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Knowledge in the Emerging Technological Innovations among the Professionals in the Building Industry and Problems of Adoption in Nigeria

Simon Ajayi Olukotun PhD, ANIVS[1*] and Emmanuel Aniala[2]

[1]*Department of Urban and Regional Planning, Lead City University, Ibadan, Nigeria.*

[2]*SpatialPro365 Solutions Ltd, United Kingdom.*

***Corresponding author**

Simon Ajayi Olukotun,
Department of Urban and Regional Planning, Lead City University, Ibadan, Nigeria.

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Abstract

The study examined the viewpoint of the professionals in the building industry in Nigeria on their level of awareness of the emerging technologies and innovation in the sector. Also, their perceptions about problem of technological adoption in Nigeria was examined. Purposive sampling procedure was adopted to select 50 professionals in the building industry and semi-structured interviews were used to elicit relevant information such as their year of experience in the industry, level of awareness of the emerging innovations in the sector and problems associated with technological adoption. The data were analyzed with both descriptive (percentage, charts, frequency) and inferential statistic (chi-square) at 0.05 alpha level of significance.

The result of the findings show that the majority of the professionals have low level of awareness of the emerging technologies in the building industry in Nigeria. Furthermore, there was a significant association with the perceptions of the professionals regarding the listed problems of technological adoptions with probability value 0.000.

The value is less than the alpha level of 0.05. therefore, it is recommended that professionals in the building industry must acquire digital literacy skills to be able to understand effective use of the emerging technologies, digital transformation is an ongoing process therefore, continuous evaluation and adaptation is necessary and lastly, government policies should support and encourage technological adoption including creation of digital enabled infrastructure and environment in Nigeria.

Keywords: Technological Innovations, Professionals, Adoption, Building Industry.

Introduction and Statement of the Problem

Human activities have over the years impacted negatively on the environment and therefore there is the need to stem the tide and guide the environment in a sustainable direction to ensure a safe living environment and also make the available resources to serve the needs of the present as well as future generations (Onyike, 2025). As the urgency for environmental sustainability intensifies the choice of environment-friendly technologies becomes imperative (Onyike, 2025). The history of property technologies is divided into three stages: 1980 – 2000, 2000 – 2005 and 2006 to the present (Jones et al., 2022; Reed & Richard, 2021). Digital technology started to be deployed and adopted by the real estate industry during the 1980s when personal computer became more common (Jones et al., 2022). The second stage started at the time when most sales and residential listings were in print media and real estate companies, offices began to focus on moving listings into the digital media (Valley, 2020). Property technology encompasses any application of digital technology or platform economics in the real estate industry. Some example of property technology include: property management using digital dashboards, smart home technology, research and analytics, listing services/ tech-enabled brokerages, mobile applications, residential and commercial lending, 3D modeling for online portals, automation (Field & Desiree, 2008). Crowd funding real estate projects, share space management (Josh, 2016). According to ICED (2019) technology-related innovation which are in use in property industry include: digital telecommunication, Computer Aided Design (CAD), Unman Arial Vehicles, Internet of Thing (IOT), modular construction, 3D/4D printing, virtual/Augmented Reality, Artificial Intelligence (AI) and machine learning among others. Building technological innovations that have been developed and deployed for use are categorized as follows: construction technologies, energy-saving innovations, resource management and pollution control innovations, Artificial Intelligence (AI) and technology and project management. These contain computer Aided Design (CAD), Building Information Modelling (BIM) Block chain technology, Digital twins & Digital built, cloud computing, internet of Things (IOT) among others (Arup, 2018, Onyike 2025, Jones et al., 2022). The features that

define a building innovation or eco-friendly include Energy efficiency and conservation, renewable energy, effective use of water, effective waste and emission management, sustainable construction materials, environmentally conscious construction methods, harmonious design, socially responsible design and circular life-cycle design (Shuttleworth, 2024). These eco-friendly innovations are critical for addressing environmental challenges, combatting climate change and achieving a more sustainable and resilient future (Olukotun, 2025). These innovations progress towards minimizing energy usage and almost full usage of recycled/reusable materials in building, zero energy building, 70% less water consumption, 100% lighting of workplace are possible in current green building certified by LEED (Serafe Ozeta Zehracanna Girgin, 2017).

