

The Effectiveness of Artificial Intelligence Systems in improving The Quality of Sustainability Reports in Light of GRI-G4

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Abstract:

The purpose of this paper is to develop a conceptual framework to explain the effectiveness of Artificial Intelligence (AI) systems in improving the quality of sustainability reports in light of GRI-G4. The analytical descriptive approach has been used to analyze and study literature reviews related to Artificial Intelligence (AI) systems and its role in improving sustainability reports quality. It has argued that adapting new Artificial Intelligence (AI) systems can improve sustainability reports quality, but through this paper, appears risks related to applying it. The paper reached to some conclusions, the most important of which is expanding the development of the necessary infrastructure to expand the application of artificial intelligence systems, in a way that contributes to achieving the goals of sustainability in light of Egypt's Vision 2030, and Holding specialized seminars and workshops to introduce AI techniques and their components and how to use and benefit from them for the purpose of increasing awareness of practitioners of the accounting and auditing profession.

Keywords: Artificial Intelligence (AI), Sustainability Reports Quality, Internet of Things (IOT).

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I.INTRODUCTION

Artificial Intelligence (AI) has spread to all aspects of our society, including infrastructure, law enforcement, banking, healthcare, and humanitarian aid. As AI becomes more widespread, there is increasing pressure to design and handle AI in a responsible, fair, and transparent manner (Cath, 2018). The emergence of artificial intelligence technology is the future technological output towards human development, as AI works to change the traditional work methods of accountants, especially in light of the emergence of Internet of Things (IOT) devices and advanced artificial intelligence technologies, with the enormous analytical capabilities of AI and the benefits of long-term work, it will create A cautious shift in the accounting function through its ability to perform accurate analyses and rapid computerized tasks with highly efficient completion of many accounting works, which supports and enhances accountants' capabilities and levels of performance, and also significantly contributes to facilitating, Storing, retrieving, and analysing data to overcome time and space constraints, which helps to improve report quality (Al-Qadi, 2023).

Sustainability is one of the fundamental factors for the future development of AI, which strives to improve company performance from an economic, social, and environmental perspective (Renda, 2019); the sustainability dimension has been captured in particular by the "AI for Good" initiative, which has been endorsed by the International Telecommunication Union and the United Nations in general. The Mission Villani report also sets a goal in France to develop AI as a tool for a sustainable and environmental economy, providing a vision for AI "green" that enables ecological transition (Mission Villani, 2018).

Social sustainability is therefore significant in the context of AI. The smart development of AI is projected to have an impact on a variety of societal aspects, according to the Sustainable Development Goals (SDGs) of the United Nations. Many social elements are likely to be affected by the intelligent development of AI; in particular, the SDGs seek full and decent employment and human capital enhancement as key objectives, which seem to be inconsistent with evidence of accelerating job replacement. In addition, regardless of whether jobs are replaced, goals related to eradicating hunger and poverty and reducing inequality inevitably constrain the development of AI (Renda, 2019).

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Accordingly, AI can open huge opportunities to achieve the Sustainable Development Goals (SDGs) set by the United Nations in the 2030 Agenda for Sustainable Development where its applications enable innovative solutions, improved risk assessment, better planning, and faster knowledge sharing.

A. Artificial Intelligence (AI)

Technical developments witnessed radical and rapid changes in the economic environments, where new applications of information systems and new standards for the design of these systems emerged, and many factors helped to spread the use of these developments, the most important of which are: the endeavor of all countries to keep pace with the developed technological systems around the world, and the presence of large amounts of available data to learn, which resulted in the creation of AI algorithms, AI is considered one of the most prominent modern applications of information systems, as it represents one of the most important modern sciences that arose due to the convergence of the technical revolution in the field of computer science and automatic control on the one hand, and the science of logic, mathematics and languages on the other hand (Amerhm, 2022).

Egypt is one of the countries that has advanced in the area of digital transformation. In particular, the Minister of Communications and Information Technology stated in 2015 that Egypt is emerging as a regional leader in the field of digital economy. It also reviewed the most significant policies in the framework of digital transformation through structural changes in the establishment of the National Council for Electronic Payments 2017, which is led by the President of Egypt (Decision No. 89, 2017).

