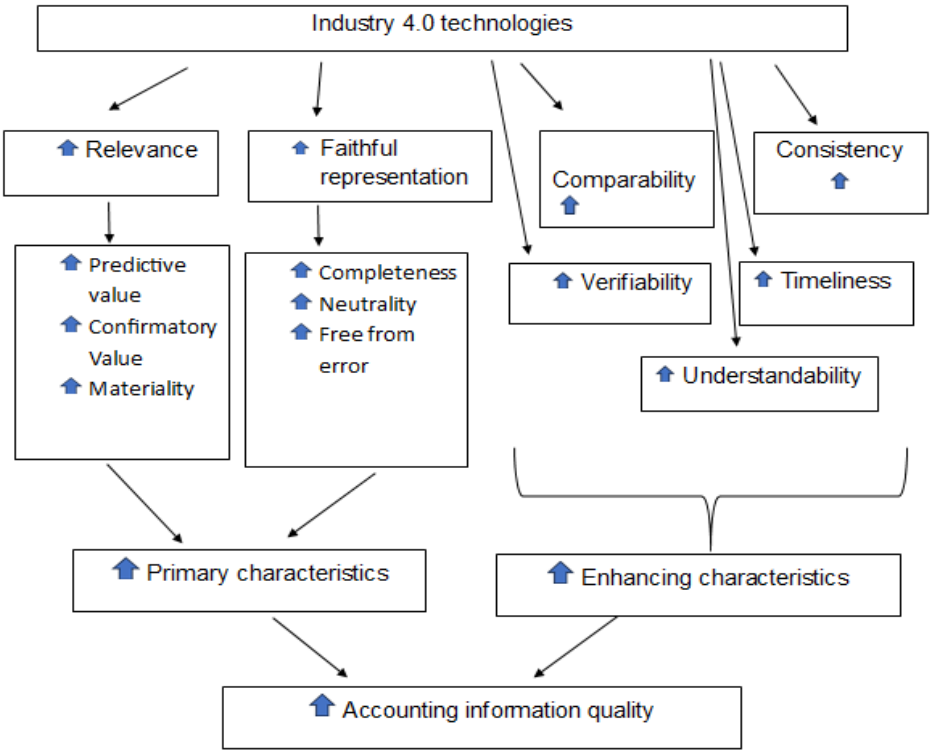

Figure 3: The effect of integrating Industry 4.0 technologies on qualitative characteristics of the accounting information

8. Conclusion

Adopting Industry 4.0 technologies such as IoT improve the accounting information quality and thus enhances the decision quality.

The IoT and Cloud may enhance some of the primary characteristics of the accounting information in terms of improving the predictive value, materiality, completeness, neutrality of the accounting information. Moreover, they may enhance some of the enhancing characteristics of the accounting information in terms of improving the timeliness, verifiability and understandability of the accounting information.

Regarding the BDA or AI, the adoption of BDA or AI may enhance some of the primary characteristics of the accounting information in terms of

improving the predictive value, confirmatory value, materiality, completeness, neutrality of the accounting information. Furthermore, they may enhance several of the enhancing characteristics of the accounting information in terms of improving the comparability, consistency, timeliness and understandability of the accounting information.

The research provides evidence regarding the usefulness of adopting cloud computing, BDA and AI to improve the primary and enhancing qualitative characteristics of the accounting information.

Hence the researcher suggests to integrate the cloud computing along with BDA or AI to benefit from the advantages of these Industry 4.0 technologies to enhance the accounting information quality.

9. Recommendations

Based on this research the researcher recommends to adopt several Industry 4.0 technologies such as cloud computing along with BDA or AI to improve the accounting information quality and thus to enhance the decision quality.

Before adopting the new technology, the organization should ensure that it has the required monetary, management, technological (IT systems, current infrastructure) and human capabilities that facilitate the adoption of the new technology.

Moreover, organizations which decide to adopt new technologies should continuously improve their employee's knowledge and skills in computer science, data analytics to successfully implement the new adopted technologies. This can be done through digital skills training by IT professional to decrease the skills gap, reduce the employee resistance to use new technologies and to maximize the benefits of adopting new technologies.

It is also important to include the new technologies in the educational curriculums so that the students and graduates can gain the required digital skills to know how to use from these new technologies.

References

Abdelrazeik, A. (2022). Accounting in the Big Data Era: A Literature Review. *Financial and Commercial Research Journal*, *23*(3), 255-272.

Ahmed, A. & Alnagar, S. (2021). the role of integration between big data analytics and blockchain technology in achieving the quality of accounting information in financial statements: An empirical study. *The Scientific Journal of Accounting Studies*, 3(4), 428–495. (in Arabic).

Akai, N. D., Ibok, N., & Akinninyi, P. E. (2023). Cloud Accounting and the Quality of Financial Reports of Selected Banks in Nigeria. *European Journal of Accounting, Auditing and Finance Research*, *11*(9), 18-42.

Al Natour, J. R. A. Q. (2021). The impact of information technology on the quality of accounting information (SFAC NO 8, 2010). *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(13), 885-903.

