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Artificial Intelligence And Business Sustainability In Sub-Sahara Africa

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ABSTRACT:
This study examined artificial intelligence and business sustainability in Sub-Sahara Africa. Anex-post facto research design was adopted. Data were generated using secondary data from annual reports and accounts of selected multinational firms from 2013 – 2022. The data were analyzed using simple regression analysis. The finding revealed that artificial intelligence has no significant effect on the economic reporting of multinational firms in Sub-Sahara Africa. Also, artificial intelligence has a significant effect on the environmental reporting of multinational firms in Sub-Sahara Africa. Based on the findings, the researchers recommend that Sub-Saharan African firms should embrace AI-specific measures such as sharing best practices and supporting new and innovative AI applications for fighting climate change. However, they should be guided in order not to throw unskilled workers out of their jobs. Initiatives like skill acquisition and entrepreneurship should be encouraged by governments of developing countries to reduce unemployment that may arise as a result of the deployment of AI systems. Displaced workers can be trained and deployed in the most sustainable way possible while minimizing negative impacts for the good of the planet. Environmental preservation and regeneration of the ecosystem are paramount for sustainable development. This will enable artificial intelligence to have direction and function effectively towards ensuring that business sustainability is achieved.
KEYWORDS: Artificial Intelligence, Technology acceptance model, Business innovations, sustainability reporting and Sub-Sahara Africa.

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INTRODUCTION

Business innovation calls for the application of Technology, which is one of the major influential factors in an industry. We are in the science and technology age, or instead, the Fourth Industrial Revolution era. Digital technologies like machine language (ML) and artificial intelligence (AI) are available for day-to-day operation activities, which will push transformation in business to the next level, and Sub-Sahara Africa should be included in the crusade for business sustainability. As stated by Abrams *et al.* (2019), in computer science, artificial intelligence is referred to as machine intelligence, whereby natural intelligence is less focused now, and machines play the role of intelligence for organizations. Jain (2017) and Yawalker (2019) observed that increasing pressures in business have made it possible for artificial intelligence to gain ground in the overall system of organizations, particularly in human resource management. Abubakar et al. (2019)

and Buzko *et al*. (2016) noted that artificial intelligence in human resources (HR) helps to support and develop a successful workforce in the organization. It has been argued that IT can produce visible impacts when integrated with the ecosystem of businesses, especially on the relationship between the company and its customers, prospects, and partners.

Developing economies are embracing AI and Machine Learning (ML), and they are rapidly evolving and transforming political, economic, and social landscapes. AI-based solutions have emerged as a game-changer with significant consequences for increasing financial access to people with low incomes (Kshetri, 2021). AI has helped solve some local problems in Africa, such as an AI chatbot system that monitors sexual and reproductive health in Kenya (Yeboah, 2021). In Nigeria, there is an intelligent farming system where AI-powered drones monitor and track illegal fishing (Yeboah, 2021). Vinuesa (2020) observed that AI provides many opportunities and dramatically contributes to a broad range of Sustainable Development Goals (SDGs), including poverty reduction, educational quality for all, portable water and sanitation, affordability and clean energy, peace and justice, and strong institutions. There is no doubt that the more significant impact of AI has been felt in advanced economies like Europe, Asia, North America, and the UK. However, its effect is hardly seen in Sub-Saharan Africa. Cisse (2018) noted that a lack of diversity in AI could perpetuate unanticipated algorithmic biases and create discrimination in AI products, particularly in Africa. It is envisaged that the disparity in the number of AI researchers implies that there will be fewer opportunities to apply AI to better Africans' lives. People need to think of efficient utilization of AI and robotics applications in African firms. The AI index revealed that the African continent scored among the lowest regions on average because of a few countries' readiness to implement AI as part of their countries' policies.

Business organizations in developed countries have adopted artificial intelligence and technology innovation. Most businesses in developed countries have reduced their workforce due to the adoption of AI, thereby reducing operating costs and maximizing profitability. Unfortunately, this is not so in developing countries like Sub-Saharan Africa. The rate of AI use in Sub-Sahara Africa is very minimal, suggesting that business organizations in this region failed to take advantage of AI and other technological innovations. Wamba-Taguimdje (2020) identified a positive association between artificial Intelligence and performance at both organizational and process levels. Oke (2008), Miler (2017), Zehong and Zheng (2018), and Margaret (2018) have also found a positive association. From the past literature, the studies have been done basically in a theoretical context. In developed countries, a minimal number of studies have been undertaken in Sub-Sahara Africa. In view of the research gap and problem observed as found in the above tasks, the researchers aimed to provide an answer to the nexus between artificial intelligence and economic reporting of businesses in Sub-Sahara Africa by examining how artificial intelligence affects environmental and social reporting among businesses in Sub-Sahara Africa.