B. Artificial Intelligence (AI) & Sustainability

The world is facing tremendous environmental change, a global biodiversity crisis, and an urgent need for sustainable human development, so, International and national bodies have developed ambitious plans to help overcome these environmental challenges, such as the United Nations (UN) Decade on Ecosystem Restoration and the 2030 Agenda for Sustainable Development (García et al., 2023), Digital transformation is characterized by the integration of physical and digital processes into decentralized systems, which represents a major change in the social and organizational environment which in turn affects all aspects of people's lives, as companies and society changed their structures (Gonçalves et al., 2022).

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Increased stakeholder demands that companies disclose the environmental and social implications of their business activities are a result of growing stakeholder interest in ethical business practices worldwide. However, in some instances, companies have turned to the "Greenwashing" practice of include misleading sustainability disclosures in corporate communications and sustainability reports. Simultaneously, advances in AI technology have made it possible to quickly and accurately analyse huge amounts of textual data, like that seen in sustainability reports. (Moodaley & Telukdarie, 2023).

The Global Reporting Initiative (GRI) states, "The basis for sustainability reporting is for an organization to identify and prioritize its impact on the economy, the environment and people to be transparent about their impacts." Many companies now choose to report ESG factors in their sustainability reports (Moodaley & Telukdarie, 2023).

It should be noted that technology could be promoted for sustainability as follows (Shaaban, 2021):

- Developing research activities by promoting new materials technology, and adopting sustainable mechanisms.
- Improving the performance of private public institutions with specific inputs based on modern technologies, which leads to a reduction of time and cost.
- Developing strategies and plans in which new technologies are integrated into plans and strategies for social and economic development, in parallel with achieving global goals.
- Digital transformation contributes to preserving available resources for a longer period.
- Digital technology in industries contributes to reducing harmful emissions resulting from the use of traditional methods in industry, which is one of the most important goals of sustainability.

AI has the potential to play a significant role in moving our planet towards a more sustainable future, as AI can help make better use of resources, increase efficiency, and create smarter solutions suited to individual needs and preferences, and thus AI-powered technologies can also help. It can improve existing processes like manufacturing and transportation with creating new opportunities for sustainability, and AI systems can identify correlations between energy use and emissions, allowing us to make informed decisions about how to best use resources without wasting them (Haluza & Jungwirth, 2023).

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II. THEORETICAL FRAMEWORK

Sustainability is a method of using resources without depleting them. Sustainability demonstrates concern for future generations' well-being and requires an integration of three critical elements: economic growth, social inclusion, and protecting the environment (Awad & Elnady, 2020).

Developments in technology have encouraged the motives of professional bodies, accounting and auditing offices at the international level, where great efforts are being made to use technological development techniques in order to keep pace with advanced software as well as to ensure the effectiveness of auditing and prepare for more developments in the future periods, and this has been translated into reality through the involvement of the Big Four accounting and auditing firms in initiatives and applications of AI applications, which represent one of the advanced technologies aimed at making machines and devices display intelligent behaviour that simulates the behaviour of the human mind to perform accounting and auditing procedures such as book audit (Amerhm, 2022).

The emergence of the idea of AI began in the middle of the twentieth century after the Dartmouth University conference on AI in 1956, and one of the most important recommendations of the conference was the shift towards automation of machines in the sixties, which in turn led to the shift towards the information industry and communication technologies at the end of the twentieth century. , and artificial intelligence has changed the ways of business practices and industries, including the accounting industry that go beyond traditional methods, and at the forefront of the twenty-first century accounting has become one of the industries that use automation in operating accounting systems (Emetaram & Uchime, 2021).

A. *Artificial Intelligence: Concept, Objectives, Types, Characteristics, and Techniques*

Rapid advances in AI pose serious challenges for companies, as they must manage the scale and speed of technology, companies need to better understand the scope and depth of the risks involved and develop processes, organizational structures, and governance to address these challenges (Taeihagh, 2021). This was supported by (Greenman, 2017) study, which found that AI is now a generally accepted theory that has affected both the humanities and all of the sciences. The best examples of this are the smart phones and

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televisions we use every day in our homes. One of the new technologies that has acquired more attention recently is AI. A group of advanced technologies known as AI can carry out tasks similar to those of human intelligence (Liao et al., 2022; Mao et al., 2019).

The term AI is one of the most commonly used terms today, and it is defined as machines' ability to imitate human cognitive functions such as problem-solving, learning, allowing them to make predictions that are used to facilitate decision-making (Merah & Taweelb, 2022). AI has been introduced to the accounting profession in order to perform more efficiently, appropriately and adequately accounting activities and to obtain reliable and accurate information, which facilitates the process of implementing and making strategic decisions more effectively than it was in the past, and to mitigate fraud and human error.

