ISSN (online) : 2249-877X

South Asian Journal of Marketing & Management Research

Marketing Research

SAJMMR

Published by

South Asian Academic Research Journals
A Publication of CDL College of Education, Jagadhri
(Affiliated to Kurukshetra University, Kurukshetra, India)

SAJMMR

ISSN (online) : 2249 –877X

Editor-in-Chief : Dr. Dalbir Singh

Impact Factor   : SJIF 2022 = 7.911

Frequency   : Monthly

Country   : India

Language   : English

Start Year   : 2011

Indexed/ Abstracted : Scientific Journal Impact Factor (SJIF 2022 - 7.911), Google Scholar, CNKI Scholar, EBSCO Discovery, Summon(ProQuest), ISC IRAN, Primo and Primo Central, I2OR, ESJI, IIJIF, DRJI, Indian Science and ISRA-JIF.

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BUSINESS MANAGEMENT CHALLENGES AND THEIR IMPROVEMENT BY ARTIFICIAL INTELLIGENCE

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DOI: 10.5958/2249-877X.2024.00004.4

ABSTRACT

The main purpose of our study is to analyze the influence of Artificial Intelligence (AI) on firm performance, notably by building on the business value of AI-based transformation projects. This study was conducted using a four-step sequential approach: (i) analysis of AI and AI concepts/technologies; (ii) in-depth exploration of case studies from a great number of industrial sectors; (iii) data collection from the databases (websites) of AI-based solution providers; and (iv) a review of AI literature to identify their impact on the performance of organizations while highlighting the business value of AI-enabled projects transformation within organizations.

In the e-commerce and financial industries, AI has been deployed to achieve better customer experience, efficient supply chain management, improved operational efficiency, and reduced mate size, with the main goal of designing standard, reliable product quality control methods and the search for new ways of reaching and serving customers while maintaining low cost. Machine learning and deep learning are two of the most often used AI approaches. Individuals, businesses, and government agencies utilize these models to anticipate and learn from data.

KEYWORDS: *Business Management, Artificial Intelligence, Management Improvement, Artificial Intelligence Development, Machine Learning.*

INTRODUCTION

Artificial Intelligence (AI) are a wide-ranging set of technologies that promise several advantages for organizations in terms off added business value. Over the past few years, organizations are increasingly turning to AI in order to gain business value following a deluge of data and a strong increase in computational capacity. Nevertheless, organizations are still struggling to adopt and leverage AI in their operations. The lack of a coherent understanding of how AI technologies create business value, and what type of business value is expected, therefore necessitates a holistic understanding. This study provides a systematic literature review that attempts to explain how organizations can leverage AI technologies in their operations and

elucidate the valuegenerating mechanisms. Our analysis synthesizes the current literature and highlights: (1) the key enablers and inhibitors of AI adoption and use; (2) the typologies of AI use in the organizational setting; and (3) the first- and second-order effects of AI. The paper concludes with anidentification of the gaps in the literature and develops a research agenda that identifies areas that need to be addressed by future studies.

What is business management and what activities does it include?

Business management is the process of overseeing and coordinating the various activities within an organization to achieve specific goals and objectives. It involves planning, organizing, leading, and controlling all aspects of a business to ensure its success.

1. Planning: This involves setting goals, developing strategies, and creating plans to achieve those goals. It also includes forecasting future trends, analyzing market conditions, and making decisions about resource allocation.

2. Organizing: This involves designing the organizational structure, allocating resources, assigning tasks, and establishing processes and procedures to ensure efficient operations. It also includes establishing communication channels and defining roles and responsibilities.

3. Leading: This involves motivating, guiding, and inspiring employees to work towards the organization's goals. It also includes providing direction, resolving conflicts, and ensuring that employees have the necessary skills and resources to perform their tasks effectively.

4. Controlling: This involves monitoring performance, evaluating results, and taking corrective actions to ensure that goals are being met. It also includes measuring progress, analyzing variances, and making adjustments as needed to improve performance.

Overall, business management encompasses a wide range of activities that are essential for the successful operation of an organization. It requires strong leadership, effective communication, strategic decision-making, and the ability to adapt to changing market conditions.

Does business management bring challenges?

Yes, business management brings various challenges. Some of the common challenges include:

1. Strategic decision-making: Business managers need to make strategic decisions that can have a significant impact on the organization. These decisions require careful analysis of market trends, competitor activities, and internal capabilities.

2. Managing resources effectively: Business managers need to allocate resources such as finances, manpower, and materials efficiently to maximize productivity and achieve organizational goals.

3. Dealing with uncertainty: The business, and managers need to adapt to unexpected events such as economic downturns, technological disruptions, or changes in consumer preferences.

4. Leading and motivating employees: Managing a team of employees requires effective leadership skills to inspire, motivate, and guide them towards achieving organizational goals.

5. Ensuring compliance with regulations: Businesses need to comply with various regulations and laws, which can be complex and time-consuming to navigate.

6. Handling conflict and resolving disputes: Managers may encounter conflicts within the organization, whether between employees, departments, or with external stakeholders. Effective conflict resolution skills are essential to maintain a harmonious work environment.

Overall, business management is a challenging field that requires a combination of skills, knowledge, and experience to successfully navigate the complexities.

Business management challenges can be both good and bad, depending on how they are approached and dealt with. On the positive side, challenges in business management can provide opportunities for growth, learning, and innovation. They can push managers and employees to think creatively, problem-solve effectively, and develop new skills. Overcoming challenges can also lead to a sense of accomplishment and increased confidence.

On the negative side, business management challenges can be stressful, time-consuming, and frustrating. They can impact productivity, morale, and overall company performance if not addressed promptly and effectively. Persistent challenges can also lead to burnout and high turnover rates among employees.

Ultimately, how managers approach and handle challenges in business management will determine whether they have a positive or negative impact on the organization. By fostering a culture of resilience, adaptability, and collaboration, managers can turn challenges into opportunities for growth and success.

Figure 1:Research model, Adapted from Anand and Fosso Wamba (2013)

Can we get help from artificial intelligence in the field of improving business management challenges?

Yes, artificial intelligence can be a valuable tool in improving business management challenges. AI can help streamline processes, analyze data to make more informed decisions, automate repetitive tasks, and provide insights for better strategic planning. AI-powered tools such as

predictive analytics, machine learning algorithms, and natural language processing can assist managers in identifying trends, predicting outcomes, and optimizing operations. Additionally, AI can enhance communication and collaboration among team members through chatbots, virtual assistants, and project management platforms. Overall, leveraging AI technology can lead to increased efficiency, productivity, and innovation in business management.

While artificial intelligence can certainly assist and enhance various aspects of business management, it is unlikely that AI will completely replace humans in this field.

AI excels at processing large amounts of data quickly and accurately, identifying patterns and trends that may not be obvious to human analysts. This can be incredibly useful for making data-driven decisions and forecasting outcomes. AI can also handle routine tasks efficiently, freeing up human managers to focus on more strategic and creative aspects of their work.

However, there are several key skills and qualities that human managers possess that AI currently cannot fully replicate. For example, human managers bring emotional intelligence, critical thinking, creativity, and the ability to navigate complex interpersonal dynamics to the table. These skills are essential for effective leadership, communication, problem-solving, and decision-making in business management.

Furthermore, human managers are better equipped to understand the nuances of a specific industry or organization, adapt to changing circumstances, and provide empathy and support to their teams. While AI can provide valuable insights and recommendations, it lacks the contextual understanding and intuition that human managers bring to the table.

In conclusion, while AI can be a powerful tool for business management, it is unlikely to completely replace human managers. Instead, the most successful organizations will likely be those that find ways to leverage the strengths of both AI and human managers in a complementary and collaborative manner.
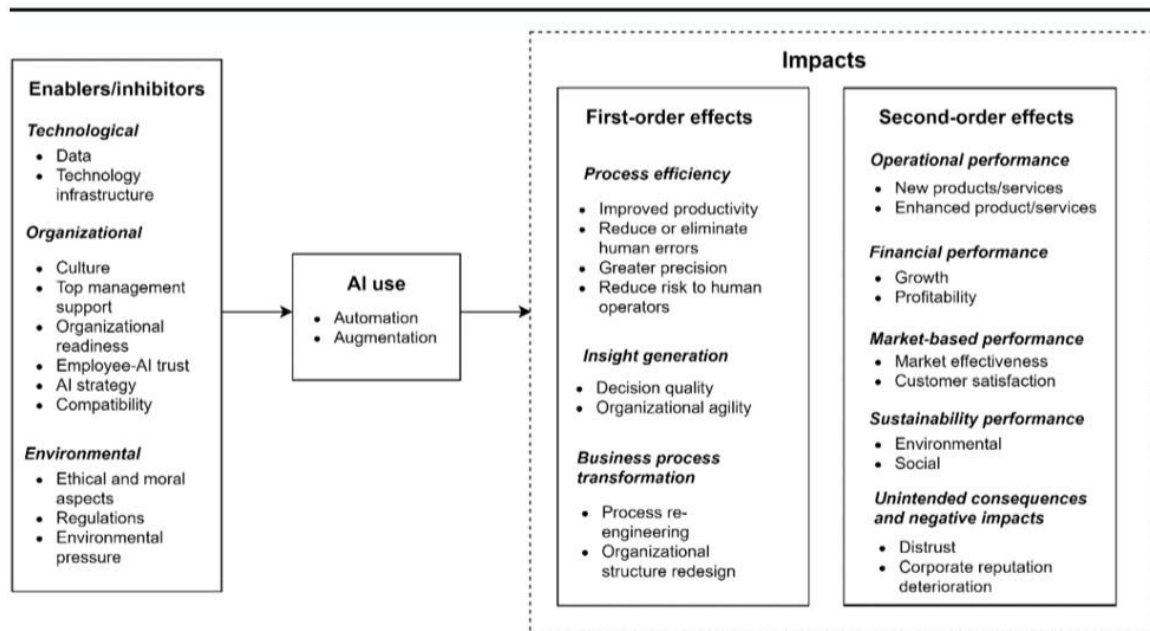
Fig. 2 Organizational framework of AI and business value

Fig. 3 AI and business value research framework

Information technologies (ITs) have become ubiquitous in professional activities, disrupting and affecting all core processes and operations(Devaraj&Kohli, 2003; Nwamen, 2006).When integrated with the ecosystem of businesses, IT can produce visible impacts, especially on the relationship between the company and its customers, prospects, and partners (Lauterbach, 2019; Nwamen, 2006).They also play a key role in the way companies' processes and operations will evolve. Today, AI remains the most spectacular IT application, a technology that has gone through an unequaled development over the last decades(Blanchet, 2016; Lee, Davari, Singh, &Pandhare, 2018; Wiljer& Hakim, 2019). It is defined as a set of 'theories and techniques used to create machines capable of simulating intelligence. AI is a general term that involves the use of a computer to model intelligent behavior with minimal human intervention'(Benko&Lányi, 2009; Haenlein& Kaplan, 2019; McCorduck, Minsky, Selfridge, & Simon, 1977). IDC estimates

that 40% of digital transformation initiatives in 2019 will use AI services and that 75% of business applications will use AI by 2021 (Crews, 2019). To improve productivity and develop new services, organizations will have to rely even more on AI to improve their performance (CIGREF, 2016, 2018; Crews, 2019).

While Artificial Intelligence (AI) is not something new, it has gained much attention in recent years (Ransbotham et al., 2018). AI has been argued to be a force of disruption for businesses worldwide and in a wide range of sectors (Davenport &Ronanki, 2018). Organizations implementing AI applications are expected to attain gains in terms of added business value, such as increased revenue, cost reduction, and improved business efficiency (AlSheibani et al., 2020).

The introduction of AI in organizational operations signals a newset of barriers and challenges (Duan et al., 2019). Some of these include bridging cross-domain knowledge to develop models that are accurate and meaningful (Duan et al., 2019), identifying, integrating and cleansing diverse sources of data (Mikalef& Gupta, 2021),andintegratingAIapplicationswith existing processes and systems (Davenport &Ronanki, 2018). To capture the potential value from AI, organizations need to understand how to overcome these challenges as well as the value-adding potential of these technologies. Yet, recent research on AI is more focused on a technological understanding of AI adoption than identifying the organizational challenges associated with its implementation (Alsheibani et al., 2020). While some studies have identified research gaps (Dwivedi et al., 2019), and looked at important aspects in being able to leverage AI technologies (Mikalef& Gupta, 2021), there is still a lack of a holistic understanding of how AIisadoptedandusedinorganizations,andwhatare the main value-generating mechanisms.

CONCLUSION

AI is increasingly becoming important for organizations to create business value and achieve a competitive advantage. However, many AI initiatives fail even though time, effort, andresources have beeninvested. There is a lack ofa coherent understanding of how AI technologies can create business value and what type of business value can be expected. And AI has been used in the e-commerce and financial industries to improve customer experience, efficient supply chain management,operational efficiency, and mate size, with the main goal of designing standard, reliable product quality control methods and the search for new ways of reaching and serving customers while keeping costs low. Deep learning and machine learning are two of the most popular AI techniques. These models are used by individuals, corporations, and government organizations to predict and learn from data. At the moment, machine learning models for the complexity and diversity of data in the food sector are being created. This article addresses the uses of machine learning and artificial intelligence in e-commerce, business management, and f inance. Some of the most common applications include sales growth, profit maximization, sales forecasting, inventory management, security, fraud detection, and portfolio management.

REFERENCES

1. Erences [1] PaulrajPrabhu, NeelamegamAnbazhagan, 2014. Improving Business Intelligence Based on Frequent Itemsets Using k-Means Clustering Algorithm. In: Meghanathan N., Nagamalai D., Rajasekaran S. (eds) Networks and Communications (NetCom2013). Lecture Notes in Electrical Engineering, vol 284. Springer, Cham, ISSN 1876-1100, ISBN 978-3-319-03691-5, ISBN 9783-319-03692-2 (eBook), DOI : 10.1007/978-3-319-03692-2_19, pp 243-254.

2. Manne, S.C. Kantheti, Application of artificial intelligence in healthcare: chances and challenges, Curr. J. Appl. Sci. Technol. 40 (6) (2021) 78–89, https://doi.org/10.9734/cjast/2021/v40i631320.

3. S.C. Bilow, Introduction: AL and machine learning, SMPTE Motion Imaging J. 129 (2) (2020) 14–15, https://doi.org/10.5594/JMI.2020.2964182.

4. I.H. Sarker, Machine learning: algorithms, real-world applications and research directions, SN Comput. Sci. 2 (2021) 160, https://doi.org/10.1007/s42979-02100592-x.

5. https://doi.org/10.1016/j.matpr.2021.06.419 2214-7853/ 2021 Elsevier Ltd. All rights reserved.

6. McCulloch and Pitts invented in 1943 the first mathematical model of the biological neuron, the formal neuron, using a physiological approach to AI (Benko&Lányi, 2009; Haenlein& Kaplan, 2019; McCorduck, Minsky, Selfridge, & Simon, 1977).

7. Wiener develops cybernetics, the science of how the human mind works, with the aim of modelling the mind as a "black box" with behavior dependent on feedback mechanisms. But this approach postulates that the brain and the architecture of its hundreds of billions of cells are mathematically mobilizable. This approach was further sublimated by the work of Donald Hebb, who is helping to endow formal neurons with learning capacities (Brown & Milner, 2003).

8. Herbert Simon introduced the notion of limited rationality in 1947. Later, in 1945, Allen Newell introduced the notion of heuristics for problem solving; an empirical method of problem solving, whose validity or efficiency is not proven. Their work also illustrates the cross-fertilization between computer science and AI. Firstly, the development of computer science makes it possible to conduct AI experiments; and secondly, the problems posed by AI experiments lead to the production of tools that serve the development of computer science (Benko&Lányi, 2009; Haenlein& Kaplan, 2019; McCorduck et al., 1977).

9. Between 1937 and 1948, Shannon established the link between Boolean algebra and electrical circuits and thus designed the digital electronics and information theory (Verdu, 1998).

10. In 1956 Newel, Simon and Shaw developed the Information Processing Language (IPL), with list structures, allowing the manipulation of chained elements to reproduce the associative character of human memory (Benko&Lányi, 2009; Haenlein& Kaplan, 2019; McCorduck et al., 1977).

11. Abbasi, A., Sarker, S., & Chiang, R. H. (2016). Big data research in information systems: toward an inclusive research agenda.

12. Journal of the Association for Information Systems, 17(2) Acemoglu, D., &Restrepo, P. (2018)

13. The race between man and machine: Implications of technology for growth, factor shares, and employment.

14. American Economic Review, 108(6), 1488–1542 Afiouni, R. (2019). Organizational learning in the rise of machine learning.

15. International Conference on Information Systems, Munich, Germany Alsheibani, S., Cheung, Y., &Messom, C. (2018). Artificial intelligence adoption: AI-readiness at firm-level.

16. Artificial Intelligence, 6,262018 Alsheibani, S., Cheung, Y., Messom, C., &Alhosni, M. (2020).

17. Winning AI strategy: six-steps to create value from artificial intelligence. Americas Conference on Information Systems, Online AlSheibani, S., Messom, C., & Cheung, Y. (2020).

18. Re-thinking the competitive landscape of artificial intelligence. Proceedings of the 53rd Hawaii international conference on system sciences Alsheibani, S.,Messom,D.,Cheung,Y.,&Alhosni,M. (2020).

19. Reimagining the strategic management of artificial intelligence: Five recommendations for business leaders.

20. Americas Conference on Information Systems, Online Amer-Yahia, S., Basu Roy, S., Chen, L., Morishima, A., AbelloMonedero, J., Bourhis, P., &Demartini, G. (2020).

21. Making AI machines work for humans in FoW. ACM SIGMOD Record, 49(2), 30–35 Anon. (2020). AI is essential to India's future of work, study finds.M2 Presswire

22. Abbasi, A., Sarker, S., & Chiang, R. H. (2016). Big data research in information systems: toward an inclusive research agenda. Journal of the Association for Information Systems, 17(2)

A REVIEW OF LITERATURE: AUDIT MARKET CONCENTRATION AND AUDIT QUALITY

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ABSTRACT

The study is a review of the literature on audit market concentration and audit quality. The research adopts a library-based methodology which essentially entails a review of extant literature as the basis for understanding the research issue and reaching necessary inferences. The review of literature has shown that debate on the value of audit market concentration especially in improving audit quality is still very contentious. From a broader viewpoint, the paucity of audit market concentration literature as a whole is the first important problem to address. Secondly, the mixed results in the few studies conducted in both the developed and developing economies indicate that more studies need to be carried out to establish the link between audit market concentration and audit quality. Thirdly, from the Nigerian perspective, it is observed that studies on audit market concentration are scarce. A few studies conducted have emphasized audit firm attributes with audit market concentration as one of the studied variables. Another gap established from the review of literature is that prior studies tend to focus on the Big 4 audit firms in the audit market. There is a possibility that among the Big 4, there areother domineering Audi(s) having a larger share of the audit market. According to the findings of the study, the problem such a firm has audit market concentration will define the audit market dynamics in the foreseeable future, and as a result, there is a need for more research-based evidence on the topic.

1. INTRODUCTION

According to the economics of auditing, the goal of audit services is to mitigate agency problems through the examination and certification of financial reports by an external auditor. The verification process entails the gathering and evaluating of evidence, which serves as a foundation for the auditors' formation of their professional view or judgment on the financial statements later on during the process. The outcome of the process, namely the audit opinion expressed in the audit report, is expected to improve the trustworthiness and value of the financial statements as a result of the process (Moizer, 2005). The quality of the audit is critical because it will have an impact on the credibility and dependability of the audit opinion. There are a variety of stakeholders who are either directly or indirectly affected or related to the audit quality of financial statements in one way or another.

Audit market concentrationis a widely acclaimed audit market-related factor that has been identified as having a substantialeffect on audit quality (European Commission, 2010).The extent

and direction of the impact of audit market concentration on audit quality are highly debatable, and differing theoretical perspectives exist on the subject. Specifically, the emphasis on audit market concentration has been placed in this research because issues relating to it has received significant regulatory attention worldwide, and among audit market-related factors, it is arguable that both variables have been the most harped on in the last decade, despite there being little agreement on how to deal with them.

Audit market concentration arisesin audit services if a few audit firms dominate and control a significant portion of the audit market share or sales volume. Market concentration has been exacerbated due to the dominance of the Big four audit firms, which include PricewaterhouseCoopers (PWC), Deloitte (Deloitte), Ernst and Young (EY), and KPMG, in the global audit services market. According to the current state of audit market concentration, there have been some developments that have piqued the interests of both regulatory interest groups and academic researchers. Aspects of these concerns include the threat of limited choice for the demand side (client firms), market systemic risk, and non-competitiveness, which reduces efficiency and audit quality (European Commission, 2017). It is even true in Nigeria that the audit market is heavily skewed in favor of the Big 4, which is promoting concentration in the market. For example, in the financial industry, the big 4 audits approximately 97 percent of firms, and in the non-financial sector, even though there is a mix of big four and non-big four firms, the market is still heavily skewed in favor of the big 4. (Eniola, 2020; Eguasa & Urhoghide 2017).

The concentration of the audit market is disconcerting on a global scale because of the possibility of a variety of scenarios. First and foremost, there is concern that the current pattern of theaudit services marketwill exacerbate the problems of limited choice and systemic risk that are already present in the market for audit services as a result of that structure (Eniola, 2020). Additionally, as Caban-Garcia and Cammack (2009 point out, the current situation poses two additional potential threats: a monopolistic situation and uncompetitive pricing, both of which are exacerbated by the lack of choice. If this development is viewed in the context of increasing supplier concentration, the market power of large audit firms may grow. This would result in cartelization, which would make it possible for the Big4 audit firms to exercise collective market dominance and to agree on pricing between or among themselves. As a result of this concentration, markets can develop into oligopolistic or monopolistic structures, and a highly concentrated or oligopolistic market can result in lower audit quality (Steven, 2016).

In light of the above, this article examines the literature on the connection between audit market concentration and audit quality to be able tounderstandhow and by what mechanisms audit market concentration, may have an effect on audit quality. Section 2 presents a review of the literature on several topics such as audit quality, joint audits, an assessment of joint audit practice across the world, and a discussion of existing research on the observed connection. Part 3 discusses the gap in the literature, and the last section concludes with the findings and recommendations provided.

2. Literature Review

2.1 Audit Quality

An enormous amount of material exists on the subject of audit quality and how to quantify it. Despite a large amount of research on the subject, no one widely recognized definition or

generally acknowledged metric of audit quality has been developed. Despite this, a careful examination of the previous relevant research showed that the word "audit quality" may be defined in a variety of ways(Ojala, Niskanen, Collis, & Pajunen, 2014). Much of the audit quality literature, according to Iswerdew (2016), is derived from DeAngelo's (1981) definition, which defines audit quality as the joint likelihood that an auditor will both find and disclose a violation in the client's accounting system. Finding a misstatement evaluates the quality of the auditor's knowledge and skills while reporting the misstatement is dependent on the auditor's motivations to reveal the mistake. The distinctive aspect of this definition is that it draws attention to two characteristics of audit quality: the likelihood of detection and the likelihood of reporting.

According to DeAngelo's point of view, the detection of fraudulent occurrences and the reporting of such cases demonstrates the auditor's independence. It is thus feasible to define audit quality as a rise in the auditor's capacity to identify accounting distortions as well as an increase in the ability and independence of auditing as assessed by the market. It seems that DeAngelo (1981) defined the auditor's function primarily in terms of detecting and reporting fraud, which is consistent with our understanding. This is a significant shortcoming of DeAngelo's definition, as Barghathi, Ndiweni, and Lasyoud (2020) have pointed out since it solely depicts auditing as a binary process of detecting and reporting breaches. Audit quality encompasses much more than simply the basic identification and reporting of breaches; in fact, it encompasses a wide range of activities (DeFond & Zhang, 2014).

Following this first description of DeAngelo, many other definitions have developed, each of which contributes to a more complete conceptualization of the topic. For example, in the opinion of Fatemeh (2018), audit quality is characterized in terms of the degree to which the applicable audit criteria are seen to be followed. As a result, the auditors' compliance with auditing standards is critical in this definition, and once this is accomplished throughout the audit, the audit quality is attained. A scenario in which financial statements include no major distortions is characterized as audit quality, according to Audousset-coulier (2015). The quality of the audit system, which is a critical component of financial reporting, has the potential to substantially enhance the reliability of financial statements. Furthermore, according to Alfraih (2016), improved audit quality will increase the financial statement value relevance.

2.2. Audit Market Concentration

According to Moeller and Hoellbacher (2009), the word concentration refers to an agglomeration of economic power that may be found in a variety of industrial sectors and has a variety of reasons. To begin with, it is essential to note that the topic of concentration development has been a topic of debate in the economic study for more than 150 years. Butevidence of concentration on the audit market of firms that do statutory audits and audits of publicly listed businesses, which is the subject of our research, has only been established worldwide since the 1960s.

