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EVALUATION OF THE ROLE OF INSURANCE POLICIES IN WORKPLACE SAFETY RISKS IN CONSTRUCTION PROJECTS IN MINNA, NIGER STATE, NIGERIA

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Construction workers are continuously liable to health and safety (H&S) risks resulting into accidents on site. One of the ways the risks could be mitigated is through insurance. Unfortunately, despite the availability of H&S policies with specific insurance and risk management considerations; injuries, fatalities and death from construction related activities appear unabated. This study evaluated the role of insurance policies in workplace safety risks in construction projects in Minna, Niger State, Nigeria. A quantitative research approach was adopted using structured questionnaire. Data were collected from twenty-two (22) purposively selected professionals from public client's organisations, contractor's organisations and insurance companies. Percentage and Mean Item Score (MIS) were used for data analyses. Findings from the study revealed that the contractor shows more willingness in complying with the undertaking of insurance policies for projects being executed than the client. It was found that the most important types insurance policies are Worker's Compensation Insurance (MIS = 4.82) and All-Risk Policies (MIS = 4.73). It was also shown that the most significant roles of insurance policies in workplace safety risks are Guarantees the success of projects (MIS = 4.73) and Averting hazards to the workers and the projects and liabilities to the insurer (MIS = 4.68). The study concluded that the role of insurance policies in workplace safety risks in construction projects in Minna is significant. It was recommended that Government regulating agency in-charge of ensuring compliance with insurance policies should organize orientation programme and regular monitoring of contractors and clients to ensure strict compliance.

BLOCKCHAIN TECHNOLOGY INNOVATION IN SUPPLY CHAIN MANAGEMENT: PERCEPTION OF SUPPLIERS IN THE CONSTRUCTION INDUSTRY IN DEVELOPING COUNTRIES

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Purpose - The purpose of this study is to investigate the level of awareness of stakeholders within the construction supply chain management (CSCM) to the adoption of Blockchain technology innovation in construction for proper monitoring, transparency, and traceability of materials during construction process.

Design- A preliminary study of archival literature was carried out to identify the areas of application of Blockchain technology in the construction industry. Data were collected using a questionnaire survey targeting 178 Contractors and Suppliers in Lagos, Nigeria. Data were analyzed using descriptive analysis by calculating the Mean item score and standard deviations. Also, Mann-Whitney U-test was used to check if a statistical significant difference exists between the views of contractors and suppliers. Data collected was analyzed using SPSS.

Findings – The study revealed that even though stakeholders are familiar with some aspects of blockchain, such as cryptocurrency, they are not extensively aware of the application of blockchain technology in the construction industry, especially in construction supply chain management and logistics management. Therefore, this research recommends that the Government and policymakers fully embrace blockchain technology by lifting its ban allowing stakeholders within the construction industry to operate.

Research limitations/implications

This research focuses on the awareness of blockchain technology in the Nigerian construction industry.

Practical implications

The findings of this study will help policymakers develop more constructive strategies to enlighten stakeholders in the construction industry about the concept of blockchain technology and its application. The study suggested that training and workshops should be encouraged.

Risk factors leading to construction cost overruns

Makgopa Tshela (University of South Africa).

Most of the construction projects fail to be completed within cost and time. The purpose of this study was to determine the factors responsible for construction cost overruns. The study employed a quantitative research approach. Data was collected with a survey questionnaire from professionals involved in the design and execution of projects within the construction industry, based in Gauteng province in South Africa. The respondents include Architects, Engineers, Construction Project Managers and Quantity Surveyors. Results of the survey were analysed using the relative importance index statistical method, which resulted in the identification of top ten major causes of cost overruns. The overall results reveal that incompetent contractors, lack of project risk governance, poor project controls, inadequate communication and slow decision making, lack of appropriate planning, payment delays by clients, lack of knowledge about the project and its complexity, insufficient planning and inaccurate estimates, ineffective decision making process and poor contract management; were perceived as the major risk factors for construction cost overruns. Project management companies could use the results of this study to develop good practices to improve the effectiveness of control of projects.

IMPACT OF COVID-19 ON PROGRESS OF ROAD CONSTRUCTION PROJECTS DELIVERY IN NIGER DELTA REGION, NIGERIA

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Purpose: This study identified covid-19 challenges impeding the progress of road construction projects in the study area and determined the strategies that could mitigate the impact to enhance the delivery of road construction projects embarked upon by the Niger Delta Development Commission (NDDC) in the Niger Delta region as a case study for such projects in Nigeria. Design/methodology: Data were collected from registered contracting and consulting firms through questionnaires administered to conveniently selected engineers, quantity surveyors, and contractors who were actively involved in the execution of NDDC road construction projects. The data were descriptively analysed. Findings: The study revealed that the challenges hindering the progress of road construction projects executed by NDDC in the era of covid-19 include the imposition of lockdown, financial constraint, time constraint, inflation/exchange rate. The significant strategies for reducing the impact of Covid -19 include government policy that could stimulate innovation among the constructors, the release of funds by the commission (grants, no-interest loans), and partnering with dependable cooperators. Research Limitation/Implication: The data were sourced through only the professionals actively involved in the execution of NDDC road construction projects compared to the nation's population of such professionals. The data for the study was restricted to road construction projects executed by NDDC. These limit the generalisation of results. Practical Implication: Disinterring the challenges posed by the pandemic prepares the construction professionals and policymakers towards precautionary measures through innovative strategies.

AN ASSESSMENT OF RISK FACTORS IMPACTING COST VARIABILITY IN NIGERIAN CONSTRUCTION PROJECTS

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According to a review of different authors' work, there are numerous risk factors that could impact the final account sums (FAS) of construction projects, causing variations in contract sum (CS). By minimising the variability between the final account sum FAS and CS, a compelling risk study could help resolve this issue. This research is concerned with the variance amidst CS and FAS while assuming that the observed variance is due to risk. The research adopted a convenience sampling technique, non-probability, purposive and definitive. Data was collected through a questionnaire survey from 43 stakeholders that showed interest from the identified 55 experts in the Nigerian construction sector during a conference organised by the Quantity surveyor's registration board of Nigeria (QSRBN). A quantitative investigation identified the critical risk factors that influence the precision of CSS. The findings demonstrated a - 28.32percent to + 27.52 per cent variance between FAS and CS (cost variability). These check disparities in construction project planned costs during construction and the observed risk factors considered the concern of project advisors. In

addition, the study offers practical solutions that suggest creating an effective mitigation plan for the construction sector by utilising a framework that supports risk management in project delivery. As a result, five highly significant risk variables in traditionally procured construction projects that initiate variance amidst CSS and FAS: Poor programme scheduling, other risks, Availability of design information, Fluctuation and Type of client, which will be considered to develop a construction project risk management framework that will encourage sustainability of the Nigerian construction industry.

The impact of COVID-19 health and safety requirements on the cost of construction projects in South Africa.

Faith Dowelani (University of Pretoria), Musimuni Dowelani (University of Johannesburg) and Yaw Yeboah Asuamah (Independent).

The South African construction industry has played a significant role in the country's economic development and growth. COVID-19 has had operational and financial impact on the industry due to the implementation of COVID-19 safety measures; as stipulated in the COVID-19 Occupational Health and Safety Measures in Workplaces Guidelines of March 2020. This study therefore assesses the impact of COVID -19 health and safety requirements on the cost of construction projects in South Africa. The researchers employ a survey research method and collects primary data from construction professionals using a questionnaire, which is then analyzed quantitatively. The research is limited to projects that were in construction in the Republic of South Africa when a National State of Disaster was declared on 15 March 2020. Projects are not differentiated by the lockdown level as amended by the Government from time to time. Preliminary results and analysis show that there was an average increase of 6% in project costs however only 78% of all projects used the government stipulated health and safety requirements. The findings will help construction managers improve financial contingency plans and provisions for unexpected expenditures.

Enchanting Women's Interest in the Construction Industry: The Role of Digitalisation

Lerato Malatji (Nelson Mandela University) and John Smallwood (Nelson Mandela University).

Although it is widely accepted that the construction industry will continue to be dominated by males as women are seldom given the benefit of the doubt to showcase their capabilities and skills, the use of Construction 4.0 technologies could be the catalyst in terms of providing flexibility and mobility of women professionals within the South African construction industry.

In light of the above and the advent of digitalisation, a quantitative study, which involved completing a self-administered online questionnaire, was conducted among architects, construction managers, engineers, and quantity surveyors within the construction industry to determine the potential of digitalisation being a framework to attract and retain women in the construction industry.

The salient findings are: the construction industry is a male-dominated sector; there is a general lack of women participation and involvement in the construction industry; digitalisation could be a useful tool to enchant the interest of women in the industry; the construction industry entails high workloads, and long hours; a patriarchal culture that threatens people's work-life balance exists in the industry; there is non-adherence to the constitutional equality clause; digitalisation can help enchant women's interest and involvement in the construction industry, and the construction industry possesses optimism towards digitalisation whilst showing reluctance in its implementation.

Based on the findings, it is concluded that: there is gross gender inequality in the South African construction industry; the construction industry is perceived as a male-dominated sector, and the construction industry will be able to utilise Construction 4.0 technologies for day-to-day work, which should improve systems, afford women professionals flexibility and mobility, thereby making the sector more enchanting to women.

It is recommended that: the construction industry adheres to the constitutional and statutory prescription of equality and promote equality between female and male employees; digitalisation be used to enchant and retain women in the construction industry, and education and awareness with respect to the construction industry should be realised among young female and aspiring graduates who want to work in the construction industry.

Factors leading to construction claims in a multi-contractor set-up

Makgopa Tshela (University of South Africa).

Mega construction projects have various scope executed by more than one contractor. Poor coordination of the scheduling and execution of the contractors can lead to very exorbitant claims. The purpose of this study was to determine the factors that can lead to construction claims. The research adopted qualitative methods and secondary

data analysis of the literature was conducted and emerging themes were identified. The findings of the study reveal that factors responsible for construction claims include contracts management, constructability, access to site, and coordination of the work of the contractors, incompetence of contracts managers responsible for claims and poor planning. Construction management companies should work together with the employer to develop practices to manage construction activities in order to avoid claims.