Also, property management software was emerged as a cornerstone of tech-enabled property management (Brown, 2023). These software have revolutionized how property managers operate by centralizing data and automating a range of tasks (Sado et al., 2025). According to Roy (2023) some of the notable features and benefit of these software include centralized data, automated rent collection, maintenance tracking, document storage and improved communication. Also Block chain technologies have also been used for tracking property for land registration (Jones et al 2022, Arup 2018). These technologies have had far reaching effect of the construction industry, Green building technology has been developed and deployed for use to enhance sustainability in different parts of the world today (Olukotun, 2025). Sustainable building materials such as electro chromic glazing, Electro chromic roofing resource management, pollution control innovations, water saving, waste-to-energy technologies are in use today to enhance environmental sustainability (Onyike, 2025). Also, Artificial Intelligence technology are in use in building industry for construction automation, property investment and management decision making, smart building management, predictive maintenance, sustainable and energy efficiency, urban planning and smart cities safety and risk management among others (Torbagham et al., 2017, Field & Desiree, 2018, Onyike, 2025). The Internet of Thing (IOT) has had a profound impact on property management by introducing a range of smart devices that continuously collect and transmit data. According to IOT Business News (2025), IOT enabled thermostats allow property manager to remotely control heating and cooling system, security system, offer real-time monitoring of property and produce alerts and notifications that keep property manager informed of security breaches or emergencies (Sado et al., 2015). Real-time property condition data which provide continuous updates on property conditions including temperature humidity and potential maintenance issues through which property manager predict when equipment or system may require maintenance or replacement (Sado et al., 2025, All Africa, 2013). Drones have been developed and deployed for use in building industry to monitor and inspect physical assets and notify users of deterioration and potential hazards, particularly in areas difficult to reach by workforce (World Bank, Arup, INTEGEMS, 2017).

Most projects missed deadlines in Nigeria, as a result of delays, integration of Artificial Intelligence (AI) tools can analyze massive data to create smarter project schedules predict potential decay and suggest ways to prevent them (Bello, 2025). For instance AI powered project management software can stimulate the entire construction process before it begins showing potential credibility. This level of foresight was not possible before. Therefore, AI integration is already proving to save time and money (Bello, 2025). Also, in Nigeria stories of accident due to negligence are common, however with the use of Artificial Intelligence (AI) this narrative is changing. AI driven cameras and drones are now being used to monitor construction sites in real-time identifying potential hazards and ensuring workers adhere to safety protocols (ICED, 2019). These tools also predict equipment failure before they occur and therefore reduce the risk of accident caused by malfunctioning machinery (Bello, 2025). Building collapse is arguably one of the most devastating disasters faced by many African countries, Nigeria inclusive. Nigeria has experienced a number of building collapses that have posed serious threat to human life and property (Adaji, 2024). Smart tools have been developed identified and deployed for use to prevent building collapse traditional methods of detecting building collapse rely on visual inspections and manual monitoring which is often time-consuming and ineffective (Adaji, 2024). However, with the advent of technologies it is now possible to detect building collapse more accurately and efficiently, smart sensors and Internet of Things (IOT) are being installed in buildings to monitor various parameters such as structural integrity, soil settlement and environmental factors (Adaji, 2024, Bala Mohammed & Adam Nabage, 2024). Another problem in the Nigeria construction industry is shortage of skilled labour, while the use of AI is not meant to replace human labour, it can certainly bridge the gap. For instance, smart machines and robotics are already being used for repetitive tasks like block laying or mixing cement and therefore freeing up human workers to focus on more complex activities (Bello, 2025).

Ultimately, the outcome of these digital transformation in construction industry and built environment should enable the improved efficiency and integration of public & private services and infrastructure, ensuring greater return on investment and value for money, enhance business opportunities, increased resilience for our infrastructure, our environment and our economy and lead to a better quality of life for the society (UK Bim Alliance, 2016). Unfortunately, despite these numerous benefits of technological innovations to the built environment in general and construction industry in particular research tends to focus on digital innovation in the built environment of the advanced countries rather than developing countries (ICED, 2019). There are very few studies investigating innovation in construction project in developing countries in general (Shi & Liu, 2019). And despite extensive work carried out on digitalization in specific regions of the world, there is a lack of knowledge surrounding the emergence, adoption and implementation of digital innovation specifically in the built environment of developing countries (Torhaghan et al., 2017) and real estate industry and construction industry in

particular has historically been conservative in its approach to technology and is slower to adopt new technologies than other industries (Reed & Richard 2016, World Economic Forum, 2016, Mckinsey 2017, Bim 2016).

