



Artificial Intelligence Techniques: A Subtle Tool for Enhancing Business Sustainability in the 21st Century Organizations

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Abstract: *With the emergence of artificial intelligence (AI), the technological revolution has trans-formed human lives and processes, empowering the products and services in today’s marketplaces. AI introduces new ways of doing jobs and business, and of exploring new global market opportunities. However, on the other hand, it provides many challenges to comprehend. Therefore, the objective of this paper is to investigate the impact of AI techniques in the sustainability of businesses in the 21st century business organization. The paper utilizes extant literature to conceptually review the concept of AI and its dimensions of Machine learning and Cloud computing and concept of business sustainability and its measures of environmental and economic sustainability. The paper discusses the benefits and challenges faced as a result of the integration of AI in business operation and approaches of addressing them was provided. The paper identified the importance of utilizing AI in the sustainability of businesses in the 21st century to include timeliness in task accomplishment, maximization and reduction of waste and cost. From the conceptual and empirical review of the concepts, it was found that AI integration in business has increasingly improved on the performance, survival, resilience, success and sustainability of businesses in especially in this digitalized business environment. Therefore, the paper concludes that organizations should strive for a balanced approach, combining the benefits of AI with human judgment and oversight to ensure fairness, transparency, and ethical practices in sustaining business operations effectively, companies that use AI systems need to be socially responsible and make AI systems as secure as possible to promote the sustainable development of countries.*

Keywords: *Artificial intelligence; Machine Learning; cloud computing; business sustainability; Environmental sustainability; economic sustainability, 21st century business.*

Introduction

Sustainability is said to mean development that meets up with the needs of present situation of the society and the organization without compromising the condition of future generation to come to achieve their own needs and enhance the ability of business organizations to better understand their operations within the business environment to foster customers relationship, employees employers relationship which will enhance better cooperation with the organization (Epstein & Buhovac, 2011). Organizations that exercise business sustainability will not only survive, but succeed in the face of uncertainty. They further opined that sustainability assists in building

up a relationship with its business partners and stakeholders in managing business related challenges, planning business, growth and leadership (Epstein & Buhovac, 2011).

Business sustainability refers to the practices of operating a business in a manner that considers the long term impacts on the environment, social and economic systems of the business (Carr and Liden (2017) .it is an integrated responsible business practices that minimizes negative effects on the environment, society and future generations while maximizing positive outcomes for all stakeholders. (Sparrow et al., 2016). Every business organization that wants to be stable, viable and successful in operations of its business activities, must apply environmental stewardship, be socially responsible, economically viable and engage stakeholders in decision making (Dobbin & Kalev, 2016). According Dobbin & Kalev, (2016), the benefits an organization derives from implementing business sustainability include cost saving implementation, risk mitigation and competitive advantage especially in a globally base business environment (Dayton, 2004). The way businesses are operated and managed globally considering the digital environment is capable of affecting their growth, success, survival and sustainability of such businesses over a certain period of time. The need to sustain the continuity, growth, survival and success of the businesses in the digitalized business environment where robotics, machines and artificial intelligence have taken over the roles and responsibilities of the human resources functions in the organization .(Zhang, 2020). Artificial intelligence is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated to or with intelligent beings (Mij well, 2015). AI is frequently applied to the project of developing systems endowed with intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience.

Artificial Intelligence (AI) has emerged as a disruptive force in various industries, revolutionizing the way organizations operate and make decisions which affects their sustainability, survival and resilience capacity. Therefore, the application of the AI techniques which are elements of digitalization and globalization of business practices, the use of artificial intelligence techniques will help in resolving the challenges faced with the management of business activities without digital attributes which the integration of AI technique within organizations has changed the landscape of doing business. It has become imperative that to note that AI tools have taken the roles of individuals in bridging the needed workforce gap for now and the future (Hendrickson, 2003).