Sustainability of Working capital Management of SMMEs in times of crisis

Lesego Mothowagae (University of South) and Makgopa Tshehla (University of South Africa).

One of the challenges faced by SMMEs during crisis is the management of their working capital requirements. The purpose of the study was to evaluate the sustainability of working capital management requirements for SMEs during crisis. The study adopted a quantitative method and the data was collected through a survey questionnaire from SMEs in the construction industry in Gauteng province, South Africa. Data analysis was undertaken using descriptive statistics. The findings of the study reveal that businesses adopt working capital management practices, have key value metrics for working capital management, consistently review their working capital, and actively manage working capital in times of crisis. Working capital was also identified as a key performance metric and mainly driven by top management in the company. The study contributed to the body of knowledge by providing information on the importance of working capital in small businesses during a crisis and it also showed that working capital is viewed as a key performance indicator during the crisis by small businesses.

PARETO ANALYSIS OF THE COVID-19 PANDEMIC IN NIGERIA

Dele Kadiri (Obafemi Awolowo University).

The Pareto Rule states that for every event, 80% of the effects come from 20% of the causes; hence, it is also called the 80/20 Rule. The implication of this Rule for the COVID-19 Pandemic is that, 80% of the reported cases must come from 20% of their locations. This paper presents analyses of the laboratory-confirmed COVID-19 cases, recoveries, deaths, tested samples and active cases in Nigeria with a view to confirming if the Rule held for the Pandemic in Nigeria. Data for the reported cases for each of the five aspects of the Pandemic between March, 2020 and January 16, 2022 were obtained from the website of Nigeria Centre for Disease Control and analysed using Pareto Analysis. The results of the analyses indicated that for all the five aspects of the Pandemic investigated, the Pareto Rule did not hold. This means that in none of the aspects (confirmed and active cases, recoveries, deaths and tested samples) did 80% of the cases come from 20% of the locations. However, in all the five aspects of the Pandemic investigated, 73% of the cases occurred in 19% of the locations. The study concluded that the Pareto-based rule for the COVID-19 Pandemic in Nigeria is 73/19.

Environmental justice in road transport infrastructure in Global South: A critical review

Dillip Das (University of KwaZulu Natal).

Realizing the importance of road infrastructure, many countries in the Global South have focused on the development of road transport infrastructure. To prevent the impact of such development provisions for Environmental Impact Assessment (EIA) and environmental clearance have been made. However, two challenges are experienced. First, EIA is conducted and environmental clearance is sought at a macro level (e.g., regional level) and local contexts are undermined. Second, the EIA is more of a technical exercise and environmental justice is not considered. Environmental justice being a critical issue that is related to the legislation, distribution, equity, and recognition of people in the development process, using the context of the Global South, the objective of the study was to explore how and why environmental justice (EJ) is relevant, what strategic and policy interventions have been suggested or implemented and how it can be improved in road infrastructure development. The study was conducted through a critical review of literature from a combination of sources that include peer-reviewed journal and conference proceedings articles, books and book chapters, published and unpublished reports, web and newspapers articles, etc. The findings of the study were categorized under several themes such as the relevancy of EJ in road infrastructure development both at the macro and micro level, EJ in EIA process, the linkage between road infrastructure development process and different types of EJ, strategic approaches to improve EJ, and future paradigms to improve EJ in road infrastructure development. Findings suggested that all the three types of EJ (distributional, procedural and interactional) have been largely undermined in road infrastructure development in Global South. Strategic and policy measures are limited to the conduct of EIA and environmental clearance. The local contexts, people's participation and recognition have been undermined. The paper argued that a holistic approach with more objective and clear legal provisions, expansion of the purview of EIA by the inclusion of local contexts and reinforcing the participation of people and consideration for context-specific socio-political aspects that include recognizing peoples needs, preferences and values for a safe, fair and nondiscriminatory environment are needed to improve EJ in road infrastructure development in Global South.

Post-Privatization Performance of Power Generation Companies in Nigeria

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Nigeria's power sector has not been able to cater for the nation's power needs, despite efforts by the government to manage the sector. To improve performance, the sector was privatized, an exercise described as the boldest privatization initiative in the global power sector over, with a transaction cost of about \$3.0bn. However, there are indications that this has not solved the massive service delivery failure, infrastructure deficit, poor return on investment, massive retrenchment, as well as escalation in electricity tariff challenges of the sector. The investment in the sector could have ensured a minimum of 20,000MW power generation, however, the operational generation capacity of the sector has dropped by 33%, after eight years of privatization. Additionally, only about 23% of the cost of electricity production is recovered, while accruing revenue has fallen by 85%. The 144KWh power consumption per capita in Nigeria is low, compared to other African countries such as South Africa (4229KWh), Egypt (1699KWh), Libya (1841KWh). This paper would evaluate the post-privatization performance of the Generation Companies (GENCOs), using a case study approach. The outcome of this study could become a policy guide for the regulators and financiers of the power sector in Nigeria.

Examine the Usage of Lean Production Approach in the Construction Industry

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Purpose: The usage of lean production approach in construction projects results in enhanced productivity, waste reduction, cost reduction, quality improvement, increase profits, and effective handling of materials, among other things. This study focuses on the examining the lean techniques/tools, and its impacts on projects. Design: A qualitative approach was adopted in the study which included a literature review and collective case study investigations. Research limitations and implications: The researchers was denied access to some construction projects within the study area (Abuja, Federal Capital Territory of Nigeria), despite the assurance of anonymity and confidentiality. In some cases, where access was allowed, taking photographs on site were major challenges for the study. Finding: The study showed that most lean construction techniques/tools were not utilised, which has a negative impact on the construction projects. Practical implication: Ensure that top management adopts the culture of training and developing their staff on new managerial tools and techniques for construction project, such as the lean production approach. Construction professionals, contractors and clients should be informed on the benefits of the lean production approach in the construction industry.

Assessing the efficacy of leading and lagging indicators in measuring safety maturity of construction firms

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Safety maturity is reflective of a firm's level of experience, responsibility, interdependence, and reliability regarding occupational health and safety at varying organizational levels. Although previous studies have highlighted the significance of attaining and maintaining high level of safety maturity by construction firms, there has been divergent arguments on the efficacy of the differing approaches to measuring the construct. In this regard, this study aims to provide better insight on the subject matter by assessing the safety maturity of construction firms using both the leading and lagging indicators approach. A quantitative research approach will be adopted, where the population of the study will comprise of construction firms in Nigeria. Data will be elicited from the selected study sample using a structured questionnaire that will be divided into two sections. The first section will be designed to assess the safety maturity of the firms using lagging indicators only, while the second section of the questionnaire will be designed to assess their safety maturity using leading indicators only. A comparative analysis would be done using both inferential and descriptive statistical methods to ascertain the efficacy of the two approaches based on the actual safety performance of the firms. Findings of the study will provide insight on the approach that is more effective which would allow for subsequent utilization and continuous improvement.

Strategic decisions impacting construction organisation performance, evidence from South Africa.

Kehinde Alade (University of Cape Town) and Abimbola Windapo (University of Cape Town).

This study examines the strategic decisions of construction company leaders in South Africa. The central objective of this study is to determine how the strategic decisions of construction company leadership impacts on the organisation's performance. The rationale of the study stems from continuous failure of large contractors and the view of some scholars that leaders make the difference. However, there are limited studies that investigate the strategic decisions of construction leaders and how it affects the company health and survival. First, the study used a qualitative approach employing semi-structured interviews to obtain information from twelve CEOs of construction companies with head office in the Western Cape, South Africa and listed in grades 6-9 of the cidb Register of Contractors. A survey of large contractors was then carried out across the nine Provinces of South Africa. The findings of this study reveal that decisions on change and innovation have the most impact on organisational performance. The findings explain that strategic decision is a major role in construction company leadership. The leadership of construction companies is expected to cast visions, channel new opportunities, and reposition their companies according to the current and future economic situations.

Key drivers of construction cost changes during the project life cycle in South Africa.

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Purpose: Many construction projects have experienced cost underruns with no research to investigate the drivers for the cost underruns. Hence, this study investigated the key drivers of construction cost changes in the South Africa. Design: This study employed a sequential mixed method research approach in obtaining data that answers the research aim and objectives. Research limitations and implications: The focus of research in the field of construction cost changes on construction projects has been limited to cost overruns. A collective investigation of the drivers of construction cost overruns are as important as the drivers of cost underruns on construction projects. Findings: The significant finding of this study shows that inadequate project preparation and planning leads to having incomplete designs at the time of tender and unrealistic pre-contract estimates. Practical implications: It is important for client to have a clear and comprehensive project brief at the inception stage to minimise variations during the construction stage, as well as to allow for sufficient time for planning and scheduling of work to be done.

Risks for Developing Country Consulting Engineers in Design-Build Construction Projects

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Existing literature has extensively explored the risks that design-build (DB) projects hold for contractors and project owners, and to whom these risks should be allocated. However, there seems to be little written about the risks that consulting engineers face in the various roles that they play during the DB process. This paper seeks to address that knowledge gap.

This paper therefore aims to investigate the risks for consulting engineers participating in DB construction projects in developing countries, by synthesizing known risks from literature with knowledge about the new roles that consultants play in the DB process.

Consultants typically play one of four roles in the DB process, namely as a criteria consultant, bridging consultant, oversight consultant or Designer-of-record. The paper identifies that in these roles, a consultant may be exposed to 24 unique risks. Many of these risks are inherited through contractual agreements with other parties and may therefore not be obvious or known, especially to consultants who are inexperienced with the DB process.

Fortunately, many of these risks can be mitigated by building good professional relationships based on trust, transparency, and collaboration. Good communication skills are therefore believed to be a key skill for success in the future. It is recommended that consulting engineers actively work to improve their professional communication skills.