The audit market is considered to be highly concentrated when a small number of audit firms dominate and control a large proportion of the audit market share or sales volume, as previously stated in this article. Industry concentration has been exacerbated as a result of the dominance of the Big4 audit firms, which comprise PricewaterhouseCoopers (PWC), Deloitte (Deloitte), Ernst and Young (EY), and KPMG, in the worldwide audit services market. According to the present status of audit market concentration, there have been certain changes that have piqued the

interests of both regulatory interest groups and academic academics. Studies relating tthehe concentrate n f audit market in the Nigerian audit market are few and, when they do exist, they are neither comprehensivnoror in-depth. Other nations, on the other hand, have empirical data on the assessment of market concentration that may be used. Zimmermann (2008), on the German audit industry, points out that the Big Four audit companies, led by PwC, receive roughly 87 percent of all audit fees collected. In addition, the consulting share amounts to 41.9 percent of the final audit, which is greater than the percentage found in the research by Lenz, Moeller, and Hoehn (2006), which was 39.5 percent (34 percent). The concentration ratio (CR4 = 0.85) is greater than the ratio in Switzerland but lower than the ratio in the United States and the United Kingdom (CR4 = 0.85). Moeller and Hoellbacher (2009) cconcluded thatthere is very high concentration measurement in the German audit market (CR4 = 0.77) The Big Four had a market share of 90 percent in the time before the collapse of Arthur Andersen in 2002 and 96 percent in the period following the collapse of Arthur Andersen in 2003, according to Beattie, Goodacre, and Fearnley (2003) in the United Kingdom, PwC is the market leader in audit engagements, accounting for 37 percent of all audit engagements. The concentration of the Big Four rose from 0.67 in 2002 to 0.73 in 2007. Stefani (2006) demonstrates that PwC (52.1 percent) dominates the market in Switzerland, with Ernst & Young (24.5 percent) and KPMG (3.5 percent) trailing behind. According to Breitkreuz and Mueßig (2010), the Swiss audit market is also split into three groups based on the Big Three. Ernst & Young, KPMG, and PwC have throughout the years maintained a very constant market share of about 95 percent, whereas Deloitte has a small part of the market.

Unfortunately, even if audit market concentration has the ccapacitancerisk if not properly managed, the issue has not received much attention from researchers and policy institutions in Nigeria, particularly when compared to the kind of attention that it has received in developed climes such as Europe and America, where the issues have been heavily debated in government and policy institutions. Audit concentration has received just a little amount of attention in Nigeria, which has the largest economy in Africa and is also the most populous country.

2.4. Audit Quality and Audit Market Concentration

Previous findings on the link between audit quality and audit market concentration is surrounded by empirical findings that are often opposed to one another. Using data from the United States from 2009 to 2017, Marleen, Simon, Liewsbeth, and Wieteke (2020) investigated the effect on audit quality. The traditional market concentration measure (the Herfindahl index) was adopted as a measure of market concentration while audit quality was measured by the level of absolute abnormal accruals and the incidence of financial statement restatements. According to the findings, there is no relationship between audit quality and market concentration.

Jeroen, Erik, Roger, and Caren (2019) explored whether the concentrated structure of the audit market influences audit quality. Based on the private division of the Belgian audit market, the authors investigated whether market structure had a positive or negative impact on quality nd alst determine whether audit complexity had a moderating effect on such effects. The results reveal that audit market concentration hurts quality in the SME-client sector.

Boone, Khurana, and Raman (2010) conducted an investigation on audit quality for Big4 and Mid-tier auditors between 2003 and 2006, as well as customers of other smaller audit firms for thmpal audit quality (as measured by earnings management indicators) and perceived audit quality were investigat,wasy investigatess operationalized by the client- and year-specific e-

loading and ex-ante equity risk premium metrics. Their findings revealed that Big4 and Mid-tier audit customers had (1) lower levels of accrual management, (2) higher levels of real earnings management, and (3) greater investor-perceived accruals quality as compared to other smaller audit firm clients, according to their research. They were unable to reject the null hypothesis that Big4 and Mid-tier audits are comparable in any of the cases studied. It is the authors' collective conclusion that, in circumstances where a Mid-tier auditor is possibly feasible, Big4 customers may use a Mid-tier company without compromising audit quality in any way.

Using cross-country variation in the audit market structure of 42 countries, Jere, Michas, and Seavey (2013) investigate two separate aspects of Big4 dominance: (1) market concentration of the Big4 as a group relative to non–Big4 auditors; and (2) concentration within the Big4 group in which one or more of the Big4 firms is dominant relative to the other Big4 firms. It is discovered that in countries where the Big4 (as a group) perform more listed company audits, both Big4 and non–Big4 clients have better quality audited profits as compared to customers in countries where the Big4 have a lower market share of listed companies. In contrast, they discover that Big4 customers have poorer quality audited profits in countries where there is more concentration within the Big4 group as compared to nations where market shares among the Big4 are more equally distributed.

Sanjay, Srinivasan, and Yoonseok (2010) researched to examine the relationship between audit market concentration (as assessed by the Herfindahl index of concentration) and audit quality (as evaluated by the audit quality index) measured by discretionary accruals). They concluded that more audit market concentration is linked with poorer overall audit quality. Their findings hold up under a series of sensitivity tests that they conducted in an effort to tto were associated with the location of the client company. Furthermore, their findings are robust to the inclusion of endogeneity controls for the association between concentrated audit market and audit quality.

On the contrary, studies showing a positive relationship between audit quality and audit market concentration includes those of Jere and Miinclude009), which investigated whether bigger offices of Big4 auditors are expected to provide higher-quality audits. They found a positive connection between audit quality and auditor market concentration. In order to test this hypothesToearchers looked at a sample of 6,568 firm-year data from the United States for the period 2003–2005, which was audited by 285 different Big4 offices. The findings are consistent with the notion that bigger offices provide higher-quality audits. Customers in bigger offices are less active in their profit management, and larger offices are more likely to provide going-concern audit reports. Despite comprehensive controls for client risk variables, as well as controls for other auditor characteristics, these conclusions remain valid. Francis (2013) researched the impact of audit market concentration on the quality of audited profits, which was comparable to the previous study. The findings of the study led to the conclusion that the Big Four dominance does not appear to hurt audit quality and appears to be associated with higher earnings quality, even after accounting for other country characteristics that may have an impact on earning quality.

Guo (2016) researched the connection between Big4 global member companies and audit quality control to better understand the relationship. A study of audit quality in China, Japan, and Eastern Europe is conducted based on Hofstede's (1980) six characteristics of national cultures and Gray's (1988) model of accounting system values. The Big Four global member companies in these three countries are examined. Also included is an analysis of both the advantages and

drawbacks of the Big Four's localization efforts, as well as predictions on how the Big Four will adapt to cultural factors while striving to enhance audit quality. The findings of the research showed that Big4 global companies improve audit quality, which is in turn linked with better earnings quality after adjusting for national factors that may have an impact on audit quality were taken into consideration.

Similar to this research, Limei, Ole-Kristian, and Langli (2016) investigated to investigate if Big-4 companies offer higher-quality audits than non-Big-4 firms when the characteristics of audit partners and auditees are kept constant in comparison to Big-4 firms. They used a one-of-a-kind dataset of individual auditors for a large sample of private businesses in a context with proven low litigation and reputation risk to assess the audit quality of partner-auditee pairings that move affiliations between Big-4 and non-Big-4 accounting firms. Measures of earnings management, deviations from clean audit reports, and accuracy of going-concern reporting are all used as proxies for audit quality. The researchers discovered that switching from a non-Big-4 company to a Big-4 firm results in fewer earnings management and better going-concern accuracy.

Eshleman and Guo (2016) investigated this problem using the frequency of accounting restatements as a metric of audit quality as a basis for their findings. They discover that customers of Big4 audit firms are less likely than clients of other auditors to issue an accounting restatement in the future, based on a propensity-score matching method similar to that employed in previous research to adjust for clients' endogenous choice of auditor. Following up on their initial findings, they discovered only minimal evidence that customers of Big4 auditors are less likely to submit accounting restatements. Taking the data as a whole, it seems that Big4 auditors are more likely to conduct higher-quality audits.

A few studies conducted in Nigeria also threw up conflicting results. For instance, Aggreh (2019) in a study ascertained the effect of audit market concentration and auditor's attributes on audit quality in the Nigerian manufacturing sector. Specifically, the study aimed at finding out the impactof relative audit market concentration (RAMC), absolute audit market concentration (AAMC), auditors' independence (AUIND), auditors' tenure (AUTEN,) and audit risk (AUDRISK) on audit quality (AQ) in the Nigerian manufacturing sector. The study employed anex-post factoresearch design because the data for the study was extracted from archivef pastarchived The study was restricted to Nigerian manufacturing firms.SA simplerandom simple randomhnique was employed to select 52 firms quotedon the Nigerian Stock Exchange as of 31st December 2015. The study covered a period of 15 years from 2001 – 2015, forming an observation of 780 firm-year observations in the Nigerian audit market. Data on relative audit market concentration, absolute audit market concentration, auditors' independence, audit tenure, and audit firm size were obtained from secondary sources (annual reports and accounts) and subjected to the regression analysis using the pooled OLS and Panel EGLS. Theresult shows that there is a negativerelationship between audit quality and relative audit market concentration, absolute audit market concentration, auditor tenure, audit firm size, and rendering of non-audit services while auditor independence and audit feehave a positiveerelationshipwith audit quality.

Further, Eguasa and Urhoghide (2017) in a Nigeria study adopted a longitudinal approach in investigatingconcentrated audit market and quality of audit. Secondary data were obtained from 60 listed companies in Nigeria for a period of 9 years running from 2007 to 2015 giving a total of 540-year end observations. The input-based model was adopted to measure audit quality. IThe findings of the study showed that a positive line exists between audit market concentration and

audit quality for the firms under investigation which by implication denotes that the big four audit firms render more professional services than the non-big four.

3. Gap in the Literature.

From a broader viewpoint, the paucity of audit market concentration literature as a whole is the first important problem to address. Secondly, the mixed results in the few studies conducted in both the developed and developing economies indicate that more studies need to be carried out to establish the link between audit quality and audit market concentration.Thirdly, from the Nigerian perspective, it is observed that studies on audit market concentration are scarce. A few studies conducted have emphasized audit firm attributes with audit market concentration as one of the studied variables. The few studies conducted also have conflicting findings as regards the association between audit market concentration and audit quality in Nigeria. Another gap established from the review of literature is that even the studies carried out in developed economies tend to focus on the Big Four audit firms in the audit market. There is a possibility that among the Big 4, there is(are) another domineering audit firm (s) having a larger share of the audit market. The audit market share among the Big 4 also needs to be investigated.

4. CONCLUSION

A review of the literature in the areas of audit market concentration, and audit quality is the focus of this research. The study employs a library-based approach, which involves primarily a review of existing literature as the foundation for comprehending the research problem and drawing the required conclusions from that literature review. According to the findings of the literature study, the argument over the merits of audit market concentration, particularly in terms of increasing audit quality, is still extremely hotly contested. In terms of audit market concentration, it appears that audit market regulators around the world are powerless to address the issue because the big four auditors tend to already have strongholdld on the audit market and have managed to garner massive investor confidence because they are regarded as the gold standard of credibility in the industry.

Even though the big four auditors are associated with audit quality, the evidence does not seem to be overwhelming, which suggests that there are likely to be negative externalities resulting from the concentration. Thereis a significant divergence of opinion, primarily between the big 4 auditors who believe that they will result in increased audit costs without necessarily adding incrementally to audit quality and regulators who believe that audit market concentration is deepening far more than what is considered healthy. According to the findings of the stop roblemsblem such as audit market concentration will define the audit market dynamics in the foreseeable future, and as a result, there is a need for more research-based evidence on the topic.

REFERENCES

Abbott, L.J., Park, Y. & Parker, S. (2000). The effects of audit committee activity andindependence on corporate fraud. *Managerial Finance*, 26(11), 55-68.

Abdulmalik, O. S., Shittu, I. & Ahmad, A. C. (2016). Political connections of boards andtheselection of auditors in Nigeria, *International Journal of Economics and Financial Issues*,(4),104–110.

Adeyemi, S.B.,& Olowokere, J.K. (2011). Shareholders; perception of audit performancegap in Nigeria. *International Journal of Accounting and Financial Reporting, 1*(1), 152 – 172.

Aggreh, M. (2019). Effect of audit market concentration and auditors' attributes on audit quality.

International Journal of Accounting and Finance, 8(1), 97-110

Ajaegbu, C. (2014).*Thcaseee for Joint audit, Institute of CharteAccountantsncts of Nigeria*, Available at http://icanig.org/ican/documents/ICAN__CASE_FOR_JOINT_AUDIT_FINAL.pdf.

Alfraih, M. A. (2016). Corporate governance mechanisms and audit delay in a jointit egulation. *Journal of Financial Regulation and Complianc*e, 24(3), 292-316

Andre, P., Broye, G., Pong, C., & Schatt, A. (2016). Are joint audits associated with higher audit fees? *European Accounting Review, 25*(2), 245–274.

Asien, E. N. (2014). Exploring the state of the audit market in Nigeria, *African Journal of Accounting, Audit,ing ,and Finance*, *3(* 4): 287 - 307.

Audousset-couier, S. (2014). Audit Fees in a Joint Audit Setting. *European Accounting Review*,1-31.

Audousset-Coulier, S. (2015). Audit Fees in a Joint Audit Setting. *European Accounting Review*, 24(2), 347-377.

Baldauf, J. & Steckel, R. (2012). Joint audit and accuracy of the auditor's report: An eempirel study.*International Journal of Economic Sciences and Applied Research*, ISSN 1791-3373, Kavala Institute of Technology, Kavala, 5(2),7-42.

Barghathi, Y., Collison, D., & Crawford, L. (2018). Earnings management and audit quality: Stakeholders' perceptions. *Journal of Management and Governance*, *22*(3), 629-659. https://doi.org/10.1007/s10997-017-9396-2

Barghathi, Y., Ndiweni, E., & Lasyoud, A. A. (2020). Joint audit, audit market concentration, and audit quality: Perceptions of stakeholders in the UAE. *Corporate Ownership & Control*, 17(2), 32-45.http://doi.org/10.22495/cocv17i2art3

Bianchi, (2018). Auditors' joint engagements and audit quality: evidence from iItalianprivateocompanies*Contemporary Accounting Research, 35*(3) 1533-1577.

Biscogno, M., & De Luca, R. (2016). Voluntary joint audit and earnings quality: Evidence from Italian SMEs. *International Journal of Business Research and Development, 5*(1), 1-22. https://doi.org/10.24102/ijbrd.v5i1.594

Brown, H., & Johnstone. K. M. (2009). Resolving disputed financial reporting issues:Effects ofuauditornegotiation experience and engagement risk on negotiation process andoutcomes. *Auditing: A Journal of Practice & Theory* 28 (2): 65–92.

Carmichael, D. R. (2004). The PCAOB andthe social responsibility of auditors. Accounting Horizons, 18(2), 127 – 133.

Cédric L., Sabine R., & Jaana K. (2012). *Struggle over joint audit: on behalf of public interest?*. *Comptabilités et innovation*, May 2012, Grenoble, France. pp.cd-rom. fffinal0935004ff.

Chin, C., & Chi, H. (2009). Reducing restatements with increased industry expertise. *Contemporary Accounting Research 26* (3): 729–765.

Cosserat. G. W. & Rodda, N.N. (2009). *Modern auditing*, 3rdEd, John Wiley & Sons Ltd.

DeAngelo, L. E. (1981). Auditor size and audit quality. *Journal of Accounting and Economics* 3 (3): 183–199.

DeFond, M., & Zhang, J. (2014). A review of archival auditing research. *Journal of Accounting and Economics*, *58*(2-3), 275-326. https://doi.org/10.1016/j.jacceco.2014.09.002

Deng, M., Lu, T., Simunic, D.A., & Ye, M. (2014). Do joint audits improve or impair audit quality? *Journal of Accounting Research, 52*(5), 1029–1060.

Dunn, K. A., & Mayhew. B. W. (2004). Audit firm industry specialization and client disclosure quality. *Review of Accounting Studies 9* (3): 35–58

Eguasa, B. E., & Urhoghide, R. O. (2017). Audit Market Concentration and Audit Quality in

Nigeria. *Journal of Business and Management*, 19(9). 1-9

Ejoh, E. (2015). Nigeria KPMG seeks review of FRC's unified corporate governance code, Vanguard, February, 17 p. 1Federation of Europian Accountants (FEE), (2011), Briefing Paper -Standing for trust and integrity, www.revizorska-komora.hr/pdf/IFAC-FEE/04-Appointment-oof the-Auditor.pdf.

Elder, R.J., Beasley, M. S., & Arens, A. A. (2010). *Auditing and assurance services: Anintegrated approach: Global edition*, 13th ed., Prentice-Hall, Englewood Cliffs, NJ.

Fatemeh, A. (2018). *Joint audit and the implications of its use*. Proceedings of Academicsera 20th International Conference, Montreal, Canada.

Financial Reporting Council of Nigeria (FRCN) (2016). National Proposed Code of Corporate Governance (Private Sector Code), Nigeria.

Green, D. L. (2006). Auditor independence in Canada: A historical perspective – from shareholder auditors to modern-day audit committees", *Canadian Accounting Perspectives*,5(1):37-65

Haak, M., Muraz, M., & Zieseniß, R. (2018). Joint audits: does the allocation of audit work effect audit quality and audit fees? *Accounting in Europe*, *15*(1), 55-80. https://doi.org/10.1080/17449480.2018.1440611

Haapamäki, E., Järvinen, T., Niemi, L. & Zerni. M. (2012). Do joint audits offer value for money? Abnormal accruals, earnings conservatism, and auditor remuneration in a settingofvoluntary joint audits. *European Accounting Research*, Forthcoming.

Hayes, R. Dassen, R. Schilder, A. &Wallage, P. (2005). *Principles of Auditing an Introduction to International Standards on Auditing*.(2nd Ed.)England; Pearson Education Limited.

Holm, C., & Thinggaard, F. (2014). Leaving a joint audit system: conditional feereductions. *Managerial Auditing Journal, 29*(2): 131-152.

Holm, C., & Thinggaard, F. (2016). Paying for joint or single audits? The importance of auditorpairings and differences in technology efficiency. *International Journal of Auditing, 20*,16.

Iswerdew J. (2016). *Does joint auditing improve the quality of auditing? A comparative analysisbetween the Netherlands and France*. A Master Thesis was submitted to the Faculty of Economics and Business, University of Amsterdam.

Ittonen, K. & Peni, E. (2011) Auditor' gender and audit fees, *The International Journal of Auditing,* forthcoming.

Jayeola, O., O, Taofeek, A., & O, T. (2017). Audit quality and earnings management among Nigerian listed deposit money banks,*Internaional Journal of Accounting Research*, 5(2), 1–5.

Kermiche, L. & Piot, C., (2018). The audit market dynamics in a mandatory joint audit setting: The french experience. *Journal of Accounting, Auditing & Finance, 33*(4), 463-484.

Khalid S. A., Hussein A. M., & Ayad A. H. (2019). Joint audit and the financial reporting quality: Empirical study on Iraqi voluntary joint audits. *International Journal of Innovation, Creativity and Change. 7*(8), 343-359.

Kilgore, A., Harrison, G., & Radich, R. (2014). Audit quality: What's important to users of audit services. *Managerial Auditing Journal, 29,* 776-799. https://doi.org/10.1108/MAJ-08-2014-1070

Knechel, W. R., Niemi, L. & Zerni, M. (2012) Empirical evidence on the implicit determinants of compensation in big four audit partnerships, *Working paper*.

Lassaad A. & Habib A. (2019). Determining factors of the quality of joint audit: Tunisian context. *Accounting and Management Information Systems*, 18(4), 559-587. DOI: http://dx.doi.org/10.24818/jamis.2019.04004.

Leasage, c., Ratzinger-Sakel, N.& Kettunen, J. (2012). Is joint audit bad or good? Efficiency perspective evidence from three countries. *working paper.*

Lesage C., Ratzinger-Sakel N.V.S. & Kettunen J. (2017). Consequences of the abandonment of mandatory joint audit: an empirical study of audit costs and audit quality effects. *European Accounting Review*, 26(2): 1-29

Lew, B. & Richardson, A. J. (1992). Institutional responses to bank failure: A comparative case study of the home bank (1923) and Canadian commercial bank (1985) failures.*Critical Perspectives on Accounting*, 3(2), 163-183

Limperg Institute, (1985). *The social responsibility of auditors: a basic theory on auditors function.* The Limperg Institute, Netherlands.

Mahmoud G. E. (2015).The effect of joint audit on audit quality: Empirical evidence from companies listed on the Egyptian Stock Exchange. *International Journal of Accounting and Financial Reporting, 5*(2),195-207.

Neveling, N. (2007). French CFO attacks joint audit. *Accountancy Age*: 4-4

Ojala, H., Niskanen, M., Collis, J., & Pajunen, K. (2014). Audit quality and decision making in small companies. *Managerial Auditing Journal, 29,* 800-817. https://doi.org/10.1108/MAJ-08-2014-1063.

Okaro, S. C. & Okafor, G. O. (2013). Audit market concentration in Nigeria: An Empirical Study. http://www.researchgate.net/....Audit_Market_Concentration Empirical_Study/.../55---- (Retrieved April 20. 2021).

Okaro, S. C., Okafor, G. O., & Ofoegbu, G. N. (2018). Mandating joint audits in Nigeria: Perspectives and Issues. *International Journal of Academic Research in Business and Social Sciences, 8*(3), 316–338.

Olowookere, J. K. (2016). Determinants of auditors choice in Nigerian quoted manufacturing companies, *Research Journal of Finance and Accounting*, *7(6)*, 49–57.

Patrick V. & Jamel A. (2015). Are joint audits a proper instrument for increased audit quality? *British Journal of Applied Science & Technology 7*(6), 528-551

Quick, R., & Schmidt, F. (2018). Do audit firm rotation, auditor retention, and joint audits matter? An experimental investigation of bank directors' and institutional investors' perceptions. *Journal of Accounting Literature, 41,* 1-21. https://doi.org/10.1016/j.acclit.2018.01.003

Razinger-Sakel, N., Audosset-Coulier, S., Kettumen, J. & Lessage, C. (2013). Joint audit issues and challenges for researchers and policy makers.*Accounting in Europe*, 10(2), 175–199.

The Guardian, (2016). Investors laud suspension of FRCN corporate governance code, November 9:1

Thinggaard, F. & Kiertzner, L. (2008) Determinants of audit fees: evidence from a smallcapital market with a joint audit requirement, *International Journal of Auditing, 12*(2), 141–158.

Velte, P. (2017). What do we know about empirical joint audit research? A literature review. *Accounting and Financial Control*,1(1), 4-14

Velte, P., & Azibi, J. (2015). Are joint audits a proper instrument for increased audit quality? *Journal of Applied Science and Technology*, 7, 528-551

Vera-Munoz, S. C., Ho, J. L. & Chow. C. W. (2006). Enhancing knowledge sharing in public accounting firms. *Accounting Horizons 20* (2): 133–55.

Watts, R., & Zimmerman, J. (1986). *Positive Accounting Theory*. Englenwood Cliffs; Prentice Hall London.

Zerni, M., Haapamaki, E., Ravinen, T., & Nieml, L. (2012). Do joint audits improve audit quality? evidence from voluntary joint audits. *European Accounting Review*, *21*(4), 731-765.

BUSINESS MANAGEMENT AND ITS MODELING WITH ARTIFICIAL INTELLIGENCE

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ABSTRACT

Business management is the process of organizing and overseeing the operations of a business to ensure efficiency, productivity, and success. It involves planning, directing, coordinating, and controlling various resources and activities within an organization to achieve its goals. Effective business management requires strong leadership, strategic decision-making, effective communication, and the ability to adapt to changing market conditions. In today's digital age, AI technologies are playing an increasingly important role in enhancing business management practices by providing data-driven insights, automating routine tasks, and improving decision-making processes. By leveraging AI tools and solutions, managers can gain a competitive edge, drive innovation, and optimize performance across all areas of their organization.Business management refers to the process of coordinating and overseeing the activities of a business or organization in order to achieve specific goals and objectives. This includes planning, organizing, leading, and controlling resources to ensure that the business operates efficiently and effectively. Business management involves making strategic decisions, managing people and processes, and continually improving performance to drive success and growth.