Liao et al., (2022) defines AI as an emerging technology that has great potential in reducing energy consumption, environmental burdens, and operational risks of chemical production. However, large-scale applications of AI are still limited. One barrier is the lack of quantitative understanding of the potential benefits and risks of different AI applications, Whereas (Fernández, 2019; Al-Qadi, 2023) sees AI as a set of theories and algorithms that allow computer systems to perform tasks that normally require human intelligence (such as visual perception, voice recognition, or text interpretation taking into account the calculation of its context).

In recent years, the global business environment has witnessed a set of developments that led to the emergence of the information and communication technology environment, which is a mixture of communication technology and information technology with its various tools (Al-Qadi, 2023). As part of digital transformation, AI has the potential to play a critical role in addressing many negative aspects of major societal trends such as increasing urbanization, health concerns, and resource scarcity.

Both studies confirmed that (Al-Qadi, 2023; Stagliano & Tanzola, 2020; Zohuri & Rahmani, 2018) AI has a set of characteristics, as follows:

- Use a method similar to the human method in solving complex and non-routine problems.
- The ability to process non-numeric data of a symbolic nature.
- Contributing to supporting human expertise and providing multiple alternatives to the system, allowing the provision of alternatives to experts that enable them to make decisions in a rational manner.

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- The ability to deal with difficult and complex cases in the absence of the necessary information.
- The ability to visualize, creates, and understands and comprehends visible things.

Nowadays, there is an increasing use of digital technologies and AI such as machine learning models that take advantage of data to improve the performance of systems in all sectors (Delanoë & Colin, 2023), accordingly, AI is evolving from simple machines to self-aware devices. A study (Dallu, 2018; Al-Qadi, 2023) confirmed that AI is divided types as illustrated into the following figure:

Figure No. (1) Types of Artificial Intelligence

Type	Definition
Interactive Machines	It is the simplest form of AI that responds to the same situation in exactly the same way every time. A machine perceives its environment/situation directly, acts on what it see, and has no concept of the wider world. Memories cannot be formed or relied on experiences to influence current decisions. They are specialized in one area only, and this type is suitable for repetitive functions, for example, payment systems, and ATMs.
Limited Memory	AI machines with limited memory can look into the past, but memories are not preserved. Limited memory machines cannot build memories or "learn" from past experiences. An example of this is a self-driving car that can decide to change course because it has noticed from the moment that there is an obstacle in the road.
Theory of Mind	Theory of mind refers to the idea that a machine can perceive that others with whom it interacts have thoughts, feelings, and expectations and the machine embedded in the third type of AI will be able to understand other people's thoughts, feelings, and expectations and be able to adjust its behavior accordingly.
Self-Conscious	A self-aware machine would be an extension of the theory of mind.” and be able to predict the feelings of others.

Source: (Dallu, 2018; Al-Qadi, 2023) Adapted from the researcher

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AI is a broad term that includes a wide range of technologies and algorithms focused on creating intelligent systems (Haluz & Jungwirth, 2023), As AI is rapidly changing how transactions and social interactions are organized in society today, AI systems and the algorithms that support their processes play an increasingly important role in making decisions of high value to society (Taeihagh, 2021). AI has great potential when it comes to helping society move towards a more sustainable future (Haluz & Jungwirth, 2023), and the most important key techniques of AI as follows (Bholane, 2023):

- Internet of Things (IoT): It is a key component of smart factories, where machines in the factory are equipped with sensors and an IP address that allows machines to communicate with other web-enabled devices.
- Cloud computing is the cornerstone of any Industry 4.0 strategy. The large amount of data can be processed more efficiently and cost-effectively by using the cloud.
- Machine Learning: Machine learning can generate insights that provide prediction, and automation of business processes.
- Edge computing: Using edge computing means that data stays close to its source, which reduces security risks.
- Cyber Security: When making a digital transformation to Industry 4.0, it is necessary to consider a cyber-security approach that includes IT equipment and operational technology.
- Digital Twin: Manufacturers can use digital twins to help increase productivity, improve workflow, and design new products.
- Augmented Reality (AR): With an augmented reality system, employees use mobile devices to visualize real-time IoT data.

The development of AI applications aims to develop the necessary methods for building and preserving information, enabling machines to process information in a way that is closer to the human method, a better understanding of human intelligence through the simulation method that the human mind cannot perform, and finding new ways to extract information (Abdel Halim, 2022).