There has been a paucity of empirical works showing the relationship between artificial intelligence technique and business sustainability especially in the digitalized businesses that operates with the aid of internet applications and software's. To fill this lacuna created by literature necessitated the cruz for which this paper is develop in order to fill by conceptually examine the relationship between artificial intelligence techniques and business sustainability in the 21st century organizations. This paper was guided by the conceptualized framework of the variables below:

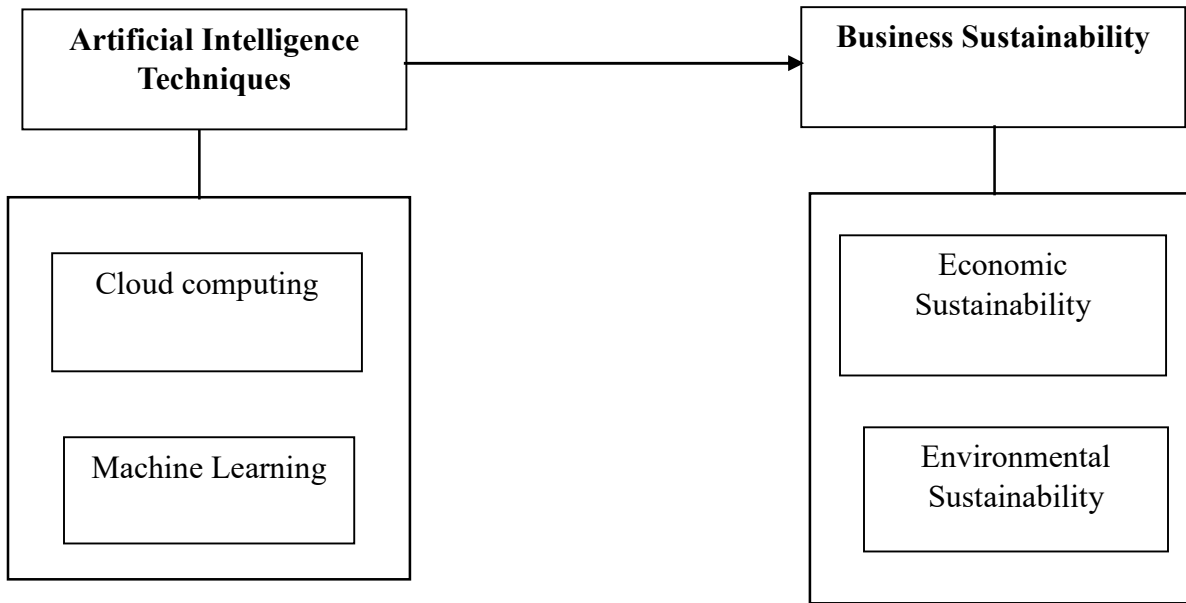


Figure 1.1: Conceptual Framework for the relationship between Artificial intelligence techniques and Business sustainability

Source: Sharma & Shukla, 2013; Pounder, 1999; Musa & Ibrahim, 2019; Linlin, 2015; Ruzgar, 2018

Purpose and Objectives of the Study

The purpose of the study was to examine the relationship between artificial intelligence and Business sustainability. The following are the specific objectives:

- i To examine the relationship between machine learning and business sustainability.
- ii To examine the relationship between cloud computing and business sustainability.

Literature Review

Theoretical Review

Intelligence Support System Theory

Using AI, researchers have attempted to improve the effectiveness of decision-making. Integrated AT support systems or IDSSs have been created and used in various fields, such as healthcare and commerce. These systems use AI tools to infer, learn, memorize, plan, and analyze the data. Simon presented four stages in a decision-making process (Simon, 1960). Intelligence is the first stage of the study and requires the decision-makers to develop an understanding of the problem and collect information related to the decision-making. Similarly, the design stage involves characterizing the data with important variables based on decision issues, determining the criteria for the decisions, and developing decision models that can be used to evaluate alternative decisions. In the third stage, the decision-makers review the alternatives and choose the consolidated decisions that satisfy the alternatives. The final stage, sometimes referred to as evaluation, is when the decision-makers assess the consequences of a decision.