Al-Qirim, N., Tarhini, A., & Rouibah, K. (2017, August). Determinants of big data adoption and success. In *Proceedings of the 1st International Conference on Algorithms, Computing and Systems* (pp. 88-92).

Alshikhi, O. A., & Abdullah, B. M. (2018). Information quality: definitions, measurement, dimensions, and relationship with decision making. *European Journal of Business and Innovation Research*, *6*(5), 36-42.

Askary, S., Abu-Ghazaleh, N., & Tahat, Y. A. (2018, October). Artificial intelligence and reliability of accounting information. In Conference on eBusiness, e-Services and e-Society (pp. 315-324). Springer, Cham.

Ayokanmbi, F. M. (2021). The impact of big data analytics on decision-making. *International Journal of Management IT and Engineering*, *11*(4), 1-5.

Bachmid, F. S. (2016). The effect of accounting information system quality on accounting information quality. *Research Journal of Finance and Accounting*, *6*.

Baig, M. I., Shuib, L., & Yadegaridehkordi, E. (2019). Big data adoption: State of the art and research challenges. *Information Processing & Management*, 56(6).

Balicka, A. (2023). Digital technologies in the accounting information system supporting decision making processes. *Scientific Papers of Silesian University of Technology. Organization & Management/Zeszyty Naukowe Politechniki Slaskiej. Seria Organizacji i Zarzadzanie*, (169).

Chatterjee, S., Chaudhuri, R., Gupta, S., Sivarajah, U., & Bag, S. (2023). Assessing the impact of big data analytics on decision-making processes, forecasting, and performance of a firm. *Technological Forecasting and Social Change*, *196*, 122824.

Chukwuani, V. N., & Egiyi, M. A. (2020). Automation of Accounting Processes: Impact of Artificial Intelligence. *International Journal of Research and Innovation in Social Science* (IJRISS), 4(8), 444-449.

Côrte-Real, N., Ruivo, P., & Oliveira, T. (2020). Leveraging internet of things and big data analytics initiatives in European and American firms: Is data quality a way to extract business value? *Information & Management*, 57(1), 103141.

Di Berardino D. & Vona S. (2023). Discovering the Relationship Between Big Data, Big Data Analytics, and Decision Making: A Structured Literature Review. *European Scientific Journal*, ESJ, 19 (19), 1. https://doi.org/10.19044/esj.2023.v19n19p1

Elgendy, N., & Elragal, A. (2016). Big data analytics in support of the decision making process. *Procedia Computer Science*, *100*, 1071-1084.

Falana, G. A., Igbekoyi, O. E., & Dagunduro, M. E. (2023). Effect of big data on accounting information quality in selected firms in

Nigeria. *International Journal of Research and Innovation in Social Science*, *7*(3), 789-806.

Frisk, J. E., & Bannister, F. (2017). Improving the use of analytics and big data by changing the decision-making culture: A design approach. *Management Decision*, *55*(10), 2074-2088.

Ghaleb, E. A., Dominic, P. D. D., Fati, S. M., Muneer, A., & Ali, R. F. (2021). The assessment of big data adoption readiness with a technology–organization–environment framework: a perspective towards healthcare employees. *Sustainability*, *13*(15), 8379.

Haddad, A., Ameen, A. A., & Mukred, M. (2018). The impact of intention of use on the success of big data adoption via organization readiness factor. *International Journal of Management and Human Science (IJMHS)*, *2*(1), 43-51.

Hangl, J., Behrens, V. J., & Krause, S. (2022). Barriers, drivers, and social considerations for AI adoption in supply chain management: a tertiary study. *Logistics*, *6*(3), 63.

Janssen, M., Van Der Voort, H., & Wahyudi, A. (2017). Factors influencing big data decision-making quality. *Journal of business research*, *70*, 338-345.

Jeble, S., Kumari, S., & Patil, Y. (2017). Role of big data in decision making. *Operations and Supply Chain Management: An International Journal*, *11*(1), 36-44.

Jin, H., Jin, L., Qu, C., Fan, C., Liu, S., & Zhang, Y. (2022, June). The Impact of Artificial Intelligence on the Accounting Industry. In 2022 8th International Conference on Humanities and Social Science Research (ICHSSR 2022) (pp. 570-574). Atlantis Press.

Kabir, M. F., Rana, M. I. C., & Rahman, M. A. (2025). The role of information technology in improving the accuracy and efficiency of

accounting data. *International Journal on Science and Technology (IJSAT)*, *16*(1), 1.

Karmańska, A. (2021). Internet of Things in the accounting field–benefits and challenges. *Operations Research and Decisions*, *31*(3), 23-39.

Kehinde, F. H., Raymonda, O. N., & Akindele, O. O. (2023). Industry 4.0/5.0 big data and accounting information quality in Nigeria. *South Asian Journal of Marketing & Management Research*, *13*(8), 1-15.

Kmaleh, A. I. M. (2023). The Impact of Using the Cloud Computing Upon the Quality of Accounting Information and it's Reflection Upon the Development of the World Standards of Financial Reports in Jordanian Corporations. *International Journal of Professional Business Review: Int. J. Prof. Bus. Rev.*, *8*(9), 23.