REVIEW OF LITERATURE

Sustainable Development and Artificial Intelligence

The United Nations (UN) in 2009 defined the Millennium Declaration's goal of halving extreme poverty, which is defined as having less than $1.25 per day by 2015.Brundtland, 1987 posits that the United Nations (UN) specifically contributed to the idea of sustainable development. In fact, the UN authored one of its most cited definitions: "Development that meets the needs of the present without compromising on the ability for future generations to meet their needs". About 191 United Nations member states at the time, and at least 22 international organizations, were mandated to help achieve the following Millennium Development Goals by 2015 as follows:To eradicate extreme poverty and hunger;to achieve universal primary education;to promote gender equality and empower women;to reduce child mortality;to improve maternal health;to combat HIV/AIDS, malaria, and other diseases;to ensure environmental sustainability; andto develop a global partnership for development.

In the advanced economy, Artificial Intelligence is used to monitor and evaluate the sustainability of companies and to link investment in companies to specific sustainability criteria. There are also promising projects and approaches in nature conservation and environmental monitoring that use AI methods to monitor and evaluate sustainability commitments. Yeboah(2020) stated that Andrew Ng, a leading Artificial Intelligence (AI)-focused computer scientist and entrepreneur at the AI Frontiers Conference, exclaimed that "AI is the new electricity." He explained by further stressing that "Just as electricity transformed almost everything 100 years ago, today, I have a hard time thinking of an industry that I don't think AI will transform in the next several years". As observed by the International Finance Corporation (2021), Artificial intelligence (AI) has vast potential to facilitate Human Intelligence (HI) and revolutionize how people utilize

products and services, acquire information, create products, and interact. PwC Global (2017) highlighted in its report that by 2030, AI would increase the world's Gross Domestic Product (GDP) to 15.7 trillion, a forecasted $6.6 trillion to productivity and $91.1 trillion to consumption effect. AI has progressed from an academic subject to a vital element in social and economic mainstream technologies such as banking, medical diagnostics, self-driving cars, and voice-activated machines that enhance people's daily lives (Mhlanga, 2020). Google Maps, Uber and Lyft rides, Facebook suggestions, spam filters in email, online shopping, and cancer detection are just a few examples of AI technology that has made life easier (Marco, 2019). Businesses are competing to become AI corporations because of the incredible speed with which AI is invading every industry (Soni *et al*., 2019).

Business innovation and artificial intelligence

Business innovation is a general concept, as observed by Ward (2020) cited in Uzokife (2023) that can apply to many different products, services, efforts, and policies. This includes new products that will better serve customers or a new program that will help employees better communicate about projects they are working on.Innovation comes up with a new way to do things, and those new ways of doing things are introduced with the goal of earning the business more money. It is believed that any effort by entrepreneurs to find new ways of improving a business venture means dabbling into business innovation. Information Technology (IT) is an excellent example of innovation because it calls for the application of technology to create a more vibrant and efficient organization. As further stated by Uzokife (2023), the purpose of the business innovation process is to create value for the organization. This is made possible through creating new revenue opportunities, driving more revenue from existing channels, creating efficiencies that save time, money or both, or from improvements to productivity or performance.

Artificial intelligence is considered a business innovation because it has the potential to facilitate human intelligence and revolutionize how people utilize products and services, acquire information, and create products and interactions (IFC, 2021).Although critics argue that the implementation of AI in automated in-house production services may also dislocate and pressure the wages of low-skilled workers and is starting to impinge on the employment prospects of middle-skilled workers, with only the most responsible creative or supervisory roles remaining, there are a tremendous increase in sales volume and profitability of firms that adopted artificial intelligence. In Sub-Sahara Africa, where AI innovation is relatively new, skill acquisition and entrepreneurship should be encouraged by governments to reduce unemployment that may arise as a result of the deployment of AI systems. Displaced workers can be trained and deployed in the most sustainable way possible while minimizing negative impacts for the good of the planet. There is no doubt that the growth in data availability, connectivity development, and the increase in electronic devices has allowed for further advances in AI adoption in Africa. AI provides many opportunities and dramatically contributes to a broad range of sustainable development goals, including poverty reduction, educational quality for all, portable water and sanitation, affordability and clean energy, peace and justice and strong institutions, as observed by Vinuesa (2020).