Conceptual Review

Artificial Intelligence (AI): In recent years, incredible progress has been made in computer science, especially, in Artificial Intelligence. Artificial intelligence can be supposed as, the exhibiting of human intelligence in machines that are automated to think like humans and emulate their activities (Ikegwuru, Jack & Amadi, 2023). Artificial Intelligence systems are now delivering services that must be considered intelligent and creative (Mij well, 2015). There are fewer organizations today that does not make or introduce artificial intelligence in their operation(s) except for some organizations in developing and underdeveloped nations that are yet to take advantage of the technology. AT systems are undoubtedly very useful as the world becomes more complex and full of uncertainties, especially for organizations.

Copeland, a Professor at the University of Canterbury has defined Artificial Intelligence (AI) as the ability of a digital computer or computer-controlled robot to perform tasks commonly associated to or with intelligent beings. According to him, the term is frequently applied to the project of developing systems endowed with intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. AI has been used to develop and advance various fields and industries in the developed and developing countries of the world; one of the areas include recruiting. There are three ways AI is being used by Human Resources and Recruiting Professionals. First, AI is used to screen resume and rank candidates according to their level of qualification. Secondly, it is used to predict candidate success in given roles through matching platforms. And thirdly, AI is also used in rolling out recruiting chat bots that can automate repetitive communication tasks. AI tools have help to facilitate the smooth running of businesses in the 21st century business organization.

Cloud Computing

Cloud computing refers to the delivery of on-demand computing resources, including servers, storage, databases, software, and networking, over the internet. It enables organizations to access and use these resources without the need for on-premises infrastructure, thereby offering flexibility, scalability, and cost-efficiency. Several scholars have studied and discussed various aspects of cloud computing, and their insights have contributed to a better understanding of this technology. Cloud computing is an intricate calculating up of different service models and a company can select diverse blends of certain service models so as to espouse cloud computing (Ikegwuru & Harcourt, 2018). According to Armbrust et al. (2010), cloud computing provides a new paradigm for delivering computing resources, allowing users to access virtualized hardware and software services over the internet. The authors emphasize the importance of the cloud's scalability and elasticity, enabling organizations to quickly scale their resources up or down based on demand. Jansen et al. (2011) discuss the security challenges associated with cloud computing.

In terms of the economic benefits of cloud computing, Mell and Grance (2011) highlight its potential for cost reduction and increased efficiency. They argue that cloud computing allows organizations to shift from a capital expenditure (CapEx) model to an operational expenditure (OpEx) model, reducing the need for upfront infrastructure investments. Another important aspect of cloud computing is its impact on sustainability. Ikegwuru and Damian-Okoro (2024)

posit that, Cloud computing when deliberated as a booster of supply chain transparency, can aid companies cultivate their businesses successfully, increase the level of products services in the all-inclusive stage of supply chains, realize competitive values in the market, and continually remain ahead of the dynamic business setting. An article by Buyya et al. (2010) discusses the concept of green cloud computing, which aims to minimize the environmental impact of data centers and improve energy efficiency. The authors propose various techniques, such as resource consolidation and dynamic resource allocation, to achieve energy-efficient cloud computing.

Overall, cloud computing has emerged as a transformative technology that offers numerous advantages in terms of scalability, flexibility, cost-efficiency, security, and sustainability. It continues to evolve, and ongoing research and advancements contribute to its further development and adoption in various industries.

Machine Learning

Machine learning has become one of the mainstays of the information technology in the past two decades and thus, an important, but hidden, part of our lives. The increasing amount of data that is being generated (and stored) daily by individuals and corporations, demands a smart analysis. It is here where machine learning comes to the stage as a necessary ingredient for technological progress (Smola & Vishwanathan, 2008) Machine learning involves computer algorithms capable of learning to improve their performance of a task on the basis of their own previous experience. It focuses on achieving smart programmable devices and “machines” which learn automatically, by themselves. Basically, it is all about systems learning from data. Machine learning is seen as the process of performing tasks by looking at historic data and from that draw generalized conclusions to respond to new situations.

