

Digitalisation and the use of Artificial Intelligence in Construction Industry for Economic Diversification in Nigeria

Tirimisiyu Gbolagade OLAITAN
Department of Technical Education
Oyo State College Of Education, Lanlate
olaitantirimisiyu@gmail.com

Abstract

The article reflects holistic view of digitalisation of construction industry and use of AI to enhance economic diversification. Having observed gaps in the scholars' ideas, the researcher dwells deep into the use of Artificial Intelligence to boost the construction industries and enhance economy diversification. This study is supported by infrastructure-led growth theory, multiplier and linkages theory and penroses theory of resource development. The paper explores the use of AI from various governmental agencies like (NCAIR and NITDA). The importance and purpose of digitalisation was harnessed, challenges like lack of funds, cost of digital facilities, poor power supply and erratic network problems among others were identified. Step to be taken in digitalizing construction industries was included in the study. The paper concludes by recommending that digitalisation must be adequately funded on areas of design, construction and management, monitoring system and project implementation. The funds must be available to put the technology in place. Upgrading of Facilities: Most construction facilities are oblate, some need to be replace while some need to be upgraded in line with rural global trend in digitalising the use of AI and Robotic machines need to be produced.

Keywords: Artificial Intelligence, Digitalisation, Construction, Economic-Diversification, Industry.

Introduction

In Nigeria, the government has acknowledged the capability of AI and has sought to develop programmes at National Centre for Artificial Intelligence and Robotics. The government also set up the National Information Technology Development Agency (NCAIR) and (NITDA) respectively for the promotion of digital economy.

In the recent years, with the development of artificial intelligence technology, block chain technology, big data technology and other digital technologies has changed the enterprises mode and have attracted more diversification mode to improve digitalisation. The construction industries are critical to economic development and infrastructural growth in any nation. The integration of digital technology has emerged as a transformative force across numerous sectors including construction sector. AI deployment in building is limited in access to rapid technological advances. Innovations such as Building Information Modeling (BIM), data analysis and artificial intelligence offer powerful tools to avoid risk management. These technologies enable improved data collection and facilitate proactive decision-making and risk mitigation. Jakhogierkeyen (2023) identified that Digitalisation plays vital role in the development of construction industry enables the control of projects and the efficient use of resource. Aghimien and Aigbavboa (2018) highlighted that the most benefits to be derived in digitalisation in the industry includes time-saving in construction projects delivery, increase productivity, increase speed of work, increase document quality, speeding up of response time and simpler working methods. Despite the potential advantages of these technologies awareness of their capabilities, the benefits remain limited particularly in the developing countries like Nigeria. Construction industry as one of the major economic sectors in Nigeria has not being experiencing critical digitalisation and the use of AI to improve this sector and diversify economic from oil mono-economy. The construction industry needs to be energized to meet the global demands and open ways for economic growth and sustainability.

The purpose of this study are:

- i. To review the positions of various studies in digitalisation of construction industry to diversify economic.
- ii. To identify challenges facing the use of digitalisation and AI
- iii. Explore steps in digitalizing and use of AI in construction industry for economic diversification.

Related Studies

- Jegede et al (2025) carried out research on application of Technology for risk management in the Nigerian Construction Industry: A study of awareness and barriers. The study

revealed that cost and infrastructure limitations are the primary obstacles or challenges and the study provide practical recommendations.

- Gap: The study does not revealed long-term impact of digital adoption on project outcomes. It does not revealed the process to be taken to improve construction industry through digitalisation and the use of AI for economic diversification.
- Heidi Aly (2020) research on digital transformation development and productivity in developing countries: Is artificial intelligence a curse or a blessings? The study identified that there is a positive relationship between the digital transformation index and economic development, labour productivity and job employment.
- Gap: It does not cover the effect of digitalisation and AI in construction industry and how to diversify the industry economically and the study does not revealed the challenges facing the digitalisation of construction industry.
- Nubi Achebo (2025) carried out a theoretical framework study on artificial intelligence and economic diversification opportunities for Nigeria's Growth Agenda. The study identified some areas where diversification can take place such as technology industry business and also identified some impediments to implementation of digital technology.
- Gap: Does not really identify how to implement digitalisation and AI in construction industry.
- Chen and Young (2023) in a paper titled the moderating effect of digitalisation on diversification and performance of enterprises. The study carried out by selected a total of 6238 valid data from a chinese A-share listed companies from 2010 to 2020 made an empirical digitalisation as the adjusting variable and drew the conclusions that the degree of enterprise diversification is negatively related to enterprise performance and the hasty diversification will damage the enterprise performance.
- Gap: The paper does not address how to digitalize the enterprise for successful diversification.
- Lanzolla (2025) revealed how external technological and market change influence the extent and type of diversification. It is also identified that to succeed with digital diversification new capabilities will be needed and those capabilities are not evenly distributed across firms.