Pillars of Sustainability Disclosures

Three pillars of sustainability consist of the following:

Economic pillar: This is otherwise known as the profit pillar. Economic sustainability describes the ability to ensure fair and equitable distribution and efficient allocation of resources. It defines strategies that promote the utilization of economic resources to the best advantage. Economic sustainability ensures that economic growth maintains a healthy balance with our ecosystem. Economic sustainability refers to the ability of an economy to support a defined level of economic production indefinitely. Baboukardos and Rimmel (2016), cited in Etim *et al*. (2021), posit that Economic sustainability disclosure encapsulates all information that covers all the firms' impact on the economic conditions of all the stakeholders and economic systems at domestic, national and global levels. The economic disclosure component of sustainability reportage is captured in the financial statements or reports that are produced at the end of every financial year.

Environmental pillar: This is also known as the planet pillar. Environmental sustainability advocates for a conservative use of the natural resources endowed on the environment. These resources are not unlimited; hence, our environment must be protected from exploitation and neglect. Environmental sustainability occurs when processes, systems, and activities reduce the environmental impact of organizations' facilities, products and operations. Environmental sustainability supports initiatives like renewable energy, reducing fossil fuel consumption and fishery, organic farming, tree planting, reducing deforestation, recycling and better waste management. Environmental sustainability disclosure deals with the reportage of the effect of the organizations' activities that directly or indirectly impact the environment or the ecosystem. Various

aspects of this disclosure include activities that cause pollution, gas flaring, erosion, and climate change (Baboukardos & Rimmel, 2016).

Social pillar: This is usually termed as people's pillar. Social sustainability is the ability of the social system, for example, a country, family or organization, to function at a defined level of social well-being and harmony indefinitely. It advocates the idea of an ethical responsibility towards human equality, social justice and poverty reduction. The social aspect of sustainability focuses on balancing the needs of the group. This pillar supports initiatives like peace, social justice, poverty reduction and other grassroots movements that promote social equity. The social aspect of sustainability disclosure, as observed by Etim et al. (2021), deals with how the activities of the organization affect the entire social systems, social strata, culture, and norms, as well as community relations.

Sustainability reporting is an Accounting performance measurement designed to go beyond the report on financial information. It brings about reports on the impact of the organization's activities on the planet and the people that dwell in it. Sustainability reporting is voluntary, as practised by multinational firms in Nigeria. The reporting was standardized, as any legislation on what to report did not guide companies. A sustainability report is vital because it enhances corporate issues and reports. It is comprised of economic, social and environmental. Sustainability reporting is the process of disclosing the performance of firms regarding the practice of sustainable development to both internal and external stakeholders (Emeka-Nwokeji, 2019). Likewise, Onoh *et al*. (2021) opined that sustainability reporting is the disclosure of an integral approach to sustainable issues, which is driven by stakeholders' pressure and legislative and ethical reasons. According to Hafni and Priantinah (2018), sustainability reporting is the practice that encompasses a company's value, governance model and approach towards creating a sustainable global economy. In the same vein, Ratanacharoenchai *et al*. (2017) explained that sustainability reporting is the reporting system that enhances transparency and the reputation of the firm and meets the interests of the stakeholders. Therefore, sustainability reporting refers to the disclosure of non-financial information following four main aspects of economic, environmental, social and governance sustainability strategically. Thayaraj and Karunarathne (2021) observed that there is an increase in companies that are now integrating environmental, social and governance sustainability (ESG) dimensions in their annual reports both in developed and developing countries, which shows that companies are promptly responding to the concerns of their stakeholders. Sustainability reporting is based on four dimensions: economic, environmental, governance and social sustainability practices. Various bodies have developed sustainability guidelines, among which are GRI. The GRI sustainability framework has been globally recognized as an international reference for companies on sustainability reporting. Thus, this study developed its sustainability reporting index based on the GRI performance indicators from economic, social and environmental dimensions. Stakeholders often see Reporting of economic, environmental and social sustainability performance as a platform to build the ethical reputation of firms **(**Nwobu, (2015). An ethical reputation can translate to an increase in demand for the shares of the firm. Investors are interested in corporate responsibilities that can guarantee long-term sustainability and not just profit maximization (Emeka-Nwokeji, 2019).

Table 1: Sustainability reporting indicators

Environmental	Social	Economic
Energy	Community involvement	Economic performance
Water	Anti-corruption behaviour	Market presence
Carbon emission	Human right	Indirect economic impact
Waste management	Employee health and safety	Value and supply chain
Compliance	Labour and industrial relation	Risk management
Product and service stewardship	Training and development	
Biodiversity	Philanthropy	
Transportation	Diversity and equal opportunity	

Source: Global Reporting Initiatives, (GRI) 2011.