Humans are considered too lazy to spend all day in front of a screen and upload data into database so they invent a “machine” which can search, access, upload, save and create database-basically can “learn” by themselves. Another point which alludes to the human preference of machine learning is the Internet. Let’s imagine the size of data in Internet, no one can sit in front of computer screen all day to upload those data into a machine, just connect that machine with Internet let them be. The question is how human teach a machine “learn” something? How can we define “learn”? The answer is neural network. It is a computer system designed for classifying data in the same way human brain does with knowledge (Marr, 2016). Based on recognizing image, color, size, text, all kind of elements which data contains a machine can divide it into difference groups. Then depend on any requirement from human, the machine can give you the group of data you want. You can imagine how much time you can save with machine learning technology in all kind of industry, at the time of free access to internet at anywhere, anytime.

Business Sustainability

Sustainability has been treated in literature to some extent over the years to mean different thing to different scholars (Munck, Shein & Dennis,2012) The three pillars of sustainability as earlier promoted by Elkington, (2000) has become the popular sustainability indicators (Lung, and Leurat, 2014; and (Moure-Eraso, & Coletiva, 2003) which many researchers today adopted as measures of business sustainability. As Munck et al. (2012) noted, business sustainability will enable the organizations to attain the capacity to render service and pay the capital invested; to

seek education on environmental impacts, and to advance the idea behind the use of natural resources; guarantees sufficient resources to gain balanced chance of social and environmental advantage and to avoid problems that arises from firm's activities (Munck et al., 2012).

To enable a better comprehension of business sustainability, there is need to examine the meaning and emergence of the concept. Scholars have projected business sustainability meanings and tried to define it based on area of application, but it seems there is no clear and acceptable definition (Cella-de-Oliveira, 2013; Munck & Souza, 2009; Redclift, 1994). Many definitions tend to dwell on how to maximize stakeholder's profits and somehow pay little attention to the environmental and social issues. Redclift (1994) considered the etymological origin of sustainability and found that sustainability has its root from the Latin verb 'sustenerere' which means to 'uphold'. The author further claimed that, this term is evidenced in the debate among Spanish-speaking scientists; so that the word 'sostenibilidad' (from sostener) or 'sustentabilidad' (from sustentar) becomes accurate in translation of the word 'sustainability' (Redclift, 1994).

However, Lung and Levrat (2014) stated that sustainability has been generally defined by Brundtland, (2020) as; 'development that meets up with the needs of present situation of the society and the organization without compromising the condition of future of the generation to come to achieve their own needs". This meaning of sustainability seeks to incorporate the present issues as well as the future related needs, which demands critical planning and consideration of future benefits and sustainability. Therefore, organizations becomes proactive and reactive in their decisions in order to avoid crisis if they want to sustain their business activities (Gray, Friedman & Handy, 2021). In line with this, the study focused on three key areas of sustainability which includes; economic, environmental and social the system. Wentworth (2012) viewed business sustainability as the ability a business organization set out its plans and strategy of operating the business with consideration of economic, social and environmental factors that will affect the success of the business in the long-run. (Rosen & Kishawy, 2012; Huppel & Ishikawa, 2005). However, Eden (2011) cited in Moneva, et al. (2006) argued that, the unique fact about sustainability which Scholars agreed upon, is the idea of no clear definition of sustainability and it is an aspect of the challenges that induced for policy-makers and other Lobbying groups. The world commission on environmental and development (2021), sees business sustainability as "a state whereby an organization or a society display a reliable relation in the consideration of the economic, environmental and social issues".