KEYWORDS: *Business Management, Artificial Intelligence, Modeling, Management Future, Performance Improvement.*

INTRODUCTION

The development of Management Information Systems (MIS) is Impossible without the use of machine learning (ML). It's a type of Artificial Intelligence (AI) that makes predictions using statistical models. When It comes to financial analysis, there are numerous risk-related concerns to contend with today (FI). In the financial sector, machine learning algorithms are used to detect fraud, automate trading, and provide financial advice to investors. To better serve its customers, the financial sector can now save borrower data according to specific criteria thanks to MIS. In fact, there is a large amount of data about debtors, making load management a difficult task. ML can examine millions of data sets in a short period of time without being explicitly programmed to improve the results. This type of algorithm can aid financial institutions in making grant selections for their clients. For the objective of classifying FI In terms of fraud or not, the Intelligent Information System for Financial Institutions (IISFI) relying on Supervised ML
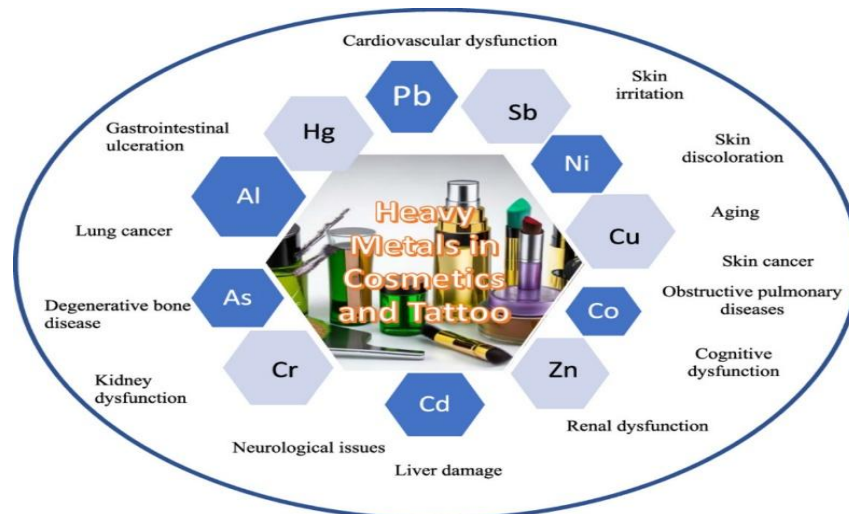
(SML) Algorithms has been created In this work. Bayesian Belief Network, Neural Network, Decision trees, Naïve Bayes, and Nearest Neighbor has been compared for the purpose of classifying FI risks using the performance measures asfalse positive rate, true positive rate, true negative rate, false negative rate, accuracy, F-Measure, Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Square Error (RMSE), Med AE, Receiver Operating Characteristic (ROC) area,Precision Recall Characteristic (PRC) area, and measures of PC. 1

Manufacturers are exploring the extent to which digital technology applications can support their sustainability efforts by helping to convert abstract sustainability goals, such as those of net-zero emissions and circular economy (CE), into feasible and practical actions, achievements, and ultimately, a sustainable competitive edge. This work adopts a resource-based view (RBV) to explore the potential role that digital technologies play in the cultivation of a manufacturing firm's competitive advantage, and the deployment of existing internal resources and core competencies to achieve net-zero manufacturing emissions and CE. Two questions are addressed: (1) What competitive advantage(s) may be derived from the integration of digital technologies to achieve net-zero manufacturing emissions, and (2) does adopting an RBV facilitate the development of meaningful (and novel) competitive advantage? Engaged scholarship is used to analyse and apply theory to an empirical, real-world dataset documenting the perspectives and experiences of 13 manufacturing firms. Applying the VRIO framework, 21 identified digital technology-based core competencies are categorised as forms of competitive advantage that may be possible for manufacturing firms pursuing net-zero emissions. Four scenarios of digital technology adoption pathways are proposed, differentiated by the degree of radical vs. incremental interests and options available to the firm. This study highlights the critical need for firms to incorporate intangible asset management and development, including the labour and supply chain relationships, as part of their digital transformation strategies. Further, we demonstrate the potential of RBV as a lens for evaluating the competitive advantage potential of corporate sustainability initiatives, and facilitating the development of related strategies 2

Fish constitute important high protein products to meet the demands of an increasing global population. However, the continued depletion of wild fish stocks is leading to increased strain on the aquaculture sector in terms of sustaining the supply of fish and seafood to global markets. Despite the fact that aquaculture is more diversified than other agriculture sectors, there are significant pressures on the industry to continue innovating in order to enable sustainability including increased fish production, improved appropriate selection of species, disease mitigation, reduced wastage, preventing environmental pollution and generating more employment globally. This viewpoint article addresses how digital transformation can help support and meet expansion needs of the fisheries/aquaculture industries that includes exploiting and harnessing ICT, IoT, Cloud-edge computing, AI, machine learning, immersive technologies and blockchain. Digital technologies are bringing significant operational benefits for global food chain, improving efficiencies and productivity, reducing waste, contamination and food fraud. The focus on digital technologies has recently evolved to Industry 5.0 where AI and robotics are coupled with the human mind in order to advance human-centric solutions. This viewpoint describes the role of Quadruple helix Hub (academic-industry-government and society) in delivering a convergent holistic approach to meeting the diversity of fishery industry needs by connecting and placing fisheries centrally in a defined ecosystem of stakeholders. This includes specialist training, testing technologies, providing access to finance and fostering disruption

through aquaculture accelerator initiatives such as that provided by Hatch Blue. Connecting digital Innovation Hubs trans-regionally, nationally and internationally will also help mitigate against significant risks for the fisheries and aquaculture industry including climate change, global pandemics and conflicts that can jeopardize fish and seafood production and supply chains. There is also a commensurate need to avail of digital technologies in order to increase awareness of key industry issues across the value chain, such as through social marketing. Thus, addressing key challenges by way of the global digital transformation of fishery and aquaculture industry will meet several sustainable development goals of the United Nations catered around the application of disruptive technology. 3

Drawing from a digital postcolonialism perspective, this paper explores how the leftover technology available in the colonised space shapes the landscape of NGOs' accountability to beneficiaries and funders during the COVID-19 lockdown. The context of the study is the Gaza Strip, a socially and politically vulnerable geographic location with heavy reliance on support from NGOs. We conducted 20 semi-structured interviews with Palestinian and international NGOs during and after the lockdown to enhance our understanding of the challenges and opportunities they faced in adopting technology to discharge accountability during a major disruptive event. Three main themes emerged from our analysis. First, the biggest challenge is downward accountability to the most deprived and marginalised beneficiaries due to implications of the digital occupation which caused digital unaffordability and illiteracy, voluntary digital resistance to counter suspicion of surveillance, and female digital disempowerment. Second, upward accountability was less problematic as funders accepted ad hoc technology-based accountability practices, but some concerns remained over the efficacy and sustainability of digital adoption in the long run. Finally, the pandemic granted NGOs new opportunities in utilising technology, which successfully changed their process and practice of accountability. 4

In what jobs is business management used?

Business management is used in a wide range of jobs and industries. Some common roles that require business management skills include:
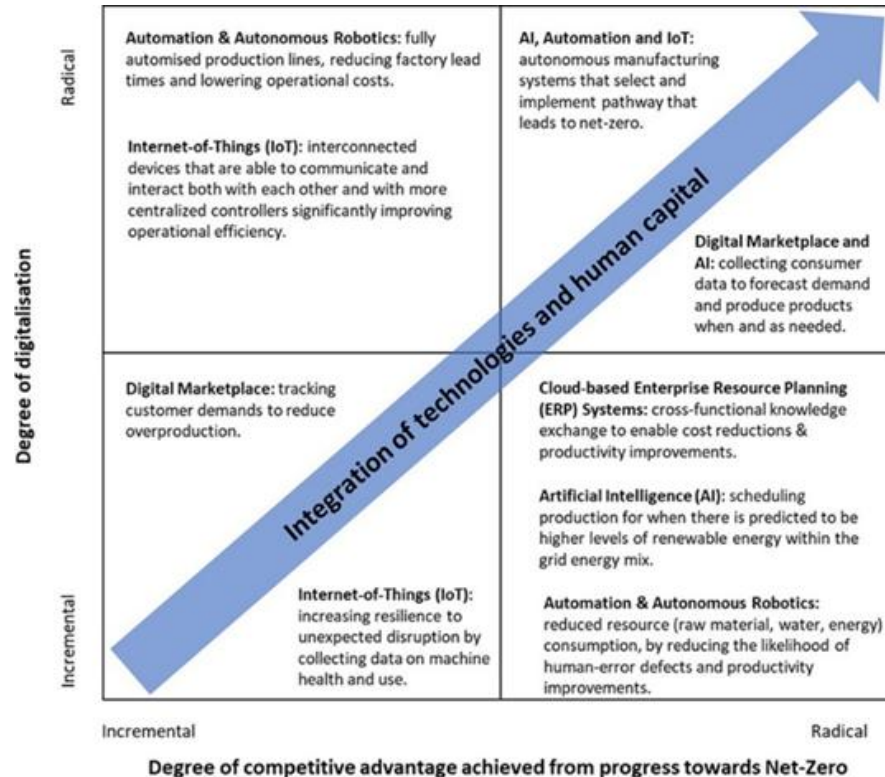
1. Business Manager

2. Operations Manager

3. Project Manager

4. Sales Manager

5. Marketing Manager

6. Human Resources Manager

7. Financial Manager

8. Entrepreneur/Small Business Owner

9. Supply Chain Manager

10. Retail Store Manager

These are just a few examples, but business management skills are valuable in almost any job that involves overseeing operations, managing resources, and driving success and growth within an organization.

What is the future of business management?

The future of business management is likely to be increasingly focused on data-driven decision making, the integration of artificial intelligence and automation into daily operations, remote team management, sustainability and social responsibility initiatives, and the ability to quickly adapt to changing market conditions. As technology continues to evolve, business managers will need to stay up-to-date with the latest tools and trends in order to remain competitive and drive innovation within their organizations. Additionally, there will be a growing emphasis on diversity and inclusion the need for strong leadership skills to inspire and motivate teams in an ever-changing global economy.

Degree of competitive advantage achieved from progress towards Net-Zero

What are the benefits of business management in the industry?

Business management in the industry offers numerous benefits, including improved efficiency and productivity, better decision-making processes, increased profitability, and enhanced strategic planning. It also helps in creating a cohesive and motivated work environment, fostering innovation and creativity, and ensuring compliance with regulations and ethical standards. Additionally, effective business management can lead to increased customer satisfaction, improved reputation and brand image, and higher employee retention rates. Overall, business management plays a crucial role in driving success and growth in the industry.
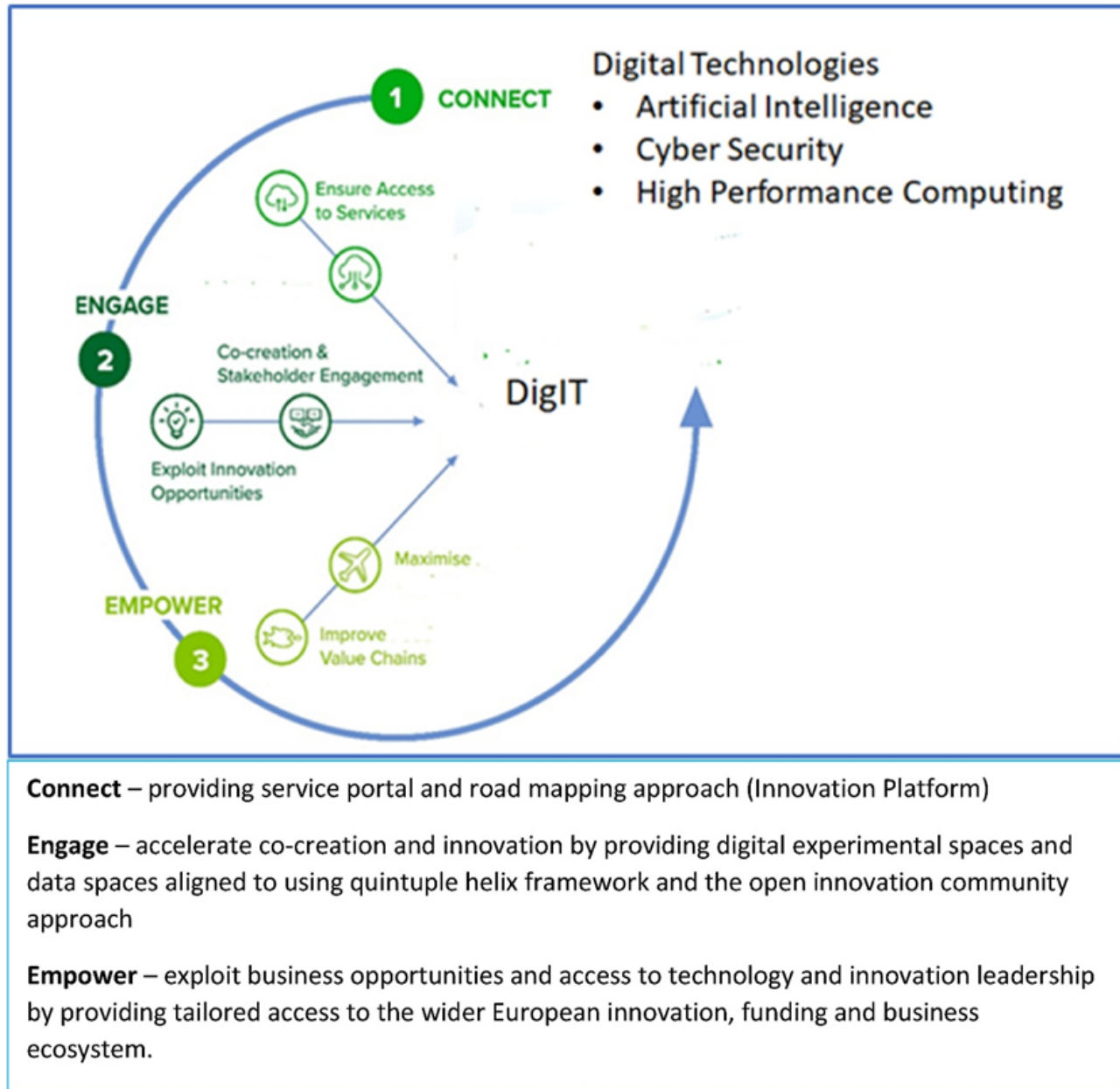
What are the disadvantages of business management?

Some potential disadvantages of business management include the risk of making poor decisions that could negatively impact the organization, the potential for conflicts and power struggles among team members, and the challenges of balancing short-term goals with long-term objectives. Additionally, ineffective business management can lead to decreased productivity, poor employee morale, and ultimately, financial losses for the company. It is important for businesses to continuously evaluate and improve their management practices to mitigate these risks and ensure sustainable success.

Can artificial intelligence be used to improve business management in various industries?

Yes, artificial intelligence can be incredibly beneficial in improving business management across a variety of industries. Here are some ways AI can enhance business management:

1. Data analysis: AI can process and analyze large volumes of data quickly and accurately. This can help businesses gain valuable insights into their operations, customers, and market trends, enabling AI-powered tools can automate repetitive tasks such as data entry, inventory management, and customer communication. This frees up employees to focus on more strategic tasks, increasing productivity and efficiency.

2. Customer service: AI-powered chatbots and virtual assistants can provide 24/7 customer support, answer queries, and resolve issues in real-time. This improves customer satisfaction and loyalty.

3. Supply chain optimization: AI algorithms can analyze supply chain data to identify inefficiencies, predict demand fluctuations, and optimize inventory levels. This helps businesses reduce costs, improve delivery times, and enhance overall supply chain performance.

4. Predictive analytics: AI can analyze historical data to predict future trends and outcomes. This enables businesses to anticipate market changes, customer proactive decision-making.

By harnessing the power of artificial intelligence, businesses can streamline their operations, enhance decision-making, and drive innovation across various industries. It is essential for organizations to embrace AI technology to stay competitive in today's rapidly evolving business landscape.

Connect – providing service portal and road mapping approach (Innovation Platform)

Engage – accelerate co-creation and innovation by providing digital experimental spaces and data spaces aligned to using quintuple helix framework and the open innovation community approach

Empower – exploit business opportunities and access to technology and innovation leadership by providing tailored access to the wider European innovation, funding and business ecosystem.

CONCLUSION

In conclusion, integrating AI into business management practices can lead to improved efficiency, better decision-making, and increased innovation. By leveraging AI technology, organizations can gain a competitive edge and adapt quickly to changing market conditions. It is crucial for businesses to embrace AI as a long-term success in today's dynamic business environment.

REFERENCES

1. Abrahamson, Z. (2020). 5 challenges to INGOs' funding during and beyond Covid-19. available on the internet at https://www.bond.org.uk/news/2020/10/5- challenges-to-ingos-funding-during-and-beyond-covid-19/. (Accessed 15 March 2022).

2. Agostino, D., Arnaboldi, M., &Lema, M. D. (2021). New development: COVID-19 as an accelerator of digital transformation in public service delivery. Public Money & Management, 41(1), 69–72.

3. Agyemang, G., O'Dwyer, B., &Unerman, J. (2019). NGO accountability: Retrospective and prospective academic contributions. Accounting. Auditing & Accountability Journal, 32(2), 2353–2366.

4. American Planning Association, 2018. APA Policy Principles for Autonomous Vehicles. https://planning-org-uploaded-media.s3.amazonaws.com/document/APA-Polic y-Principles-Autonomous-Vehicles.pdf. Anderson, J.M., Kalra, N., Stanley, K.D., Sorensen, P., Samaras, C., Oluwatola, T.A., 2016. Autonomous Vehicle Technology: A Guide for Policymakers The RAND Corporation. Santa Monica, California. Azad, M., Hoseinzadeh, N., Brakewood, C., Cherry, C.R., Han, L.D., 2019. Fully autonomous buses: a literature review and future research directions. J. Adv. Transp. 2019, 4603548.

5. Arab Centre for Social Media Advancement. (2017). Internet freedoms in Palestine: Mapping of digital rights violations and threats. available on the internet at https://7amleh.org/wp-content/uploads/2018/01/7amleh_Internet_Freedoms_in_Palestine.pdf. (Accessed 1 February 2023).

6. Arnaboldi, M., Busco, C., &Cuganesan, S. (2017). Accounting, accountability, social media and big data: Revolution or hype? Accounting. Auditing & Accountability Journal, 30(4), 762–776.

7. Barnes, P., Turkel, E., 2017. Autonomous Vehicles in Delaware: Analyzing the Impact and Readiness for the First State. Institute for Public Administration, University of Delaware.

8. California Multi-Agency Workgroup on AV Deployment for Healthy and Sustainable Communities, 2018. Automated Vehicle Principles for Healthy and Sustainable Communities. https://opr.ca.gov/docs/20181115-California_Automated_Vehicle_ Principles_for_Healthy_and_Sustainable_Communities.pdf.

9. Center for Global Policy Solutions, 2017. Stick Shift: Autonomous Vehicles, Driving Jobs, and the Future of Work. http://globalpolicysolutions.org/report/stick-shift-autonom ous-vehicles-driving-jobs-and-the-future-of-work/, Washington, D.C.

10. Centralina Council of Governments, 2019. Preparing the Greater Charlotte Region for: Connected & Autonomous Vehicles. https://centralina.org/wp-content/up loads/2017/04/CAV_Preparation-FINAL.pdf.

11. Chase, R., 2014. Will a World of Driverless Cars Be Heaven or Hell?, Bloomberg CityLab. Chatman, D.G., Moran, M.E., 2019. Insights on Autonomous Vehicle Policy from Early Adopter Cities and Regions. Policy Brief. Insitute of Transportation Studies, University of California.

12. City of Portland Oregon, undated. Connected and Automated Vehicles Policies. https://www.portlandoregon.gov/transportation/article/643814. City of Tempe Arizona, 2018. Autonomous Vehicles in Tempe: Opportunities and Risks. https://ifis.asu.edu/sites/default/files/tempe_av_report_-_final.pdf.

13. Clark, J., Curl, A., 2016. Bicycle and Car Share Schemes as Inclusive Modes of Travel? A Socio-Spatial Analysis in Glasgow, UK. Social Inclusion 4, 83–99. Claypool, H., Bin-Nun, A., Gerlach, J., 2017. Self-Driving Cars: The Impact on People with Disabilities. Ruderman Family Foundation. Cohen, S., Shirazi, S., 2017. Can We Advance Social Equity with Shared, Autonomous and Electric Vehicles? Policy Brief. Institute of Transportation Studies, University of California, Davis.

14. Development of an intelligent information system for financial analysis depend on supervised machine learning algorithms

15. Digital postcolonialism and NGO accountability during COVID-19: Evidence from the Gaza Strip

16. Digital transformation and the circular economy: Creating a competitive advantage from the transition towards Net Zero Manufacturing

17. Fact Sheet for health care providers emergency Use authorization (EUA) of REGEN-COV. Available at: https://www.fda.gov/media/145612/ download. Accessed July 7, 2022.

18. Guo Y-R, Cao Q-D, Hong Z-S, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (covid-19) outbreak- an update on the status. Mil Med Res. Avaliable at: https://www.ncbi.nlm.nih.gov/ pmc/articles/PMC7068984/. Accessed July 7, 2022.

19. Heavy metals in cosmetics and tattoos: a review of historical background, health impact, and regulatory limits

20. How firms can create delightful customer experience? Contrasting roles of future reward uncertainty

21. Jorgensen SCJ, Kebriaei R, Dresser LD. Remdesivir: review of pharmacology, pre-clinical data, and emerging clinical experience for COVID-19. Pharmacotherapy. Available at: https://www.ncbi.nlm.nih.gov/pmc/ articles/PMC7283864/. Accessed July 11, 2022.

22. Kirtipal N, Bharadwaj S, Kang SG. From SARS to SARS-COV-2, insights on structure, pathogenicity and immunity aspects of pandemic human coronaviruses. Infect Genet Evol. Avaliable at: https://www.ncbi.nlm.nih. gov/pmc/articles/PMC7425554/; 2020. Accessed July 7, 2022.

23. Predicting climate factors based on big data analytics based agricultural disaster management

24. Tennessee Department of Health. August 17, 2021. Monoclonal antibody statement. Available at: https://www.tn.gov/health/cedep/ncov.html. Accessed July 7, 2022.

25. The role of digital technologies in supporting and improving fishery and aquaculture across the supply chain – Quo Vadis?

A STUDY ON UNDERSTANDING UNEMPLOYMENT

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ABSTRACT

The primary focus in this paper is on understanding the impact of unemployment in Sandton, Johannesburg. In order to address this, as a starting point, it is noted that unemployment and the crisis of joblessness remains a problem in both low-density as well as high-density population areas. I have emphasised the development initiative to promote employment opportunities for the unemployed to enhance entrepreneurship amongst those with appropriate livelihoods. This could be understood, based on the understanding of the causes of unemployment and could provide relevant intervention strategies within the context of the people intended to be reached. The focus of the article is to suggest ways to provide training, share information, skills development and implement practical contributions to alleviate poverty in the community. It investigates the impact of unemployment in human lives with a view to understand how to balance life and employment. The article found a positive contribution on how to improve human life through job creation.

Purpose*: The purpose for the article is to explore the impact of unemployment in human lives and to establish strategies to assist unemployed people to create jobs by practicing the skills development to enhance a balanced lifestyle.*

Findings: *An investigation focused on the recognition that the high rate of unemployment in Sandton, Johannesburg, especially among those who are lacking skills and skills mismatch in a labour market, can be best resolved by the promotion of training and the creation of opportunities to start new businesses within the community. The causes of unemployment and its effect on human lives are also discussed.*

KEYWORDS: *Work, Work Ethics, Poverty.*

INTRODUCTION

The article reviews the literature on the different aspects of work and unemployment. The challenges of unemployment or underemployment in our society have been viewed as a social issue that affects the community in multiple dimensions. The first attempt in this section is to present the outline of the researcher's intention to provide important views and findings on how other authors have contributed to the subject presented in this project. To achieve this, the researcher reviews the literature in the following section, divided into six sub-divisions. First, the terms of unemployment or underemployment are understood, concerning how other scholars have conceptualised them. Second, the effect of unemployment on human life is discussed.

Third, the causes of unemployment and poverty in contemporary times is investigated. Fourth, the impact of unemployment and poverty in the community is analysed. Fifth, the impact of unemployment on the economic growth is discussed and last, the costs of unemployment on individuals, as well as the society at large is discussed. Definitions used are:

Work: To do something that involves physical or mental effort, especially as part of a job.

Work team: A work team is a group of people with complementary skills who are committed to a common mission, performance goals, and approach for which they hold themselves mutually accountable.

Poverty: Poverty is a state of want or deprivation in which those who suffer from it have no basic, minimum requirements for survival. The poor suffer from basic economic needs, and they are deprived of material goods necessary to live with dignity.

Methodology

The study adopts the literature review by prominent writers who have contributed on the causes of unemployment and its impact in human lives. Library sources, and other scholarly articles that are relevant to the aspect of unemployment or underemployment have been used.

Results and Discussion

The Effect of Unemployment in Human Life

First and foremost, the researcher argues about the effect of unemployment in human life. The unemployed, as individuals, suffer both from their income loss while unemployed, and related social problems caused by long periods of unemployment. Society, overall, loses from unemployment because the total output is below the potential level [1].

This contributes to low self-esteem in an unemployed individual and community social exclusion. Having argued about unemployed and marginalised prospects, the term 'unemployment' is used to describe anyone who is able to work but does not have an occupation. Even though unemployment is one of the most common chronic complications in the cities, it is a concern for individuals, as well as global communities. As a result, unemployment is expressed as a percentage of the total available workforce that is unemployed but actively seeking employment and willing to work, which is known as the unemployment rate. There is a link between unemployment and poverty which is considered as the major effect in human life. The level of unemployment varies with economic situations and other circumstances in the community. This is based on the discussion of this project with an emphasis on the ministry to the unemployed in Sandton. Unemployment remains the biggest challenge that affects life and hope among the people residing in Sandton. In short, unemployment undermines human dignity. In other words, unemployment is mostly described as economic issues, but the researcher has argued that it poses a threat to human dignity, therefore, it must be viewed as a serious concern. To strengthen the argument further, there are three major effects of unemployment: (i) There are financial problems which result from prolonged unemployment. Focusing on the loss of income, unemployed individuals struggle to meet financial needs. As a result of this financial crisis, unemployed individuals are unable to maintain the minimum standard of living; (ii) Unemployment has a social dimension. There are problems an individual

faces socially as a predicament of unemployment. As an indirect effect of unemployment, many find it easy to abuse alcohol and drugs, thus even leading to cases of domestic violence, in some instances. In addition to the stated challenges of high unemployment, there is often an observed increase in the rate at which of marriages break down, community divisions, and discrimination in society. The number of suicide cases also increases, due to the lack of self-esteem caused by financial instability; (iii) Unemployment bears negatively also on personal human social relations. There is a certain stigma attached to the poor and disadvantaged which is associated with certain supposed problems attached to them, such as poor hygiene, illness, disease, and poor/ no education. According to this view on the effect of unemployment, these prejudices lead to distance between the poor and the rich and contribute to mistrust in the labour market.