The contribution of technology in public procurement infrastructure projects in South Africa

Tselane Chicks (Denel) and Makgopa F Tshehla (Unisa).

The purpose of this study is to demonstrate the contribution of technology in the achievement of public procurement objectives. Exploratory, qualitative approach is used to probe the main practices used by public organisations when engaging in E-procurement activities. Major benefits and challenges of implementing E-procurement in competitive bidding and other essential public procurement practices are discussed in relation to the research questions which the study seeks to explore. Data is gathered through peer reviewed documents and analysed using thematic analysis method. The study findings indicate a positive relationship between E-procurement and efficiency in open or competitive procurement. Yet, despite the benefits that can be derived from both the E-procurement and E-tendering, public entities in South Africa, like in most of Africa, has not fully migrated to E-procurement with some procurement activities still handled manually. The paper is limited to similar construction organisation in Africa. The study hopes to contribute to public procurement by focusing on the submission of proposals which is still a manual process and regarded as one of the functions in the E-bidding that is prone to delays, inefficiencies and mistakes.

Conceptualizing governance's influence on public-sector infrastructure delivery

Refiloe Maletle (university of witwatersrand) and Nthatisi Khatleli (university of witwatersrand).

For society and the economy to be able to build long-term infrastructure, governance is essential. It makes a substantial contribution to more inclusive economic, social, and environmental conditions, which can help to increase growth. The government plays a crucial and possibly reflective role in infrastructure delivery. The scale of society's infrastructure demands is rapidly outpacing the government's ability to provide such. Infrastructure project delivery is hampered by a lack of governance, process, and sufficient institutional frameworks. A failure to build the required governance and institutional structures to handle these challenges has also occurred. The current focus on infrastructure suggests that governance change is required in response to current demands. The study examines empirical data on governance in infrastructure efforts in public organizations. Data was gathered through a rigorous qualitative literature review. The study's limitations include the fact that it focuses solely on the public sector and excludes private businesses. The findings reveal current governance arrangements are ineffective. Governance and institutional arrangements were discovered to have a significant impact on the process of infrastructure development and service provision, highlighting the need to improve the current governance arrangement to make it more effective and compatible with existing infrastructure needs and requirements.

SHOULD ALL CONSTRUCTION CONTRACTS BE NEGOTIATED USING INTEGRATED PROJECT DELIVERY ("IPD") PRINCIPLES?

Abiola Aderibigbe (Liverpool John Moores University) and Nnedinma Umeokafor (Liverpool John Moores University).

Problem: Adversarialism is an endemic feature of the construction industry, resulting in devastating effects on productivity, cost, performance and client satisfaction within the industry. This can be explained by various factors of which adversarial 'traditional' construction contracts is one. These traditional contracts rigidly delineate responsibilities with much elaboration on the consequences of failure (e.g., milestone penalties, and liquidated damages), reinforcing self-protective behaviour and instilling mistrust among contracting parties. Adversarial 'traditional' conflict type contracting is still the norm in the industry. To establish sustainable construction practices, a change in contractual approach towards construction contracts is needed.

Purpose: This paper aims to demonstrate whether the IPD principles have the potential to address adversarialism, hence should be adopted in construction contract negotiations. IPD is a method of delivery which fully integrates collaborative working amongst parties. Its principles are: (i) mutual respect and trust, (ii) mutual benefit and reward, (iii) collaborative innovation and decision making, (iv) early involvement of key participants, (v) early goal definition, (vi) intensified planning, (vii) open communication, (viii) appropriate technology; and (ix) organisation and leadership

Design: Using IPD principles as a framework, this paper draws on existing case studies and extant relevant literature to determine the workability (i.e. how and why), challenges and implications associated with their use.

Preliminary Findings: There are indications that the use of IPD philosophy/principles have resulted in a reduction in adversarial contracting and/or behaviour thus improving project performance (productivity, cost, performance and client satisfaction). However, challenges such as fragmentation within the industry, unfair risk allocation and implicit distrust in the supply chain make perceived implementation difficult and unpalatable. Therefore, certain questions like how to achieve fair risk allocation need to be addressed. Objective methods of testing this could be one of the solutions could be a way to address this.

Research Implications: This paper provides a platform for further research where propositions and/or hypotheses in it can be tested empirically.

Practical Implications: The thesis of this paper will be tested empirically as part of a PhD programme. Additionally, it stimulates discussion in the industry and academia (particularly in the UK) on an alternative approach to tackle adversarialism in the industry, thus reinforcing good faith-like clauses and behaviours within the industry.

Conceptual construction safety archetypes to improve worker behavior to improve safety in road construction projects

Dillip Das (University of KwaZulu Natal).

Occupational health and safety (OHS) in a dynamic work environment of road construction projects are influenced by human factors or worker behaviour. Several studies have been conducted on OHS management by using analytical methods both in developed and developing worlds. However, the mechanisms that underline the occurrence of accidents and improve safety, specifically concerning worker behaviour at road construction sites have not been explored explicitly in developing countries. Therefore, using the context of road construction projects in developing countries, the objective of the study is to explore causal feedback relationships among different worker behaviour factors and develop a conceptual safety archetype to examine the mechanisms that cause the occurrence of accidents and also improve safety. A conceptual System Dynamic (SD) Modelling method premised upon the Systems Analysis approach was used to develop the causal relations and the archetype and extract the mechanisms. Evidence from literature was used as a precursor for the development of the causal relations that underpin the archetype and mechanisms. The findings suggested that accidents occur because of violation of safety codes and practices, which was an outcome of poor worker behaviour because of poor attitude and/or pressure on workers to complete the job in haste. Also, the occurrence of accidents reduces the availability of critical human resources, which invariably adds pressure on the operatives to work within their limited availability leading to a negative impact on worker behaviour, thus adversely influencing worker behaviour through a reinforcing causal feedback relationship. On the other hand, knowledge and training in safety aspects would lead to the creation of awareness of safety codes and measures which would support their implementation and enhance capacity to handle work pressure. The implementation of safety codes and measures and capacity to handle work pressure would improve worker behaviour through a balancing causal feedback relationship, which, consequently, would reduce the occurrence of accidents.

Impact of Contractual Disputes on Construction Cost Overruns of Construction Companies in Gauteng Province

Nomsa Shabangu (University of South Africa) and Makgopa Tshehla (University of South Africa).

The construction industry in Gauteng province, South Africa, is associated with a plethora of quagmires that tend to be the sources of conflicts and disputes. These disputes are detrimental to the construction businesses and the entire construction industry as they increase construction cost overruns thereby impacting on sector performance. The purpose of this study was to evaluate the impact of contractual disputes on construction cost overruns of construction companies in Gauteng Province. The research adopted qualitative methods and secondary data analysis of the literature was conducted and emerging themes were identified. The findings of the study reveal that the impact of the disputes may include additional expenses in administration and management, litigation possibility, loss of company reputation, profitability, cost overruns, deterioration of relationships, higher tender prices, relocation costs for me, and loss of professional reputation. The study contributed to the body of knowledge by providing necessary information to new entrants in the construction industry on the impact of disputes on performance. This will result in drawing mitigation measures businesses must take to protect and increase the wealth of its shareholders.

Trends in Exchange rate of the Naira and the Cost of Roof Coverings in Benin City

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The exchange rate has been identified as a factor that contributes to the price increase trend in building materials and is one of the drivers of construction costs. This study examined the relationship between the exchange rate of the Naira and the cost of selected roof coverings in Benin City from 2017 to 2021. The exchange rate of the Naira values was sourced from the database of the Central Bank of Nigeria while the price of the selected roof coverings was obtained from a survey in the study area. Correlation analysis was used to test the statistical relationship between the exchange rate of the Naira and the price of the roof coverings, and Regression analysis to test the impact of the exchange rate of the Naira on the cost of roof coverings. Findings indicated a strong positive correlation between the exchange rate of the Naira and the price of 1m² of the roof coverings. Furthermore, a positive linear relationship exists between the exchange rate of the Naira and the cost of roof coverings. A policy to enable the Naira to regain its lost foreign exchange value is

exigent and recommended. This study revealed how the cost of roof coverings is influenced by movements in the exchange rate of the Naira within the period under review.

SIGNIFICANT DEMOGRAPHIC INDICATORS INFLUENCING INNOVATIVENESS OF QUANTITY SURVEYING FIRMS IN NIGERIA

Solomon Ojo (Ahmadu Bello University), Yakubu Musa-Haddery (Ahmadu Bello University) and Peter Chindo (Ahmadu Bello University).

Studies have shown that the level of innovativeness of Nigeria Quantity Surveying firms (NQSFs) is still low. NQSFs as a service provider is mandatory to be innovative. Low innovation impedes the survivability of QS firms. Even though numerous researches have been carried out in this area but the narrative still remain the same. Hence, this study delved into assessments of significant demographic indicators that could influence innovativeness of NQSFs. The study identified demographic parameters and assess the significance of each in influencing innovativeness of NQSFs. The study adopts a positivists approach. Empirical data was obtained using a structured questionnaire survey through a convenient random sampling technique. Obtained data was analysed using SPSS version 20 by means of arithmetic mean, relative importance index and ANOVA and result presented in tables. The major finding of the study indicates that, age categories, size of firm, educational and gender disparities of Qs within NQSFs impact on their ability to innovate. The study concluded by recommending further studies on how and why do NQSFs scored low in innovation and how and why these significant demographic indicators affect innovation in QS firms.

A critical overview of BIM in construction: a bibliometric universal trend checks

James Olaonipekun (Durban University of Technology) and Modupe Cecilia Mewomo (Durban University of Technology).

Purpose Building Information Modeling (BIM) is an uprising innovation within the Architecture, Engineering, and Construction (AEC) industry, which virtually aids design, construction, and manage projects throughout their entire lifespan. For decades BIM has been progressively adopted and implemented in the AEC industry globally. There is a need to checkout for the various influence and contributions it had in the industry over the years through a critical review of published literature in this context.