As Dylick and Hockets (2013) argued, 'business sustainability has become a sound or prayer that is repeated again and again during this 21st century, that involves promising of societal changes for better in relation to a more justifiable and wealthy generation by paying focus on national environment and where our cultural achievements are protected and kept for the benefit of the future generations. This implies that, organizations struggling for survival need to actually incorporate the concepts of business sustainability in its decision making and policy. Sustainable business requires the ability of the business to put into consideration long term economic, environmental, and social effects when formulating the production and other policies (Setia &

Soni, 2013). Businesses should implement effective sustainability practices, this can drive competitive advantage for an organization and power it towards a more innovative, sustainable and green future. The concept of business sustainability has gradually become an important rating factor, driver of growth, profitability, value creation, social relationship builder, a survival tool, for organizations around the world. Sustainability led business owners to ensure organizations differentiate their products and services in a crowded marketplace (Setia & Soni, 2013).

Economic Sustainability

Economic sustainability has great implications for oil firms, as submitted by Hami, Muhamad and Ebrahim (2015). The emergence of sustainable oil concept shows a rising change in corporate world policies, this has ensured that business firms had to re-strategized and formulate policies that are in tandem with the global thinking of sustainable business. The current conditions and continuous awareness been created about sustainable business, has shown that any firm that hope to remain economically relevant, need to reconsider its production policies by inculcating sustainable business practices into their policies through utilization of AI techniques.

Khan, Dewan and Chowdhury (2014) concluded that economic sustainability consists of several aspects including “employment, sales growth, income stability, profitability and return on investment”. While in an earlier research, Doane and MacGilivray (2001) submitted that economic sustainability is “the most elusive component of the triple bottom line approach which includes the economic, social and environmental sustainability”. Economic sustainability is defined as “the degree to which a company actively and constructively use its resources to support the social and economic development of its host communities, through direct investments of cash, in-kind support or staff time, or through company policies that generate community capital, such as local sourcing, hiring, partnerships and education” (Buried Treasure, Sustainability, 2001). Economic sustainability involves the use of resources in a candid manner so as to to launch enduring noteworthy impression by means of lessening the antagonistic magnitudes of resource exploitation (Acee-Eke & Ikegwuru, 2020).

Environmental Sustainability

Kamara, Coff and Wynne (2006) opine that the concept of environmental sustainability can be traced as far back as the thirteenth century, however it has re-surfaced in management and environmental literature starting 1970’s and since then it has drawn wide spread attention from several scholars with diverse opinion but all agreeing on its importance to the maintenance of the eco-system. Pathak (2015) noted that the industrial revolution witnessed in Europe in the last century has “transformed society and its interaction with the environment, increasing the use of natural resources and the pace of development of new products and processes”. The continuous exploitative nature of humans through production activities have left the natural environment depleted.

Roper (2012) stressed that “weak sustainability prioritizes economic development, while strong sustainability subordinates economies to the natural environment and society, acknowledging ecological limits to growth”. Similarly, Khan, Dewan and Chowdhury (2014) submitted that

natural environment sustainability covers a wide range of indicators and that all firms contribute to the degradation of the environment through factors such as “water and energy use, waste and emissions, waste management, space management and hygiene factors”.

There are several definitions of environmental sustainability; Goodland (1995) defined environmental sustainability as “the maintenance of natural capital, arguing that environmental seeks to improve human welfare by preserving the sources of raw materials used for human needs and ensuring that the sinks for human waste are not exceeded in order to prevent harm to humans”. United States Environment Protection Agency (2014) opined that environmental sustainability is defined as the creation and maintenance of good environment conditions for human habitation. That is, existing in a “productive harmony that permits fulfilling the social, economic and other requirements of present and future generations”.