Sustainability Analysis

The sustainability analysis investigates what sustainability means for the system under development and how the sustainability of the application's domain context will be impacted by the system (Penzenstadler, 2018). To structure this analysis, two concepts are used: sustainability dimensions and orders of impact. The sustainability dimensions are individual, social, economic, technical, and environmental. We refer to the definition of sustainability dimensions found in (Becker et al., 2016) as follows:

1) The individual dimension covers individual freedom and agency (the ability to act in an environment), human dignity, and fulfilment. It includes individuals' ability to thrive, exercise their rights, and develop freely.
2) The social dimension covers relationships between individuals and groups. For example, it covers the structures of mutual trust and communication in a social system and the balance between conflicting interests.
3) The economic dimension covers financial aspects and business value. It includes capital growth and liquidity, investment questions, and financial operations.
4) The technical dimension covers the ability to maintain and evolve artificial systems (such as software) over time. It refers to maintenance and evolution, resilience, and the ease of system transitions.
5) The environmental dimension covers the use and stewardship of natural resources. It includes questions ranging from immediate waste production and energy consumption to the balance of local ecosystems and climate change concerns.

Theoretical background

This study is anchored on the Technology acceptance model (TAM). TAM is a theory propounded by Davis in 1989, cited in Abrams et al. (2019). The theory talks about the adoption, acceptance and usage of technology. Artificial intelligence is information technology. Many experiments have shown that this theory firmly explains the adoption of information technology. The TAM proposes two factors that influence organizational intention to use new tools; they are considered valuable to use. The AI procedure applied by information technology proves that the higher the usefulness, the easier it is to use, and the more users will be. Both factors affect a person's attitude towards using the system, influencing the intention to use behaviour (intent to use, IU). Surendran (2012) opined that TAM is aided in resolving critical challenges in the field of information technology. Deciding between the adoption of any new technology by an individual or group is complicated, and the results are the adoption or rejection of the technology. Factors underlying the acceptance of technology are determined by the attitude and intention of using the product. This, in turn, depends on the use as well as the ease of using the product and, thus, the satisfaction of customers. The usage of AI is still a challenge for most organizations, especially in Sub-Sahara Africa, due to a need for knowledge and learning about the usage or application of such services. It is believed that a lack of understanding of the applicability of AI by business organizations is the primary reason for its low usage. However, TAM explains why business organizations should adopt AI for the purpose of enhancing their sustainability.

On the economic dimension of sustainable development, substantial investments have been made by the governments in advanced continents, and it was predicted that by 2022, 40% of customer-facing employees and government workers will consult an AI-powered virtual agent every day for decision-making or process-related support (Andrews, 2018). Governments of countries with advanced economies and large technology companies, such as the United Kingdom (UK) and France, are investing in the implementation of AI to create a competitive advantage. Cerulus (2022) posits that the government of the United Kingdom (UK) announced a £1 billion deal to put the nation at the forefront of the AI industry. In the same vein, France has invested about 1.5 billion into AI research. Such investments give advanced economies a competitive advantage at the national level; however, there are no appreciable investments in AI in Sub-Sahara Africa. It was noted that they also have negative impacts on the globalization of production and services. Hawking (2018) opined that critics argue that the implementation of AI in automated in-house production services may also dislocate and pressure the wages of low-skilled workers, and this is starting to impinge on the employment prospects of middle-skilled workers, with only the most responsible creative, or supervisory roles remaining.

In the case of the environmental dimension of sustainable development, AI-Jarrah et al. (2006) report on the impacts of improved waste management by using fuzzy inference models, which may be helpful in helping us take better care of the planet in terms of supporting waste and pollution management. Predictive systems can be used for earthquakes and weather forecasting to recognize better the likelihood of extreme event occurrences such as hurricanes and tsunamis. Ramachandran et al. (2017) proposed a modified Environmental Vulnerability Index (EVI) to assess the environmental impact of aviation on connected cities. Iglinski *et al.* (2017) point to the potential of autonomous vehicles to reduce greenhouse gas emissions through less fuel consumption. AI can also have a negative impact on the environmental dimension, mainly due to the contribution it makes towards the further acceleration and consumption of technological devices. It was observed that the increase in the production and consumption of technological devices would have two adverse effects, namely planned obsolescence and depletion of natural resources. The acceleration of technology is closely interlinked with planned obsolescence, which means designing products that wear out

"prematurely" (i.e., have valuable lives that were well below customer expectations). However, the rise of AI could potentially amplify these negative impacts by further automating extraction in more complex environments that are dangerous to human operators.

For the social dimension, Wisskirchen et al. (2017) opined that AI systems could help strengthen communities by helping with various minor roles of supporting the development of networks, conducting the administration and facilitation of collaboration, and taking over simple tasks in households, nursing, and teaching. It was noted that there are benefits as well as dangers; there is the chance to strengthen communities, but there is also a requirement to develop legal frameworks around AI, and all of the strengths and weaknesses here come with the threat of turning over too much power to AI. Nevertheless, AI can assist in a task such as classroom teaching. Similarly, Serholt et al. (2017) argue that several ethical issues need to be examined, such as the privacy of children's data, the boundaries of responsibility between teachers and robots, and the potential for AI's negative influence. Other areas where social interactions are being automated are social media and online community management. As the number of users in online services increases, the manual management of users becomes increasingly challenging. Hence, the adoption of AI systems in Sub-Saharan African businesses is imperative.