Research Aim and Objective

This study aims to assess the level of knowledge of technological innovations among the professionals in the building industry and adoption problems in Nigeria. In order to achieve this aim, the objectives are to:

- investigate the experience of the professionals in the building industry
- investigate various perceptions of the professionals regarding their level of awareness of emerging innovation in the building industry
- identify the factors hindering innovation adoption in Nigeria.
- proffer suggestions to both professionals and government for digital literacy and policy support respectively.
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Justification for the Study

To address the socio-environmental challenges of the built environment and achieving a more sustainable and resilient future, building sector need to be continuously innovative (Ahmad, 2023). Most extant studies carried out focused on different areas, for instance Sado et al (2025) investigated tech-enabled property management strategies, Ahmad (2023) explores innovation on Green building projects, Collins (2023) compared traditional with tech-enabled property management strategies, Nesbit (2023) focused on best property management software for 2023, Roy (2023) examined property management software features Lish 2023 among others Guide.

Various reasons have been identified for the low use of technological innovations among the professionals in the building industry in Nigeria. however, the problem persists. Some of the areas that have not been extensively researched in relation to the use of technological innovations include: the level of awareness of the professionals in the building industry about emerging innovations. This creates a knowledge gap on digital innovations in the building industry in Nigeria. examining this area could create a better understanding of the potential benefits associated with the use of digital innovations in the construction industry.

Research Methodology

This study adopts a qualitative research design and purposive sampling procedure was used to select (50) fifty professionals in the building industry. These includes engineers, estate surveyors, land surveyors, quantity surveyor, the architects, the builders among others. Since innovation is a technical area of enquiry only building industry related professionals who have acquired reasonable years of experience in building development and management and who were able to provide the required information for this study were sampled.

Sampling Technique and Sample Size

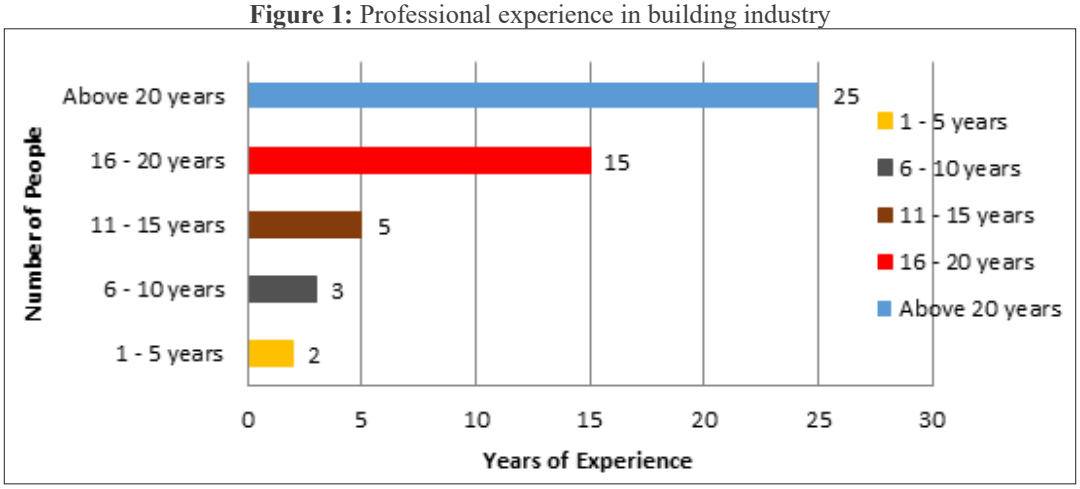
Purposive sampling procedure was adopted for the study. When using purposive sampling for qualitative research, the sample size is often determined by data saturation. Data saturation is a state/situation when the collection of new data does not shed any further light on issue under investigation (Baker et al., 2012, Morse, 2010, Mason, 2010). Guest (2006) suggested that (12) twelve interviews are enough for most research studies aiming to understand the common perceptions and experiences among a group of relatively homogenous individual, however in this study interviewed professionals are relatively heterogeneous i.e belonged to different professional roles, had varying experiences in building industry. As a result, reasonably large sample of 50 professional was used for the interview base data collection. Semi-structure interview were used since the study is primarily exploratory in nature. Information elicited include: professionals' year of experience in building industry, level of awareness by the professionals of various itemized building technological innovations and their perceptions on associated problems with innovation adoption in Nigeria.