Design/Methodology/Approach A literature evaluation of conference proceedings, journal articles, book chapters, and published reports from different sources will be employed in this study. This paper will employ the use of VOS VIEWER to conduct various bibliometric analyses.

Practical Implications The main practical relevance of this research is that the findings can be utilized as a basis for further study and to influence a future direction of BIM study in the AEC industry.

Originality/Value This research will hopefully offer information on the transformation/advancement that BIM has brought to the various phases/stages of building production in the AEC industry.

Investigating Impacts of Implementing Digital Technologies in Construction Education A Case of DUT in Kwazulu Natal, South Africa During Covid-19 Pandemic

Phindile Sohuma (Durban University of Technology), Modupe Cecilia Mewomo (Durban University of Technology) and Chikezirim Okorafor (Durban University of Technology).

The Coronavirus 2019 (COVID-19) pandemic has already caused major disruption in society, bringing difficulties to education and construction throughout the world. For students to study at home, educational institutions are implementing novel emergency remote teaching (ERT) and virtual learning (VL) systems. As a constructive reaction to the COVID-19 epidemic, digital technologies are being used. The core feature of the Industrial Revolution (IR) 4.0 is the trend towards digitization, automation, and a rising reliance on Information and Communications Technology (ICT). Despite the significant advances demonstrated by other industries, the construction industry has been too slow to adopt modern technologies such as artificial intelligence into its conventional practices. From a range of angles, there are several barriers preventing the construction industry from adopting IR 4.0. The key constraints to the deployment of IR 4.0-related technologies in the educational and construction sector, as well as the long-term possibilities, are investigated in depth. This will reveal that social and technological concerns have a significant impact on implementation effectiveness. The primary data from literature will be used and also secondary data sourced from journals, books, reports and published literatures related to Covid-19 pandemic digital technologies and education. The findings will be used to conclude on the impacts of implementing of digital technologies in education during Covid-19 pandemic. This study will

Financing Built Asset in Nigeria through Crowdfunding

Imoleayo Abraham Awodele (Durban University of Technology), Modupe Cecilia Mewomo (Durban University of Technology), Nathaniel Ayinde Olatunde (Quantity Surveying Department, Federal University Oye-Ekiti, Oye, Nigeria), Emmanuel Chidiebere Eze (Quantity Surveying Department, Federal University of Technology, Owerri, Imo State, Nigeria) and Chinonyerem Ukaji (Quantity Surveying Department, Federal University of Technology, Owerri, Imo State, Nigeria).

Purpose- One of the rich sources of fund for financing-built asset projects is through crowdfunding. Often time, individuals, construction professionals and client still rely on the use of traditional means to project financing without considering other varieties of alternative's sources of funding. One of such is crowdfunding; it offers a great and robust source of fund for financing-built asset projects in NPurpose- Crowdfunding offers a great and robust source of fund for financing-built asset projects in Nigeria but its usage in the Nigeria context is not popular, despite its huge potential in the construction industry. This study assessed the factors influencing the use of crowdfunding, its benefits and limitation in financing-built asset in Nigeria. **Design/methodology/approach-** A well-structured questionnaire was purposively used to gather data from 40 construction professionals (Developers, Quantity Surveyors, Architects, Builders/Engineers) on their perception regarding the use of crowdfunding in financing-built asset in Owerri, Imo State. The gathered data was analyzed using appropriate descriptive tools. **Findings-** The study found that the major factors influencing the use of crowdfunding to finance-built assets in Nigeria are; credibility and expectations for rewards, period of funding and goal amount, continuous communication between the people who participate in a project, and lack of crowdfunding project, among others. Also, fraud, risk of business failure, a lack of finances, poor management decisions, investor protection difficulties, and other factors are deterring elements to the use crowdfunding in Nigeria. **Practical implications –** This study would be of immense benefits to stakeholders and researchers to understand the influencing factors to financing built asset projects through crowdfunding. Stakeholders executing construction projects can implement crowdfunding approach to finance their projects convincingly. **Originality/value-** Studies on the suitability of crowd funding in financing-built asset in the context of construction projects are scarce. This study pioneers the suitability of using crowd funding in financing-built asset.

Challenges and sustainability of SMMEs in the real estate development business privately sourcing of funds in Johannesburg - A South African Context

Edith Ebele Okeke (University of South) and Makgopa Tshehla (University of South Africa).

Access to finance is one of the challenges experienced by SMMEs in real estate development during the start-up phase of their business or in the expansion of the real estate ventures. Most of the SMMEs used their private capital to start their real estate projects. Commercial and government enabling institutions do not provide adequate financial support of SMMEs in the real estate ventures. The purpose of this study was to evaluate the sustainability of private sourcing of funds by real estate development owners. The research adopted qualitative methods and secondary data analysis of the literature was conducted and emerging themes were identified. The findings of the study reveal that that real estate developments are capital intensive projects and some of the business owners were not able to fund their projects from start to finish from their private equity. They needed external funding support to enable the completion of the project to avoid delays in project completion. Real estate development should be seen as a collateral needed by the financier as it is an immovable property.

MAINTENANCE PRACTICES OF PUBLIC LAVATORIES IN TERTIARY INSTITUTIONS IN GHANA

Mark Pim-Wusu (Accra Technical University), Bernard Martin Arthur-Aidoo (Accra Technical University) and Mudasiru Bawa (Accra Technical University).

Purpose: This research aimed to investigate public lavatories' maintenance practices in Ghana's tertiary institutions. **Design:** This study gathered data from both primary and secondary sources. The probability sampling technique was used since it was the most valid choice for producing results, while 180 participants were sampled from the entire population using a sample size calculator. **Research limitations and implications:** The study was limited to the Accra Technical University campus as a case study, and the staff and students were the target population. The key factors were the appropriate way of maintaining public lavatories. **Findings:** The study revealed that the public lavatories at the university campus are not in good condition. Several sanitary appliances in the lavatories are unsafe, indicating ineffective maintenance practices. According to the survey's findings, the problem of damaged toilet flush handles and unflushed

excreta was widespread. The issue of the strong odour was one of the significant findings of this work. Practical implications: This work facilitates the maintenance officers and management in Ghana's tertiary institutions and guides designers when specifying sanitary appliances for public lavatories. It is critical to improving lavatory upkeep to ensure students, the entire working staff, and visitors' welfare on health and safety, comfort and happiness.

A DESK REVIEW OF PRECONSTRUCTION PROJECT DEVELOPMENT PLANNING DELAYS IN SOUTH AFRICA: A CASE FOR IMPROVEMENTS

Bedan Nyaga Githae (Heriot Watt University), Hakim Hagir (Heriot Watt University) and Rebecca Alowo (University of Johannesburg).

Purpose The paper attempts to identify policy issues in construction such as gaps in: building regulations, planning laws, the spheres of government and other factors that cause preconstruction planning delays with a view to proposing solutions for improvements. This paper highlights preliminary results from an ongoing exploratory analysis of construction sector policies. As a featured article, the authors have provided a concise description of the specific application or the potential of their interim/preliminary findings.

Design In this exploratory descriptive research methodology, a rapid desk review was conducted, the authors personal experiences were documented and conversations with construction industry players were captured. The outcome of this has been structured into this paper. Going forward more data will be collected through wider and deeper literature exploration and administration of questionnaires to 100 different construction operatives and planning operatives. These will include professional engineers, architects, surveyors, contractors, physical planners, and academics in the built environment. The collected data will be analysed using statistical scales. A normative scale will be used to identify: the building regulations; planning laws; the spheres of government and other factors that cause preconstruction planning delays with a view to proposing solutions for improvements in South Africa.

Research Limitations and implications There is limited literature on the causes of delays in preconstruction project development planning in South Africa. This will affect the timely completion of the research.

Findings The researchers acknowledge that the research is still ongoing, however the preliminary findings are that preconstruction project planning delays world over are caused by payment delays by clients, Design changes by clients, slow decision making by clients, late review, and approval of design documents by client, mistakes, discrepancies in design documents, and corruption. While in Africa, preconstruction development planning delays arise from slow planning, project viability, limited internal government implementation capacity, lack of policy coherence, corruption, lack of skills, lack of funding, and design specification changes. In South Africa the delay in preconstruction development planning seem to arise largely from gaps in the South African building regulations and planning laws which result in planning delays in the preconstruction project development. The gaps lead to a lack of shared vision about what spatial development should be; a lack of coordination between different spheres of government and between different departments; a lack of capacity; a high degree of legal and procedural complexity; and a very slow pace of land development approvals.

Practical implications It is argued that the principles that govern planning need be expanded and made clearer and more user friendly. It is important that such principles specifically those which deal with the compatibility of land use management and the spatial dimension of the integrated development plans be clearer and easy to apply. The solutions proposed may help increase efficiency and bring harmony in the regulatory processes to enhance a speedy preconstruction project development planning in South Africa.

Prognosticating BIM diffusion by 2030: A qualitative study

Samuel Adekunle (cidb Centre of Excellence, University of Johannesburg, Johannesburg, South Africa), Clinton Aigbavboa (cidb Centre of Excellence, University of Johannesburg, Johannesburg, South Africa), Obuks Ejohwomu (University of Manchester), Andrew Ebekoziem (SARChI in Sustainable Construction Management and Leadership in the Built Environment) and Beauty John (University of Lagos).

Purpose BIM is central to the achievement of the digital transformation of the construction industry and the achievement of various milestones for sustainability and improved infrastructural development by regional bodies and government (for instance, NDP and SDG). At the moment, BIM maturity is low in developing countries, and countries are struggling in terms of diffusion. Therefore, it is vital to explore the multi-perspective prospects of BIM in developing countries, considering its importance to achieving the milestone. **Design** A qualitative approach through structured interview was adopted. Nine BIM experts and construction industry professionals in the South African construction industry were interviewed, and the collated data was analysed thematically. **Research limitations** The limitation of this study includes the qualitative approach but does not impact the findings adversely. **Findings** Although, respondents that BIM maturity is low in the SACI. **Findings group** the prospects of BIM under the technological, socio-cultural projections

(stakeholder and organisation) and regulatory. Practical implications This paper presents a collective insight on the prospects of BIM in the South African construction industry. The findings of this study provide a scorecard of the readiness of the South African construction industry in the actualisation of the infrastructural development in the NDP through the lens of BIM.