METHODOLOGY

This study adopted an ex post facto research design. The population of the study is made up of all 46 Sub-Saharan African Countries. Sub-Sahara Africa is grouped into four regions, namely, Central Africa, South Africa, East Africa and West Africa. Judgmental sampling was used to select one country from each region. The selection is based on two conditions. (i) The country must have a recognized multinational firm, and (ii) the firm must engage in artificial intelligence. In this regard, four countries were judgmentally selected. The selected countries are Cameroon, Kenya, South Africa and Nigeria. The study covered a period of 10 years ranging from 2013-2022.

Table 3: Sample size distribution

S/N	Regions	Countries	Multinational companies
1	Central Africa	Cameroon	Coca Cola
2	East Africa	Kenya	East African Breweries
3	Southern Africa	South Africa	MTN Group
4	West Africa	Nigeria	Nestle Plc

Source: Researchers' field survey, 2023

This study used indicators supplied by the GRI Sustainability Reporting Framework (2011) in Table 2.1 above for each of the sustainability dimensions analysis. The sustainability index is calculated as a simple average of the total index achieved for each sustainability disclosure dimension. In line with previous studies such as Laskar (2018), this study used content analysis to create an index for each sustainability dimension by quantifying the data obtained from the audited financial reports of the multinational firms for each year based on the frequency of indicators disclosed (occurrence) and the nature or quality of those indicators (quantitative or narrative). If a corporation reveals an indicator (i.e. incidence), we give it a 1; otherwise, we give it a 0. Additionally, if the multinational firm uses artificial intelligence, we give it a 1; otherwise, we give it a 0. Finally, we obtained the average sustainability disclosure index by taking a simple average of the total index score (TOD) obtained for all indicators in a dimension.

Model Specification

The model specification is as follows:

$$ECR_{it} = \beta_o + \beta_1 AI_{it} + e_i \quad (1)$$

$$ENVR_{it} = \beta_o + \beta_1 AI_{it} + e_i \quad (2)$$

$$SOR_{it} = \beta_o + \beta_1 AI_{it} + e_i \quad (3)$$

Where;

ECR = Economic Reporting
ENVR = Environmental reporting
SOR = Social cost
AI = Artificial intelligence
β_o = constant intercept term
β_1 = slope coefficient
e = stochastic disturbance term
t = period of data.

i = cross-section of firms.

Decision rule: Accept the null hypothesis if the p-value is less than 0.05 or 5% level of significance; otherwise, reject and accept the alternate hypothesis.

RESULT AND DISCUSSIONS

A regression analysis was carried out to estimate the effect of artificial intelligence, innovation, and business sustainability in Sub-Sahara Africa. Artificial intelligence was used as the independent variable, while economic reporting (ECR), environmental reporting (ENVR) and social reporting (SOR) were used as measures for business sustainability. As a way of determining the overall significance of the model, in this study, the adjusted R square, coefficient of determination, and F statistic were used. Using the F-statistic and T-statistics, variables were analyzed to determine their relationship.

Table 4: Effect of Artificial Intelligence on economic reporting of multinational firms in Sub-Sahara Africa

Dependent Variable: ECR
Method: Least Squares
Date: 08/06/23 Time: 13:36
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.000000	0.063818	15.66967	0.0000
AI	0.071429	0.076277	0.936442	0.3550

R-squared	0.022556	Mean dependent var	0.950000
Adjusted R-squared	-0.003166	SD dependent var	0.220721
SE of regression	0.221071	Akaike info criterion	-0.131963
Sum squared resid	1.857143	Schwarz criterion	-0.047519
Log-likelihood	4.639264	Hannan-Quinn criter.	-0.101431
F-statistic	0.876923	Durbin-Watson stat	1.016484
Prob(F-statistic)	0.354959		

Table 4 above revealed the ordinary least square-based simple regression analysis results on the effect of artificial intelligence (AI) on economic reporting (ECR) of multinational firms in Sub-Sahara Africa. The R-square has a value of 0.022, which implies that 2.2% of the total variation in the dependent variable (ECR) is caused by the explanatory variable (AI). In comparison, the remaining 97.8% of the variation in the dependent variable was unaccounted for. Therefore, the 97.8% could be explained as other factors/variables not captured in the model. The T-statistic of 0.936442 with the probability (sig) value of 0.3550 (greater than a significant value of 0.05) implies that the model is not statistically significant at 0.05. The AI has a positive coefficient value of 0.071429, indicating that a 1% increase in AI will lead to about 0.071429% increase in ECR.