The essence of this argument is that poverty is more than a lack of resources to meet basic needs. Poverty inflicts physical, psychological, and spiritual pain in people's lives in all ages, who strive for wellness and resist the oppressive burden of destitution. In conclusion, the various effects of unemployment are financial, social, and psychological problems. The effect of unemployment influences not only the personal well-being of the individual but also the wellness of the broader society. The leading challenge that affects human life, health, economy, and community is unemployment. The impact of unemployment felt by the unemployed is worth noting. Unemployment causes workers to suffer financial difficulties that may lead to emotional destruction. There is a demand for employment in Sandton, but due to an influx of job seekers every day, it is difficult to arrange jobs for all these new workers. In this case, the demand of workers will be more than the available positions. When this happens, consumer spending leads to a recession or even a depression when left unaddressed. The evidence shows that unemployed people suffer low-self-esteem and discrimination. In addition, when the challenge of unemployment is handled and addressed, community members may empower all the beneficiaries of development programmes by enhancing their skills and assist in breaking away from the dependency mentality.

Unemployment and Poverty Today

Employment is one of the basic ingredients of human activity and has always been considered an important aspect of life in most, or even all, cultures. There is a connection between poverty and unemployment. The study explores more deeply the different ways through which poverty and unemployment affect people and how it perpetuates inequality. Poverty is the condition of lacking sufficient money or goods to meet basic human needs, such as food, shelter, and clothing. In making this comment, the problem of unemployment which causes poverty, is complex and produces many faceted challenges. However, proposing to address unemployment and poverty in this section is motivated by the fact that there is a link between unemployment and poverty which is investigated in this section of the project. There are many factors which contribute to unemployment in the affluent community. In addressing the question of unemployment and poverty, most, if not all, of them such as low-quality education, lack of adequate food, healthcare, and geographic location - can be traced to the legacy of discrimination that plagues people in Sandton. Ultimately, many factors contribute to poverty, as a result, many people have been confronted by lack of employment and underemployment for a long period.

To put it simply, many people live in poverty in Johannesburg, Sandton, because they are unable to find a job that pays a living wage or to find a job at all. Many people assume that not everyone

who is unemployed lives in poverty, hence this study unearths how unemployment and underemployment contribute to poverty. Lötter stated, "A major cause of poverty is unemployment, especially in a situation where individuals have no social or family support. It is worth noting that poor communities are often characterised by the virtual absence of people who are formally employed"[2] but he did not describe the behaviour. Having just argued that people of low class suffer from both unemployment and poverty, not everyone experiences the same challenge in Sandton. In many cases, even those who qualify for certain jobs find themselves unemployed. You would think that people who live in poverty are lazy, individuals are rarely responsible for their unemployment and poverty.

Poverty and Moral Values

In recent discussions on the impact of unemployment, a controversial issue has been investigated whether unemployment is the major cause of poverty. From this perspective, poverty erodes people's morale as desperation to make a living provides the incentive for behaviour that the rest of society regards as immoral. To describe someone as poor, thus indicates that a person has fallen below the standard of life deemed appropriate for a human being in a specific society. Lötter stated:

> "Poor people may argue that morally acceptable methods of earning a living did not work for them; they followed the rules of society to no avail, therefore, they are in a position where making a living through immoral means becomes a serious option. They may indeed lack material means to continue living a moral life"[2]

To put it clearly, unemployment and poverty become a cause of moral decay. To see whether these findings apply to unemployed and poor people, the researcher proposed to include another dimension of moral decay as Lötter argues, "that goes into the extent that a poor person can decide to enter the underground economy by engaging in illegal trading of goods like alcohol, diamonds, drugs, or sex".[2] Furthermore, if immoral behaviour leads to financial success and social power, it might become easier to slip deeper into immoral and criminal behaviour than to return to a moral lifestyle. While focusing on the contribution of employment to household income is particularly important since work tends to be more reliance on families than on individuals.[3] By focusing on poverty and moral values, it helps to understand the damage unemployment does in human lives. Admittedly, the consequences of unemployment or lack of income in the society may contribute to multifaceted challenges that are investigated in the following sections of this project.

The Psychological Effects of Unemployment

It is worth noting that unemployment appears to contribute to psychological development and behavioural disorders, as indicated in the previous section. It is true that the complexity of the problem of community non-participation and gross unemployment rates may produce behavioural disorders. According to Vorster, "the fear of losing one's job and associated anxieties of unemployment is quite absent from the soviet economy" [4]. Having just argued that the unemployment rate, as an economic measure, produces a higher incidence of life stress which in turn, produces behavioural changes in the affected population, unemployment may result in life stress and a subsequent increase in symptoms, such as depression and physical illness, but this does not necessarily mean that an individual who loses his or her job will then

report life stress and experience illness. An observation has been made during the period of the state of disaster necessitated to curb the spread of the coronavirus (COVID-19) outbreak in South Africa that employment decreased while the number of people admitted to mental institutions increased. Those who lost their jobs during the period of the COVID-19 pandemic suffered economic stress which precipitated and induced mental illness. One explanation for the psychological effects finding is the fact that semi-skilled and skilled workers had somewhat higher levels of education and it was this group that suffered most economic loss due to unemployment. After that, those who suffered large losses were business entrepreneurs who were assumed to have the highest educational levels. Having argued that intolerance of mental illness grew during periods of economic depression, this was the result of the families that might have been able to support mentally ill members during times of relative prosperity, might have found the burden too great when financial resources were depleted. In conclusion, unemployment induces greater life stress which in turn, increases heart disease and excessive consumption of alcohol and family violence. As a result, the psychological effect of the unemployment rate has contributed to social challenges, such as abuse, suicide rates, homicide, morality and crimes against people and property. In addition to the psychological impact of unemployment, it is necessary to include the challenge of the COVID-19 lockdown period in South Africa, which contributed to stress and uncertainty to those self-employed with no extra income source. Vorster suggested:

> "The psychological experience and the impact of unemployment need to balance because work is a fundamental ingredient of an individual's identity, self-esteem and general wellbeing; work is central to family development, and it determines the order and quality of life in societies at large"[4].

Having selected the above prominent writer, Vorster, because he addresses the important idea in the recent studies on being unemployed and religious, brings in a deep analysis on a balanced view between the individual and the community. Moreover, this is equally important in this project which brings our support for the unemployed and our solutions to change the condition to one of opportunity.

The Impact of Unemployment on the Community

According to Nadene Peterson and Roberto Cortéz González, "work is the medicine for poverty."[5] It is worth noting that unemployment and underemployment have negative impacts on the community's welfare, the workers attributed this to the poor standard of living which is not unconnected with the meagre stipends they receive at the end of the month as salary. As a result, they cannot meet the necessary amenities needed to live a comfortable life; this consequently affects their family as well as their children. For instance, they could not get good accommodation, nor eat a balanced diet as well as wear decent clothes, nor could they afford a good education for their children. [6]

Having just argued that long periods of high unemployment are, without a doubt, detrimental to unemployed workers and the health of the economy, however, there are other, less known consequences. Further work in this area may lead to the development of social consequences of a prolonged jobless period that may be significant as this has economic consequences. In other words, the aggregate relationship between the employment rate and illness in terms of individual stress, it is necessary to show that changes in employment rate leads to psychological and physical stressors. There is strong evidence that shows that various life stresses produce illness

behaviours. These findings have important consequences for the broader domain on the impact of unemployment on the community. To some extent, these findings implicate those who have qualifications and moderate degrees of education, experienced greater illness in response to job loss and economic construction. Garret suggests:

> "Studies on unemployment and crime suggest that a high unemployment rate is positively linked to an increase in property crime. An increase in the unemployment rate is accompanied by soaring property crime, while a decline in the unemployment rate followed by only a gradual drop in property crime."[7]

It has become common today to dismiss the fact that serious property crimes may further damage the economic development and social welfare in urban areas, especially in the inner-city neighbourhood. However, the impact of unemployment may escalate when social issues in human behaviour are not in balance. These may include family breakdown among married couples, excessive drug abuse, increased anxiety, stress which is caused by alcohol consumption, physical and mental illness. In examining unemployment from the perspective of the unemployed, it is argued that the increase of crime rates is associated with an impact of unemployment on the community.

Social Effects of Unemployment

Socially, unemployment and underemployment tend to strain relationships, even between the members of the family and the community where an individual resides. Sometimes, as a result of unemployment, an individual may abandon the family members, relatives, and friends. It is worth noting that people who are jobless and unemployed are subjected to stigmatisation and are marginalised. Ultimately, what is at stake here is how stigma is defined, "as a social construction that defines people in terms of distinguishing characteristic or mark and devalues them, therefore, stigma occurs when society labels someone as tainted, less desirable, or handicapped.[8] In understanding the personal and social costs of unemployment it is seen to include severe financial hardship and poverty, debt, homelessness and housing stress, family tensions and breakdown, boredom, alienation, shame and the stigma of increased social isolation, crime, erosion of confidence and self-esteem, the atrophying of work skills and ill-health.[9] While it is true that unemployment falls disproportionately on already disadvantaged groups in society, especially for those of lower-income earners, recently arrived migrants and indigenous people in the city of Sandton, unemployment is the major reason for poverty with those who cannot find jobs who are on the highest rate of poverty with almost 70 per cent of the unemployed being those who have no qualifications. It is, however, a cause of concern that the proportion of the unemployed people with no educational qualifications is relatively high - more than half. The number of people with standard ten certificates is also gradually increasing, and they come out from secondary school without a relevant skill to generate income. This implies a high cost for the country in terms of expenditure on this person's education, in addition to the hardship suffered by all unemployed persons. Moreover, persons with high education qualifications become frustrated more easily if they do not find jobs, and this increases the potential for crime and civil unrest.[10]·The essence of this argument is that unemployed people experience hardship and a decline in their standard of living. As a result, this may lead to social exclusion if an individual is without employment for a long period. Unemployment reduces social contact and social support. In our industrialised society, the fact of being employed, the type of job, the status, one's position and role are central to personal identity and self-esteem. In

making this comment, low self-esteem, total dependence on others and an inability to provide for self and others are the important negative effects of unemployment. In conclusion, research findings indicate that the physical and psychological health of the individual is related to the state of employment in the family.

Emotional Effect of Unemployment

In recent discussions on the impact of unemployment, a controversial issue has been whether unemployment contributes to the individuals' emotional state. On the one hand, some argue that being unemployed hurts. Many may experience depression and can find it extremely difficult to overcome the stress of being marginalised, rejection and hopelessness. To be precise, most individuals' basic life requirements are met through employment. In terms of this project, regarding the emotional effects of unemployment, those who are unable to get employment may suffer emotional instability. Although this should have been indicated earlier, unemployment produces symptoms such as depression and anxiety which are significantly greater to the unemployed individuals in society. The evidence on the emotional effect of unemployment shows that the psychological pattern occurs in an individual and that is associated with present distress with a significantly increased risk of suffering death, pain, disability, or an important loss of freedom.[11] However, the cure of the emotional effect of unemployment is, of course, work on the straightforward premise that work is good for emotional health. In addition to these individual effects, unemployment may act as a social bad, that is, people may be unhappy about unemployment even if they are not themselves out of work.[12] Having argued that, the aspect of helping community efforts to address social, psychological, and emotional disorders is to offer work to those who have not been employed for a particular period.

Economic Effect of Unemployment

The researcher shares the new light on the economic and social costs of unemployment, which may include components such as, personal costs to the unemployed (lost income, loss of sense of value, less on-the-job training). Also, the economic effect of unemployment includes costs to government (lost tax revenue and higher benefits spending); costs to society in general, social problems, alienation, and lost GDP.[13]Tejvan Pettinger argues that "potential loss of income can leave people without sufficient income to meet housing costs." He is right in making such a valid point, but he omitted the important point which Mafiri elucidates, that unemployment in South Africa has a socio-economic impact which leads to criminal activities as the only means of survival for certain groups of the unemployed people. Here, many writers on the issue of the impact of unemployment would probably object to this statement, since not every unemployed person is involved in criminal activities. Ultimately, what is at stake here is that, when it comes to the subject of the socio-economic effect of unemployment, most scholars agree that personal cost of unemployment is on a loss of earnings to the unemployed which leads to poverty. On the other hand, I agree with Pettinger that, "long periods of unemployment can push households into debt and increase rates of relative poverty."[13] It is noteworthy that those who are unemployed will find it difficult to get work in the future since they may suffer the hysteresis effect, while it is true that being unemployed can also affect the future confidence of the unemployed and they become less employable in the future. In general, it does necessarily follow that the conception when people are out of work, they miss out on the job training and latest working experiences and trends. During the state of the nation address by President Cyril Ramaphosa, the outbreak of Covid-19 pandemic left over 10 million South African jobless as from 25th March 2020 until the

end of April 30 (Integrated Development Plan: 2020, pp.16-26). Numerous official documents have been issued addressing the impact of the COVID-19 pandemic on unemployment and poverty during the country's lockdown period and present the important information to be considered in this section. The situation is so serious that the Department of Agriculture offered an amount of 4 billion R to assist those who are doing essential services on agriculture or food industry. The Coronavirus Aid, Relief and Economic Security (CARES) has increased the social grants and expanded unemployment benefits to the self-employed, part-time workers through the Pandemic Emergency Assistance, which paid R500 for social grants and R350 for those who are unemployed until the end of October 2020. In short, unemployment compensation is the result of the risk brought about by the COVID-19 pandemic. Unemployed workers receive funding from the state because of the lockdown period and retrenchments as a result of the pandemic. Unemployment credit insurance or (UIF) benefits workers who have lost their jobs during the quarantine period of the COVID-19 pandemic (South Africa) have also benefitted. Certain amounts of money were allocated to benefit those without income as from 25th March-December 2020. The evidence shows that the impact of COVID-19 lockdown in the country has affected the GDP in the second quarter in September 2020 by 51%. According to Stats SA, the record plunge was due to "the impact of the COVID-19 lockdown restrictions since the end of March 2020". This extends South Africa's recession for yet another quarter, as the economy continues to battle the COVID-19 pandemic and growing unemployment. In conclusion, the socio-economic status of society is determined by the employed people who contribute to the labour market. What is more important, high unemployment indicating the economy is operating below full capacity and is inefficient; this will lead to lower output and incomes. Having argued that, a rise in unemployment can cause a negative multiplier effect. Unemployment has costs to a society that are more than just financial. By the way, the socio-economic effects of unemployment contribute to crime and vandalism. While economics and academics make convincing arguments that there is a certain natural level of unemployment that cannot be erased, elevated unemployment imposes significant costs on the individual, the society, and the country. When an individual loses a job, there is often an immediate impact on that person's standard way of living. Unemployment tends to disturb the physical well-being of an individual.

Physical Effect of Unemployment

The evidence shows that unemployment indirectly contributes on the physical effect of people who may not be employed. The researcher's assertion is based on the following contribution by being unemployed. Joblessness may contribute to depression, mental anxiety, and other health issues. Another study found that common outcomes of unemployment include depression, substance abuse, admission to psychiatric hospitals, death by suicide and violence. While the previous literature has addressed the social, economic, and emotional, it has neglected the aspect of whether unemployment affects the physical well-being of an individual. Gleeson suggests that "the longer the unemployment goes on, the more severe the health consequences, with increased depression and other health consequences, with increased depression and other health issues worsening over time." [14] In summary, our studies show that the persons who are distressed emotionally due to loss of a job may suffer excessive misuse of alcoholism, drug abuse and domestic violence which may lead to an increase of medical care attention. Numerous studies have revealed the relationship between unemployment and psychological problems which affect the physical wellbeing of an individual. Therefore, an unemployed person may be forced to adjust their lifestyle, for instance, by changing their diet, their place of residence which may

influence their physical behaviour. Finally, it is worth noting that results have shown that the physical effect of unemployment stress is exacerbated by the lack of social support. It is important to note that unemployed individuals may experience a problem with insomnia. Having argued that, unemployed individuals visited physicians, took more medications, spent more days in bed sick, the anxiety and stress of being without work contributes to premature death. Holland insists that "the effects of unemployment on physical well-being, when people lose their jobs, they are not only affected financially but their stress can manifest physically as well",[15] It is true that being unemployed may indirectly produce physical symptoms of loss of appetite, sexual interest is exacerbated by more worry which affects physical performance. One underlying leading disease which has been diagnosed as the factor of unemployment is cardiovascular function that is related to premature death due to unemployment.

The Costs of Unemployment to an Individual

Unemployment is mostly described as an economic issue, but it is argued here that unemployment poses a threat to human dignity and should, therefore, be a theological concern. [16]By contrasting the costs of unemployment with the theological themes, it is grounded on the fact that indicates how unemployment undermines human dignity. Certain theological themes on human dignity are outlined in the previous sections of this project. Unemployment is an economic condition in which individuals actively seeking jobs remain unhired. The problem of unemployment is indeed a serious reality; the developed countries, as well as the developing countries, suffer from it. This is not to say that employment is all about depending on the income, but rather unemployment has an impact on society more than just financial sustainability. Unemployed individuals not only lose income but also face a challenge to their physical and mental health. To put it another way, the societal costs of high unemployment, include higher crime and it also exacerbates poverty. In short, costs to the government go beyond the payment of benefits to the loss of the production of workers. To take a case in point, the costs of unemployment to the individual are not hard to imagine. In summary, this section shows that the experience of unemployment (either direct or indirect) can alter how workers plan for their futures - prolonged unemployment can lead to greater scepticism and pessimism about the value of education and training and lead to workers being less willing to invest in the long years of training some jobs require. When unemployment becomes a pervasive problem, there is often increased calls for protective and severe restrictions on those who cannot be absorbed into any labour market. Further to that, the absence of income created by unemployment can force families to deny educational opportunities to their children and deprive the economy of that future. Studies have shown that prolonged unemployment harms mental health and can worsen physical health and shorten lives. [17] Other social costs include how people interact with each other. It is common today that because there is absent a wage-paying job, people may turn to crime to meet their economic needs. The last component of the costs of unemployment affects the country in many ways. It is worth noting that companies pay a price for high unemployment as well. You would think that only unemployed individuals experience financial challenges in our society until you realise that unemployment benefits are financed largely by taxes assessed on businesses. The bottom line is that the costs of unemployment can have a self-perpetuating negative impact on business and the economic health of the individual. This suggests that the costs of unemployment have an impact on the country. The costs of unemployment have been investigated which while mostly damaging, can sometimes also be positive and best understood by identifying the meaning of work. This can help to explain why people do not experience work

and unemployment similarly.

Pastoral Contribution to the Unemployed

The main objective on the concept of understanding unemployment is the implementation of an intervention strategy which will focus on establishing candid relationships with the unemployed in order to create a wedge through a relational approach to reach them on their level. Moreover, to help in creating an opportunity for skills development programmes. Gleaning from this intervention, the unemployed will be able to share their challenges as individuals or a group. In addition, a data base of their acquired skill will assist for better marketing and potential employers to utilise their skills. A spiritual approach will be implemented as a way of introducing the Gospel to the unemployed in the community.

Recommendations

The evidence shows that unemployment has affected the community and destroyed the individual's confidence in participating in the activities of community development. As the starting point, the findings shows that unemployment is increasing; the only way to meet the needs of the community is to increase opportunities for skills development and participation of the unemployed in the community. As indicated in the findings, limited skills on the part of the unemployed creates low absorption rates in the labour market which contributes to low income. In addition to the recommendation, people must be encouraged to be self-employed so that they are able to provide for their families. It is recommended that the Department of Labour, in partnership with humanitarians, should establish programmes to cover independent workers, and self-employed community projects that will generate an income for its workers. Finally, it is recommended that an urban agricultural project would be able to provide families with meals that would work toward alleviating poverty among the unemployed in Sandton, Johannesburg. The Centre of Influence will also be a good institution to be considered in the city.

CONCLUSION

In conclusion, the concept of unemployment has been discussed in this article to show the deeper impact on society and the fact that it is usually applied only to humans. It refers to a condition that results in people not being able to live without work in which they can participate in the range of activities that show an expressive nature as human beings. There is still more to be learned when it comes to the causes of unemployment. The researcher has investigated the understanding of unemployment as a social issue that has affected all classes of people in the community. It has been argued that unemployment has contributed to the society's lack of decency and respect. As the concluding remarks, unemployment has affected people who are unable to have basic needs met and the lack of resources which forces them to live below a good standard of life. Unemployed people still feel that they are not regarded as community members and are being treated with disrespect. Also, unemployed people suffer humiliation, being seen as not worthy to contribute to community activities. This lack of respect contributes on low self-esteem and participation in community development. At this point, the strategy to address this community challenge has been stated and has already been implemented in certain areas which demonstrates its usefulness. The findings show that much can be learned from the strategies to be employed that are well-designed which are accompanied by a careful evaluation process planned for community projects to alleviate poverty and establish a long-term plan for employment.

REFERENCES

1. DornbuschRudiger, Stanley Fischer, and Richard Startz, *Macroeconomics*, 10th ed. Boston, MA: McGraw-Hill, 2008.

2. Lötter, H.P.P. (2008). When I Needed a Neighbour Were You There? Christians and the Challenge of Poverty, Wellington, New Zealand: Lux Verbi.

3. Miriam Altman, "The State of Employment and Unemployment in South Africa, accessed on the 13 March 2020, https://www.gtac.gov.za/Researchdocs/The%20State%20of%20Employment%20and%20Un employment%20in%20South%20Africa.pdf.

4. Vorster, W. S. (1992). On Being Unemployed and Religious: A Collection of Papers Presented at the Sixteenth Symposium of the Institute for Theological Research (Unisa) Held at the University of South Africa in Pretoria on 2 and 3 September 1992, 1st ed., Miscellanea Congregalia 43. Pretoria, South Africa: University of South Africa.

5. Peterson, N. & Cortéz González, R. (2000). The Role of Work in People's Lives: Applied Career Counselling and Vocational Psychology, Belmont, CA: Wadsworth.

6. AdelekeA. (2013) Effect of Underemployment on Human Resources Efficiency and Wellbeing in Nigeria, *The African Symposium: An online journal of the African Educational Research Network* 13, no. 2, (December 2013): 14-27, accessed 22 April 2020.

7. Garret, T.A. & Ott, L.S. (2008). City Business Cycles and Crime, Working Paper 2008-026B, accessed 23 April 2020. https://research.stlouisfed.org/wp/more/.ornbusch, R. (2008). Macroeconomics, 10th ed., Boston, MA: McGraw-Hill.

8. Vyhmeister, W.K. (2015), Unemployment: The Curse of Joblessness, accessed 01 May 2020, https:// www.imf.org/external/pubs/ft/fand/httml.(2015). 20(2).

9. Dixon D and Brotherhood of St. Laurence, *Unemployment: The Economic and Social Costs*, 2nd ed.Melbourne, Australia: Brotherhood of St. Laurence, 1992.

10. Mafiri, M. I. (2002). Socio-Economic Impact of Unemployment. Pretoria, South Africa:University of Pretoria.

11. Classen, T.J. & Dunn, R.A. (2012). The Effect of Job Loss and Unemployment Duration on Suicide Risk in The United States: A New Look using Mass-Layoffs and Unemployment Duration, Health Economics 21, no. 3.

12. Ochsen, C. & Welsch, H. (2011). The Social Costs of Unemployment: Accounting for Unemployment Duration, Applied Economics 43: 3999–4005, accessed 29 April 2020, https://www.tandfonline.com/doi/full/10.1080/00036841003761900.

13. Pettinger, T. (2019). Economic costs of Unemployment, 28 June 2019, accessed 30 April 2020, https://www.economicshelp.org/macroeconomics/unemployment/costs.

14. Gleeson, P. (2019). The Overall Effects of Employment, February 01, 2019, accessed 07 May 2020, https://smallbusiness.chron.com/overall-effects-unemployment-37104.html.

15. Holland Kelly, *Effects of Unemployment on Health and Mental Health Based on Gender*, (Sophia, SO: St. Catherine University, 2012), 11.

16. Cloete. A. (2015). Youth Unemployment in South Africa: A Theological reflection Through the Lens of Human Dignity, Missionalia: South African Journal of Missiology 43, no 3:513–525, accessed May 14, 2020, https://missionalia.journals.ac.za/pub/article/view/133/pdf_66.

17. Sullivan, D & von Wachter, T. (2009). Job Displacement and Mortality: An Analysis Using Administrative Data, The Quarterly Journal of Economics 124(3), 1265–1306.

MULTI-OBJECTIVE OPTIMIZATION OF ACCURATE PRODUCTION AND MAINTENANCE PLANNING USING PSO ALGORITHM, IN ORDER TO REDUCE PRODUCTION AND WAREHOUSING COSTS

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ABSTRACT

Production planning is one of the main factors affecting real productivity and efficiency. Effective scheduling programs greatly improve the performance of production systems. In this research, an extended multi-objective optimization model is defined. The proposed model includes minimizing service time, production costs, and minimizing maintenance costs. The advantage of the proposed model is that it is defined based on the Poisson distribution of the reduction of the number of failures, also the defined Gaussian model can determine the optimal production capacity according to the previous data. In this regard, the function of the second goal is to reduce maintenance costs. High accumulation of inventory increases the cost of the organization or industrial plant and hides the problems, and keeping the inventory at the optimal level reveals the manageable problems that can be corrected in the organization and production. The proposed model is finally solved and compared using a multi-objective suspended particle swarm optimization algorithm and genetics for a numerical example.