Significant Barriers to Smart Computing Adoption For Construction Projects in a Developing Nation

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Construction industry in developing countries is characterised with ineffective decision-making which contribute to poor project performance, stakeholder's dissatisfaction, amongst others. Meanwhile, smart computing proffer solutions to these and other problems with proven benefits; however, some barriers continually hinder its applications on construction projects. Therefore, this study investigated the barriers to the application of smart computing on construction projects in a developing nation through survey with a view to determine the significant ones. Data was retrieved from construction professionals while descriptive and inferential statistical analysis such as mean score, standard deviation, normality test, and Kruskal-Wallis H-test were conducted accordingly on the data. Five significant barriers namely inadequate technological knowledge, client's unwillingness, professional complacencies, protection monopoly, and lack of government policies were identified. Interestingly, the main barriers deduced are construction-related, client-related, and government-related. Therefore, several practical recommendations were posited for the three key actors in the construction industry, i.e., construction professionals, clients and government agencies. Training is recommended for the construction professionals to update their technological competencies and skills in global construction market. The client's willingness can be improved through convincing proofs of importance of smart computing to project owners, while the government is advised to implement and enforce policies that encourage digitalisation in the construction industry.

Sources of financing public infrastructure projects in South Africa

Jabulani Jacobs (University of South Africa), Wellington Thwala (University of South Africa), Clinton Aigbavboa (University of Johannesburg) and Khotso Dithebe (University of Johannesburg).

The lack of financial investment in infrastructure development limits the delivery of public infrastructure; thus, it is important to ensure adequate investments for the delivery of infrastructure. This study aims to identify sources of financing public infrastructure projects in South Africa. To achieve the objective of the study, a quantitative method was used to gather data; the data was collected using closed-ended questionnaires that were distributed using google forms. The sample of 196 respondents, currently registered with the Councils for the Built Environment Professions (CBEP), was approached to form part of the study. Of the 196 questionnaires sent out to professionals in the construction industry only 153 questionnaires were returned, which represents a 78% response rate. The data received was analysed and interpreted using descriptive statistics and exploratory factor analysis. Given the explored sources of financing public infrastructure projects in South Africa, the findings reveal that government budget, Development Bank of Southern Africa (DBSA), local tax revenues, Public-private partnerships (PPPs), and state-owned enterprises (SOEs) are the key sources available for the South African government to use to finance public infrastructure projects in the country. Currently, in South Africa, government and state-owned entities mostly finance the delivery of public infrastructure, and financing only from the government is not adequate to meet the infrastructure-financing needs. This study recommends that the private sector participate in infrastructure investment and project financing schemes in order for the government to be able to deliver the much-needed infrastructure and that international and innovative financing schemes should be considered for the financing of public infrastructure projects in South Africa.

Impact of Government Intervention Loans on the Performance of Nigeria's Agricultural Sector

Francis Ezeokoye (Department of Project Management, Federal University of Technology, Minna) and Ikechukwu Diugwu (Department of Project Management, Federal University of Technology, Minna).

To boost agricultural production, and reduce dependency on the oil economy, the Federal Government of Nigeria had rolled out different agricultural intervention loans (GIL). These GIL were instituted to increase output in the agricultural

sector. This study assessed the impact of GIL on the agricultural sector in Nigeria. The study utilized secondary data obtained from the Central Bank of Nigeria sources, which was analyzed using simple percentage change. The result shows that crop, livestock, and forestry outputs showed positive growth trends with percentage growth rates ranging from 2.30% to 4.88 %, 0.33% to 5.50%, 0.21% to 3.31% respectively. The fishery subsector had a negative growth between 2015 and 2016, with a growth rate ranging from -3.55 to 5.59 %. It also established that government intervention loans contribute between 25% to 48% to the agricultural sector's output. Therefore, GILs positively impact farmers' output, leading to a net reduction in the importation of agricultural commodities into the country.

Organisational Leadership as a Driver for the Adoption of Digital Technologies for Construction Projects Delivery

Matthew Ikuabe (University of Johannesburg), Douglas Aghimien (University of Johannesburg), Clinton Aigbavboa (University of Johannesburg), Ayodeji Oke (University of Johannesburg), Wellington Thwala (Department of Civil Engineering, College of Science, Engineering and Technology, University of South Africa), Emmanuel Ayorinde (University of Johannesburg) and Rotshidzwa Mugaga (University of Johannesburg).

The uptake of digital technologies for construction activities seek to proffer solace to some of the challenges plaguing the delivery of construction projects. Organisational leadership plays a vital role in the drive for the espousal of digital technologies in construction management. This study evaluates the factors affecting the pursuit of adopting digital technologies by construction organisational leadership. The study utilised a quantitative technique by deploying questionnaire for data collection using built environment professionals as the target respondents and the study area was Gauteng province in South Africa. The methods of data analysis used were Mean Item Score, Kruskal Wallis H-test, and SNK post hoc test. Findings from the study presents a clear path of varying indicators that are influential to the adoption of digital technologies by the leadership of construction organisations. The study contributes significantly to the knowledge base on the call for digital transformation in the construction industry.

Stakeholders' Perception on the Barriers of Integrating Green Concept into the Higher Educational Institution Buildings.

Kunle Elizah Ogundipe (cidb Centre of Excellence, Faculty of Engineering and Built Environment, University of Johannesburg), Clinton Aigbavboa (cidb Centre of Excellence, Faculty of Engineering and Built Environment, University of Johannesburg), Babatunde Fatai Ogunbayo (cidb Centre of Excellence, Faculty of Engineering and Built Environment, University of Johannesburg) and James Dele Owolabi (Covenant University, Nigeria, and cidb Centre of Excellence, Faculty of Engineering and Built Environment).

Green construction or sustainable building practices integrate the green concept into the building structures, using environmentally friendly processes and efficient resources all through the building life cycle. On this background, the research examined the barriers to integrating green technology concepts into higher educational institutions. A survey was conducted among one hundred and nineteen faculty members in five major departments: Architecture, Building Technology, Estate management, Civil Engineering, and mechanical engineering at Covenant University, Nigeria using purposive quota sampling to obtain data in study. The study showed that barriers to integrating the green concept could be grouped into five categories: economic, legislation, environmental, technological, and contractual barriers. The study findings further showed that low awareness of green building materials price and contractors' managerial concern on green practices were top contractual barriers to integrating green technology concepts into higher educational institutions' buildings. The study concluded that limited examples of green building projects had mitigated the impact of technology adoption of the green building concept. This study recommends increasing awareness of problems associated with resource efficiency and uncertainty in the performance of green materials to limit the environmental barriers of integrating the green technology concept.

Critical success factors influencing adoption of green technology in higher education institutions

Kunle Elizah Ogundipe (cidb Centre of Excellence, Faculty of Engineering and Built Environment, University of Johannesburg), Clinton Aigbavboa (cidb Centre of Excellence, Faculty of Engineering and Built Environment, University of Johannesburg), Babatunde Fatai Ogunbayo (cidb Centre of Excellence, Faculty of Engineering and Built Environment, University of Johannesburg) and James Dele Owolabi (cidb Centre of Excellence, Faculty of Engineering and Built Environment, and Covenant University, Nigeria).

Green technology concept is a form of integrating applicable technologies to mitigate the effects of human activities on the environment. Construction records many activities and practices depleting natural resources. This research investigated critical success factors influencing adoption of green technology concept in higher educational institutions (HEIs). The study adopted purposive quota sampling to administered one hundred and twelve questionnaires to faculty members in five major departments, Covenant University, Nigeria. The exploratory factors analysis findings clustered the twenty-six identified critical success factors into five groups as 'conservation of natural resources'; 'sustainable construction process and system management'; 'economic advantage of green materials and technologies'; 'innovative framework and regulations for green concept implementation'; and 'stakeholder training and publicity'. The reliability of these critical success clusters was checked by calculating the Cronbach's alpha. The study recommends strategies for adopting green concept adoption by 'establishing green policies and regulations', 'adopt green planning, design, and specification', 'standardized local green construction materials and technologies', and 'enhance the economic advantage of reuse, recycling, and waste management'. This study concluded that the construction of HEI buildings in the 21st century must integrate sustainable materials and practices into their processes to avoid depleting natural resources that may impact the environment.

COMPARISON OF COMPRESSIVE STRENGTH OF CONCRETE PRODUCED WITH DIFFERENT TYPES OF FINE AGGREGATE

Ayodele Alejo (Rufus Giwa Polytechnic, Owo. Ondo state, Nigeria) and Clinton Aigbavboa (University of Johannesburg).

Compressive strength of concrete is the main criteria for structural designs; the compressive strength is not only influenced by coarse aggregate but also has a great influence of fine aggregate. This research focuses on comparing the compressive strength of concrete produced with different types of fine aggregate. The samples were gotten from Owo town in Owo local government area of Ondo state, Nigeria. Sieve analysis was conducted on the three samples for this research which are quarry dust, erosion deposited sand and borrow pit sand. Thirty six cubes were cast, twelve cubes for each sample in the mix ratio 1:2:4. Curing was done by total immersion into the water for 7, 14, 21 and 28 days and the compressive strength test was carried on the samples. The result revealed that the concrete produced with quarry dust gave the highest compressive strength followed by borrow pit sand and erosion deposited sand with compressive strength of 9.93N/mm², 9.03N/mm² and 8.0N/mm² respectively. It was recommended that quarry dust is considered suitable out of the samples tested for concrete production.

Validating factors influencing Maintenance Policy for the Maintenance Management of Educational Buildings in Developing Economies

Babatunde Fatai Ogunbayo (cidb Centre of Excellence, Faculty of Engineering and the Built Environment, University of Johannesburg.), Clinton Aigbavboa (cidb Centre of Excellence, Faculty of Engineering and the Built Environment, University of Johannesburg.), Wellington Didibhuku Thwala (Department of Civil Engineering, College of Science, Engineering and Technology, University of South Africa) and Ramabodu Molusiwa (Department of Construction Management and Quantity Surveying, University of Johannesburg.).