Hypothesis one

$H0_1$: Artificial intelligence has no significant effect on the economic reporting of multinational firms in Sub-Sahara Africa.

To test the hypothesis, The T-statistic of 0.936442 with a p-value of 0.3550 per cent level of significance was shown in Table 4 above. Since the p-value of 0.3550 is greater than 0.05, we would reject the null hypothesis, which states that artificial intelligence has no significant effect on the economic reporting of multinational firms in Sub-Sahara Africa. We therefore conclude that AI has a positive and significant effect on the economic reporting of firms in Sub-Sahara Africa. This finding is in agreement with Himanshu, Chandrika and Rabindra (2021), who assessed the influence of AI on the operating performance of the companies because their study found that artificial Intelligence has a significant influence on companies' operating costs as well as operating profit.

Table 5: Effect of Artificial Intelligence on environmental reporting of multinational firms in Sub-Sahara Africa

Dependent Variable: ENVR
Method: Least Squares
Date: 08/06/23 Time: 13:38
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.000000	0.123582	8.091781	0.0000
AI	0.464286	0.147709	3.143247	0.0032

R-squared	0.206349	Mean dependent var	0.675000
Adjusted R-squared	0.185464	SD dependent var	0.474342
SE of regression	0.428101	Akaike info criterion	1.189793
Sum squared resid	6.964286	Schwarz criterion	1.274237
Log-likelihood	-21.79585	Hannan-Quinn criter.	1.220325
F-statistic	9.880000	Durbin-Watson stat	0.780586
Prob(F-statistic)	0.003235		

Table 5 above shows the ordinary least square-based simple regression analysis results of the effect of artificial intelligence (AI) on environmental reporting (ENVR) of multinational firms in Sub-Sahara Africa. The R-square has a value of 0.206, which implies that 20.6% of the total variation in the dependent variable (ENVR) is caused by the explanatory variable (AI). In comparison, the remaining 79.4% of the variation in the dependent variable was unaccounted for. Therefore, the 79.4% could be explained as other factors/variables not captured in the model. The T-statistic of 3.143247 with the probability (sig) value of 0.0032 (less than the significant value of 0.05) implies that the model is statistically significant at 0.05. The AI has a positive coefficient value of 0.464286, indicating that a 1% increase in AI will lead to about 0.464286% increase in ENVR.

Hypothesis two

$H0_1$: Artificial intelligence has no significant effect on environmental reporting of multinational firms in Sub-Sahara Africa.

To test the hypothesis, The T-statistic of 3.143247with a p-value of 0.0032 per cent level of significance was shown in Table 2 above. Since the p-value of 0.0032 is less than 0.05, we would accept the null hypothesis and reject the alternative hypothesis, which states that artificial intelligence has a significant effect on the environmental reporting of multinational firms in Sub-Sahara Africa. This finding did not support the finding of Tian, Wu, and Xiao (2023), who researched the impact of artificial intelligence orientation on enterprise green innovation and found that AI has a significant positive effect on enterprises' green innovation.

Table 6 shows the ordinary least square-based simple regression analysis results of the effect of artificial intelligence (AI) on social reporting (SOR) of multinational firms in Sub-Sahara Africa. The R-square has a value of 0.037, which implies that 3.7% of the total variation in the dependent variable (SOR) is caused by the explanatory variable (AI). In comparison, the remaining 96.3% of the variation in the dependent variable was unaccounted for. Therefore, the 96.3% could be explained as other factors/variables not captured in the model. The T-statistic of 0.506142 with the probability (sig) value of 0.6157 (greater than a significant value of 0.05) implies that the model is not statistically significant at 0.05. The AI has a positive coefficient value of 0.071429, indicating that a 1% increase in AI will lead to about a 0.071429% increase in SOR.

Table 6: Effect of Artificial Intelligence on social reporting of multinational firms in Sub-Sahara Africa
Dependent Variable: SOR
Method: Least Squares
Date: 08/06/23 Time: 13:37
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.750000	0.118072	6.352032	0.0000
AI	0.071429	0.141124	0.506142	0.6157

R-squared	0.036696	Mean dependent var	0.800000
Adjusted R-squared	-0.019443	SD dependent var	0.405096
SE of regression	0.409015	Akaike info criterion	1.098577
Sum squared resid	6.357143	Schwarz criterion	1.183021
Log-likelihood	-19.97153	Hannan-Quinn criter.	1.129109
F-statistic	0.256180	Durbin-Watson stat	0.948636
Prob(F-statistic)	0.615681		

Hypothesis three
$H0_3$: Artificial intelligence has no significant effect on the social reporting of multinational firms in Sub-Saharan Africa.
To test the hypothesis, The T-statistics of 0.506142 with a p-value of 0.6157 per cent level of significance was shown in Table 6 above. Since the p-value of 0.6157 is greater than 0.05, we would reject the null hypothesis, which states that artificial intelligence has no significant effect on the social reporting of multinational firms in Sub-Sahara Africa. This is in agreement with the findings of Khakurel *et al.* (2021). They examined the Rise of Artificial Intelligence under the Lens of sustainability and concluded that there is a significant impact on all five dimensions of sustainability studied.