KEYWORDS: *Production Planning, Warehousing, Maintenance, Mpso Algorithm, Genetic Algorithm.*

INTRODUCTION

Considering that accurate planning to reduce production and inventory costs is of great importance, this research has endeavored to address this gap and provide an optimal solution for accurate planning to reduce production and inventory costs.

In this research, a multi-objective optimization problem is considered, the objective functions of which are time, cost, maintenance, and the number of system failures over time. An important issue that has been considered is accurate maintenance. In accurate maintenance, dynamic strategies are considered. In this case, the device's lifetime is also considered as a variable and is taken into account in the calculations. The longer the life of a device, the more expensive its maintenance will be. Also, the probability of random failure is also taken into account in the calculations. For this purpose, the generalized Weibull function is used. The difference between this function and the standard Weibullfunction is that in the generalized function, a new variable

is also added to the problem, which results in more control over the problem. Adding a parameter to the distribution function allows the maintenance problem to be defined more accurately.

The objective function is the number of failures in a time period. The fewer the failures, the more efficiently production planning is carried out and, as a result, the model's performance improves. The proposed function is defined based on the Poisson distribution. The Poisson process is a point counting process that is defined around the occurrence of random events on a time interval or a spatial distance. In examining this process, the time between two successive events is specified by an exponential distribution, and separate time intervals are considered independent of each other.

While reducing production time and volume can improve inventory management, this issue needs to be considered more carefully. Therefore, a new optimization function is defined for this purpose. In warehousing, the number and variety of raw materials and manufactured parts are not the same. For example, to produce a product, M raw materials may be needed, all of which are necessary for production. Therefore, a general relationship should be developed for this issue that is valid regardless of the product. In the proposed method, it is assumed that optimal production has a Gaussian distribution. In other words, based on the available information, the optimal production quantity of a product in a factory will be K. If the factory's production exceeds this amount, it may have problems with inventory management. In this research, the creation of more warehouse space is not considered, as this issue needs to be examined from various aspects. On the other hand, the Gaussian distribution function used is an effective solution for this issue, which can define optimal production in a range.

One of the important issues facing production units is reducing production and maintenance costs. Since the failure of production systems cannot be definitively predicted, it is therefore necessary to consider probabilistic methods. In addition, inventory management also has many complexities, because some warehouses are actually intermediaries between production and consumption, and both production and consumption aspects must be considered in their formulation. Both production and maintenance are closely related and need to be considered comprehensively and simultaneously.

Production planning is one of the main factors affecting actual productivity and efficiency. Effective plans greatly improve the scheduling of production system performance. Wear and tear, damage to the device with continuous use, is inevitable. Maintenance is only needed if a failure occurs. Therefore, there are few studies on this strategy due to the irreparable economic losses.

Careful planning and maintenance play a very important role in production as they can help increase production efficiency and product quality. Inventory management allows the production center to better meet the needs of users.

In this research, an optimization problem is defined that considers two important parameters: First: reducing maintenance time, second: reducing maintenance costs. In the defined relation, the device's lifetime is also considered as a probabilistic variable, which makes it possible to perform maintenance accurately and effectively. In addition, a function is introduced to reduce the number of failures during the device's lifetime.

Literature Review

Hosseini et al. (1) studied the integrated production and maintenance planning problem. This problem has two objective functions. The first objective function is the total system cost, which includes all cost factors of production. The second objective function is the level of customer dissatisfaction, which increases due to delays in timely demand fulfillment. Then, considering that this problem is of the NP-Hard type, a solution method based on the non-dominated sorting genetic algorithm - revision was presented.

SajjadiNejad et al. (2) presented a non-periodic preventive maintenance and repair (PM) scheduling model for multi-component (series-parallel) systems, based on the maximum availability of system components. Also, since the proposed model has a complex structure, a genetic algorithm was used to solve it.

Gholamrezaee et al. (3) introduced a multi-product and multi-objective production planning model with fuzzy parameters and time value of money based on inventory level, workforce level, machine capacity and storage space. The proposed model maximizes sales profit, minimizes maintenance costs and backorders, and changes in manpower levels.

Ahmadinejad et al. (4) examined a practical linear programming model to minimize production costs in the Adrang furniture workshop. The objective function was to reduce the cost of furniture production.

Yang et al. (5) studied a system under two common failure modes, degradation-based failure and sudden failure. This system operates in a random environment where external shocks are introduced according to a Poisson process. The impact of shock damage on system failure is twofold: (a) it increases the hazard rate of sudden failure; (b) it causes a sudden increase in degradation. The objective of the paper is to jointly optimize the replacement interval, monitoring interval, and reliability metric to minimize the expected cost per unit time.

Poppe et al. (6) investigated condition-based maintenance in a monitored component with preventive periodic maintenance and corrective maintenance. Two thresholds were implemented at the degradation level to determine the service time. Both thresholds are optimized to minimize the total expected maintenance costs of the monitored monitor or to minimize the downtime of the device due to maintenance in the monitored component.

Martinod et al. (7) proposed a stochastic optimization model to minimize the total maintenance cost of complex systems over the long term. The proposed work is based on the following approaches: and a clustering method for maintenance actions to reduce the total maintenance cost of the complex system. This work evaluates each maintenance policy and evaluates its impact on incomplete maintenance actions. Finally, the proposed optimization model is applied to a numerical example that focuses on urban passenger aerial ropeway transportation systems, where the current maintenance policy was evaluated.

Yang et al. (8) investigated a new two-phase preventive maintenance policy for a single-component system with the objective of maximizing revenue from performance-based contracting. The system enters a faulty state before failure and generates a signal indicating it. The results showed that the proposed maintenance policy outperforms some existing maintenance policies in terms of net revenue.

Rifai et al. (9) presented a ranked non-dominated sorting genetic algorithm optimization for scheduling multi-loading/unloading diagrams and injected shortcuts in re-entrant feature spaces. This model was formulated to identify the closest optimal trade-off solutions that can meet both objectives of minimizing production time and early completion. The goal was to simultaneously determine the best machine assignment and job sequence to meet both objectives. A set of test problems was analyzed to assess the effectiveness, efficiency, and diversity of the proposed approaches compared to the standard NSBBO and NSGA-II. The results showed that the NSBBO trapezoid model performs well and is comparable to existing models. Therefore, it can be said that the developed NSBBO and its variants are suitable alternatives for achieving two-objective satisfaction in the FMS rescheduling problem.

Yu et al. (10) designed a two-phase opportunistic maintenance framework based on defect information, which integrates production expectation characteristics into the decision-making process. In the first phase, a limited number of inspections were performed to reveal the faulty state, followed by incomplete preventive repair. In the second phase, no maintenance action is taken until a scheduled maintenance window (deferred maintenance) or production expectations (opportunistic maintenance) are reached.

Mathematical Modeling

The proposed model is as follows: A set of n jobs represented by the set J {J={J1, J2, …, Jn} and a set of m machines represented by M and M={M1, M2, … Mm}. Each job Ji has a sequence of operations ni {Oi,1, Oi,2, …, Oi,ni}. Processing is done sequentially according to a predetermined priority constraint. The model has the characteristics of a flexible processing path, which means that at least one operation can be processed on multiple machines and the processing time of the same operation on different machines is different. Therefore, two subproblems are considered:

(1) Machine Selection Problem (MS): Selecting an appropriate machine Mk for operation Oi, j from the optional machine set Mopt

(2) Job Sequencing Problem: Since at least one machine can process multiple jobs or operations, the processing sequence of operations on the machine must be optimized. When changing jobs with the machine (replacing a job or different operations of a job), the job generally goes through the stages of unloading, transportation, loading, calibration, and so on. The time occupied here is called setup time. When setting up the machine for different jobs, it is assumed to be different and the setup time should not be considered in the machine running time. In addition, the setup time of adjacent operations on a machine depends on their similarity, that is, the more similar two workpieces are, the shorter the setup time (drawing the setup time at the beginning of the next operation). This means that the processing sequence affects the setup time and then affects the overall scheduling and maintenance time.

Reliability-based Maintenance Scheduling for Multi-Machine Production Systems with Heterogeneous Failure Distributions

Reliability is an important indicator for evaluating the ability of a machine to perform an operation. Degradation, one of the most important factors affecting machine reliability, is inevitable with increasing age of the machine. To prevent machine failure, reliability for performing the corresponding maintenance activity should be analyzed. Maintenance activities play an important role in production. In other words, the activity determines the specific start

time and duration required for maintenance at different reliability intervals (e.g., accurate maintenance). The probability distribution of failures in different types of machines is different due to their specific characteristics. Most machines for processing workpieces in this research are electromechanical equipment whose probability of failure is close to the Weibull distribution. The probability density function of failure fk(Zk) of machine Mk at operating time Zk is as follows [1]:

(1)

$$f_k(Z_k) = \frac{\beta_k}{\eta_k}\left(\frac{Z_k}{\eta_k}\right)^{\beta_k-1} \exp\left(\left(\frac{Z_k}{\eta_k}\right)^{\beta_k}\right) \quad Z_k \geq 0$$

$$(2)\, R_k(Z_k) = 1 - \int_0^{Z_k} f_k(Z_k)dZ_k$$

Since βk and ηk are related to the effective age of the machine (operating time), Zk should be analyzed before examining reliability. The machine cannot be returned to a new desired state after maintenance. Therefore, it is assumed that the age reduction factor pk of Mk is constant. If the effective age of Mk is Zky before the maintenance period yk is performed, the effective age Zk1 for the first maintenance (i.e., y = 1) is the total processing time of operations on the machine. After y years of maintenance, the effective age of the machine can be expressed as Zky = (1-pk) Zky. In addition, the effective age curves Zk of the machine with calendar time t are shown in Figure (1). Based on the physical phenomenon of machine deterioration, it is proposed that reliability can be considered in three parts R, Y, and G with different failure frequencies or probabilities. In each region, the maintenance activity is different, as shown in Figure (2), where the reliability thresholds for regions Y and R areRy and Rr, respectively. Accurate maintenance activities are entered into the dispatching schedule using a dynamic strategy. When considering processing Oi, j, the processing time is added to the current age of the machine (virtual age, called t) to calculate the reliability value (Rk (t)).
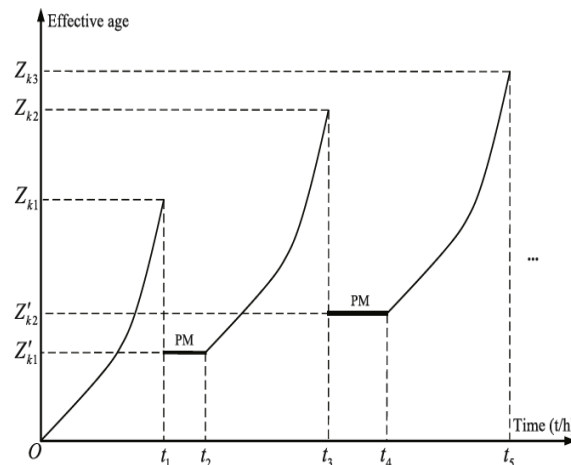

Figure 1.Effective device lifespan

In total, there are three scenarios for different reliability values related to accurate maintenance activities:

(1) If the reliability Rk(t') falls in the G region, no maintenance activity is performed.

(2) If the reliability Rk(t') is in Y, a repair and delay progression selection factor YZ is introduced, which is a random number between zero and one. AM activity is performed before Oi, j. Otherwise, the activity is performed after oi, j. YZ can bring the flexibility of maintenance activities closer to actual production.

(3) If the reliability Rk(t') is in R, the AM activity must be performed before Oi, j, and then the reliability value R is calculated after the machine is finished with Oi, j.
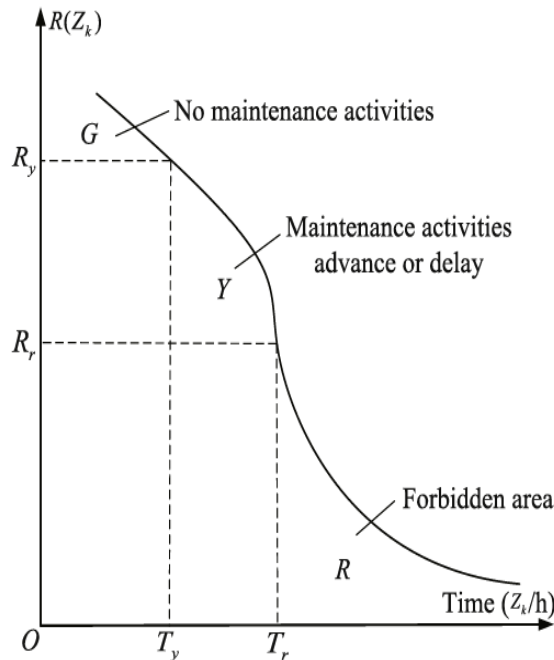

Figure 2.Time-based maintenance policy

If R <Rr, this is prohibited. In this case, for calculation purposes, the maintenance time (before Oi, j) is an infinite value a0 and the effective age of the machine is zero (i.e., Zky = 0). Therefore, the reliability value determines the duration of maintenance. In other words, the higher the failure frequency, the more serious the damage to the machine, so the longer the maintenance time. If the reliability value before processing Oi, j (called Rb) is in the G region, the maintenance time before processing Oi, j, which is a linear function of the age difference, is shorter than the initial maintenance time ak (which can occur in scenario 2 when RbRy and (Rk(t')) are in region Y or occurs in scenario 3, while RbRy and R Rr). If the reliability value (Rk(t')) is in the Y region, the time, which is a quadratic function of the age difference, is greater than ak (which can occur in scenario 2 and Rb<Ry or deferred maintenance, or in scenario 3). Accordingly, the actual time for the y-th maintenance is calculated as:

(3)

$$MT_k(y) = \begin{cases} a_k - b(T_y - Z_k) & 0 \leq Z_k \leq T_y \\ a_k + b(T_y - Z_k)^2 & T_y < Z_k \leq T_r \\ a_0 & R' < R_r \end{cases}$$

whereak is the original maintenance time of Mk and b is the ratio coefficient. Ty and Tr are the reliability ages corresponding to Ry and Rr, respectively. In addition, Zk is the effective age at which accurate maintenance is performed. (3) (2) Integrated Multi-Objective Optimization Model for Production and Accurate Maintenance Scheduling In this section, we present the assumptions of the mathematical model and the corresponding symbols. Then, an integrated multi-objective optimization model is created by combining production planning with AM.

Assumptions and Symbols The integrated multi-objective optimization model considered in this paper is based on the following assumptions:

(1) All jobs have the same priority and the processing time of each operation is predetermined.

(2) Once a repair operation starts, it must be completed without interruption.

(3) At a given time, each machine can only process one operation. Meanwhile, an operation can only be processed by one machine in the optional machine set Mopt.

(4) The effective age of the machine is determined by the processing/working time considering the impact of other factors (e.g., idle time).

(5) After incomplete maintenance of the machine, its effective age can return to the assumed state Zky. Therefore, the notations used in the mathematical model are summarized as follows:

2-4- Model Components

The model components are as follows:

- n: Total number of jobs.
- m: Total number of machines.
- ni: Total number of operations for job Ji.
- uk: Total maintenance time for machine Mk.
- Zk: Effective age/performance of machine Mk.
- g: Total number of objectives.
- Ci,j: Completion time of operation Oi,j.
- Ai: Arrival time of job Ji.
- Oi,j: j-th operation of job Ji.
- sptijk: Start processing time of Oi,j on machine Mk.
- pij: Repair time of Oi,j on machine Mk.
- eptijk: End processing time of Oi,j on machine Mk.
- sitk: Start idle time of machine Mk.
- satijk: Start setup time of Oi,j on machine Mk.
- eatijk: End setup time of Oi,j on machine Mk.
- wk: Maintenance cost per unit time for machine Mk.
- ck: Setup cost per unit time for machine Mk.

- MTk: Array of maintenance times for machine Mk.

Decision Variables

xijk: 0-1 variable, whether Oi,j is processed on Mk.

4-4- Functions and Constraints

The multi-objective optimization model has two objective functions. The first objective function, f1, represents the repair and setup time of the damaged machine, and the second objective function, f2, represents the repair and setup cost of the system. Therefore, by minimizing these two functions, the time and cost of repair and maintenance can be reduced, which in turn will reduce production costs. By reducing repair and maintenance costs and time, machines return to production lines faster. These functions are:

$$(4)\ \min\{f_1, f_2\}$$

$$(5)\ f_1 = \sum_{i=1}^{n}\sum_{j=1}^{n_i}\sum_{k=1}^{m}\left(at_{ijk}.x_{ijk}\right)$$

$$(6)\ f_2 = \sum_{k=1}^{m}\sum_{y=1}^{u_k}\left(w_k MT_k(y)\right) + \sum_{i=1}^{n}\sum_{j=1}^{n_i}\sum_{k=1}^{m}\left(c_k.p_{ijk}.x_{ijk}\right)$$

$$(7)\ \begin{aligned} & spt_{i(j-1)} + x_{i(j-1)}.p_{i(j-1)k'} \le sat_{ijk}, \\ & \forall i \in J', \forall\{j, j-1\} \subseteq I_i,\ \forall\{k, k'\} \subseteq M' \end{aligned}$$

$$(8)\ \begin{aligned} & spt_{i(j-1)} + x_{i(j-1)}.p_{i(j-1)k'} \le sat_{ijk}, \\ & \forall i \in J', \forall\{j, j-1\} \subseteq I_i,\ \forall\{k, k'\} \subseteq M' \end{aligned}$$

$$(9)\ \begin{aligned} & spt_{ijk} + x_{ijk}.p_{ijk} \le ept_{ijk}, \\ & \forall i \in J', \forall j \in I_i,\ \forall k \in M' \end{aligned}$$

$$(10)\ \begin{aligned} & sat_{ijk} \ge \max\left\{sit_k, ept_{i(j-1)k'}\right\}, \\ & \forall i \in J', \forall\{j, j-1\} \subseteq I_i,\ \forall\{k, k'\} \subseteq M' \end{aligned}$$

$$(11)\ sit_k = \begin{cases} ept_{i'j'k} + MT_k(y), & \text{maint enance beore } O_{i,j} \\ ept_{i'j'k} & O.w \end{cases},\ \forall i \in J', \forall j \in I_i, \forall k \in M'$$

$$(12)\ sat_{i,j,k} + at_{i,j,k} \le eat_{i,j,k},\ \ \forall i \in J', \forall j \in I_i,\ \forall k \in M'$$

$$(13)\ eat_{i,j,k} \le spt_{i,j,k},\ \ \forall i \in J', \forall j \in I_i,\ \forall k \in M'$$

$$(14)\ 0 < R_r \le R_k(Z_k)$$

$$(15)\ \sum_{k=1}^{m} x_{i,j,k} = 1,\ \ \forall i \in J', \forall j \in I_i$$

$$(16) \quad \sum_{i=1}^{n}\sum_{j=1}^{n_i} x_{i,j,k} = 1, \quad \forall k \in M'$$

$$(17) \quad x_{i,j,k} = \begin{cases} 1, & O_{i,j} \text{ is processed on } M_k \\ 0, & O.W \end{cases}, \quad \forall i \in J', \forall j \in I_i, \forall k \in M'$$

$$(18) \quad C_{i,j} \geq 0, A_i \geq 0, \quad \forall i \in J', \forall j \in I_i$$

$$(19) \quad c_k \geq 0, w_k \geq 0, u_k \geq 0, s_{itk} \geq 0, \quad \forall k \in M'$$

Constraint (7) is the operation precedence constraint, which means that an operation must start setting up after the completion of the previous operation. Constraint (8) states that the start processing time of Oi,j must be less than its end processing time. Constraint (9) indicates that the start setup time of Oi,j must be greater than or equal to the time when the machine starts working and the end processing time of the previous job on the same machine. Constraint (10) determines the start idle time of the machine (Oi,j is an immediate previous activity of Oi,j on machine Mk). Constraint (11) specifies the setup time constraint for Oi,j. Constraint (12) defines the relationship between the final setup time and the start processing time of Oi,j. Constraint (13) states that the reliability Rk(Zk) should not be less than the red zone reliability threshold Rr. Constraint (14) ensures that each operation can only be assigned to one of the available/suitable machines. Constraint (15) enforces that a machine can only process one operation at a time. Constraint (16) indicates that xijk is a binary variable. Constraints (17)-(19) are non-negativity constraints.

Inventory Management

There can be a dependency between the different goods in stock and those used by the organization, so the policies adopted for one good will usually affect the other goods in stock. In this section, a new optimization function is introduced that aims to reduce the cost of storing parts in the warehouse. This cost is the same as the inventory holding cost, which includes the cost involved in inventory, taxes, insurance, and the like.

The cost of placing an order from a supplier for a number of different products consists of the following two components:

- **Total order cost:** This is independent of the number of different products in a single order.

- **Partial order cost:** This depends on the number of different products in an order.

Due to the existence of a total order cost, the use of group ordering can lead to significant cost savings. This saving is particularly significant when the demand between items is closely related.

As in the previous section, to develop the inventory model, assumptions must be considered and the model developed on the basis of these assumptions. The assumptions are as follows:

- **Existence of deterministic and uniform demand.**

- **Linearity of holding cost.**

- **Shortage is not allowed.**

- **Warehouse space constraint.**

It can be seen that in the above assumptions, in order to make the model more practical, the warehouse space constraint, which most existing inventory control systems face in practice, has also been added to the model. Therefore, the optimization function is defined as follows:

$$(20) \quad f_4 = \frac{\sum_{j=1}^{n}(k_j D_j h_j)}{2} T + \frac{S + \sum_{j=1}^{n}\frac{s_j}{k_j}}{T}$$

$$(21) \quad f_5 = T\sum_{j=1}^{n}(c_j k_j D_j)$$

where function f4 represents the total ordering and inventory holding cost per unit time, and objective function f5 is the total capital cost tied up in inventory. The constraint of the optimization problem is as follows:

$$(22) \quad \sum_{j=1}^{n} k_j D_j v_j \le \frac{V}{T}$$

where we have in the above relationships:

- **n:** Number of products.
- **i:** Product index n, ..., i = 1.
- **Di:** Annual demand for product i.
- **hi:** Annual holding cost for product i.
- **S:** Total order cost per order.
- **si:** Partial order cost that is paid if product i is ordered.
- **ci:** Cost of purchasing one unit of product i.
- **V:** Maximum warehouse space.
- **vi:** Space required to store one unit of product i.

The decision variables also include **T**, the time between two consecutive orders, and **ki**, the integer order quantity for product i. The optimization algorithm should reduce the inventory cost by selecting the optimal values of these two parameters.

Numerical Example

In addition to the MPSO method, the NSGA-III optimization method is also used for optimization. Therefore, this method will be explained first. It should be noted that the simulations were performed in the MATLAB 2014a software environment and on a Core i5 laptop with a 2.33 GHz processor and 4 GB RAM.

In order to simulate the algorithms, data were selected from the article by XiaohuiX[1] and colleagues (11). It is assumed that the number of machines and tasks is 4. In other words, there are four machines in the production line, each of which performs one task. Tables (1) to (3) show the simulation parameters:

TABLE 1: SIMULATION PARAMETERS: TIME PER JOB

J_1	O	M_1	M_2	M_3	M_4	J	M_1	M_2	M_3	M_4
	$O_{1,1}$	-	8	12	13	J_3	-	6	9	15
	$O_{1,2}$	16	-	15	7		5	2	-	14
	$O_{1,3}$	15	16	3	6		6	6	-	12
	$O_{1,4}$	8	15	-	8		14	-	4	13
J_2	$O_{4,1}$	13	20	15	5	J_4	14	8	9	11
	$O_{4,2}$	18	20	3	15		10	2	5	4
	$O_{4,3}$	13	8	6	15		18	11	16	8
	$O_{4,4}$	5	2	10	15		3	7	12	12

TABLE 2: SIMULATION PARAMETERS: COST PER MACHINE

M	J	J_1	J_2	J_3	J_4	M	J	J_1	J_2	J_3	J_4
M_1	J_1	1	2	1	3	M_3	J_1	1	2	1	3
	J_2	1	1	3	2		J_2	2	1	3	2
	J_3	1	1	1	2		J_3	1	1	1	1
	J_4	3	1	1	1		J_4	3	1	1	1
M_2	J_1	1	2	1	3	M_4	J_1	1	2	1	3
	J_2	1	1	3	2		J_2	1	1	1	3
	J_3	2	1	1	1		J_3	2	1	1	1
	J_4	3	2	2	1		J_4	2	2	2	3

TABLE 3: SIMULATION PARAMETERS

Parameter	M_1	M_2	M_3	M_4
β_k	1.6	1.7	1.6	1.8
η_k	78	75	73	77
a_k	4	3	2	3
p_k	0.65	0.63	0.7	0.75
w_k	18	20	19	17
c_k	8	5	10	9

To evaluate the performance of the algorithm, the results were simulated in three scenarios, the details of which will be explained below. Table (4) also shows the simulation parameters.

TABLE 4: MPSO ALGORITHM PARAMETERS

Parameter	Value
Number of variables	4
Maximum problem iterations	100
Number of objective functions	3
Particle swarm population	200
Number of archives	100
Particle inertia coefficient	0.5
Particle inertia damping coefficient	0.99
Local learning coefficient	1.5
Global learning coefficient	1.5
Growth rate	0.1

In multi-objective problems, there are usually multiple optimal solutions, each of which optimizes one of the functions. This is called the selection of dominant solutions. In the present study, the solution that minimizes the repair time was considered as the optimal solution. The faster a machine returns to the production line, the more efficient the company becomes and as a result can produce more products.