Maintenance policy is one of the core elements of maintenance management that deals with organisation maintenance planning and procedures. Based on this contextual setting, this study investigates whether factors that guided maintenance policy in Western countries are similar in the maintenance management of educational buildings in developing economies using the Nigerian education sector as a case study. A Delphi study was used in obtaining the required data for this study. The Delphi findings indicate fifteen (15) factors that impacted effective maintenance management of the educational buildings in the Nigerian education sector. Among these fifteen (15) factors, four (4) of the factors have a very high impact on the maintenance management of educational buildings (VHI: 9.00 -10.00), seven (7) factors had a high impact (HI: 7.00-8.99) while four (4) other factors had a medium impact score (MI: 5.00-6.99). The key result of the study based on the Delphi study reveals that the factors of maintenance policy that influence effective MM of educational buildings in the Nigerian education sector include: assembling of maintenance organisation structure; maintenance strategies development; spare-part management; meeting maintenance objectives; suitable maintenance procedures and process; optimisation of the maintenance action plan; risk factor establishment; timely identification of maintenance work; analysis of maintenance procedure; working together with regulatory agencies and well define priority system. The result indicates that these factors are similar to those of the developed countries, and if incorporated into policies guiding maintenance operations within the education sector in Nigeria, effective MM of the educational buildings will be achieved.

Effectiveness of Controls for Respirable Crystalline Silica Dust Exposure in Construction: A Literature Review

Prisca Tente (Department of Civil and Environmental Engineering, School of Engineering, University of Zambia), Erastus Misheng'U Mwanaumo (Department of Civil Engineering, University of Zambia, Department of Civil Engineering, University of South Africa) and Wellington Didibhuku Thwala (Department of Civil Engineering, College of Science, Engineering and Technology, University of South Africa).

Silica dust is unavoidable hazard which is produced from construction activities such as grinding, cutting concrete and other materials that contain silica. Respirable silica dust can lead to occupational diseases such as chronic obstructive pulmonary disease, renal disease, tuberculosis, lung cancer and silicosis. In construction, workers are exposed to levels of respirable silica dust that are beyond the Permissible Exposure Limit which makes them prone to deadly respirable diseases. This paper reviews the effectiveness of exposure controls that are used in construction to reduce exposure levels to permissible limits. Eight studies that measured the reduction of exposure levels of controls were reviewed. Other sources of information were reports, reviews of HSE and National Institute for Occupational Safety and Health. The paper is only based on the review of literature and case studies in construction. Peer reviewed articles and other articles on respirable crystalline silica exposure controls in the construction industry were reviewed. Water control was found to be more effective compared to local exhaust ventilation and the use of a silica substitute materials. Nevertheless, the use of water alone could not reduce exposure levels below the permissible limits. There is no one single control was able to reduce exposure levels to permissible levels. In one study the combination of two controls, water and local exhaust ventilation reduced exposure levels significantly below the permissible level. The use of all the controls in combination is recommended for the effective reduction of silica dust exposure below the permissible levels.

Academic Training Evaluation of Building Technology Programme

Biodun Obaju (Department of Building Technology, Covenant University Ota, Ogun State), Olabosipo Fagbenle (Department of Building Technology, Covenant University Ota, Ogun State), Lekan Amusan (Department of Building Technology, Covenant University Ota, Ogun State) and Temitope Olaniran (Department of Architecture, Durban University of Technology Durban, South Africa).

Several employers have voiced displeasure with the quality of training provided to built environment graduates by most tertiary institutions. As a result, educational institutions must regularly evaluate the training they provide to students in order to assess their efficacy in preparing graduates for the job. Hence, the study evaluated the training satisfaction of graduates in construction management and construction technology courses in the Building Technology programme and the competencies gained from the training. The study adopted the Kirkpatrick model's first two stages of training evaluation with a questionnaire distributed to purposively selected Building technology graduates from two polytechnics in Southern west Nigeria using a snowball sampling technique. Data obtained were analysed using descriptive statistical tools. The study's findings show that respondents were satisfied with the training acquired and possess the basic competency from the training. However, the graduates lack sufficient knowledge of laws and regulations governing construction work, the use of computer programme for project planning and scheduling and the ability to use tools and equipment for construction work. As a result, graduates of Building technology graduates may not be able to fully integrate into the construction industry, therefore putting an enormous strain on construction firms to retrain the graduate. Tertiary institutions need to revamp their training strategies and method of students to improve their competency in order to thrive in the construction industry.

A Review of the Impact of Emotional Intelligence on Construction Firms Human Resource Management Practices in a Developing Economy

Ifedolapo Babalola (University of Johannesburg, South Africa), Clinton Aigbavboa (University of Johannesburg, South Africa) and Didibhuku Thwala (University of Johannesburg, South Africa).

The study assessed the attributes of emotional intelligence (EI) that impact construction firms (CFs) human resource management practices (HRMPs) as well as evaluated the impact of each of the attributes on CFs' HRMPs in the Nigerian construction industry (NCI). For this study, a qualitative research design was adopted. Delphi approach was utilized to elicit experts' opinions on some identified attributes of EI. Data collected was analysed using a combination of interquartile deviation, median, standard deviation, mean, and Cronbach's alpha to attain a robust consensus among respondents. The theoretical basis of the study is in the Path-goal theory. The study is limited to construction professionals (CPs) and human resources (HRs) in the Nigerian built environment. The findings revealed that seven (7) attributes of EI impact on CFs HRMPs, with two (2) attributes possessing a very high impact (VHI: 9.00-10.00), while five (5) scored high impact (HI: 7.00-8.99). Also, the study found that the attributes of EI that impact CFs' HRMPs include:

encouraging self-control, promoting on-the-job relationships, and having a good listening ability. The study recommends CPs' and HRs should exhibit self-control, build relationships, and possess good listening ability while on construction projects to achieve performance. The study will increase the understanding of CPs and HRs in the NCI on EI's various attributes and impacts on performance. Additionally, it will encourage CPs and HRs to think critically about the need for HRMPs implementation to show different EI characteristics

Error! Reference source not found.*Improving on job creation through fragmentation of capital infrastructure projects*

Edoghogho Ogbeifun (University of Jos), Fwangshak Mije (University of Jos) and Jar-Harm C Pretorius (University of Johannesburg).

Purpose: The triple problems of unemployment, under-employment and skill development in the engineering and built environment professions, in the construction industry of developing economies deserves attention. The development of employable professionals requires the blend of educational training and practical exposure or workplace training in the construction industry. Therefore, crafting of suitable procurement instrument, the variant and mode of execution, should encourage the creation of employment opportunities. In this regard, this research evaluated the operations of three capital construction projects, tagged Projects 1, 2 & 3, with the objectives of exploring the most suitable mode of execution that provided the highest employment opportunities.

Design: The multiple site case study method of qualitative research was adopted. The data were obtained through contextual analysis and evaluation of project operation documents, published journal articles, and the comparative analysis of the organisational structure of the construction companies involved in the projects examined. Research limitations: At the time of this research all the project examined has been concluded. Therefore, it was not possible to interact with the project personnel but relied solely on available project operation documents. Findings: The findings revealed that Project 1 was executed through the single contractor concept, while projects 2&3 were executed through the multiple contractors' approach. The employment opportunities at the tactical and operational levels of leadership, were higher in Projects 2&3 compared to what were obtained in Project 1. Practical implications: This research has demonstrated that adopting the concept fragmentation of capital infrastructure project holds the potential of ameliorating the triple problems of unemployment, under-employment, and skill development. Therefore, the concept of fragmentation of capital project should be contextually adopted for the execution of capital construction projects. This approach will allow the creation of more jobs, improve skills development, and reduce the incidence of urban migrations.

Assessment of Potential Benefits and Barriers of adopting Lean Construction Principles by Clients organisations in Nigeria

Muhammad Laminu Ibrahim (Federal University Birnin Kebbi (FUBK)), Hassan A. Ahmadu (Ahmadu Bello University (ABU), Zaria), Ahmad Muhammad Sani (Ahmadu Bello University (ABU), Zaria) and Muhammad Abdullahi (Ahmadu Bello University (ABU), Zaria).

Waste reduction and adding value are the most important concepts to adopt in terms of client satisfaction and getting value for money in construction projects. Thus, this study identified and assessed the potential benefits and barriers of adopting lean construction principles by client organisations in Nigeria. Quantitative research approach was adopted and 67 questionnaires were distributed to the respondents. The target respondents are TETFUND beneficiary institutions. 45 (67%) questionnaires were retrieved and analyzed using descriptive statistics. Maximise productivity, reduced waste, improved health & safety and reduced cost & inventory, are the most significant potential benefits of adopting lean construction principles by the client sector of the Nigerian Construction industry. While poor planning, inadequate resources, corruption practices, lack of awareness programmes and lack of design constructability were identified as the major barriers of adopting lean construction principles by the client sector in Nigerian construction industry. There is need for more awareness campaign on the lean construction concept. Nigerian tertiary institutions, professional and regulatory bodies should consider integrating lean construction into the tertiary education curriculum because of its importance and benefits to the construction industry at large. Adequate efforts should be put in place to bring lasting solutions to the barriers identified.

Analysis of cost overruns and delays in mega projects in South Africa

Lindelani Matshidze (University of the Witwatersrand).