CONCLUSION AND RECOMMENDATIONS

This study concludes that artificial intelligence influences the environmental dimension of sustainability reporting in Sub-Sahara Africa, while AI has no significant influence on the economic and social variables investigated. On an environmental level, artificial intelligence can impact waste and pollution management and can also negatively impact sustainability in the form of power and resource consumption. On the social level, artificial intelligence can assist communities in managing social media, automating routine tasks that are commonly outsourced. All stakeholders involved in the operation of firms in Sub-Sahara Africa should make sound ethical decisions based on values commonly shared amongst citizens for the joint vision of sustainable development. Based on the findings, the following recommendations were made; Sub-Saharan African firms should embrace AI-specific measures such as sharing best practices and supporting new and innovative AI applications for fighting climate change, but be guided in order not to throw unskilled workers out of the job. Initiatives like skill acquisition and entrepreneurship should be encouraged by governments of developing countries to reduce unemployment that may arise as a result of the deployment of AI systems. Displaced workers can be trained and deployed in the most sustainable way possible while minimizing negative impacts for the good of the planet.

Environmental preservation and regeneration of the ecosystem are paramount for sustainable development. While engaging in artificial intelligence, multinational firms should also adhere to global reporting initiatives (GRI); this will enable artificial intelligence to have direction and function effectively towards ensuring that business sustainability is achieved.

Multinational firms should configure their artificial intelligence in such a way that they will be functioning in agreement with GRI for the overall benefit of society. Communities and people will be better off when sound ethical decisions based on values commonly shared amongst citizens for the joint vision of sustainable development are taken.

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Appendix: Data on Economic, Environmental and Social Disclosures Checklist

FIRMS	YEARS	PROFIT	MARKET	indirect Per.	Value chain	supply chain	risk mgt	**ECR**
COCA COLA	2014	1	1	1	1	1	1	**1**
COCA COLA	2015	1	1	1	1	1	1	**1**
COCA COLA	2016	1	1	1	1	1	1	**1**
COCA COLA	2017	1	1	1	1	1	1	**1**
COCA COLA	2018	1	1	1	1	1	1	**1**
COCA COLA	2019	1	1	1	1	1	1	**1**
COCA COLA	2020	1	1	1	1	1	1	**1**
COCA COLA	2021	1	1	1	1	1	1	**1**
EAB	2014	1	1	1	1	1	1	**1**
EAB	2015	1	1	1	1	1	1	**1**
EAB	2016	1	1	1	1	1	1	**1**
EAB	2017	1	1	1	1	1	1	**1**
EAB	2018	1	1	1	1	1	1	**1**
EAB	2019	1	1	1	1	1	1	**1**
EAB	2020	1	1	1	0	1	1	**0.83**
EAB	2021	1	1	1	0	1	1	**0.83**
MTN	2014	1	1	1	0	1	1	**0.83**
MTN	2015	1	1	0	1	1	1	**0.83**
MTN	2016	1	1	0	1	1	1	**0.83**
MTN	2017	1	1	1	1	1	1	**0.83**
MTN	2018	1	1	1	1	1	1	**0.83**
MTN	2019	1	1	1	1	1	1	**1**
MTN	2020	1	1	1	1	1	1	**1**
MTN	2021	1	1	1	1	1	1	**1**
NESTLE	2014	1	1	1	1	1	1	**1**
NESTLE	2015	1	1	1	1	1	1	**1**
NESTLE	2016	1	1	1	1	1	1	**1**
NESTLE	2017	1	1	1	1	1	1	**1**
NESTLE	2018	1	1	1	1	1	1	**0.83**
NESTLE	2019	1	1	1	1	1	1	**1**
NESTLE	2020	1	1	1	1	1	1	**1**
NESTLE	2021	1	1	1	1	1	1	**1**