Results and Discussion of Findings

Results

This section presents an empirical analysis of the data starting from the attributes of the professionals followed by the others as shown below

Figure 1: Professional experience in building industry



Source: Field survey 2025

Figure 1 above shows that majority of the professionals samples, 25 (50%) among have above 20 years of experience in the building industry in their respective job roles. This is followed by 15 years (30%). The least experience is 2 years (4%). This analysis shows that the professionals are well experienced in their respective job roles. Having varied number of years in building industry on varied job roles allowed the researcher to have more control and access to rich information about technological innovation in building industry in Nigeria.

Table 1: Perception on level of awareness of technological innovation among professionals in building of emerging innovations

Item	Statement	Response No Awareness (NA) (%)	Response Awareness (A) (%)
1	Computed Aided Design (CAD) can lead to the resolution of some issues in the design before the construction phase	39 (78%)	11 (22%)
2	Building information modeling (BIM) allows the professional team visualize and analyze design decisions and resolve issue in the design before the construction phase	32 (64%)	18 (36%)
3	Cloud computing has made it possible to access, share and collaborate in the use and application of data to any desired objectives	35 (70%)	15 (10%)
4	On the site Blockchain improves the reliability and trustworthiness of construction log Book, work perform and materials quantity recorded	38 (76%)	12 (24%)
5	Drones are used for surveying and mapping inspection and risk and safety management	39 (78%)	11 (22%)
6	3D scanner is for on-site surveying mapping, project inspection safety and other task	42 (84%)	8 16%)
7	Innovative technology features include renewable energy, energy efficiency, efficient use of water sustainable construction materials etc	35 (70%)	15 (30%)
8	Artificial Intelligence (AI) tools analyzes massive data to create smarter project schedules, predict potential delays and suggest ways to prevent them	40 (80%)	10 (20%)
9	Smart sensor and Internet of Things (IOT) devices can monitor various parameters such as structural integrity, soil settlement, environmental factors and enhanced predictive maintenance	32 (64%)	18 (36%)
10	Smart machine and robotics are being used for repetitive task such as blocklaying or mixing cement etc	37 (74%)	13 (26%)

Source: Field survey 2025

Table 1 above presents the data on the level of awareness of technological innovations among the professionals in the building industry. Table 1 reveals that 39 (78%) of the respondents affirmed that they have no awareness that Computer Aided Design (CAD) can leads to the resolution of some issues in the design before the construction phase while only 11 (22%) are fully aware. Furthermore, on item 2, 32(64%) lacks the knowledge that Building Information Modeling (BIM) allows the professional team visualize and analyze design decisions and resolve issue in the design before the construction phase, however only 18 (36%) are aware. Likewise in item 3, 35 (70%) of the respondent are not aware that Cloud computing has made it possible to access, share and collaborate in the use and application of data to any desired objectives while only 15 (30%) of the respondents are fully aware. Item 4, 38 (76%) of the respondents lack awareness that On the site Blockchain improves the reliability and trustworthiness of construction log Book, work perform and materials quantity recorded while only 12 (24%) affirmed that they are aware. Item 5, 39 respondents (78%) do not have awareness that Drones are used for surveying and mapping inspection and risk and safety management while 11 (22%) of the respondents do. Also, item 6 42 (34%) respondents lack awareness that 3D scanner is for on-site surveying mapping, project inspection safety and other task. However, only 8 (16%) have. Item 7, 35 (70%) of the respondents affirmed that they do not have the knowledge that Innovative technology features include renewable energy, energy efficiency, efficient use of water sustainable construction materials etc while 15 (30%) said they have the knowledge. Item 8, 40 (80%) of the respondents declined the awareness that Artificial Intelligence (AI) tools analyzes massive data to create smarter project schedules, predict potential delays and suggest ways to prevent them, while only a few respondent 10 (20%) are quiet aware of this fact. Item 9, 32 (64%) of the respondents said they are ignorant of the fact that Smart sensor and Internet of Things (IOT) devices can monitor various parameters such as structural integrity, soil settlement, environmental factors and enhanced predictive maintenance while 18 (26%) affirmed that they are aware of this fact. Lastly, item 10, 37 (74%) of the respondents