Mega projects have a tendency of experiencing cost overruns and completing behind schedule. This usually results in affecting a wider aspect of a country's economy both socially and economically. Poor planning, poor cost estimating, and lack of quality project management skills are some of the primary causes that lead to cost overruns and delays in most

mega projects globally. The massive delays in projects and the increase in costs affect the state in terms of budget and the issue further affects other sectors in the economy. This study's objective was to explore more on the causes of cost overruns and delays of mega projects that were previously constructed in South Africa. Furthermore, the aim of this report was to analyse the impacts mega projects have on the society and the economy and lastly aims to implement some of the few methods on how to mitigate the issues of cost overruns and delays in the South African mega-structures. The study followed a qualitative approach which was conducted through interviews and literature reviews. Industry professionals who have experience in mega projects were selected due to their relevance to the study and knowledge they have in mega projects. Analysis revealed that stakeholders have a massive impact on the way mega projects can perform. The results outlined corruption, poor planning, lack of relevant skills and stakeholders as the main causes of cost overruns and delays. Results also revealed that these cost overruns have a negative impact on the economy.

Consumer preferences for plastic waste recycling in retail facilities in Johannesburg: a university community perspective

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Research on global best practice on waste management indicates that the associated problems of plastic, waste disposal, which forms a bulk of waste can be reduced, if systems can be put in place to help their return for recycling by consumers and collectors through a chain involving the retail sector, and manufacturers when incentivized. The aim of this paper is to determine which incentives and knowledge affects the overall performance of recycling in retail facilities. An online survey was conducted and sent to staff and students at a top-rated public university in Johannesburg, South Africa. The survey was analysed using mean scores, ANOVA and regression analysis to determine the impact of incentives and knowledge on recycling. The study found that provision of shopping discounts at selected stores was the best form of incentive. Also, providing free parking to shoppers was another way of providing incentives to shoppers to engage in recycling as well as rewards such as discounts on plastic bottles. Knowledge of recycling and recycling incentives have a weak influence on the performance of recycling. The primary recommendation was that mall managers and the university community can use the findings to encourage participation in recycling.

A REVIEW OF THE IMPACT OF ARTIFICIAL INTELLIGENCE ON CONSTRUCTION INDUSTRY HEALTH AND SAFETY PRACTICES

Olatoyese Oni (UNIVERSITI TUNKU ABDUL RAHMAN), Abdullateef Olanrewaju (UNIVERSITI TUNKU ABDUL RAHMAN) and Soo-Cheen Khor (UNIVERSITI TUNKU ABDUL RAHMAN).

Artificial intelligence (AI) is a broad and diversified scientific topic that has pervaded every part of our lives and grown in significance over time. AI has been used in various industries to handle a variety of issues, including decision-making, environmental monitoring, lowering operational costs, and increasing productivity. The goal of this study is to examine how artificial intelligence applications may be employed in the construction industry to improve workplace safety and health. A comprehensive literature review of existing research in the fields of AI and occupational health and safety was conducted. The study was confined to studies published between 2010 and 2021, and a total of 65 articles were chosen after screening. The findings demonstrated that AI can aid in the elimination of hazardous work, risk reduction analytics, and the simplification of safety and health workflows. The study concludes that artificial intelligence can be used to improve workplace health and safety through remote sensing, monitoring, and alerting managers and workers to potential hazards. This research adds to the growing body of data that artificial intelligence (AI) may be used to detect, identify, and forecast dangerous behaviour in a potentially hazardous workplace.

THE OUTCOME OF POOR MATERIALS MANAGEMENT IN THE CONSTRUCTION INDUSTRY

Idowu Albert (Department of Construction Management, Nelson Mandela University, Port Elizabeth) and Winston Shakantu (Department of Construction Management, Nelson Mandela University, Port Elizabeth).

Purpose: A relatively large amount of materials is being wasted because of poor material control on building sites. Poor materials management can have a negative impact on cost as a result of excessive waste, quality and time of work, which will affect project delivery and profitability. Design: The qualitative method was adopted for the study. The research was conducted in Abuja, the federal capital territory of Nigeria. Ten case studies were purposefully selected for the study. Research limitations and implications: The study focuses on the outcome of PMM in building projects in Abuja, Nigeria. This article only focuses on knowing the level of effects of PMM on waste generation, quality and profitability.

Subsequent research will address the mitigation strategies. This research uses observation of what was observed on site with the observation guide by the observer (researcher). No interviews were conducted. Thus, the voice of the contractor/consultants was not considered. Finding: The study found that effective materials management is poor on materials waste, quality of work and accounting for materials. Practical implication: The construction stakeholders should be well informed on the issues of poor materials management, and establish a policy that stimulates materials waste minimisation at all levels in construction projects.

Strategies to the acceptance of Sandbag building technology for sustainable and affordable housing delivery in South Africa

Johnson Adetooto (University of Cape Town, South Africa), Abimbola Windapo (University of Cape Town, South Africa) and Francesco Pomponi (Edinburgh Napier University, United Kingdom.).

Although Sandbag building technologies have been proposed as an affordable, sustainable, and recyclable alternative building material capable of accelerating housing provision in South Africa., their level of acceptance is still very low in South Africa. The strategies to the social acceptance of Sandbag building technologies need detailed investigation. However, little or no study has been done on strategies to the social acceptance of Sandbag building technologies in South Africa. This study aims to investigate the strategies to the social acceptance of Sandbag building technologies in South Africa. To achieve this objective, 18 strategies were identified from a comprehensive literature review, and a questionnaire survey was performed with 220 professionals, government officials, end-users and developers. Using mean score, ANOVA and exploratory factor analysis, the study revealed the strategies to the social acceptance of sandbag building technologies. A comparative analysis of the perceptions of the diverse groups of survey participants was conducted and discussed. The findings are relevant to policymakers and practitioners in adopting appropriate strategies towards sustainable and affordable housing delivery in South Africa. This study adds significantly to the limited body of knowledge on Sandbag technology.

Evaluation of Implementation Levels of BIM Tools for Project Delivery by Architecture, Engineering and Construction (AEC)Firms in Southwestern Nigeria

Cyril Chinonso Ejidike (Durban University of Technology, Durban,4001, South Africa.), Victoria Olufunke Akinola (Federal University of Technology, Akure, Ondo State, Nigeria), Sina Abayomi Makanjuola (Federal University of Technology, Akure, Ondo State, Nigeria), Favour David Agbajor (Durban University of Technology, Durban,4001, South Africa.), Modupe Cecilia Mewomo (Durban University of Technology, Durban,4001, South Africa.) and Ikura Chijindu Anugwo (Durban University of Technology, South Africa.).

Purpose Building Information Modelling (BIMTools) is a revolutionary technology and process that has transformed the buildings designed, analyzed, construction, and management. The construction industry has witnessed low productivity compared to other industries, no thanks to medieval approaches that are error-prone, cost-inefficient, time-consuming, and deficient in meeting the rising trends. Therefore, this study aims to evaluate the awareness level and the level of BIM Tools usage for project delivery in AEC firms in southwest Nigeria. **Design/Methodology/Approach** Data were collected through a questionnaire survey from 227 AEC firms in southwest Nigeria. Descriptive analysis was employed to analyze the data. **Finding** The AEC private construction firm observed a high awareness level of Building information modeling (BIMTools) for project delivery. The study further revealed that the level of maturity usage of BIMTools for project delivery is level 1 (2D and 3D) in the AEC firm in southwest Nigeria **Practical Implications** This study established that AEC construction firms are fully aware of BIMTools for project delivery and further indicates that AEC firms are currently using 2D and 3D for project delivery. BIMTools has progressed beyond 2D and 3D, and the study advised firms to invest in BIMTOOLS to improve their long-term efficiency

Optimization Application to Cost Retrofit and Energy Efficiency of Building Retrofitting: A Bibliometric Analysis.

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Purpose The building sector consumes an extensively more significant amount of the world's final energy, negatively impacting the built environment, such as climate change, global warming, and depletion of the ozone layer. As a result, building retrofitting is a cost-effective and feasible technique to improve energy efficiency in the sectors. The organization of scientific production can evaluate the need to evolve the research in the field of study up to the present date. This study aims to analyze quantitatively the research produced in terms of optimization associated with cost

retrofit and energy efficiency in the building. Design This study is based on a systematic literature review drawn from book chapters, journal articles, and conference proceedings in the Scopus index from 2011 till the present. This study will employ VOSViewer to conduct most cited author, journal source, country, and co-occurrences work in this field. Practical implication The practical importance of this research is the contribution to the consolidation knowledge on building retrofitting and the direction for future research in optimization in building retrofitting. Originality/Value This research is expected to offer vital information on the achievement of optimization of building retrofitting of cost optimization and energy efficiency

KEY DRIVERS FOR STRATEGIC MANAGEMENT IN CONSTRUCTION

Comfort Olubukola Iyiola (Durban University of Technology) and Modupe Cecilia Mewomo (Durban University of Technology).

Strategic management enables the construction industry to accomplish project and organizational goals. However, organisations are concerned with issues relating to changes occurring over time and construction firms need to overcome and adapt to such changes in order for construction projects to be delivered under a strategically oriented suitable organizational goals. This paper aim to identify and assess the key drivers for strategic management in construction industry in Abuja, Nigeria. Descriptive and inferential statistical techniques will be employed in analysing the data collected from construction professionals. The findings will reveal the gaps in implementing strategic management in various climes and organization setups and provide useful and practical strategies for enhancing strategic management in the construction industry. The analysis of the key drivers for strategic management is expected to aid the decision-making of the relevant construction stakeholders in overcoming the challenges created by changes in a dynamic environment and also serve as instrument for government agencies in their design of localized policies and guidelines to deal with strategic issues.

ASSESSING THE ADOPTION OF DIASPORA BONDS FOR FINANCING INFRASTRUCTURE PROJECTS IN MALAWI

Chiponosko Mkandawire (GN engineering Limited) and Grace Sukasuka (Malawi University of Business and Applied Sciences).

Infrastructure development plays a vital role in the development of a nation. Even though this is the case, there is a financing gap and many nations including Malawi are looking for ways to fill this gap. Diaspora bond is one tool that is being considered as the diaspora community is a key contributor to the well-being of developing countries. This study aimed at contributing on how Malawi can successfully issue the diaspora bond. The study adopted the qualitative approach which made use of semi structured interviews and open-ended questionnaires.