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B. Artificial Intelligence Opportunities, Risks and addressing Challenges

The booming adoption of AI poses both benefits and challenges (Schoormann et al., 2023). Over the past decade, the use of various AI tools has increased as companies from various industries seek to develop and apply AI in their operations to improve their efficiency or reduce costs. However, the rapid development of new technology has also raised certain concerns regarding human rights, data security, privacy or ethical issues. In particular, disruptive AI tools, big data collection and processing are causes of concern for the wider community (Bonsón et al., 2023).

While technology can produce positive effects for humanity, AI applications can also lead to unforeseen and unintended consequences and pose new forms of risks that need to be effectively managed by companies, since AI systems learn from data as well as programmed rules, unexpected situations that the system is not trained to handle and uncertainties in human-machine interactions can drive AI systems to exhibit unexpected behaviors that pose safety risks to their users (Helbing, 2019; Taeihagh, 2021).

Complementary to AI risks, non-specific human biases may be embedded in AI technology, human logical errors may be embedded in AI technology, and inadequate testing and oversight of AI may lead to ethically questionable results (Dallu, 2018; Al-Qadi, 2023), Therefore, AI raises major ethical issues of making sure that algorithms do not violate basic human rights to privacy and data confidentiality.

As a result, AI focuses on investigating three specific research areas as follows :(Cath, 2018)

- Ethical Governance: Focusing on the most relevant ethical issues raised by AI covering issues such as fairness, transparency and privacy, the use of AI by industry, government and companies, and the ethical response to the disappearance of jobs generated by AI applications
- Interpretability is represented in potential mechanisms for increasing algorithm fairness, transparency and accountability. For example, the idea of the right to interpret algorithmic decisions is discussed whereby this right gives individuals the right to an explanation if the algorithm decides on their behalf to decline a loan application. However, this right is not yet guaranteed.
- Ethical audit: For highly ambiguous and complex algorithmic systems,

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accountability mechanisms cannot rely solely on interpretability, so audit mechanisms have been proposed as possible solutions that consider the inputs and outputs of algorithms.

Guan, (2019) believes that despite the enormous potential for research and development of AI in the field of medical care, the ethical challenges resulting from its applications have set new requirements for governance. To ensure AI applications in healthcare and medicine, it is proposed to establish an ethical global governance framework and system as well as specific guidelines for AI applications in medicine. The most important aspects include the roles of governments in ethical audit and the responsibilities of stakeholders in the ethical governance system.