declared that they lack the knowledge that Smart machine and robotics are being used for repetitive task such as blocklaying or mixing cement etc while only a few respondents 13 (26%) affirm that they are quiet aware of the fact. In summary, from the analysis above, it can be concluded that majority of the professionals in the building industry have no knowledge and awareness of the emerging technologies and innovations in the building sector.

Table 2: Chi-Square showing the perceived associated problems with adoption of emerging technological innovations in the building industry in Nigeria

Item	Professionals' Perceived Problems with Emerging Innovation Adoption	SD %	D %	A %	SA %	Chi-Square x^2/*p*-value
1	Technology often face challenges related to initial cost	0	0	42 (84%)	8 (16%)	26.120 0.000
2	Risk of uncertainty	0	0	38 (76%)	11 (22%)	15.680 0.000
3	Lack of government support or appropriate policies	0	0	38 (76%)	12 (24%)	13.520 0.000
4	Lack of awareness and complete ignorance of the emerging technologies	0	0	10 (20%)	40 (80%)	18.00 0.000
5	Resistance to change	0	7 (14%)	34 (68%)	9 (18%)	27.100 0.000
6	Shortage of infrastructure to support emerging innovations in Nigeria	0	0	10 (20%)	40 (80%)	18.00 0.000

Source: Field survey 2025

Table 2 above presents a chi-square assessing the perception of the professionals in the building industry, if they significantly associated with the listed problems of technology innovation adoption in Nigeria. The analysis categorized participants responses into four options: Strongly Disagree (SD), Disagree (D), Strongly Agree (SA) and Agree (A). Each item includes the percentage, the corresponding chi-square (x2) with probability value (p-value). The analysis revealed a significant issue with item 1 where substantial majority of the respondents 42 (84%) affirmed that initial cost and high implementation and operation cost are responsible for non-adoption of the emerging innovations in Nigeria. This is further shown by a chi-square value of 23.120 and a p-value of 0.000. This indicates a strong statistical significance highlighting initial cost, implementation and operation costs as critical barriers to technological innovation adoption in the building industry in Nigeria. A significant concern is raised regarding rise of uncertainty with 39 (78%) of the respondents Agreed and 11 (22%) strongly agreed that the risk of uncertainty occasioned by the strange and unfamiliar of the emerging innovations to the developing nations in general and Nigeria in particular brings about doubt about their adoption. The perceived consequence of adopting unknown technologies is a barrier. The chi-square of 15.680 and p-value of 0.000 indicate significant agreement with this issue. In item 3, the majority of the respondent 38 (76%) agreeing and 12 (24%) strongly agreeing highlight that lack of government support and appropriate policies, are barrier to technological adoption in Nigeria. This is supported by a chi-square value of 13.520 and p-value of 0.000. This suggests that technological adoption typically requires government support to be successful. Item 4, 40 (80%) respondents strongly agree and 10 (20%) agree that low level of awareness of the emerging technological innovation is responsible for lack of their adoption in Nigeria. The chi-square value of 18.00 with p-value of 0.000 underline the significance of addressing the issue of awareness for effective adoption. Item 5 shows that 34 (68%) agree and 9 (18%) strongly agree that resistance to change among the people who are already used to the traditional technologies is a significant concern with the chi-square of 27.160 and p-value of 0.000 indicating the statistical significance of the problem suggesting that the unwillingness of people to change to new Technological solutions hinders adoption of innovations in Nigeria. Lastly, Item 6 shows that 40 (80%) of the respondents strongly agree and 10 (20%) agree that shortage of digital infrastructure and enabling environment is responsible for lack of adoption of the emerging innovations in Nigeria. This fact is confirmed by the chi-square of 18.00 with p-value of 0.000 which suggest a strong association of the perception of the professionals with the issue. Suggesting that enabled environment and digital infrastructure is important in enhancing emerging innovations in the developing countries in general and Nigeria in particular.