The differences in the optimization problem and the optimization algorithm, which used NSGA-II instead of MPSO, which is an improved version of the genetic optimization algorithm.

Figures (3) to (5) show the output of the simulations. Figure (3) shows the output of the repair time of the machines for four machines. It can be seen that except for machine number 3, the proposed method is better than the reference method (11) for the other machines. This figure shows that for machine number 2, the reference method is slightly better than the proposed method. However, this figure shows that the proposed algorithm has been more efficient for machines number 1 and 4.

Figure (4) also shows the output of the two algorithms for the cost of the machines. It can be seen that for all four machines, the proposed method is more efficient and as a result the repair cost is reduced. This is because the Weibull function is used to model the failure of mechanical parts. A new function is considered in the problem that is related to the number of failures, which is indirectly related to the repair and maintenance cost.

Figure (5) also shows the output of the two algorithms for the third objective function. This figure shows that the performance of the proposed algorithm is much better for all four machines, and the probability that the machine will fail less in its lifetime is higher. Therefore, this figure clearly shows that using a new objective function can improve the performance of the problem.

In the second scenario, it was assumed that the number of machines and tasks is three. In other words, the fourth task and machine were removed. The obtained results are shown in Figures (6) to (8). Figure (6) shows the output of the repair time of the machines for three machines. It can be seen that unlike the previous scenario, the performance of the proposed method is better than

the reference method for all machines. Figure (7) also shows the output of the two algorithms for the cost of the machines.
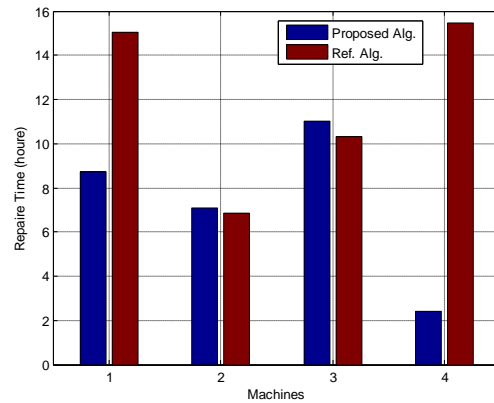

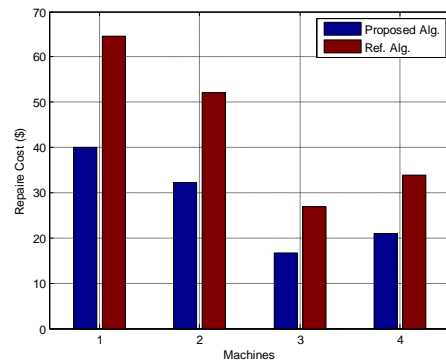**Figure 3.Repair time of devices in Scenario 1**

Figure 4. Repair and maintenance costs of devices in Scenario 1
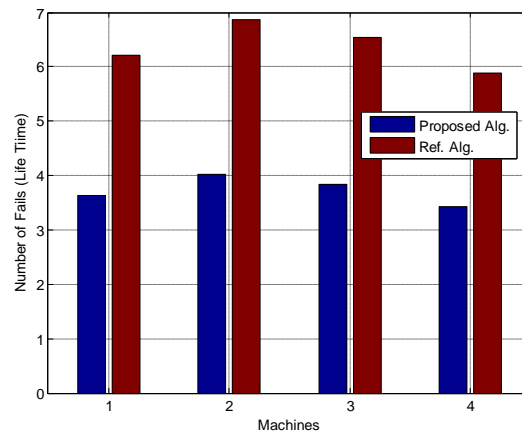

Figure 5. Average number of failures during the useful life of the device Scenario 1

It can be seen that for all three machines, the proposed method is more efficient than the method proposed in the reference paper, and as a result the repair cost is reduced. Figure (8) also shows the output of the two algorithms for the third objective function. This figure also shows that the performance of the proposed algorithm is much better for all three machines, and the probability that the machine will fail less in its lifetime is higher.

In the third scenario, the number of machines was considered to be four, as in the first scenario. However, this scenario has one difference from the first scenario. This change is the change of formula 3, which is used in a single sentence and it is assumed that maintenance is independent of the life of the machine. The effect of precise maintenance has not been considered.
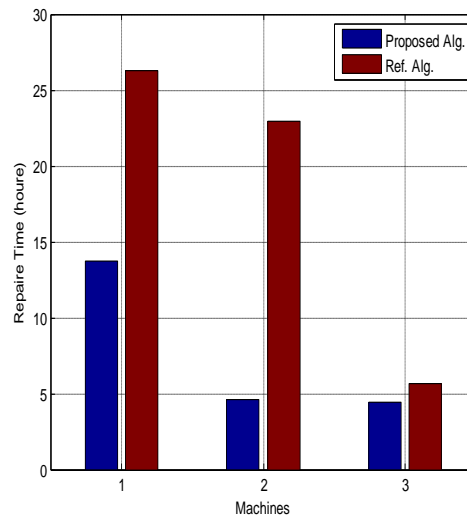

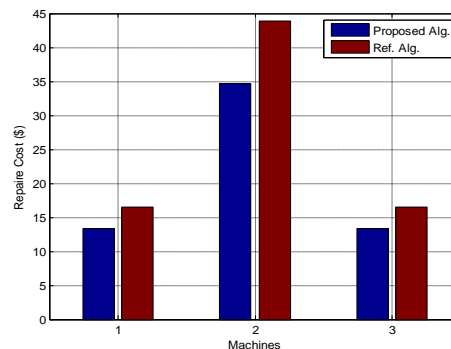**Figure 6. Repair time of devices in Scenario 2**

Figure 7. Repair and maintenance costs of devices in Scenario 2

Figure 8. Average number of failures during the useful life of the device Scenario 2

The results are shown in Figures (9) to (11). It can be seen that in all three figures, the performance of the proposed method is better than the reference method. In addition, these

figures clearly show that precise maintenance reduces the cost and repair time, although this does not have a significant impact on the number of failures during the life of the machine.

Figure (9) shows the output of the repair time of the machines for four machines. It can be seen that unlike the previous scenario, the performance of the proposed method is better than the reference method for all machines. Figure (10) also shows the output of the two algorithms for the cost of the machines. It can be seen that, as in the previous scenario, the proposed method is more efficient than the method proposed in the reference paper for all four machines, and as a result the repair cost is reduced. The reason for this has been explained before. Figure (11) also shows the output of the two algorithms for the third objective function. This figure also shows that the performance of the proposed algorithm is much better for all four machines, and the probability that the machine will fail less in its lifetime is higher.
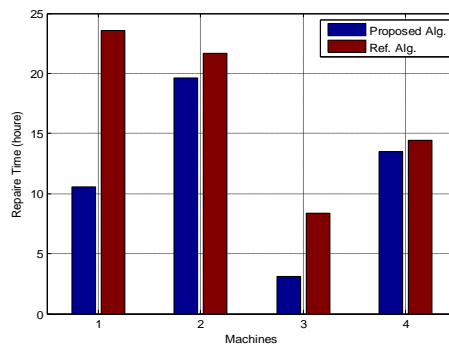

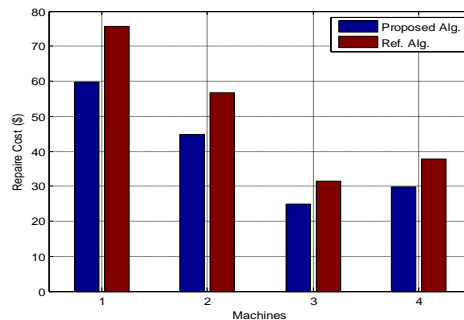**Figure 9. Repair time of devices in Scenario 3**

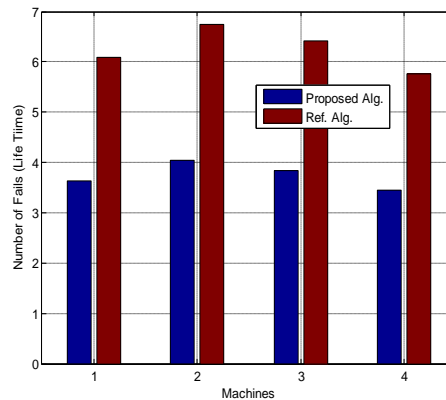**Figure 10. Repair and maintenance costs of devices in Scenario 3**

Figure 11. Average number of failures during the useful life of the device Scenario 3

In order to evaluate more accurately, we will investigate the changes of different parameters. This investigation is only performed on our proposed method because the parameters and objective functions are selected based on the proposed method. For this purpose, we investigated the changes of different parameters and measured their effect on the values of the objective functions. Simultaneous changes of two parameters were considered. We assumed that the time values in Table (1) are increasing and the output value is calculated for each unit increase. This table shows the time. It should be noted that for the values not defined in this table, this unit increase has not been applied. The second variable considered was the change in the number of tasks, which is shown in Table (2). Therefore, we calculated the results as three-dimensional functions and plotted them.

Figure (12) shows the obtained values for the repair and maintenance time objective function for each of the four assumed machines. It can be seen that for each machine, the value of the objective function, i.e., the repair and maintenance time, changes, and this is more for machine 3 than for the other machines. It can be concluded from these figures that the assumed time and also the number of tasks can have an impact on the performance of the systems. As a result, it can also increase the repair and maintenance time. In addition, this figure shows that the performance of the systems may vary between different machines.
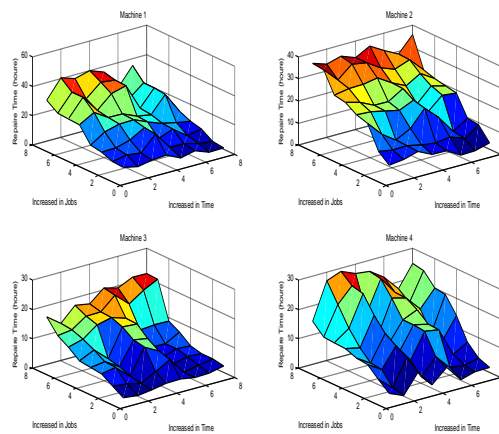

Figure 12. Effect of different parameters on the first objective function

Figure (13) also shows the performance of each of the four machines based on the second objective function, i.e., the repair cost. This figure also clearly shows that the effect of changes in task execution time and the number of tasks is different for different machines. In other words, it can be seen from this figure that for each of the four machines, the cost will also change with the increase of the input variables. As a result, it is not possible to consider the same scenarios for all machines, and each machine must be considered according to its own assumptions. In addition, this figure also shows that the repair and maintenance cost is higher for machines 1 and 2 than for the other two machines.
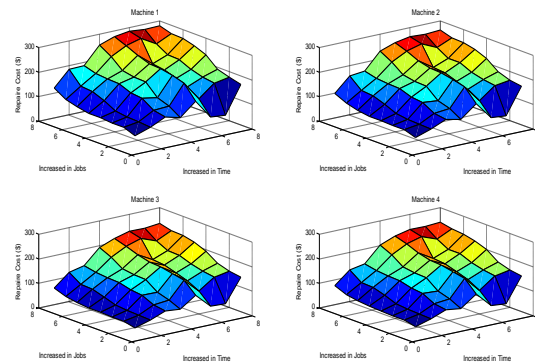
Figure 13. Effect of different parameters on the second objective function

Figure (14) also shows the performance of each of the four machines based on the third objective function, i.e., the number of failures in the machine's lifetime. As in the previous two figures, it can be seen that for different machines, the effect of changes in task execution time and the number of tasks on the useful life of the machine is different. In other words, it can be seen from this figure that for each of the four machines, with the increase of the input variables, the number of times the machine fails will also change.
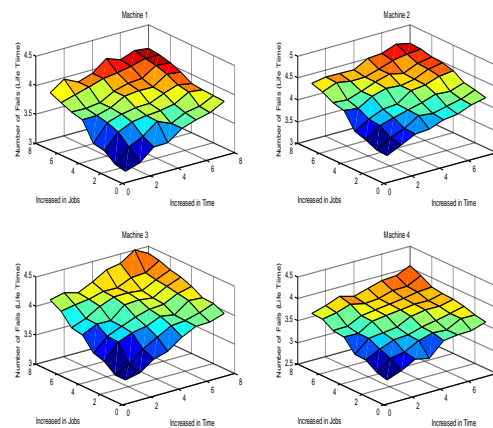

Figure 14. Effect of different parameters on the third objective function

Inventory optimization problem

As mentioned, the simulation values in the present study are shown in Table (5). The algorithm values are the same as the previous problem because the investigations showed that the problem can also be optimized using these values. In these simulations, it is assumed that the order is placed in two stages and a total of 4 products are to be purchased. For simplicity, the cost is also considered as one unit, which can be different. In fact, since the product is selected based on need and not cost, the cost has no effect on the algorithm process. It is also assumed in this simulation that there is only one warehouse for storage, which is a valid assumption for many organizations and departments.

Values	Parameter
100,250	Demand
5,10,15,20	Total ordering cost
[0. 5,5]	Partial ordering cost
10,20,30,50	Number of products
[0. 2,3]	Holding cost
1	Storage space required for each item
1	Purchase price of each item

Figure (15) shows the output of the inventory valuation function. It can be seen in this function that the larger the range of acceptable optimal production, the smoother the objective function, and as a result, production planning can be better because the capacity of the company's different warehouses has more flexibility.
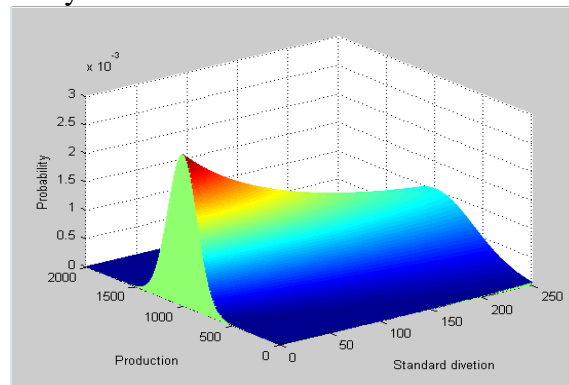

Figure 15. Output of the inventory valuation function

Figures (16) and (17) respectively show the set of dominant solutions for each of the two algorithms under consideration. By examining these two figures, it can be seen that the dispersion of solutions in the MPSO algorithm is less than that of the NSGAII algorithm, which is one of the advantages of the MPSO algorithm. Because in a multi-objective optimization problem, the less the dispersion of solutions, the better the performance of the algorithm will be. These two figures show that the values obtained for the variables based on the MPSO algorithm are less than those of the other algorithm, and therefore both the order time and the number of orders have been reduced. In both figures, the first function refers to the order quantity and the second function refers to the time between two consecutive orders.
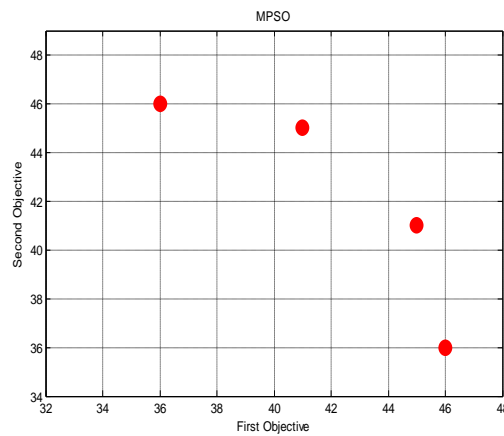
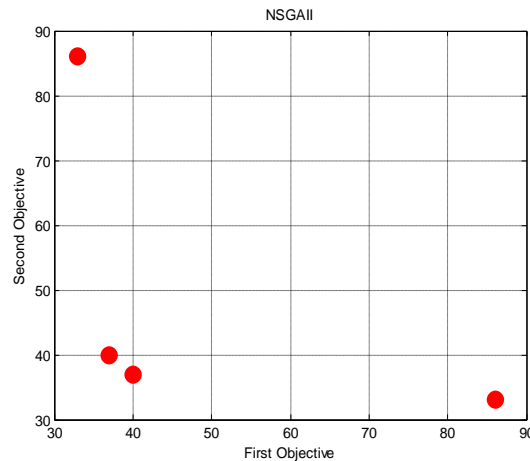**Figure 16. Pareto optimal solution for the MPSO algorithm**

Figure 17. Pareto optimal solution for the NSGAII algorithm

By substituting these variables, the set of solutions for the two objective functions is also obtained. The results obtained for the first objective function are shown in Figure (18) and the results obtained for the second objective function are shown in Figure (19). The meaning of the first and second objective functions is fully explained in Chapter 3. Therefore, by examining these two figures, it can be concluded that for some Pareto solutions, the performance of the NSGAII algorithm is better than MPSO, and for others, the performance of MPSO is higher than NSGAII. Therefore, this figure clearly shows that both algorithms can have acceptable performance. However, as can be seen in these two figures, the dispersion of solutions in the MPSO algorithm is less; therefore, it can be concluded that the overall performance of the MPSO algorithm is better than the NSGAII algorithm.
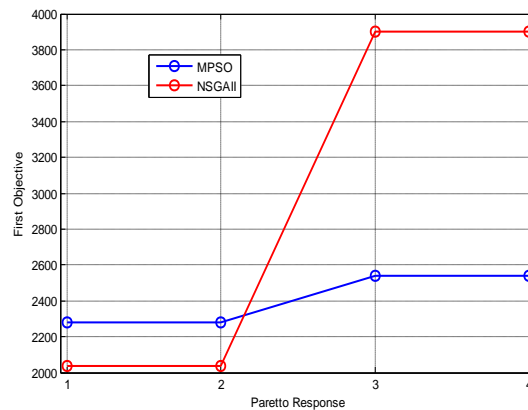
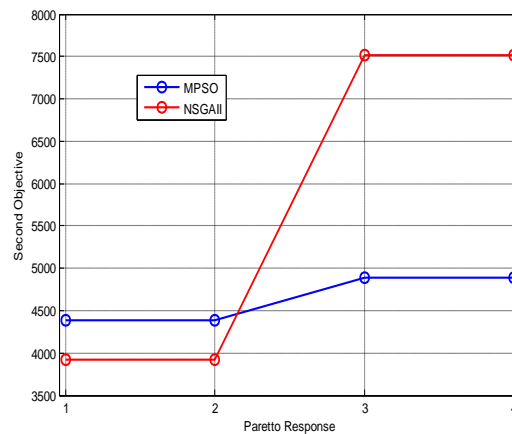**Figure 18. Optimal solution for the first objective function**

Figure 19. Optimal solution for the second objective function

6. CONCLUSION

While the use of the Gaussian model can provide us with a deep and acceptable insight, it is necessary to optimize the use of effective parameters in warehousing such as time, number of orders and optimization algorithm to optimize the use of the warehouse. As mentioned before, there may be a dependency between the different goods in the warehouse and used by the organization. Hence, the policies adopted for one good will affect the other goods in the warehouse. In this study, a new optimization function was introduced, which aims to reduce the cost of keeping parts in stock. This cost is the same as the inventory holding cost, which includes the cost involved in inventory.

Based on the review conducted in this study, it is suggested that machine learning algorithms be used for the aforementioned problem in future research. Therefore, artificial neural networks can also be used as a suitable solution.

REFERENCES

[1]   Hosseini, M. H. (2020). Modeling and solving a bi-objective integrated production planning and maintenance problem with the aim of reducing customer dissatisfaction. Journal of Industrial Management Studies, 18(56).

[2] SajjadiNezhad, A., &Lotfi, M. (2019). A model for optimizing preventive maintenance scheduling for multi-component systems using a genetic algorithm. Journal of Industrial Management Studies, 17(55).

[3] Gholamrezaei, M., &KhadamiZare, H. (2015). Developing a multi-product, multi-period, multi-objective production planning model with fuzzy parameters. Production and Operations Management, 6(1).

[4] AhmadiNejadfarsi, N. (2018). Applied model of linear programming to minimize production costs in the Adrang furniture workshop. The 1st National Conference on New Studies and Research in Environmental and Management Sciences.

[5] Yang L, Zhao Y, Peng R, Ma XB.(2018) Hybrid preventive maintenance of competing failures under random environment. ReliabEngSyst Saf;174:130–40.

[6] Poppe J, Boute RN, Lambrecht MR.(2018) A hybrid condition-based maintenance policy for continuously monitored components with two degradation thresholds. Eur J Oper Res

[7] Martinod RM, Olivier B, Castaneda LF, Rezg N.(2018). Maintenance policy optimisation for multi-component systems considering degradation of components and imperfect maintenance actions. ComputInd Eng;124:100–12

[8] Yang L, Ye ZS, Lee CG, Yang SF, Peng R.(2019) A two-phase preventive maintenance policy considering imperfect repair and postponed replacement. Eur J Oper Res. 274:966–77.

[9] Rifai AP, Nguyen HT, Aoyama H, Dawal SZM, Masruroh NA.(2018). Non-dominated sorting biogeography-based optimization for bi-objective reentrant flexible manufacturing system scheduling. Appl Soft Comput;62:187–202

[10]   Yu T, Zhu C, Chang Q, Wang JF.(2019) Imperfect corrective maintenance scheduling for energy efficient manufacturing systems through online task allocation method. J ManufSyst 2019;53:282–90.

[11]   Xiaohui C, Youjun A, Zhiyao Z, Yinghei,(2020) An approximate nondominated sorting genetic algorithm to integrate optimization of production scheduling and accurate maintenance based on reliability intervals, Journal of Manufacturing Systems 54; 227-241

BRAND LOYALTY IN THE DIGITAL AGE: INVESTIGATING THE ROLE OF DIGITAL CUSTOMER EXPERIENCE AND PERSONALIZATION

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ABSTRACT:

In today's digitally driven marketplace, brand loyalty has evolved into a multifaceted concept influenced by a myriad of factors. This paper explores the pivotal roles of digital customer experience and personalization in shaping brand loyalty. Through an extensive review of literature and empirical evidence, it aims to uncover how these strategies foster enduring connections between consumers and brands. The study begins by outlining the foundational importance of brand loyalty in the face of heightened competition and technological advancements. It then delves into the digital realm, highlighting digital customer experience as a critical determinant encompassing website usability, mobile responsiveness, and omnichannel coherence. Additionally, the paper scrutinizes the emerging trend of personalization, emphasizing its potential to deepen consumer engagement through tailored offerings. By elucidating the interplay between digital customer experience, personalization, and brand loyalty, the study examines their contributions to trust, satisfaction, and brand attachment. Ultimately, it emphasizes the necessity for firms to invest in these strategies to fortify their competitive edge and foster enduring relationships with digitally empowered consumers.

KEYWORDS: *Brand Loyalty, Digital Customer Experience (Dcx), Personalization, Consumer Engagement, Customer Retention, Digital Marketing.*

INTRODUCTION

The retail landscape is undergoing a transformative shift in the Digital Age, reshaping transactions and redefining exchanges, actors, and offerings (Reynolds and Sundstrom, 2014).The integration of digital technologies into consumer shopping experiences facilitates new avenues for value creation and capture. Retailers are increasingly adopting omnichannel strategies, synchronizing physical and digital channels to optimize customer experiences.

Personalization, driven by trends like mobile usage and artificial intelligence, plays a crucial role in omnichannel retail settings, yet empirical research on its investment returns remains limited. It is reported that there is an interplay between hedonic motivation, personalization, and customer

experiences in the omnichannel context, influencing consumer preferences and loyalty intentions(Hanninen et al., 2019).

The rapid advancement of digital solutions, fuelled by digitization, artificial intelligence (AI), and information and communication technology (ICT), signals the onset of the fourth industrial revolution. AI plays a pivotal role in automating routine functions for firms, offering customization, personalization, and improved service quality, thereby enhancing sales effectiveness (Chatterjee et al., 2019). In response to shifts in consumer behaviour, particularly the increased reliance on online channels, marketing practices are evolving. Corporations must now focus on the entire customer journey, aligning touchpoints with marketing actions to provide relevant information. Consumers, more demanding and value-conscious, necessitate high levels of personalization and customization in the purchase process. Marketing automation tools, projected to see substantial investment, address these challenges by personalizing and customizing the marketing mix(Syam & Sharma, 2018). However, while AI's impact on interactive marketing has been studied, the exploration of personalization remains underexplored. In a study, Paschen et al. (2019) introduced the concept of AI-enabled personalization (AIP) in the Nigerian context, aiming to understand its influence on customer experience and loyalty, filling a gap in existing empirical analyses.

The evolution of the business marketing landscape, driven by technology, has seen a profound impact from social media. Traditionally, brand managers held the power of influence, but social media has empowered consumers, reshaping the dynamics of interaction. With 2.77 billion internet users globally, social media platforms like Facebook, Instagram, and Twitter play a pivotal role. US millennials dominate social media usage at 90.4%, making it a crucial channel for brand communication(Ebrahim, 2020). With a large number of marketers finding social media marketing effective, businesses leverage these platforms for customer engagement, hoping to build brand awareness and foster loyalty. Customer loyalty, recognized for cost-effectiveness and long-term relationships, remains a strategic imperative for enterprises in competitive markets (Amersdorffer et al., 2012).