FIRMS	YEARS	energy	water	carbon	waste	compliance	biodiversity	transportation		**ENVR**
COCA COLA	2014	1	1	0	0	1	1	1	PSS	**0.75**
COCA COLA	2015	1	1	1	1	1	1	1	1	**1**
COCA COLA	2016	1	1	1	1	1	1	1	1	**1**
COCA COLA	2017	1	1	1	1	1	1	1	1	**0.88**
COCA COLA	2018	1	1	1	1	1	1	1	1	**1**
COCA COLA	2019	1	1	1	1	1	1	1	1	**1**
COCA COLA	2020	1	1	1	1	1	1	1	1	**1**
COCA COLA	2021	1	1	1	1	1	1	0	1	**0.88**
EAB	2014	1	1	1	1	1	1	0	1	**0.88**
EAB	2015	1	1	1	1	1	1	1	1	**1**
EAB	2016	1	1	1	1	1	1	1	1	**1**
EAB	2017	1	1	1	1	1	1	1	1	**1**
EAB	2018	1	1	1	1	1	1	1	1	**1**
EAB	2019	1	1	1	1	1	1	1	1	**1**
EAB	2020	1	1	1	1	1	1	1	1	**1**
EAB	2021	1	1	1	1	1	1	1	1	**1**
MTN	2014	1	1	1	1	1	1	1	1	**1**
MTN	2015	1	1	1	1	1	1	1	1	**1**
MTN	2016	1	1	1	1	1	1	1	1	**1**
MTN	2017	1	1	1	1	1	1	1	1	**1**
MTN	2018	1	1	1	1	1	1	1	1	**1**
MTN	2019	1	1	1	1	1	1	1	1	**1**
MTN	2020	1	1	1	1	1	1	1	1	**1**
MTN	2021	1	1	1	1	1	1	1	1	**1**
NESTLE	2014	1	1	0	0	1	1	1	1	**0.75**
NESTLE	2015	1	1	0	0	1	1	1	1	**0.75+K7**
NESTLE	2016	1	1	1	0	1	1	1	1	**0.88**
NESTLE	2017	1	1	1	0	1	1	1	1	**0.88**

NESTLE	2018	1	1	1	1	1	1	1	1	**1**
NESTLE	2019	1	1	1	1	1	1	1	1	**1**
NESTLE	2020	1	1	1	1	1	1	1	1	**1**
NESTLE	2021	1	1	1	1	1	1	1	1	**1**

FIRMS	YEARS	Community INV.	Anti-corruption	human right	health and safety	industrial relation	training	diversity	equality	philanthropic	**SOR**
COCA COLA	2014	1	1	1	1	1	1	1	1	1	**1**
COCA COLA	2015	1	1	1	1	1	1	1	1	1	**1**
COCA COLA	2016	1	1	1	1	1	1	1	1	1	**1**
COCA COLA	2017	1	1	1	1	1	1	1	1	1	**1**
COCA COLA	2018	1	1	1	1	1	1	1	1	1	**1**
COCA COLA	2019	1	1	1	1	1	1	1	1	1	**1**
COCA COLA	2020	1	1	1	1	1	1	0	1	1	**0.89**
COCA COLA	2021	1	1	0	1	1	1	1	1	1	**0.89**
EAB	2014	1	1	0	1	1	1	1	1	1	**0.89**
EAB	2015	1	1	0	1	1	1	1	1	1	**0.89**
EAB	2016	1	1	0	1	1	1	1	1	1	**0.89**
EAB	2017	1	1	0	1	1	1	1	1	1	**0.89**
EAB	2018	1	1	1	1	1	1	1	1	1	**1**
EAB	2019	1	1	1	1	1	1	1	1	1	**1**
EAB	2020	1	1	1	1	1	1	1	1	1	**1**
EAB	2021	1	1	1	1	1	1	1	1	1	**1**
MTN	2014	1	1	1	1	1	1	1	1	1	**1**
MTN	2015	1	1	1	1	1	1	1	1	1	**1**
MTN	2016	1	1	1	1	1	1	1	1	1	**1**

MTN	2017	1	1	1	1	1	1	1	1	1	**1**
MTN	2018	1	1	1	1	1	1	1	1	1	**1**
MTN	2019	1	1	1	1	1	1	1	1	1	**1**
MTN	2020	1	1	1	1	1	1	1	1	1	**1**
MTN	2021	1	1	1	1	1	1	1	1	1	**1**
NESTLE	2014	1	1	1	1	1	1	1	1	1	**1**
NESTLE	2015	1	1	1	1	1	1	1	1	1	**1**
NESTLE	2016	1	1	1	1	1	1	1	1	1	**1**
NESTLE	2017	1	1	1	1	1	1	1	1	1	**1**
NESTLE	2018	1	1	1	1	1	1	1	1	1	**1**
NESTLE	2019	1	1	1	1	1	1	1	1	1	**1**
NESTLE	2020	1	1	1	0	1	1	1	1	1	**0.89**
NESTLE	2021	1	1	1	0	1	1	1	1	1	**0.89**