The continuous impact of human activities on the eco-system has negative effect on its sustainability. The manifestation of the negative effects of human activities on the environment includes global warming, depletion of the ozone layer. This has culminated in death of humans, plants and animals. Recently, most people have come to realized that our actions and inactions are responsible for the level of environmental degradation and its consequences are staring us in the face (Pathak, 2015)

Impact of Artificial Intelligence Tools on the sustainability of Businesses in the 21st century Organization

Artificial intelligence software packages have gradually taken over the functions of the personnel’s in so many organizations in the contemporary business environment (Bedoor, 2023). AI techniques introduction in businesses has helped to erase the challenges faced by organization with pregnant, sick leave, late coming, absenteeism, arrears etc associated with employees in the workplace, thereby slowing the process of performance and productivity of the organization. Although artificial intelligence (AI) has been reluctant to gain attraction in the sustainability and success segment of a company, many organizations have started to see its potential in the sustainability process of the business activities since it enables numerous sectors in the evolution of their business models. AI refers to intelligent algorithms or apparatuses that are capable of autonomously and systematically performing activities or cognitions without human intervention or mental decisions. In procurement and supply chain applications, AI can enhance design and operational frameworks, data visibility and analytics, opportunity assessment, accurate report generation and contract management, etc. This paper presents opportunities and applications of AI tools in sustaining businesses in the 21st century. The cost of hiring and retaining workforce with needed talent and skill has been identified as a major challenge that the 21st century organizations are facing on daily basis (Uhuru,2020). The ability to manage this challenges is through effective integration of AI tools in the management of the business considering the competition and strive within the business environment. Zeb-Obipi, & Kolio, (2018) identified that effective utilization of AI tools will help enhance competitive advantage, reduce wastage, maximize cost, increase effectiveness and efficiency at work, increase timeliness and accuracy in task accomplishment.

The Relationship between Artificial Intelligence and Business sustainability

Artificial Intelligence (AI) has significantly impacted various industries, including survival, growth, resilience, agility, performance and sustainability of business through the revolutionizing traditional processes of managing business to contemporary business using information technology. This critical analysis in exploring the complex relationship between AI and sustainability of business is by examining both the potential benefits and drawbacks of each variable. AI technologies offer numerous advantages in Sustainability, primarily by enhancing efficiency and streamlining processes of doing business. AI- tools is use to power the human resource functions to automate various tasks such as resume screening, candidate shortlisting, and interview scheduling, saving significant time and effort for HR professionals (Strohmeier, 2019). By leveraging machine learning algorithms, AI systems can quickly analyze large volumes of data, identifying patterns and matching candidates to job requirements more accurately (Marler & Parry, 2016). Consequently, AI enables HR teams to focus on higher-value activities, such as candidate assessment and strategic decision-making, leading to enhanced efficiency in the recruitment process. AI also venture into the marketing, finance, procurement, security etc of the business, ensuring these activities are improved and monitored for efficiency and effectiveness.

While AI holds promise in Business sustainability, it also raises concerns regarding bias and discrimination attributed to its integration in the organization which are circled around social issues, ethical issues and behavioral issues (Burrell, 2016). Consequently, AI-based recruitment systems might inadvertently perpetuate and amplify existing biases, leading to discriminatory practices (Dastin, 2018). For instance, if historical data indicates a preference for candidates from specific backgrounds, the AI system might perpetuate this bias by favoring similar candidates in future selections. This potential for bias necessitates careful scrutiny and continual monitoring of AI systems to ensure fair and equitable HR procurement practices (Dastin, 2018).

Conclusion and Recommendations

The integration of artificial intelligence in business sustainability has both potential benefits and limitations in the performance of business entities in the 21st century organizations. AI technologies/tools can streamline the human resource functions of the organization (recruitment, selection, and talent management), thereby enhancing efficiency and objectivity in the execution of task. However, concerns related to ethical issues, behavioral issues and cultural issues concerning its integration especially in Nigeria organization has been an issue that has set most of the businesses operating in Nigeria its full utilization of the AI tools in running of its business activities. Organizations should strive for a balanced approach, combining the benefits of AI with human judgment and oversight to ensure fairness, transparency, and ethical practices in sustaining business operations. Based on the literature reviewed and conclusion, the following recommendations were made:

- i. AI should consider continuous improvement in its ability to detect and mitigate biases within business environment because by minimizing bias, AI can help promote fairness and equal opportunities, leading to a more talented workforce.
- ii. AI should consider leveraging on technology to streamline and automate the business processes from tradition model to contemporary, implementing standardized and

objective evaluation criteria, and providing training to recruiters on diversity and inclusion principles.