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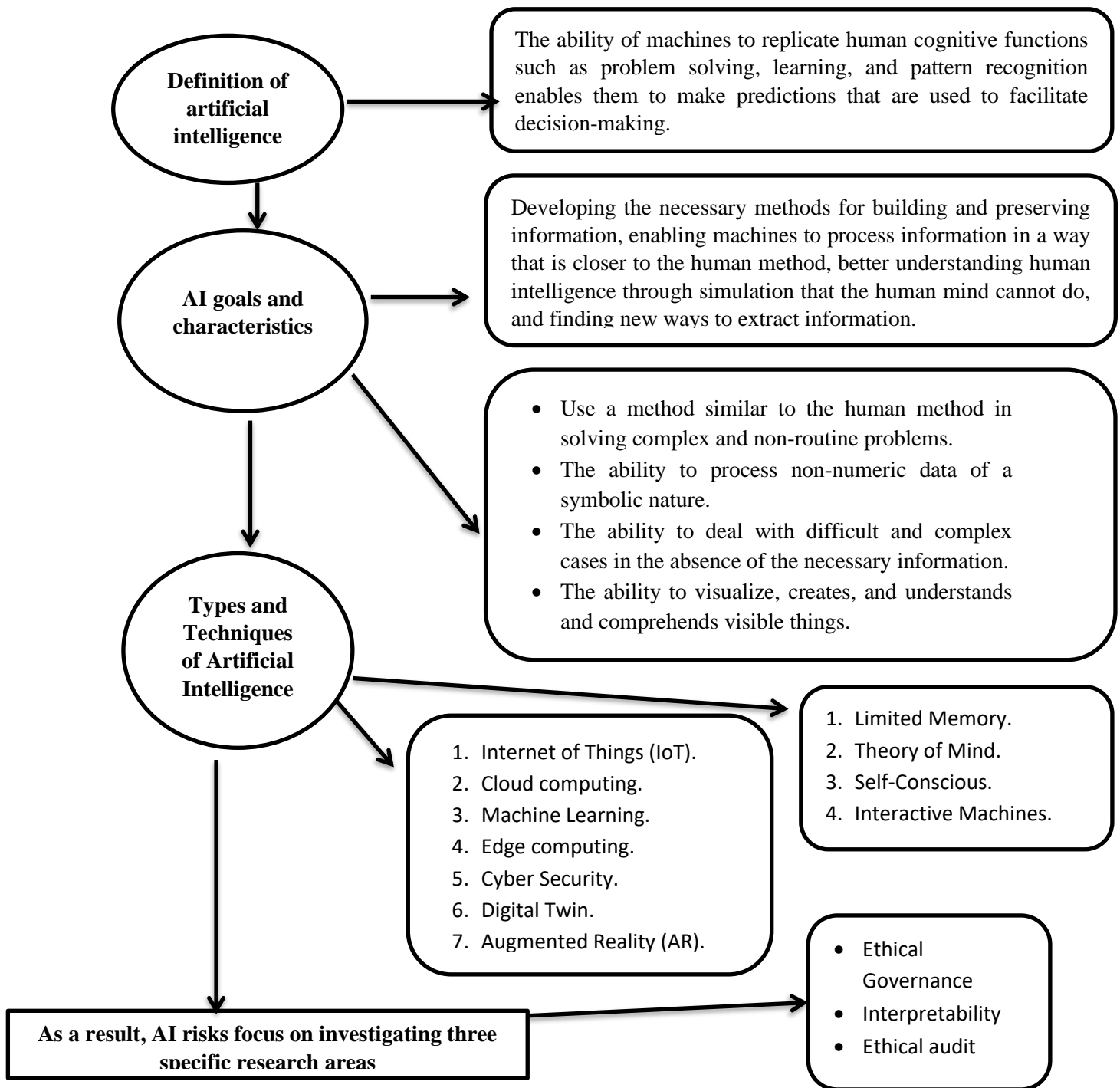


Figure No (2): Theoretical Framework (Source: Researchers)

Over the past two decades, companies around the world have begun to develop non-financial disclosures to supplement their financial statements with the aim of shedding more light on the public implications of their activities. The enormous pressure from stakeholders has led companies to be more transparent about their ESG performance due to potential negative impacts on the environment and society. This has also led to the development of generally accepted non-financial reporting standards, such as the Global Reporting

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Initiative (GRI), ISO 26000, etc., which provides guidance to companies on how to disclose non-financial performance with key performance indicators. Alongside these standards, legislation has been developed in some countries where environmental, social and governance issues may have particular threats to society as a whole (Bonsón et al., 2023).

C. Artificial Intelligence Techniques and Disclosure of the Dimensions of Sustainability

In 2015, the United Nations launched the Sustainable Development Goals (SDGs) in collaboration with civil society and companies, recognizing that leading companies have the potential to innovate solutions to achieve global sustainability. To explore the impact of launching the SDGs on companies, researchers applied an analysis with computer-assisted the language used in the sustainability reports of 164 large companies to check whether the SDGs influenced their sustainability reports. The results showed that when comparing corporate sustainability reports before and after 2015, increased alignment with some SDGs was observed, while alignment did not change significantly for other SDGs (Whittingham et al., 2023).

Bonsón et al., (2023) sought to analyze the current practices of major Western European companies with regard to automated disclosure of decision-making in their annual reports or sustainability reports, and the sample consisted of 962 annual / sustainability reports, published in 2018 and 2019, from 337 listed companies on the stock exchanges of 13 European countries. The results showed that the automated disclosure is still at an early stage and that the first adopters are mostly companies operating in the financial sector, While Eid, (2020) aimed to assess the role of modern technological developments, especially the Internet of Things (IoT), in developing sustainability disclosure practices through a proposed approach that relies on electronic platforms in building the informational platform and the software platform. The study found that there is a direct relationship between the use of applications Internet of things (IoT), achieving instant disclosure and increasing levels of disclosure about sustainability.

The practice of sustainability reporting reflects growing public awareness regarding the importance of sustainability, increasing stakeholder expectations and pressure on companies to disclose the impact of their operations on the environment and society. In this context, sustainability reporting has become increasingly important for companies to indicate their

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commitment to their stakeholders in relation to ESG factors (Moodaley & Telukdarie, 2023).