- Ogunbode and Atchrim (2025) carried out a study on Artificial Intelligence in Nigeria: A catalyst for economic growth, innovation and technological advancement. The study investigates Nigeria Current State of AI adoption across various sectors the application and the challenges. The study concluded that Nigeria has the potential to harness AI for economic growth and development. The paper highlighted the need for strategic investing in AI infrastructure, research findings, education and developing policies that ensure ethical and responsible AI development.
- Jakhlogir Isayeu (2023) on the importance of the digital economic in the development of the construction industry, it discusses current state and prospects of digitalisation of the construction industry and the main directions of the use of technologies for increasing the resources efficiency of the enterprises. The study revealed that the digitalisation of construction industry is a must for efficient resourced control, management and increase in the growth and efficiencies of the industry.
- Holzmann and Vchiara (2022) carried out research work on Artificial Intelligence in Construction projects: An Explorative Study of Professionals' Construction project practitioners identified that AI is the solution to support the quantitative processes mainly related to scope, schedule, cost and quality of the.

Theoretical Frameworks and Analysis

- i. Infrastructure – Led Growth: This theory maintains that investment in infrastructure – transportation, energy and communication networks is critical for initiating economic growth and reducing production bottlenecks. This facilitates diversification into manufacturing and services (Ofori, 2015).
- ii. Multiplier and Linkages Theory: The construction industry has some of the highest international linkages (both backward and forward) among twenty economic sectors. It drives demand for raw materials (cement, steel) and services fostering growth in related sectors (Ofori, 2015).
- iii. Penroses's Theory of Resource Deployment: This theory posits that companies (including construction firms) diversify by deploying surplus resources (labour, equipment's, capital) into new reverted business cereals reducing X-inefficiency (internal wastage) (Montagomerg, 1994).

Challenges Facing Digitalisation and the use of AI in Construction Industry for Economic Diversification in Nigeria

- **Cost of Implementation of digital Facilities:** Implementation of digital facilities requires high capital investment especially small and medium-scale industries. The financial burden is heavy due to limited access to credit, high interest rate and cost of importation. As a result, slow digital uptake limit productivity improvements, efficiency gains and innovation in the construction sector.
- **Infrastructure deficiencies (Achelio, 2023):** This is a critical challenge to digitalisation and the use of AI in the industry. Most facilities are obsolete and effective deployment depends heavily on reliable power supply, internet facilities and the use of modern technology. Infrastructural gaps disrupt real time data processing and automation on the sites.
- **Infrastructural Limitations (Jegede et al., 2020):** This has pose a significant challenge to digitalisation and the successful application of digital tools requires stable, reliable power supply. There is need for holistic digitalisation of construction industry. Partial deployment of facilities may not yield the expected result.
- **Funding Limitation (Achelo 2025):** This is another obstacle to digitalisation and AI adoption. Implementation requires significant financial resources for software and hardware installation and the list of recruitment needed experts across the whole facilities.
- **Lack of set rules and regulations:** Absence of clear, well defined rules and regulations is a major challenge. Currently there is limited regulatory framework guiding the practice and without established policies and guidelines, construction firms are reluctant to invest in digital and AI technologies due to risks of legal disputes and lack of protection for intellectual property.
- **Lack of Experts, Adequate Skills and Capabilities:** Adequate technical capabilities are a significant challenge. Effective use of digital technologies and data analytics requires a workforce with strong ICT and data-handling competencies. However, many professionals have limited exposure due to gaps in education curricula and inadequate training opportunities. These difficult results to poor utilization of available digital tools. There is need for recruiting qualified hands and re-training officers.