As digital marketing gains prominence, chatbots emerge as crucial tools for enhancing customer experience. These computer software simulate human interactions through text and perform various tasks like answering queries and facilitating transactions. Chat Generative Pre-trained Transformer (ChatGPT), a family of language models by OpenAI, demonstrates human-like responses(Duan and Liu,2020). Despite the growing significance of chatbots in digital marketing, thereiss a notable scarcity of studies on the specific topic of ChatGPT. With applications ranging from translation to content creation, the latest version, ChatGPT-3, boasts billions of parameters(Chen and Chen 2021). While existing research focuses on technical aspects, there's a need for a comprehensive exploration of factors influencing customer experience, including familiarity, personalization, relevance, and convenience (Buchanan and McMullan, 2017).

The imperative for business sustainability in today's fiercely competitive global market has led to a heightened focus on various aspects of sustainability in marketing literature. Among these, sustainable brand loyalty emerges as a critical factor directly contributing to increased market

share and profitability. A study by (Zhang et al., 2018)delves into the complex dynamics of brand-loyal behaviour and attitudes, highlighting their role in the survival and sustainability of businesses Despite extensive studies on brand loyalty, the literature has largely overlooked its moderating impact on consumer acceptance. Examining antecedents such as trust, quality, ease of use, and self-image, and the study found varying effects across different customer loyalty segments, offering crucial insights for marketers striving to convert low loyalty groups into high loyalty segments. Notably, the study explored how technology brands navigate challenges, exploiting customer trust and managing crises to maintain or enhance their positions. The comprehensive examination reported on the intricate relationship between brand loyalty, customer attitudes, and repurchase intentions in today's dynamic market landscape.

Adjei et al. (2010) studied the evolving landscape of online-based brand communities within the context of social media, exploring their mediating role and impact on consumers' purchasing attitudes in the mass-market. As the proliferation of similar products in the market complicates brand identification, their study looked into the interconnection between Social media platforms, OnlineBasedBrand Communities, and consumers' attitudes toward brand relationships. It also investigated the moderating role of social media in brand community engagement and its influence on consumer purchasing attitudes. Further, the studies of Kozinets(2007)and Gong (2018)aim to contribute both theoretically and practically, addressing literature gaps and providing insights for brand community practitioners and are expected to enhance the understanding of consumer-brand community dynamics, brand promise, trust, and loyalty in the context of social media, ultimately offering valuable guidance for effective brand management in the medium to long term.

In the digital era, companies strive to maintain constant online presence to cater to the discerning customer base (Suwono, 2016). The surge in digital options has empowered customers with choices, intensifying the competition. To enhance customer experience and satisfaction, online communication becomes pivotal, necessitating a personalized approach (Ameenet al. 2021). Amidst digital advancements and heightened competition, the role of chatbots emerges as a crucial instrument. Chatbots facilitate proactive engagement, addressing customer inquiries promptly and instilling confidence and satisfaction. It is found that chatbots contribute to increasing customer loyalty, exploring the dynamic in the evolving digital landscape. The research by Crolic et al. (2021)aims to bridge the gap in understanding the connection between chatbots and customer loyalty, shedding light on their role in contemporary customer relationship management. The findings offer valuable insights for companies looking to leverage chatbots for enhanced customer service, satisfaction, and loyalty, ultimately impacting market share and profitability in the digital realm.

In the digital age, brand loyalty faces several challenges. With an abundance of choices and easy access to information, consumers are more discerning and prone to switching brands. Digital platforms also amplify the impact of negative experiences, making brand trust fragile. Moreover, personalized advertising can sometimes be perceived as intrusive, leading to consumer privacy concerns. Additionally, in the fast-paced digital environment, maintaining consistent brand messaging across various channels can be difficult. To thrive, brands must prioritize transparency, deliver exceptional digital experiences, and navigate the fine line between personalization and privacy to foster enduring loyalty in digitally empowered consumers. In view of the recent trends, emerging digital technologies and changing consumer preferences, the

present study is aimed at exploring the relationship among personalization, digital customer experience and brand loyalty.

LITERATUREREVIEW

<u>Online Customer Experience:</u> Customer experience has emerged as a pivotal marketing tool, epitomizing the evolving relationship between brands and consumers (Gentile et al., 2007). It entails the strategic creation of consumer value through memorable interactions (Jain et al., 2017). Shaw (2007) underscores that the online consumer experience integrates physical performance with sensory and emotional stimuli. This complex concept encompasses sensory, affective, intellectual, and behavioural outcomes across brand touchpoints (Brakus et al., 2009). Customer experience is integral to marketing strategies, emphasizing the creation and implementation of experiences tailored to consumer needs (Bolton et al., 2018).

In today's experience economy, digital evolution shapes experiential marketing strategies, giving rise to online customer experience—a psychological state resulting from interactions with online brands (Rose et al., 2012). Consumers form impressions of brands based on cognitive and affective components encountered online. Marketing efforts focus on stimuli like informative content, visual imagery, videos, and audio to enhance online experiences (Rose et al., 2012). Bleier et al.'s (2019) framework identifies informativeness, entertainment, social presence, and sensory appeal as key components of online customer experience.

Informativeness aids decision-making, while entertainment offers pleasure and fun (Mathwick& Malhotra, 2001). Social presence fosters human-like interaction, and sensory appeal aims to stimulate multiple senses (Bleier et al., 2019). Though replicating physical sensations online poses challenges, innovative digital technologies enable multisensory experiences through imagery (Brakus et al., 2009).

<u>Online Brand loyalty:</u> Brand loyalty denotes the enduring relationship between a customer and a brand or a company, marked by resistance to external pressures and positive emotions towards the e-business (Aspinall et al., 2001). While the theoretical underpinnings of offline and online loyalty are similar, online loyalty has evolved alongside digital marketplaces, representing favourable attitudes towards a brand (Kandampully et al., 2015). It often manifests as repeat

purchasing from a specific website, with customers likely to remain loyal to the same e-business (Srinivasan et al., 2002; Al-Adwan & Al-Horani, 2019).

Fulfilment of personal needs enhances brand consistency, enabling e-businesses to foster positive customer experiences that encourage return visits and loyalty (Luo et al., 2011). Loyal consumers contribute significantly to a company's profitabilityM. Customer loyalty encompasses behavioural aspects such as repeat purchases and word-of-mouth marketing, as well as attitudinal components including commitment, trust, and emotional attachment (Mohammad et al., 2015; Luo et al., 2011).

Online customer loyalty involves stable, favourable attitudes and behaviours towards a specific online brand, evidenced by repeat purchases (Amy Gallo, 2014). Given the higher cost of acquiring new customers, digital businesses prioritize strategies to design digital customer experiences that foster attitudes and behaviours conducive to customer loyalty.

Artificial Intelligence and Personalization: In recent years, a considerable body of research has explored the intersection between artificial intelligence (AI) and personalization within the marketing domain, focusing on AI-enabled personalization in interactive marketing, mapping it across the customer journey stages. Their findings elucidated various manifestations of AI-based personalization, including personalized profiling, nudges, navigation, and retention strategies.

Anticipating the increasing impact of AI on personalization in marketing, Paschen et al. (2019) highlighted its growing significance. Kumar et al. (2019) further underscored the convergence of AI and personalization, emphasizing the pivotal role of personalization in driving the popularity and adoption of AI. Unlike earlier limitations imposed by data quality and volume, AI has revolutionized personalization by internalizing it within corporations worldwide, facilitating improved personalized services. The complexity of AI required for personalization varies depending on the desired level of personalization. Huang and Rust (2018) differentiated between analytical intelligence for mass personalization and intuitive intelligence for offering personalized, quality services based on intuition.

AI has revolutionized various personalization applications, notably recommender systems (RS). RSrecommends items based on user behaviour or preferences, serving personalized product recommendations to fulfil consumer needs. Prominent examples include Amazon and Netflix, which employ advanced RS to suggest products or content based on user behaviour.

Moreover, automated generation of personalized marketing messages has gained traction, with systems capable of tailoring advertising content to individual customer needs (Deng et al., 2019). As per Anzén& Ekberg (2020) the study indicates higher click-through rates for personalized marketing content. AI has significantly enhanced personalization across various marketing functions, from recommending products to generating tailored marketing messages. As AI continues to evolve, its integration with personalization is expected to deepen, reshaping marketing practices and customer experiences in the digital age.

Digital Customer Experience: In brand management, the ability to leverage customer experience as a competitive advantage is paramount for success. However, challenges arise, particularly in managing direct touchpoints during customer interactions. The overall customer experience is shaped by engagement with personnel, product/service functionality, and mechanical aspects throughout various touchpoints in the customer journey (Prentice & Nguyen, 2020). Digital technologies, including AI, significantly influence business initiatives and customer experiences, impacting consumer habits, sales cycles, and overall service quality (Davenport et al., 2020).

Empirical reviews identify cognitive, emotional, sensory, bodily, and social components of the customer experience. Dwivedi et al. (2019) emphasize cognitive components related to speed, usefulness, and accessibility. Sensory and corporeal aspects differentiate offline and online experiences, encompassing factors like layout, lighting, and technological structure (Davenport et al., 2020).

Mixed realities and virtual realities enhance the buying experience, impacting consumer cognition through machine learning and augmented reality. AI facilitates personalized engagement by analyzing consumer interests and past experiences.

AI technologies such as natural-language understanding, machine learning, and natural-language processing enable precise analysis of customer sentiments and feedback at scale (Gartner, 2020).

This empowers marketers to improve customer interactions, gain insights into customer needs, and automate processes for enhanced efficiency (Newman, 2019). In retail, AI complements technologies like computer vision-driven image recognition and predictive inventory management. AI's role is significant in improving customer experience through enhanced insight, interaction, and automation. Integrating AI into customer experiences yields superior service delivery, as evidenced by studies on drone delivery and AI-driven customer data analysis (Dahlhoff et al., 2018). Overall, AI emerges as a pivotal tool for marketers to enhance the customer experience, gain valuable insights, and drive efficiency, ultimately strengthening their competitive edge (Jeffs, 2018).

Objectives: The present study was aimed at investigating the Influence of Digital Customer Experience and Personalization on Brand Loyalty.

RESEARCH METHODOLOGY

The study adopted a mixed-methods approach combining quantitative and literature research methods to gain a comprehensive understanding of the brand loyalty, brand experience and personalization in the digital age. The Quantitative Data was Collected via an online survey based on the three scales for Brand Loyalty (Thirteen Items); Digital Customer Experience (Ten Items) and Personalization (Six Items). The target population was the Online shoppers across various age groups, genders, and educational backgrounds.Sampling Method used wasconvenience sample. A sample size of 77 respondents was used for the purpose of data

analysis. Inferential Statistics tools were used such as: Correlation and Regression Analysis for testing the relationships between digital customer experience, personalization, and brand loyalty.

RESULTS AND DISCUSSION

The scores for the three variables were calculated with the help of three scales used of collecting data for Brand Loyalty (Thirteen Items); Digital Customer Experience (Ten Items) and Personalization (Six Items).

The correlation analysis revealed a significant positive correlation between Brand Loyalty and Digital Customer Experience and Personalization (Table – 1). The results further reveal the Digital Customer Experience has relatively stronger correlation (0.328) with Brand Loyalty as compared to Personalization (0.250).

Table – 1 Correlations		DIGITAL CUSTOMER EXPERIENCE	PERSONALIZATION
BRAND LOYALTY	Pearson Correlation	.328[**]	.250[*]
	Sig. (2-tailed)	.004	.033
	N	74	73
**. Correlation is significant at the 0.01 level (2-tailed).			
*. Correlation is significant at the 0.05 level (2-tailed).			

Regression analysis revealed a significant effect of Digital Customer Experience on Brand Loyalty with R Square value 0.108 (Table 2a and 2b). The functional relationship between these two variables can be described by the following regression equation:

Brand Loyalty = 32.358 + .27 Digital Customer Experience

Table – 2 (a) Regression –Effect of Digital Customer Experience on Brand Loyalty Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.328[a]	.108	.095	3.49965
a. Predictors: (Constant), DIGITAL CUSTOMER EXPERIENCE				

Table – 2(b) Regression –Effect of Digital Customer Experience on Brand Loyalty Coefficients[a]					
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	32.358	3.861		8.380	.000
	DIGITAL CUSTOMER EXPERIENCE	.270	.092	.328	2.947	.004
a. Dependent Variable: BRAND LOYALTY					

Regression analysis further revealed a significant effect of Personalization on Brand Loyalty with R Square value 0.63 (Table 3a and 3b). The effect of Personalization on Brand Loyalty is relatively weak as compared to Digital Customer Experience. The functional relationship between these two variables can be described by the following regression equation:

Brand Loyalty = 36.869 + .381 Personalization

Table – 3 (a) Regression – Effect of Personalization on Brand Loyalty Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.250[a]	.063	.050	3.53702
a. Predictors: (Constant), PERSONALIZATION				

Table – 3 (b) Regression – Effect of Personalization on Brand Loyalty Coefficients[a]					
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	36.869	3.111		11.851	.000
	Personalization	.381	.175	.250	2.179	.033
a. Dependent Variable: BRAND LOYALTY					

Regression analysis, to study the combined effect, further revealed a significant effect of Digital Customer Experience and Personalization on Brand Loyalty with R Square value 0.154 (Table 4a

and 4b). The functional relationship among these variables can be described by the following regression equation:

Brand Loyalty = 26.997 + .254 Digital Customer Experience + .339 Personalization

Table – 4 (a) Regression – Effect of Brand Experience and Personalization on Brand Loyalty Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.392[a]	.154	.131	3.39670
a. Predictors: (Constant), PERSONALIZATION, DIGITAL CUSTOMER EXPERIENCE				

Table – 4 (b) Regression – Effect of Brand Experience and Personalization on Brand Loyalty Model Summary Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	26.997	4.588		5.884	.000
DIGITAL CUSTOMER EXPERIENCE	.254	.089	.308	2.850	.006
PERSONALIZATION	.339	.169	.218	2.013	.048
a. Dependent Variable: BRAND LOYALTY					

The correlation analysis and regression analysis between Brand Loyalty as a dependent variable and Digital Customer Experience and Personalization as independent variables, shows that there is a significant positive relationship among these variables. The Digital Customer Experience, which is described in terms of ten factors related to different customer interface with the digital platform, seem to develop perceptions and feelings towards the brand.In a similar manner,

Personalization, described in terms of six items representing different aspects of customization and personalization, has attempted to capture customers preferences for personalized solutions. The findings are in line with the earlier studies reaffirming the crucial role of emerging digital technologies, including AI, in shaping personalization and customer experience, which interact with customers to develop loyalty towards such brands and company.

CONCLUSION

In an era of increasing competition, proliferation of brands and use of digital technologies in all aspects of marketing activities, brand loyalty is a significant measure of sustained growth and profitability for any organization. Marketers are adopting innovative practices to attract and retain customers to achieve sustainable competitive advantage. The present study has established the role of two critical elements – Digital Customer Experience and Personalization on Brand Loyalty. It is found that both these constructs play a significant role in shaping the brand loyalty. The study suggests that marketer should identify and use appropriate digital tools and technologies, suitable for their target customers, for crafting seamless pleasurable customer experience and personalize the solutions as per the unique personality and preferences of individual customers. There is also a need for further studies in this direction to explore the role of other related constructs in shaping brand loyalty in the digital era.

REFERENCES

1. Adjei, M. T., Noble, S. M., and Noble, C. H. (2010). The influence of C2C communications in online brand communities on customer purchase behavior, *Journal of the Academy of Marketing Science*, 38(5), 634–653.

2. Al-Adwan, A. S., and Al-Horani, M. A. (2019). Boosting Customer E-Loyalty: An Extended Scale of Online Service Quality, *Information*, 10(12), 380.

3. Ameen, N., Hosany, S. andTarhini, A. (2021). Consumer interaction with cutting-edge technologies: Implications for future research. *Comput.Hum. Behav*., 120, 106761.

4. Amersdorffer, D., Oellrich, J., Bauhuber, F. and Gottstein, B. (2012). Social media imMICEsegment", in Schreiber, M.T. (Ed.), Kongresse, Tagungen und Events. Potenziale, Strategien und Trends der Veranstaltungswirtschaft, Oldenbourg, Munich, 195-209.

5. Amy Gallo (2014). The Value of Keeping the Right Customers. Harvard Business Review.

6. Anzén, E., & Ekberg, L. (2020). Understanding how automatized personalization with AI can drive value in B2B marketing: A case study of a Swedish industrial equipment manufacturer. Master of Science Thesis TRITA-ITM-EX2020:138.

7. Aspinall, E., Nancarrow, C. and Stone, M. (2001). The meaning and measurement of customer retention, *Journal of Targeting, Measurement and Analysis for Marketing*, 10(1), 79-87.

8. Bleier, A., Harmeling, C. M., and Palmatier, R. W. (2019). Creating Effective Online Customer Experiences, *Journal of Marketing*, 83(2), 98-119.

9. Bolton, R. N., McColl-Kennedy, J. R., Cheung, L., Gallan, A., Orsingher, C., Witell, L., and Zaki, M. (2018). Customer experience challenges: bringing together digital, physical and social realms, *Journal of Service Management*, 29(5), 776-808.

10. Brakus, J. J., Schmitt, B. H., &Zarantonello, L. (2009). Brand Experience: What is It? How is it Measured? Does it Affect Loyalty?,*Journal of Marketing*, 73(3), 52-68.

11. Buchanan, T. and McMullan, R. (2017). How chatbots and conversational agents can improve customer experience, *Business Horizon*, 60 (5) (2017) 823–833.

12. Chatterjee, S., Ghosh, S. K., Chaudhuri, R., and Nguyen, B. (2019). Are CRM systems ready for AI integration? A conceptual framework of organizational readiness for effective AICRM integration,*The Bottom Line*, 32(2), 144–157.

13. Chen, C. andChen, F. (2021). Chatbots and customer experience: an empirical investigation, *Journal of Interactive Marketing*, 56, 101–113.

14. Crolic, C., Thomaz, F., Hadi, R. and Stephen, A.T. (2021). Blame the Bot: Anthropomorphism and Anger in Customer–Chatbot Interactions,*Journal of Marketing*, 86, 132–148.

15. Dahlhoff, D., Bender, S., Cerovina, I., Mak, E., Mat, B., McFeely, O., Weseman, K. (2018), Artificial Intelligence: Touchpoints with Consumers (Rep). Available from: https://www.pwc.com/gx/en/ retail-consumer/assets/artificial-intelligence-globalconsumerinsights-survey.pdf. [Last accessed on 2023 Nov 11].

16. Davenport, T., Guha, A., Grewal, D., and Bressgott, T. (2020). How artificial intelligence will change the future of marketing, *Journal of the Academy of Marketing Science*, 48(1), 24-42.

17. Deng, S., Tan, C.W., Wang, W., and Pan, Y. (2019). Smart Generation System of Personalized Advertising Copy and Its Application to Advertising Practice and Research. Journal of Advertising, 48(4), 356–365.

18. Duan, L. and Liu, Y. (2020). Understanding chatbot usage intention: an empirical study, Comput. Hum. Behaviour. 105, 106231.

19. Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., and Williams, M. D. (2019). Reexamining the unified theory of acceptance and use of technology (UTAUT): Towards a revised theoretical model,*Information Systems Frontiers*, 21(3), 719-734.

20. Ebrahim, R. (2020). The Role of Trust in Understanding the Impact of Social Media Marketing on Brand Equity and Brand Loyalty, *Journal of Relationship Marketing*, 19(4), 287–308.

21. Gao, Y. and Liu, H. (2022). Artificial intelligence-enabled personalization in interactive marketing: a customer journey perspective, *Journal of Research in Interactive Marketing*, pp. 1-18.

22. Gentile, C., Spiller, N. and Noci, G. (2007). How to Sustain the Customer Experience, *European Management Journal*, 25(5), 395-410.

23. Gong, T. (2018). Customer brand engagement behavior in online brand communities,*Journal of Services Marketing*, 32(3), 286–299.

24. Grewal, D., Hulland, J., Kopalle, P. K., andKarahanna, E. (2020). The future of technology and marketing: A multidisciplinary perspective, *Journal of the Academy of Marketing Science*, 48(1), 1-8.

25. Grewal, D., Roggeveen, A.L., andNordfalt, J. (2017). The future of Retailing, *Journal of Retailing*, 93 (1), 1–6.

26. Hanninen,M., Mitronen, L. and Kwan, S.K. (2019). Multi-sided marketplaces and the transformation of retail: a service systems perspective, *Journal of Retailing*, 49 (1), 380–388.

27. Huang, M.H. and Rust, R. T. (2018). Artificial Intelligence in Service, *Journal of Service Research*, 21(2), 155–172.

28. Jain, R., Aagja, J., andBagdare, S. (2017). Customer experience – a review and research agenda, *Journal of Service Theory and Practice*, 27(3), 642-662.

29. Jeffs, V. (2018), Artificial Intelligence and Improving Customer Experience [White Paper]. Pegasystems: Available from: https:// www1.pega.com/system/files/resources/2018-08/AI-ImprovingCustomer-Experience.pdf. [Last accessed on 2023 Nov 11].

30. Kandampully, J., Zhang, T. and Bilgihan, A. (2015). Customer loyalty: a review and future directions with a special focus on the hospitality industry, *International Journal of Contemporary Hospitality Management*, 27(3), 379-414.

31. Kozinets, R. V. (2007). Technology/ideology: How ideological fields influence consumers' technology narratives,*Journal of Consumer Research*, 34(6), 865–881.

32. Kumar, V., Rajan, B., Venkatesan, R. and Lecinski, J. (2019). Understanding the Role of Artificial Intelligence in Personalized Engagement Marketing. *California Management Review*, 61(4), 135–155.

33. Luo, M. M., Chen, J.S., Ching, R. K.H. and Liu, C.C. (2011). An examination of the effects of virtual experiential marketing on online customer intentions and loyalty, *The Service Industries Journal*, 31(13), 2163-2191.

34. Marketing Week. Brands Are Losing Out on £774bn by Failing to Bridge the 'Self-Esteem Gap'. 2018. Available online: https://www.marketingweek.com/brands-losing-out-failing-to-bridge-self-esteem-gap/(accessed on 28 November 2023).

35. Mathwick, C., Malhotra, N. and Rigdon, E. (2001). Experiential value: conceptualization, measurement and application in the catalog and Internet shopping environment, *Journal of Retailing*, 77(1), 39-56.

36. Mohammad, J., Taghi P., Mahsa, M., Bakhsh (2015). Loyalty: From Single-Stage Loyalty to Four-Stage Loyalty, *International Journal of New Technology and Research*, 1(6), 48-51.

37. Newman, D. (2019). 5 ways AI is transforming the customer experience. https://www.forbes.com/sites/danielnewman/2019/04/16/5-ways-ai-is-transformingthe-customer-experience/#49e17a31465a Accessed November, 16, 2023.

38. Omale G. (2019). Improve customer experience with artificial intelligence. https://www.gartner.com/smarterwithgartner/improve-customer-experience-withartificial-intelligence/

39. Paschen, J., Kietzmann, J. and Kietzmann, T. C. (2019). Artificial intelligence (AI) and its implications for market knowledge in B2B marketing,*Journal of Business & Industrial Marketing*, 34(7), 1410–1419.

40. Prentice, C., & Nguyen, M. (2020). Engaging and retaining customers with AI and employee service, *Journal of Retailing and Consumer Services,* 56, 102186.

41. Reynolds, J. and Sundstrom, M. (2014). Digitalisation, retail transformation and change: what will European Consumers want from their future shopping experience?. In Proceedings of the 4th Nordic Retail and Wholesale Conference Stockholm, Sweden, 5-6 November 2014.

42. Rose, S., Clark, M., Samouel, P. and Hair, N. (2012). Online Customer Experience in e-Retailing: An empirical model of Antecedents and Outcomes, *Journal of Retailing*, 88(2), 308-322.

43. Shaw, C. (2007). The DNA of Customer Experience. London, Palgrave Macmillan UK.

44. Srinivasan, S. S., Anderson, R., &Ponnavolu, K. (2002). Customer loyalty in e-commerce: an exploration of its antecedents and consequences, *Journal of Retailing*, 78(1), 41-50.

45. Suwono, L.V. andSihombing, S.O. (2016). Factors Affecting Customer Loyalty of Fitness Centers: An Empirical Study. *J. Din. Manaj*., 7,45.

46. Syam, N. and Sharma, A. (2018). Waiting for a sales renaissance in the fourth industrial revolution: Machine learning and artificial intelligence in sales research and practice, Industrial Marketing Management, 69, 135–146.

47. Verhoef, P. C. and Bijmolt, T. H. (2019). Marketing perspectives on digital business models: A framework and overview of the special issue. International Journal of Research in Marketing, 36(3), 341-349.

48. Zhang, X., Ding, X., Ma, L. and Wang, G.(2018). Identifying Factors Preventing Sustainable Brand Loyalty among Consumers: A Mixed Methods Approach,*Sustainability*, 10, 4685.

BARRIERS TO EFFECTIVE OFFICE AND INFORMATION MANAGEMENT IN A GLOBALIZED WORLD: A CASE STUDYOF IGNATIUS AJURU UNIVERSITY OF EDUCATION

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ABSTRACT

This study investigates the barriers to effective office and information management in a globalized world: A case study of IAUE. A descriptive survey research design was used to guide the study. The study population consists of 500 academic and non-academic staff within the university. A sample of 250 staff was selected for the study, representing 50% of the total population. A simple random sampling technique was employed to draw the sample proportionately in the university. The instrument for data collection was a 18-item structured questionnaire titled "Barriers to office and information management Questionnaire" (BOIMQ). The instrument was validated by the two experts in information and management department, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Rivers State. The reliability of the instrument was established using the test-retest method while Cronbach Alpha was used to estimate the reliability index of 0.80. The copies of the instrument were administered by the researcher directly to the respondents. Data collected were analyzed using mean and standard deviation to answer the research questions, while t-test was used to test the null hypotheses at 0.05 level of significance. The study concludedthat human capacity barriers, organizational barriers, and financial and technological barriers all significantly affect the university's ability to manage office and information systems effectively in an increasingly globalized and digital-driven world. Based on the findings, the researcher recommended that IAUE should institutionalize training programs and workshops aimed at improving staff competence in digital tools, modern office management practices, and information systems. Capacity development must be continuous, not occasional.