And since the disclosure of sustainability is one of the practices that aim to develop the company's performance through the development of non-financial information disclosure practices (environmental and social), the emergence of modern technologies related to (IoT) may also contribute to the development of sustainability disclosure practices through the technological link that It relies on smart sensors that link financial transactions and deals with environmental and social impacts, Hence, immediate disclosure and meeting the needs of the stakeholders, meaning that (IoT) will not only meet the customer's needs for material goods, but will also show the economic, social and environmental effects immediately, which helps to shift to immediate disclosure and meet the needs of the external user of the financial statements immediately (Yang et al., 2013).

Accordingly, the study (Eid, 2020) examined the possibility of developing sustainability disclosure practices through a proposed accounting approach based on the following steps:

- **First:** Designing the software platform that aims to link the internal parts and components of the organization, this relies on linking the company's internal networks to the organization's internal information systems through the Internet.
- **Second:** Building the informational platform: This platform helps store all available information about the company and its decisions, as well as the potential and expected effects of the company's current decisions, including the economic, social and environmental effects.
- **Third:** Linking the information platform with the index of disclosure of sustainable development by storing relevant information, whether economic, environmental or social, on the company's information platform.

Within this context, the use of AI and machine learning (ML) has radically changed companies and society in recent years as advances in sustainability disclosure have coincided with increased interest in and use of AI – both within business and society (Moodaley & Telukdarie, 2023), unfortunately, the discipline and practice of sustainability disclosure face critical issues as follows: (Corazza et al., 2023)

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- **The first issue** relates to data manipulation, and this often happens in a way that affects the reliability of sustainability reports. Many scholars have shown how unsustainable companies can make effective use of sustainability reports that make their performance unstable.
- **The second issue** relates to the relative importance of the sustainability information provided. Since the content of the report is based on material topics addressed internally and externally to an organization, it is easy for a manager to manipulate these results, with the goal of disclosing, discussing and reporting the more positive and less serious issues about the company's performance. Disclosure of critical sustainability information will be value-related.
- **The third issue** concerns the global governance of the sustainability and standards movements. Meaning all the forums, associations, standards and guidelines that have the global power to define who is sustainable.

In order to advance sustainability and address issues pertaining to environmental, social, and economic optimism, AI can be an useful instrument. Researchers suggest how AI might support sustainability:

- Smart Resource Management through using machine learning (ML) algorithms, and IoT sensors, AI can assist optimise the utilisation of resources like water, electricity, and food. AI can employ data analytics to reduce energy use, analyse weather patterns, and improve distribution supply networks to reduce wastage.
- Climate Change through using data from historical experiences, AI can be used to forecast the effects of climate change. In order to create policies that prevent climate change, we can employ machine learning (ML) algorithms and deep learning models to forecast potential future scenarios of climatic change.

Machine learning (ML) can be extremely useful in revealing sustainability information. This can assist companies in creating more meaningful and transparent sustainability reports that stakeholders can easily understand.

Subsequently, the use of AI in sustainability reporting can assist companies in more accurately measuring and reporting their sustainability performance, identifying areas for improvement, and developing more effective sustainability strategies.

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III. DISSCUSSION AND CONCLUSION

- The need for more companies to implement the requirements of applying digital transformation technologies in general, and AI systems as one of the digital transformation technologies in particular.
- Directing the attention of the preparers of sustainability reports and managers of companies in the information and communication technology sector towards the role of applying AI systems in improving the quality of sustainability reports through the economic, environmental and social dimensions.
- Expanding the development of the necessary infrastructure to expand the application of artificial intelligence systems, in a way that contributes to achieving the goals of sustainability in light of Egypt's Vision 2030.
- Follow-up the development of government institutions and companies and digitally transform them into implementation of the digital transformation process in order to ensure the sustainability of companies.
- Holding specialized seminars and workshops to introduce AI techniques and their components and how to use and benefit from them for the purpose of increasing awareness of practitioners of the accounting and auditing profession.

IV. FUTURE RESEARCH AREAS

AI is one of the modern topics that open new research horizons for researchers to conduct more research, some of which are as follows:

- Measuring the impact of applying AI systems in improving environmental disclosure about climate change for companies listed in the EGX30 index.
- Opportunities and risks of applying AI systems in Egyptian companies - an analytical study.
- The ethical implications of applying AI systems in companies listed on the Egyptian Stock Exchange.

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