Kozioł-Nadolna, K., & Beyer, K. (2021). Determinants of the decision-making process in organizations. *Procedia Computer Science*, *192*, 2375-2384.

Kwafo, D. (2019). The impacts of artificial intelligence on management accounting students: a case study at Oulu Business school. University of Oulu. Master Thesis.

Li, B. (2025). Using Data Mining Technology to Improve the Reliability of Accounting Information Cloud Data. *Informatica*, *49*(5).

Li, Z. (2020, June). Analysis on the influence of artificial intelligence development on accounting. In 2020 International conference on big data, Artificial Intelligence and Internet of Things Engineering (ICBAIE) (pp. 260- 262). IEEE.

Liu, H. (2025). Research on Financial Sharing and Accounting Information Quality Under the Background of Big Data Information. *International Journal of e-Collaboration (IJeC)*, *21*(1), 1-19.

Lotfy, S. (2020). The effect of internal control structure quality on the firm's financial performance. An applied study on listed companies in Egyptian

Stock Exchange. Unpublished Master Thesis. Faculty of Commerce. Alexandria University.

Maelah, R., Al Lami, M. F. F., & Ghassan, G. (2019). Management accounting information usefulness and cloud computing qualities among small medium enterprises. *International Journal of Management Studies*, 26(1), 1-31.

Marques, S., Gonçalves, R., da Costa, R. L., Pereira, L. F., & Dias, A. L. (2023). The impact of intelligent systems on management accounting. *International Journal of Intelligent Information Technologies (IJIIT)*, *19*(1), 1-32.

Mohamed, M. (2018). Challenges and benefits of industry 4.0: An overview. *International Journal of Supply and Operations Management*, *5*(3), 256-265.

Monino, J. L. (2021). Data value, big data analytics, and decision-making. *Journal of the Knowledge Economy*, *12*, 256-267.

Muniswamaiah, M., Agerwala, T., & Tappert, C. (2019). Big data in cloud computing review and opportunities. *arXiv preprint arXiv:1912.10821*.

Najafi, A., Soleimanpur, S., & Morady, Z. (2022). The Impact of Information Technology Methods on Accounting Information Quality: Empirical Evidence From Iran. *Journal of Information and Organizational Sciences*, *46*(1), 63-77.

Naqvi, R., Soomro, T. R., Alzoubi, H. M., Ghazal, T. M., & Alshurideh, M. T. (2021, May). The nexus between big data and decision-making: A study of big data techniques and technologies. In *The International Conference on Artificial Intelligence and Computer Vision* (pp. 838-853). Cham: Springer International Publishing.

Okeke, N. M., & Eze, A. A. (2025). Assessment of the effect of big data analytics on accounting information quality in Nigeria. *Journal of Global Accounting*, *11*(1), 64-83.

O'Leary, D. E. (2013). Big data, the "Internet of Things" and the "Internet of signs". *Intelligent Systems in Accounting, Finance and Management*, *20*(1), 53-65.

Puspitawati, L., & Anggadini, S. D. (2019). The Influence of the Quality Accounting Information System to the Quality of Accounting Information-Evidence In Indonesia. *Majalah Ilmiah UNIKOM*, *17*(1), 3-12.

Qiu, J. (2021). Analysis of human interactive accounting management information systems based on artificial intelligence. *Journal of Global Information Management (JGIM)*, *30*(7), 1-13.

Sayah, A., & Badi, A. (2024). The impact of using big data on the quality of accounting information. *Contemporary Economic Research*, *7*(1), 39-48.

Shaffer, K. J., Gaumer, C. J., & Bradley, K. P. (2020). Artificial intelligence products reshape accounting: time to re-train. Development and Learning in Organizations: *An International Journal*, 34(6), 41-43.

Shahbaz, M., Gao, C., Zhai, L., Shahzad, F., & Arshad, M. R. (2020). Moderating effects of gender and resistance to change on the adoption of big data analytics in healthcare. *Complexity*, *2020*, 1-13.

Shaikh, M. H., Mustafa, F., Bishop, B. G., & Zeb, M. A. (2022). Qualitative Characteristics of an Accounting Information System inside a Financial Corporation: A Case Study on Multi-Method Information at Haines Watts Corporation. *International Journal of Innovative Science and Research Technology*, *7*(3).

Sohail Khan, H., & Siddiqui, D. A. (2023). Understanding the determinants of Big Data Analytics Adoption and their impact on the overall business performance, with the moderating effect of technology readiness in the organizations.

Trunk, A., Birkel, H., & Hartmann, E. (2020). on the current state of combining human and artificial intelligence for strategic organizational decision making. *Business Research*, *13*(3), 875-919.

Vincent, V. U. (2021). Integrating intuition and artificial intelligence in organizational decision-making. *Business Horizons*, *64*(4), 425-438.

Wang, H., Xu, Z., Fujita, H., & Liu, S. (2016). Towards felicitous decision making: An overview on challenges and trends of Big Data. *Information Sciences*, *367*, 747-765.