Discussion

The finding that there is low level of awareness of the emerging technological innovations among the professionals in the building industry corroborates the observation of Torbaghan et al 2017 & Chakrarathi & Aravm Dan 2019 that there is a lack of knowledge surrounding the emerging adoption and implementation of digital innovation in low income countries. Also, there are very few studies investigating innovation in construction projects in developing countries in general as observed by Shi and Liu (2019).

Moreover, the perceptions of the professionals in the building industry about the problem associated with technological adoption in Nigeria are in tandem with (Richard & Reed, 2021) who observed that real estate industry has historically been conservative in it's approach to technology and is slower to adopt new technologies than other industries. The

strong statistical significance associated with such item as lack of government support and appropriate policies indicate a pressing need for reform and public awareness. This is in tandem with Takolo, Taraloo and Panzi (2021) who in their study asserted that innovation adoption typically requires policy support and changes in consumer behavior. It is also in conformity with Bim (2016) which affirmed that the main benefit of the project is to explore how through the "processes and people". It could be possible to understand the challenges related to technological adoption in the low income countries. Initial and operations costs as barriers to innovation adoption corroborated the study by World Economic Forum (2016), Mckinsey (2017), Bim (2016) and Fu et al. (2014) who observed that a lack of access to credit are the main challenges to innovation adoption. The adherence to traditional technologies and not willing to change by the professionals and people in the developing countries corroborates the study by Adaji 2024 who observed that people often prefer to use traditional technology for property inspection in order to detect defects and preventive maintenance, however, these methods often fail and ineffective.

Recommendations

In order to overcome challenges faced by the building industry with the use and adoption of the emerging digital innovation in that sector, the following are recommended:

1. Skill Gap: professionals in the building industry must acquire digital literacy skill (awareness) to be able to understand the effective use of the emerging innovations. This could be done by launching comprehensive digital literacy initiative to empower users with the skills to navigate the digital landscape responsibility. Digital literacy programme should target diverse demographics to bridge the digital divide in the developing countries.
2. Continuous Evaluation: It should be recognized that digital transformation is an ongoing process. Continuously evaluating the effectiveness of strategies adapt to evolving technologies and remain responsive to user needs and sustainability goals is very important.
3. Government initiative and tax incentive: These initiatives and incentives could be to encourage investment in emerging innovation and technologies. For instance, Green financing initiatives of Nigeria is meant to enhance investment in sustainable development.
4. Access to Credit facilities from financial institutions to finance the emerging innovations should be made possible by the government.