References

- Acee-Eke, B.C. (2020). Green marketing and sustainable development: An empirical study of Local Government in Rivers State of Nigeria, *Global Scientific Journal*, 8(4),1088-1101.
- Afuah, A., Tucci, C.L. (2013). Value Capture and Crowd sourcing. *Acad. Manage. Rev.* 38, 457-460.
- Agrawal, R., Imieliriski, T., & Swami, A. (1993). Mining association rules between sets of items in large databases. In Proceedings of the 1993 ACM SIGMOD *International Conference on Management of Data*, 207-216.
- Armbrust, M., et al. (2010). A view of cloud computing. *Communications of the ACM*, 53(4), 50-58.
- Barocas, S., & Selbst, A. D. (2016). Big data's disparate impact. *California Law Review*, 104(3), 671-732.
- Bauer, T. N., Bodner, T., Erdogan, B., Truxillo, D. M., & Tucker, J. 5. (2017). Newcomer adjustment during organizational socialization: A meta-analytic review of antecedents, outcomes, and methods. *Journal of Applied Psychology*, 102(3), 519-548.
- Bedoor, B., Mohammed, Y., Robert, F., & Brenno, M., (2023). Artificial intelligence in procurement: An overview and case study of Qatar Foundation. *International Journal of Industrial Engineering and Operations Management (IJIEOM)*, 722-732.
- Belbase, A., et al. (2019). Artificial intelligence in HR: A gentle introduction. World Development Report Background Paper.
- Bellazzi, R., & Zupan, B. (2008). Predictive data mining in clinical medicine: Current issues and guidelines. *International Journal of Medical Informatics*, 77(2), 81-97.
- Bhatt, P.; Ahmad, A.J.; Roomi, M.A. (2016). Social innovation with open source software: User engagement and development challenges in India. *Technovation*, 52(53), 28-39.
- Bock, P., Filho, W. L., da Silva, J. F., & Castro, P. (2018). The potential of industry 4.0 and the internet of things in the Brazilian agro-industrial sector. *Sustainable Development Research in the Asia-Pacific Region* 19-37.
- Burrell, J. (2016). How the machine "thinks": Understanding opacity in machine learning algorithms. *Big Data & Society*, 3(1).
- Buyya, R., et al. (2010). Green Cloud Computing: Balancing Energy Efficiency and Quality of Service. *Future Generation Computer Systems*, 29(5), 1-21.

- Cappa, F., Rosso, F.; Hayes, D. (2019). Monetary and social rewards for crowdsourcing. *Sustainability*, 11, 2834.
- Carr, J. Z., & Liden, R. C. (2017). Predicting Employee Engagement in an Age of Impersonal Interaction: The Role of Procedural Justice and Organizational Reputation. *Group & Organization Management*, 42(4), 520-555.
- Cazorla, L.; Alcaraz, C.; Lopez, J. A (2015). Three-stage analysis of IDS for critical infrastructures. *Comput. Secur.* 55, 235-250.
- Dastin, J. (2018). Amazon scraps secret AI recruiting tool that showed bias against women. Reuters. Retrieved from <https://www.reuters.com/article/us-amazoncom-jobs-automation-insight-idUSKCN1MKO8G>.
- Dobbin, F., & Kalev, A. (2016). Why Diversity Programs Fail. *Harvard Business Review*, 94(7/8), 14-16.
- Etzioni, A. & Etzioni, O. (2017). Incorporating ethics into artificial intelligence.
- Gatewood, R., Feild, H., & Barrick, M. (2020). *Human resource selection* (9th ed.). Cengage Learning.
- Han, J., Kamber, M., & Pei, J. (2011). *Data mining: concepts and techniques*. Elsevier.
- Hayes, D.R.; Cappa, F. (2018). Open-source intelligence for risk assessment. *Bus. Horiz.* 61, 689-697.
- Hengstler, M., Enkel, E. & Duelli, S. (2016). Applied artificial intelligence and trust— The case of autonomous vehicles and medical assistance devices. *Technological Forecasting and Social Change*. 105, 105-120.
- Ikegwuru, M., & Damian-Okoro, I.R. (2024). Cloud computing: A veritable driver of supply chain transparency. *International Academic Journal of Business School Research*. 8(9), 1 – 15
- Ikegwuru, M., & Harcourt, H. (2018). Understanding the impact of cloud computing service adoption on supply chain performance: An empirical study. *RSU Journal of Strategic and Internet Business*, 3(2), 182-204,
- Ikegwuru, M., Jack, O.T., & Amadi, N.E. (2023). Artificial Intelligence Implementation and Organizational Performance of Mainstream Oil and Gas Companies in Nigeria. *International Academy Journal of Business Administration Annals*, 9(5), 91-106.
- Jain, A. K., Murty, M. N., & Flynn, P. J. (1999). Data clustering: a review. *ACM Computing Surveys (CSUR)*, 31(3), 264-323.