INTRODUCTION

In today's rapidly evolving global environment, effective office and information management remains a crucial pillar for institutional efficiency, particularly in higher education institutions. The emergence of globalization has significantly transformed how organizations operate, communicate, and manage data. This transformation has placed new demands on institutions like Ignatius Ajuru University of Education (IAUE), which must now contend with the dual challenge of aligning traditional administrative practices with modern information management systems. However, despite the many opportunities presented by globalization, several barriers continue to hinder the smooth operation and management of office and information systems within such institutions.

One of the prominent challenges is rooted in human capacity barriers, which refer to limitations in staff skills, training, and adaptability to new technologies. Many office personnel in Nigerian universities lack the requisite ICT competencies needed for effective information management in a digital age. The persistence of manual filing systems, poor document retrieval processes, and limited computer literacy among some staff are indicative of this problem. According to Olumoye and Ojo (2019), inadequate training and resistance to change among administrative staff have continued to obstruct the integration of innovative information systems. The globalized world demands a knowledge-driven workforce, but institutions often fall short in equipping their personnel with the necessary digital and managerial skills.

Another set of obstacles to effective office and information management are organizational barriers, which stem from the internal structure, culture, and leadership approach of the institution. In many Nigerian universities, hierarchical communication patterns, lack of policy implementation, and poor information flow between departments affect productivity and decision-making. Eze and Nwankwo (2020) argue that ineffective communication channels and bureaucratic delays often result in fragmented information systems, which reduce the ability of office units to respond swiftly and efficiently to internal and external demands. Furthermore, weak institutional commitment to innovation and change management practices impedes the successful adoption of modern technologies and the reform of existing administrative protocols. Where leadership fails to champion digital transformation, information management systems become disjointed and inefficient.

Chiefly among the challenges is financial and technological barriers confronting institutions like IAUE. The high cost of procuring and maintaining modern office equipment, installing reliable internet infrastructure, and purchasing enterprise software often exceeds the financial capacity of public institutions. Okoro and Adebayo (2018) noted that limited budgetary allocations, poor funding priorities, and irregular financial disbursements severely affect the ability of Nigerian universities to digitalize and automate office processes. Furthermore, even where technologies are acquired, the absence of technical support, frequent power outages, and obsolete ICT infrastructure contribute to the under-utilization or outright abandonment of such tools. The gap between technological availability and usability continues to widen, especially when sustainable investments in ICT infrastructure are lacking.

The challenges of office and information management in a globalized world are thus multi-dimensional, touching on human, structural, and resource-related issues. For institutions like IAUE striving to position themselves competitively in the global academic space, addressing these barriers is not merely a matter of administrative reform, but a necessity for institutional

survival and relevance. It is imperative that deliberate strategies be adopted to strengthen human capacity, reengineer organizational structures, and ensure consistent investment in technology.

Statement of the Problem

Despite the increasing demands of globalization, effective office and information management remains a persistent challenge in many Nigerian universities, including Ignatius Ajuru University of Education. While global trends require institutions to adopt efficient systems and practices, several internal barriers hinder this progression. Human capacity limitations such as low digital literacy and inadequate training reduce the efficiency of administrative personnel. Organizational challenges, including poor communication flow, rigid structures, and lack of coordination, further weaken information management processes. Additionally, financial and technological constraintssuch as limited funding for ICT infrastructure, outdated systems, and inadequate technical supportcontinue to hamper the university's ability to modernize its operations. These barriers collectively undermine the institution's administrative effectiveness and its ability to compete in a globalized academic environment.

Aim and Objectives

The study investigated barriers to effective office and information management in a globalized world: A case study of IAUE. Specifically, the study achieved the following objectives:

1. identified the extent to which human capacity barriers affect effective office and information management at IAUE.

2. found out the extent to which organizational barriers affect effective office and information management at IAUE.

3. examined the extent to which financial and technological barriers affect effective office and information management at IAUE.

Research Questions

The following research questions will guide the study.

1. To what extent does human capacity barriers affect effective office & information management in IAUE?

2. To what extent does organizational barriers affect effective office & information management practices in IAUE?

3. To what extent does financial and technological barriers affect effective office & information management in IAUE?

Hypotheses

The following null hypotheses will guide the study:

1. There is no significant difference between the mean rating of senior and junior academic staff on the extent human capacity barriers affects effective office & information management in IAUE.

2. There is no significant difference between the mean rating of senior and junior academic staff on the extent organizational barriers affects effective office & information management in IAUE.

3. There is no significant difference between the mean rating of senior and junior academic staff on the extent financial and technological barriers affects effective office & information management in IAUE.

LITERATURE REVIEW OF RELATED

Office and Information Management

Office and information management involves the planning, coordination, and control of administrative activities that support the day-to-day operations of an organization. In a university context, this includes maintaining records, processing correspondence, managing files, and ensuring that accurate information is available for decision-making. Information management refers to how data is collected, stored, retrieved, and shared across departments to support academic and administrative functions. According to Nwachukwu and Adebayo (2018), effective office management enhances workflow efficiency, while information management ensures that the right data is accessible at the right time, facilitating effective service delivery in institutions.

Concept of Globalization

Globalization is the process of increasing interconnectedness among countries through the exchange of ideas, technology, culture, and services. In educational institutions, globalization has led to the adoption of international best practices in office management, increased reliance on digital communication systems, and the need for real-time data processing. As noted by Okoro and Chinedu (2020), globalization compels universities to modernize administrative processes and embrace ICT-driven operations in order to remain competitive and responsive to global academic standards.

Human Capacity Barriers

Human capacity barriers refer to the limitations in skills, knowledge, and competencies of office staff. In many Nigerian institutions, administrative personnel often lack the necessary training in ICT, resulting in ineffective information handling and resistance to new technologies. Staff may also be reluctant to adopt new systems due to fear of job redundancy or unfamiliarity with digital platforms. Eze and Nwogu (2019) observed that lack of continuous professional development and limited exposure to modern administrative tools are major obstacles to institutional growth and efficiency.

Organizational Barriers

Organizational barriers are structural and procedural issues within an institution that hinder effective office operations. These include rigid hierarchies, unclear communication channels, poor supervision, and absence of clear policies. Such constraints create delays, confusion, and duplication of tasks in the university system. According to Ibrahim and Olaitan (2017), organizational culture that discourages innovation or flexible decision-making often results in low staff morale and inefficiency in handling information and office tasks.

Financial and Technological Barriers

Financial and technological barriers refer to the lack of adequate funding and access to modern equipment required for effective office management. Many public universities struggle with outdated systems, poor internet infrastructure, irregular electricity supply, and limited budgets for ICT development. These constraints hinder the implementation of automated office

procedures and result in over-reliance on manual processes. A study by Adekunle and Fagbemi (2021) revealed that insufficient investment in technology limits the productivity of administrative units and slows down institutional performance.

Effective Office and Information Management in a Globalized World

In a globalized world, effective office and information management requires a combination of skilled personnel, streamlined organizational systems, and reliable technology. Universities must adopt integrated information systems, encourage digital literacy, and ensure efficient communication across departments. This will not only improve service delivery but also align the institution with international academic and administrative standards. As Umeh and Ogunleye (2019) noted, global relevance in university administration depends on the institution's ability to overcome internal barriers and adapt to changing technological landscapes.

System Theory

The Systems Theory, propounded by Ludwig von Bertalanffy in 1950, conceptualizes an organization as a system composed of interdependent and interconnected parts working together to achieve common objectives. Each component of the systembe it human, structural, or materialmust function optimally for the system as a whole to operate effectively.In relation to office and information management, this theory is relevant in explaining how inputs such as human resources, infrastructure, and financial resources are transformed through administrative processes into outputs like documentation, communication, and service delivery. When any part of the system is weaksuch as a lack of skilled personnel, poor communication, or inadequate technological supportthe efficiency of the entire system is negatively affected. Thus, human capacity limitations, organizational inefficiencies, and financial or technological barriers can be understood as systemic weaknesses that hinder optimal performance.

Technology Acceptance Model (TAM)

The Technology Acceptance Model was developed by Fred Davis in 1986. This model focuses on how individuals accept and use new technologies, based on two main factors: perceived usefulness and perceived ease of use. Perceived usefulness refers to the belief that using a particular technology will enhance job performance, while perceived ease of use relates to the belief that the technology will be simple and free of effort.TAM is particularly useful in understanding human capacity barriers in office and information management. If staff perceive technological tools as difficult to use or irrelevant to their work, they may resist adopting them, which hinders effective communication, documentation, and service delivery. This resistance is often rooted in lack of training, low digital literacy, or fear of change. Therefore, addressing human-related barriers requires not only providing the right tools but also ensuring that users find them accessible, beneficial, and easy to integrate into their daily tasks.

Human Capacity Barriers

Okon and Ibrahim (2021) investigated the barriers to effective office and information management in a globalized world in selected state-owned tertiary institutions in South-South Nigeria. The descriptive survey research design was adopted for the study. The study was guided by three research questions and three corresponding null hypotheses. The Population of the Study consisted of 400 administrative staff in tertiary institutions in South-South Nigeria. The Sample Size of the study was 180 administrative staff selected through stratified random sampling technique. A self-structured questionnaire was used to analyze the data. Pearson

Product Moment Correlation statistics was used to analyze the data. The result of the study revealed that human capacity barriers was positively significantly related to barriers to effective office and information management in a globalized world in tertiary institutions in South-South Nigeria.

Organizational Barriers

Adeyemi and Nwachukwu(2022) investigated the barriers to effective office and information management in a globalized world in three federal universities in Nigeria. The correlational survey research design was adopted for the study. The study was guided by three research questions and three corresponding null hypotheses. The Population of the Study consisted of 350 senior and junior administrative staff in three federal universities in Nigeria. The sample size of the study was 200 administrative staff selected through purposive sampling techniques. A self-structured questionnaire was used to analyze the data. Pearson Product Moment Correlation statistics was used to analyze the data. The result of the study revealed that organizational barriers were positively significantly related to barriers to effective office and information management in a globalized world in three federal universities in Nigeria.

Financial and technological barriers

Yusuf and Afolabi(2020) investigated the barriers to effective office and information management in a globalized world in three federal universities in Nigeria. The ex-post facto research design was adopted for the study. The study was guided by four research questions and four corresponding null hypotheses. The Population of the Study consisted of 300 ICT personnel and administrative officers in public tertiary institutions in Southwestern Nigeria. The sample size of the study was 150 administrative officers and ICT personnel was selected through cluster sampling techniques. A self-structured questionnaire was used to analyze the data. Pearson Product Moment Correlation statistics was used to analyze the data. The result of the study revealed that financial and technological barriers were positively significantly related to barriers to effective office and information management in a globalized world in public tertiary institutions in Nigeria.

Methodology

This study adopts a descriptive survey research design to investigate the barriers to effective office and information management in a globalized world, using Ignatius Ajuru University of Education (IAUE) as a case study. The population of the study consists of 500 staff members. Academic staff (350) and administrative staff (150) in IAUE.A sample size for the study will be 250 sample size of the various academic and administrative staffs in IAUE. The stratified random sampling technique will be used for this study. The researcher developed questionnaire to elicit data for the study and tagged it"Barriers to Office Information Management Questionnaire (BOIMQ) structured after 4-point modified Likert Scale. of Very High Extent (VHE)-4, High Extent (HE)-3, Low Extent (LE)-2, Very Low Extent (VLE)-1.The instrument of the data collection (BOIMQ) was validated by the researcher's supervisor and an expert in the department Office and Information Management while test-retest method was used to establish the reliability of the instrument with PPMC giving a reliability index of 0.78 using 20 academic staff of the university.

Mean and Standard deviation was used to answer all the research questions while t-test was used to test the null hypotheses at 0.05 level of significance.All statistical data were analysis using Statistical Package for Social Sciences (SPSS) version 25.

Results and Discussion

Research question one: To what extent does human capacity barriers affect effective office & information management in IAUE?

Table 1: Descriptive analysis (Mean & SD) on the extent human capacity barriers affects effective office & information management in IAUE

S/N	How does human capacity barriers affect	Senior Staff Mean	SD	Junior Staff Mean	SD	Mean Set	Remark
1.	Staff lack adequate training in modern office management techniques	2.78	0.78	2.72	0.64	2.75	High Extent
2.	There is insufficient knowledge of information management systems among staff	2.91	0.65	2.85	0.81	2.88	High Extent
3.	Inadequate computer literacy skills hinder effective information management	2.89	0.99	2.28	0.65	2.59	High Extent
4.	Poor communication skills affect information flow and management	3.04	1.02	3.31	0.73	3.175	High Extent
5.	There is poor understanding of data security and privacy requirements among academic staff	2.63	0.75	2.67	0.76	2.65	High Extent
6.	Lack of specialized skills in records management affects office efficiency	2.72	0.94	2.97	0.88	2.85	High Extent
	Grant Total	**2.83**	**0.86**	**2.80**	**0.75**	**2.81**	**High Extent**

The data on table 1 revealed the extent human capacity barriers affect effective office & information management in IAUE is high (Mean=2.81). The table further revealed that staff lack adequate training in modern office management techniques (Mean=2.75), insufficient knowledge of information management systems among staff (Mean=2.88), inadequate computer literacy skills hinder effective information management (Mean=2.59), poor communication skills affect information flow and management (Mean=3.175), poor understanding of data security and privacy requirements among academic staff (Mean=2.65) and lack of specialized skills in records management affects office efficiency (Mean=2.85). The table revealed that the opinion mean ratings of senior academic staff (Mean=2.83, SD=0.86) is higher than their junior counterparts (Mean=2.80, SD=0.75).

Research question two: To what extent does organizational barriers affect effective office & information management practices in IAUE?

Table 2: Descriptive analysis (Mean & SD) on the extent organizational barriers affects effective office & information management practices in IAUE

	ORGANIZATIONAL BARRIERS	Senior Staff		Junior Staff		Mean Set	Remark
		Mean	SD	Mean	SD		
7.	The organizational structure does not support effective information flow	2.23	0.69	2.43	0.65	2.33	Low Extent
8.	Poor coordination between departments affects information sharing	2.88	0.58	2.86	0.77	2.87	High Extent
9.	Management does not provide adequate support for office modernization	3.04	0.85	2.99	0.82	3.02	High Extent
10.	Inadequate supervision and monitoring of office activities exists	2.78	0.66	2.89	0.7	2.835	High Extent
11.	Conflicting priorities between departments affect my information management roles as an academic staff	2.76	0.76	2.74	0.72	2.75	High Extent
12.	There is resistance from management to adopt global best practices	2.96	1.02	2.9	0.99	2.93	High Extent
	Grand Total	**2.89**	**0.76**	**2.87**	**0.78**	**2.88**	**High Extent**

The data on table 2 revealed the extent organizational barriers affect effective office & information management in IAUE is high (Mean=2.88). The table further revealed that organizational structure support effective information flow 2.33), poor coordination between departments affects information sharing (Mean=2.87), management does not provide adequate support for office modernization   (Mean=3.02), inadequate supervision and monitoring of office activities exists (Mean=2.84), conflicting priorities between departments affect my information management roles as an academic staff (Mean=2.75), there is resistance from management to adopt global best practices (Mean=2.93), The table revealed that the opinion mean ratings of senior academic staff (Mean=2.89, SD=0.76) is higher than their junior counterparts (Mean=2.87, SD=0.78).

Research question three: To what extent does financial and technological barriers affects effective office & information management in IAUE?

Table 3: Descriptive analysis (Mean & SD) on the extent financial and technological barriers affects effective office & information management in IAUE

	FINANCIAL AND TECHNOLOGICAL BARRIERS	Senior Staff		Junior Staff		Mean Set	Remark
		Mean	SD	Mean	SD		
13.	Insufficient funding limits the acquisition of modern office equipment	2.81	0.96	2.77	0.92	2.79	High Extent
14.	Outdated computer systems and software affect information management efficiency	3.21	0.76	3.18	0.79	3.20	High Extent
15.	Poor internet connectivity hinders global information sharing	2.99	0.82	2.84	0.8	2.92	High Extent
16.	Lack of budget allocation for staff training limits capacity development	2.78	0.89	2.88	0.76	2.83	High Extent
17.	High cost of modern information management systems prevents their adoption of ICT in school management.	2.94	0.92	2.97	0.95	2.96	High Extent
18.	Limited budget for software licenses affects system updates and security	2.75	1.03	2.72	0.98	2.74	High Extent
	Grand Total	**2.91**	**0.90**	**2.89**	**0.87**	**2.90**	**High Extent**

The data on table 3 revealed the extent financial and technological barriers affect effective office & information management in IAUE is high (Mean=2.90). The table further revealed that insufficient funding limits the acquisition of modern office equipment (Mean=2.79), outdatedcomputer systems and software affect information management efficiency (Mean=3.20),poorinternet connectivity hinders global information sharing (Mean=2.92), lack of budget allocation for staff training limits capacity development (Mean=2.83), high cost of modern information management systems prevents their adoption of ICT in school management (Mean=2.96), limited budget for software licenses affects system updates and security (Mean=2.74). The table revealed that the opinion mean ratings of senior academic staff (Mean=2.91, SD=0.90) is higher than their junior counterparts (Mean=2.89, SD=0.87).

Testing of Hypotheses

HO1: There is no significant difference between the mean rating of senior and junior academic staff on the extent human capacity barriers affects effective office & information management in IAUE.

Table 4: Summary of t-test on the difference between the mean rating of senior and junior academic staff on the extent human capacity barriers affects effective office & information management in IAUE

Rank	N	Mean	SD	Df	t-test	Sig.	Remark
Senior Staff	156	2.83	0.86	248	0.280	0.780	NS
Junior Staff	94	2.80	0.75				

NS= Not Significant

Table 4 above showed the t-test calculated value is 0.280, the corresponded significance value is 0.780 showing > 0.05 at 248 degrees of freedom. Hence, it is concluded that there is no significant between the mean rating of senior and junior academic staff on the extent human capacity barriers affects effective office & information management in IAUE. Therefore, the null hypothesis one is retained at 0.05 level of significance.

HO2: There is no significant difference between the mean rating of senior and junior academic staff on the extent organizational barriers affects effective office & information management in IAUE.

Table 5: Summary of t-test on the difference between the mean rating of senior and junior academic staff on the extent organizational barriers affects effective office & information management in IAUE

Rank	N	Mean	SD	Df	t-test	Sig.	Remark
Senior Staff	156	2.89	0.76	248	0.200	0.842	NS
Junior Staff	94	2.87	0.78				

NS= Not Significant

Table 5 above showed the t-test calculated value is 0.200, the corresponded significance value is 0.842 showing > 0.05 at 248 degrees of freedom. Hence, it is concluded that there is no significant between the mean rating of senior and junior academic staff on the extent organizational barriers affects effective office & information management in IAUE. Therefore, the null hypothesis two is retained at 0.05 level of significance.

HO3: There is no significant difference between the mean rating of senior and junior academic staff on the extent financial and technological barriers affects effective office & information management in IAUE.

Table 6: Summary of t-test on the difference between the mean rating of senior and junior academic staff on the extent financial and technological barriers affects effective office & information management in IAUE

Rank	N	Mean	SD	Df	t-test	Sig.	Remark
Senior Staff	156	2.91	0.90	248	0.172	0.863	NS
Junior Staff	94	2.89	0.87				

NS= Not Significant

Table 6 above showed the t-test calculated value is 0.172, the corresponded significance value is 0.863 showing > 0.05 at 248 degrees of freedom. Hence, it is concluded that there is no significant between the mean rating of senior and junior academic staff on the extent organizational barriers affects effective office & information management in IAUE. Therefore, the null hypothesis three is retained at 0.05 level of significance.

Discussion of Findings

The findings from Table 1 revealed that human capacity barriers significantly affect effective office and information management in IAUE, with an overall high. Interestingly, though the mean rating of senior academic staff was marginally higher than that of junior staff, there was no statistically significant difference between the two groups. This suggests a shared perception of inadequacy in human capacity across the board, regardless of seniority or experience.The second dimension of analysis in Table 2 focused on organizational factors, with results revealing a high. Also highlighted were issues such as inadequate supervision and conflicting departmental priorities, which can derail unified information management strategies. Again, the mean ratings of senior and junior academic staff showed no significant difference, reflecting a unified concern about systemic organizational challenges.Findings from Table 3 indicate that financial and technological limitations significantly impede effective office and information management at IAUE, with the highest aggregate among the three dimensions. Moreover, high costs associated with adopting modern information management systems and limited budgets for software licenses and security updates were reported as major deterrents to implementing comprehensive digital solutions. As with other dimensions, senior academic staff and junior staff shared similar views, with no significant difference in opinion.The study's findings revealed that there is need for institutional transformation across human resource development, organizational structure, and financial investment in digital tools. Addressing these barriers is not just an operational issue—it is a strategic educational factor that can impacts the quality, relevance, and competitiveness of higher education in the global context.

CONCLUSION

The study explored the multifaceted barriers hindering "effective office and information management in a globalized world: A Case Study of IAUE".Findings revealed that human capacity barriers, organizational barriers, and financial and technological barriers all significantly affect the university's ability to manage office and information systems effectively in an increasingly globalized and digital-driven world. The study established that insufficient ICT training, poor communication skills, and limited understanding of information systems contribute to human capacity constraints. Likewise, organizational inefficiencies such as inadequate supervision, poor coordination, and resistance to adopting best practices were found to be major setbacks. Furthermore, financial and technological limitations — including outdated infrastructure, poor internet connectivity, and limited funding for digital tools — emerged as the most critical obstacles to transformation. There were no statistically significant differences between the responses of senior and junior academic staff, indicating a shared institutional awareness and consensus on the pressing need for reform. The implications is that for higher institution like IAUE to survive in the contemporary time, must reposition itself technological to be relevant and competitive in a global academic environment.Hence, must overhaul its human resource capacities, modernize its organizational framework, and consistently invest in technology and innovation.

Recommendations

Based on the findings and conclusion of this study, the following recommendations are proffered:

1. IAUE should institutionalize training programs and workshops aimed at improving staff competence in digital tools, modern office management practices, and information systems. Capacity development must be continuous, not occasional.

2. The university should review and reform its internal structures to foster clear communication flows, departmental collaboration, and effective supervision. Policies that encourage flexibility, teamwork, and accountability should be developed and implemented.

3. There is a need for strategic investment in modern office equipment, reliable internet infrastructure, and updated software tools. This includes budgeting for ongoing maintenance, licensing, and technical support services.

REFERENCES

1. Adekunle, O. A., & Fagbemi, O. M. (2021). ICT and administrative effectiveness in Nigerian public universities. *Journal of Educational Administration and Planning*, 11(1), 45–52.

2. Adeyemi, T. A., & Nwachukwu, E. C. (2022). Organizational structure and service delivery in Nigerian public universities. *Nigerian Journal of Educational Management and Leadership*, 10(2), 65–78.

3. Bertalanffy, L. von. (1950). The theory of open systems in physics and biology. *Science*, 111(2872), 23–29.

4. Eze, J. U., & Nwankwo, B. E. (2020). Administrative challenges in the implementation of information and communication technology in Nigerian universities. *Journal of Educational Management and Policy*, 5(2), 47–55.

5. Eze, M. U., & Nwogu, C. O. (2019). Capacity development and staff productivity in Nigerian higher institutions. *Nigerian Journal of Educational Management*, 7(2), 38–46.

6. Ibrahim, A. S., & Olaitan, A. B. (2017). Organizational structure and administrative efficiency in Nigerian universities. *African Journal of Educational Research and Development*, 9(1), 60–69.

7. Nwachukwu, A. C., & Adebayo, R. A. (2018). Information management strategies for improving university administration. *International Journal of Educational Studies*, 6(3), 88–94.

8. Okon, M. I., & Ibrahim, L. T. (2021). Capacity development and administrative effectiveness in Nigerian public institutions. *Journal of Public Administration and Education* Studies, 9(1), 43–56.

9. Okoro, J., & Adebayo, F. A. (2018). Funding ICT infrastructure for educational development in Nigerian universities. *Nigerian Journal of Educational Technology and Society*, 16(1), 89–97.

10. Okoro, J. O., & Chinedu, A. E. (2020). Globalisation and ICT-driven reforms in Nigerian universities. *Journal of Management and Technology in Education*, 5(2), 112–120.

11. Olumoye, M. Y., & Ojo, R. A. (2019). Human capacity building and ICT adoption among administrative staff in Nigerian universities. *Journal of Contemporary Issues in Educational Planning and Administration*, 9(3), 123–134.

12. Umeh, C. O., & Ogunleye, S. T. (2019). Enhancing administrative performance in universities through digital tools. *Nigerian Journal of Educational Technology*, 10(1), 73–81.

13. Yusuf, O. A., & Afolabi, R. A. (2020). ICT infrastructure and administrative efficiency in Nigerian higher institutions. *West African Journal of Educational Research*, 8(1), 89–102.

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