References

1. Onyike, J. A. (2025) Technological Innovations and Strategies for a Sustainable Built Environment International Conference Faculty of Environmental Science Imo State University, Owem, Nigeria
2. IOT Business News. (2023). Why IoT Is The Future Of Property Management. IOT Business News. https://iotbusinessnews.com/2023/04/19/05657-why-iot-is-the-future-of-property-management/
3. Collin, A. J., & Trevillion, E. (2020). Real Estate Investment: Theory and Practice Springer Nature, 288-290.
4. Reed, R. & Sims, S. (2021). Property Development. (6th edition). Rontledge
5. Valley, V. (2020). Modernizing Real Estate: "The Property Tech Opportunity" Forbes.
6. Field & Desiree. (2018) "Automated Landlord" city Road Podcast (podcast).
7. Josh, E. (2016). Buildings are Grant Computers Product Research at Wework Blog.
8. ICED. (2019). Digital Innovations in the Built Environment in Low Income Countries: diagnostic Report & Implementation Opportunities. https://ukgreencitiesandinfrastructure.org/wp-content/uploads/2019/07/Digital-Innovation-in-the-Built-Environment.pdf
9. Arup (2018). Block chain technology report. Retrieved from https://www.arup.com/perpective/publications/research/section/blockchain-technology
10. Shuttleworth, L. (2024). Eco friendly Buildings explained and five ming blowin example https://climatesort.com
11. Serafe Ozeta Zehracanna Girgin. (2017). Innovation Technologies in Green Buildings and Utilization.
12. Brown, J. R. (2023) Property Management: Definition, roles, types and duties. Investopedia https://investopedia.com/terms/p/proeprty.management.asp
13. Sado, R. O., Jinanwa, C. U., & Ndeche, C. B. (2025) Assessment of tech-enabled property management in Awka, Anambra State International Journal of Real Estate.
14. Roy, R. (2023). Property Management Software feature list 2023 Guide https://www.selecthub.com/property-management/property-management-software-feature
15. Olukotun, S. A. (2025). Understanding Green Building, Innovative Materials and Technologies in enhancing Sustainable Development International Conference Faculty of Environmental Science (Proceedings) Imo State University, Owerri, Nigeria
16. Torbaghan, M. E., Lulu, C. A., & Burrow, M. (2017). Application of digital and innovative construction on technologies in low-income countries. Report retrieved from https://www.gov.uk.dfld-research-outputs/applications-of-digital-and-innovate-construction-techniques-in-low-income-countries
17. All Africa. (2013, May 23). Uganda: Big Data to Drive private water investment projects. https://allafrica.com/stories/201305240016.html
18. World Bank Arup INTEGEMS Right EDA. (2017). Affected Buildings and household in Kamayama/Malamojuba/Karingo and Lumley neighborhoods image. Retrieved from https://www.gfdrr.org/sites/default/files/publicatio/sierra0leone-Dal-a-web for printing pot
19. BIM. (2016). Why autodesk is heading to Rwanda. Retrieved from: https://www.bimplus.co.uk/people/why-autodesk-heading-riwander
20. Adaji, D. (2024, July 18). Smart tools for preventing building collapse Punch Newspaper 2024. https://punchng.com/smart-tools-for-preventing-building-collapse/

21. Bala Muhammed I. & Adam Nabage, Y. (2024) Smart Technology Integration: SNA and BIM for preventing building collapses. African Journal of Advances in Science and Technology Research, 17(1), 69-88.
22. UK BIM Alliance. (2016). BIM in the UK: past, present and the future repost retrieved from: https://www.ukbimalliance.org/media/1050/ukbim-bim0review-past-present-future-2016/019-iPDF
23. World Economic Forum. (2026). What is the future of construction industry? https://www.weforum.org/stories/2016/04/building-in-the-fourth-industrial-revolution/
24. McKinsey, (2017). Imagining constructions digital future. Retrieved from https://mckinsey.com/industrial/capital-project-and-infrastructure/our-insight/imagining-constructing-digital-future
25. Collins, G. (2023). Traditional vs Tech-enabled property management. Retrieved from https://managecasa.com/article/traditional-vs-tech-enabled-company/
26. Nesbit, J. (2023). 9 Best Rental Property management software for 2023 https://www.rocketmortgage.com/learn/property-mamangement software
27. Baker, S. E., Edward, R., & Doldge, M. (2012). How many qualitative interview is enough? Expert voices did early career reflections on sampling and cases in qualitative research 2012 available on https://eprint.brighten.as.uk/id/eprint/11633
28. Morse, J. M. (2000) Determining sample size SAGE publishing. Thousand Oarks CA USA 2000 McGraw Hill Construction (2012) world green building trend: Business Benefit driving new and rettrafit market opportunities in over 60 countries in https://uigbc.org/ai
29. Mason, M. (2010). Sample size and saturation in PhD studies using qualitative interviews forum Qual. sozialforschum/forum Qual soc.res, 11, 3.
30. Guest, G., Bunce, A., & Johnson L. (2006). How many interviews are enough? An experiement with data saturation andvariability. FieldMethods, 18(1), 59-82. DOI: https://doi.org/10.1177/1525822X05279903?urlappend=%3Futm_source%3Dresearchgate.net%26utm_medium%3Darticle
31. Chakravaarth, D. P., & Aravindan A. (2019). A study of financing for sustainable construction projects. International Journal of Recent Technology and Engineering (IJRTE), 7(6c2), 1-5. https://www.ijrte.org/wp-content/uploads/papers/v7i6c2/F10310476C219.pdf
32. Jones, Collin A, Trevillion Edward. (2022-08-18) Real Estate Investment: Theory and Practice, Springer Nature PP 288-290 ISBN 978-3-031-00968-6