- Jansen, W. A., et al. (2011). Cloud hooks: Security and privacy issues in cloud computing. *IEEE Internet Computing*, 15(2), 44-53.
- Lakhani, K.; Wolf, R.G. (2003). Why Hackers Do What They Do: Understanding Motivation and Effort in Free/Open Source Software Projects.
- Lee, T., & Kwon, Y. (2017). Predicting employee turnover using data mining: A case study. *Journal of Business Economics and Information Technology*, 1(2), 67-76.
- Marler, R. T., & Parry, M. L. (2016). Observing and measuring visual double stars. Springer.
- Marr, B. (2016). What is the difference between artificial intelligence and machine learning? Available at: <https://www.forbes.com/sites/bernardmarr>.
- Marr, B. (2018). Artificial intelligence in the real world: The business case takes shape. *Harvard Business Review*. Retrieved from <https://hbr.org/2018/01/artificial-intelligence-in-the-real-world>.
- Mathis, R. L., & Jackson, J. H. (2021). Human resource management (17th ed.). Cengage Learning.
- Mell, P., & Grance, T. (2011). The NIST definition of cloud computing. National Institute of Standards and Technology, Special Publication 800-145.
- Muehienhaus, I., & Forcht, K. A. (2015). Data mining and analytics in the process of human resource recruitment: A systematic literature review. *Journal of Human Resource and Sustainability Studies*, 3(04), 226-244.
- Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M. (2020). Human resource management: Gaining a competitive advantage (11th ed.). McGraw-Hill Education.
- Phillips-Wren, G. (2013). Intelligent decision support systems. In *Multicriteria Decision Aid and Artificial Intelligence: Links, Theory and Applications*; Wiley-Blackwell: Hoboken, NJ, USA.
- Phua, C., Lee, V., Smith-Miles, K., & Gayler, R. (2010). A comprehensive survey of data mining-based fraud detection research. ArXiv Preprint arXiv:1009.6119.
- Scherhierhorn, J. R. (2019). Exploring management. Wiley.
- Simon, H.A. (1960). *The New Science of Management Decision*; Prentice Hall PTR: Upper Saddle River, NJ, USA.
- Sparrow, P., Brewster, C., & Chung, C. (2016). *Globalizing Human Resource Management*. Routledge.

- Strohmeier, S. (2019). Computational models of emotion recognition in human computer interaction: A review. *ACM Computing Surveys (CSUR)*, 52(6), 1-34.
- Zeb-Obipi, I, & Kolio, N. (2018). Employee information systems and human resource procurement in the oil and gas sector in Nigeria. *International Journal of Human Resource Management and Research*, 8(4), 51-64.
- Zhang, W. (2020). Deep learning for emotion recognition: A survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 10(6), 13-74.