- Inadequate awareness about the use and importance of digitalisation and AI: This is a key challenge facing Nigeria construction industry. Many stakeholders have limited knowledge on how digital technologies and AI can improve project planning and overall productivity. As a result, there is weak demand for digital and AI driven solutions.
- Resistance to technology and change by stakeholders: This is a notable challenge and many stakeholders are accustomed to traditional construction methods and often reluctant to embrace technology due to fear of change. Consequently the persistence of manual processes and outdated practices limit productivity and improvements and efficiency gains.
- Inadequate power supply: Digital tools depend on stable electricity for continuous operation. However, incessant power irregularities affect the use of AI. As a result, industries are forced to rely on alternative power sources which may lead to high cost of implementing of digitalisation.
- Erratic Network Problem: Erratic network connectivity is a significant challenge. Most digital tools depend on stable and high-speed internet access. Inconsistent network coverage and frequent service interruptions are common particularly to construction sites. Network problems hinder real-time data sharing and effective use. The location and at times result project coordination becomes inefficient and firms often revert to manual method and this will delay the project and hinder its effectiveness.

Digitalizing Construction Industry for Economic diversification involved the following steps:

- Awareness, Training and Capacity Building: Government need to create awareness about the need for the use of AI and digitalisation. Sensitization campaign and introduction of digital literacy education and training on digital tools to all construction workers, professionals and students is very important.
- Infrastructure Development: All facilities that will boost the functionalities of digitalisation must be provided such as Electricity and Internet Facilities.
- Adoption of Foundational Digital Tools: Bim for 3D Modelling and design, IOT sensors for site. Sequential steps for digitalisation and AI adoption in the Nigerian Construction Industry for economic diversification.

- **AI integrate for Property Management:** AI can be used to maintain construction process, predict the unforeseen circumstance, manage the resources use in designing and preparation of scheduling for the projects.
- **Advanced Technology Deployment:** Advanced Technology can be applied in construction site by using robotic machine in the production of concrete, laying of blocks and plastering of wall surfaces. Other advanced technology can also be used for production of site and management of both human and materials resources.
- **Policy and Regulatory Framework:** Governments at all levels should be establish policies and framework that will guide and produce the use of AI and Robotic Machines in Nigeria to foster the economic diversification.

Conclusion

The paper concludes that emergence of integration of digital technology into industry has become a transformative force across numerous sector of which construction industry is one of them. Various reviewed; works emphasized the important of digitalisation in construction industry. The theoretical frameworks were also pointers to digitalisation and economic diversification of the nation; therefore, it has now become imperative to energize construction industry through digitalisation and use of AI for economic diversification in Nigeria.

Recommendations

The following recommendations were made for effective digitalisation of construction industry for economic diversification in Nigeria.

- **Fundings:** Digitalisation must be adequately funded on areas of design, construction and management, monitoring system and project implementation. The funds must be available to put the technology in place.
- **Upgrading of Facilities:** Most construction facilities are oblate, some need to be replace while some need to be upgraded in line with (rural global trend in digitalisation. The use of AI and Robotic machine need to be produced.
- **Expansion of the scope of the infrastructure or area of digitalisation** to covers all the construction stages such as: planning stage, design stage, management aspect and construction stage of construction project.

- Up skilling: This is very important. Most construction workers in Nigeria need adequate training and re-training to upgrade their skill. Some have little skills while some did not have at all in the areas of digitalisation. Both local and foreign training required must be given to them to cope with the word of digitalisation.
- Network Service: Network services provider needs to improve on their network service. Some of this digital may rely on network. For effective usage, network must be properly functioning.
- Power supply: Nigeria has not really find solution to some of the erratic power supply. This is the area where government needs to come in by improving the power supply.
- Formulation of Regulations and Policies: Rules, regulations and policies must be formulated to guide the use of digital, AI and Robotic machine. This will guide the user and protect the existence and will go a long way to encourage and promote the implementation, the use of digitalisation and Robotic machines in construction industry economic diversification in Nigeria.

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