The findings indicated that political risk can be one of the major hindrances in the issuance of the diaspora bonds. Other factors to be considered when issuing the diaspora bond includes the governance systems, a mass of well to do diaspora community. The findings also revealed that there are many local investment platforms that the government and other infrastructure developers have not fully utilized. The policy recommendations have been directed in a way that would enable government tap into both the local investment platform and the diaspora resources.

AN INVESTIGATION INTO THE DIGITALIZATION OF QUANTITY SURVEYING SERVICES DURING COVID-19 IN NIGERIA

Abdullateef Olanrewaju (UNIVERSITI TUNKU ABDUL RAHMAN), Paul Anavhe (CPD Partnership Ltd, Kaduna, Nigeria), Shalini Sanmargaraja (UNIVERSITI TUNKU ABDUL RAHMAN), Olatoyese Oni (UNIVERSITI TUNKU ABDUL RAHMAN) and Cecilia Modupe (Durban University of Technology).

The global COVID-19 crisis has presented the construction sector with challenges that the world has never seen before. Productivity is down, the cost has increased, regulations and guidelines are becoming more incompatible, conflict and claims are increasing, delays are high, health and safety practise are increasingly high and profit margins have been reduced. This requires changes to construction management practices and strategies. In response, construction professionals are digitalizing the construction delivery processes and procedures to be competitive. Through a survey questionnaire, the extent of the adoption of construction technologies by the consultant quantity surveying organisations is investigated. Building information modeling, Internet of Things, Automated Workflow Tools, Big Data, 5G and Wi-Fi 6, Mobile and Cloud Technologies, and Document Imaging and Digitization are the most applied technologies during the pandemic to digitalize the construction delivery process. This research provides new information on reimagining the roles

of quantity surveying organizations post pandemic. From an ontological standpoint, the main findings of this study are generalizable to quantity surveying practice in and outside of Nigeria.

Assessing Factors Militating Against Affordable Housing Delivery in Developing countries

James Dele Owolabi (Covenant University, Nigeria, and cidb Centre of Excellence, Faculty of Engineering and Built Environment), Clinton Aigbavboa (cidb Centre of Excellence, Faculty of Engineering and the Built Environment, University of Johannesburg), Babatunde Fatai Ogunbayo (cidb Centre of Excellence, Faculty of Engineering and the Built Environment, University of Johannesburg) and Kunle Elizah Ogundipe (cidb Centre of Excellence, Faculty of Engineering and Built Environment, and Covenant University, Nigeria).

The increase in population in the urban centres and the inability of these individual migrants to have access to shelter has made the need for housing a continuous subject of discourse. The housing deficit in most developing countries has been an issue of concern despite all efforts to make housing affordable, available, and accessible. The study examines the factors militating against housing affordability in developing countries using Nigeria as a case study. The study employed purposive quota sampling of a low-income earner in Lagos mega-city, Nigeria. Through questionnaire administration, one hundred and thirteen respondents were sampled. The exploratory factors analysis findings identified seven major factors militating against affordable housing delivery as: 'external influence'; 'problem with utilization of conventional materials and technologies'; 'financial constraints'; 'problems of affordable land and security of tenure'; 'absent of innovative framework and housing regulations'; 'un-predictable return on investment'; and 'poor infrastructural management service.' The study recommends that a successful implementation of affordable housing delivery hinged on an innovative housing framework and affordable supply chain that will stimulate the provision and distribution of affordable housing in developing countries. The study concluded that there is a need for the government to improve its infrastructure provision for the easy take-off of affordable housing delivery.

Reducing the risk of Incomplete Designs on Construction Projects

Lindelani Matshidze (University of the Witwatersrand).

Incomplete designs are common among construction projects. This is necessary due to the fragmentation nature of the construction project. This has been a challenge as it impacts on the overall costs of the project and often leads to costs overruns. In South Africa prior to commencement of a construction project, there are four stages that contribute to the design of a project. These include the inception, concept and viability, design and development, procurement and documentation. The study focuses on the role of incomplete design in increasing projects' risk. The design of the project impacts every aspect of the construction process, including its duration. Based on the nature of the research, this study will be conducted through qualitative data in order to answer the research question and solve the research problem. The study focused on project-related risks due to incomplete designs.

The study found that incomplete designs have negative impacts on time, costs, quality performance of a construction project. A study concluded that the impacts of incomplete designs on projects will have negative effects on the traditional process of construction work. This will be both at the inception of the project and at its completion. This is because the traditional process of procurement entails integrating teams of consultants into a single project.

Affordable Housing Issue: Users' Perception on the Adoption of Cargotecture Housing in Developing Economies

James Dele Owolabi (Covenant University, Nigeria, and cidb Centre of Excellence, Faculty of Engineering and the Built Environment), Clinton Aigbavboa (cidb Centre of Excellence, Faculty of Engineering and the Built Environment, University of Johannesburg), Kunle Elizah Ogundipe (cidb Centre of Excellence, Faculty of Engineering and the Built Environment, and Covenant University, Nigeria) and Babatunde Fatai Ogunbayo (cidb Centre of Excellence, Faculty of Engineering and the Built Environment, University of Johannesburg).

The housing deficit in Nigeria has been an issue of concern due to the influx of people into the urban region for employment and a better life. Various housing policies implemented by the government are yet to achieve the affordable housing provision goals. On this background, this study aimed to assess users' perception on the adoption of cargotecture for affordable housing provision in developing economies using Nigeria as a case study. This study conducted a survey using purposive quota sampling techniques among one hundred and thirteen low-income earners in Lagos City, Nigeria. The study findings showed that shipping containers are mainly used for stores, shops, and site offices in the study area. The findings also indicated the limiting factors that mitigate the adoption of cargotecture housing as concerns on thermal insulation, limited examples of cargotecture housing, low awareness of cargotecture housing, and concerns on insulation.

The study concludes that adopting cargotecture housing could help solve the housing issues, such as deficit, affordability, collapse, pollution, sustainability, flexibility, durability, and delay in completion time. The study recommends that cargotecture houses should be built with the low-income earners in mind with the option of installmental payment to reduce homelessness.

Job Satisfaction in the South African Construction Industry: Towards Sustaining Productivity

Osamudiamen Kenneth Otasowie (Faculty of Engineering and the Built Environment, University of Johannesburg, Johannesburg, South Africa), Matthew Ikuabe (Faculty of Engineering and the Built Environment, University of Johannesburg, Johannesburg, South Africa), Clinton Aigbavboa (Faculty of Engineering and the Built Environment, University of Johannesburg, Johannesburg, South Africa) and Ayodeji Oke (Faculty of Engineering and the Built Environment, University of Johannesburg, Johannesburg, South Africa).

Workers' satisfaction has been discovered to be fundamental to continuous productivity in the construction industry. This might not be unconnected with the fact that construction in developing nations tends to be mostly physically intensive. Therefore, the need to find measures that ensure job satisfaction among workers in the South African construction industry to sustain productivity. In order to achieve this, this study appraised the measures to ensure job satisfaction among workers in the South African Construction industry. A survey design was adopted and data was collected through questionnaire. Collected data was analysed descriptively. The findings show that approved leave and rest days, employee empowerment, and training for career development are most of the significant measures that should be in place for job satisfaction among workers. As a result, this study made meaningful recommendations such as construction firms putting in place a structure that will lead to the career development of workers for maximum productivity.

Public Procurement Challenges Facing Emerging Contractors within the Construction Industry in South Africa

Thulani Alfred Mdadane (Gauteng Department of Infrastructure Development) and Theodore Haupt (University of KwaZulu-Natal).

Purpose: This study aimed to investigate the public procurement challenges emerging contractors within the construction industry faced in South Africa. Research Design: Quantitative research was carried out to accurately measure the research phenomenon. Data was collected from 229 respondents using online questionnaires. The reliability and validity of the questionnaires were determined using Cronbach's alpha coefficient and factor analysis, respectively. The Statistical Package for the Social Sciences was used to analyse the data. Research Limitations and Implications: The study was limited to only the quantitative research method. This research method does not provide an in-depth description of the research findings and phenomenon. Therefore, future studies should employ mixed-methods research to obtain divergent views and results on the same phenomenon. Findings: The results suggested that the public procurement challenges emerging contractors faced include limited access to funding, lack of managerial skills, restrictive procurement regulations, lack of human capital, fraud and corruption, and access to information. Practical Implications: The study provides a better understanding of the public procurement challenges emerging contractors experienced in South Africa. Therefore, the findings will assist the government and procurement authorities in strengthening the procurement system.

Factors that affect the sustainability of small, medium and micro enterprises within the construction industry during the COVID-19 pandemic

Thulani Alfred Mdadane (Gauteng Department of Infrastructure Development) and Theodore Haupt (University of KwaZulu Natal).

Purpose: The study aimed to investigate the factors that affect the sustainability of small, medium and micro enterprises within the construction industry during the COVID-19 pandemic. Research Design: Descriptive research was conducted to describe the research phenomenon accurately. The quantitative research method was employed to generate new knowledge and understand the research phenomenon. The data was collected from 229 respondents through questionnaires. The Statistical Package for the Social Sciences was used to analyse the data. Research Limitations and Implications: The scope of the study was limited to a quantitative research method. Future research should adopt mixed methods to obtain divergent views and results on the same phenomenon. Findings: The overall findings indicated that access to finance, human resource management issues, legal frameworks, supply chain management and quality management were the factors that affected the sustainability of small, medium and micro enterprises in the construction industry during the COVID-19 pandemic. Practical Implications: The study enhances the competitiveness and

Relationship between Big data and Internet of Things: bibliometric review

Peter Adekunle (University of Johannesburg), Clinton Aigbavboa (University of Johannesburg), Wellington Didibhuku Thwala (University of South Africa), Opeoluwa Akinradewo (University of Johannesburg) and Ayodeji Oke (University of Johannesburg).

It is indisputable that big data and internet of things (IoT) archetypes adoption is gaining momentous recognition globally. The two 4IR elements are characterised by innovative measures capable of transforming organisations into having performance-focused culture and building high-performance teams. Big data is a platform that proffers means to analyse and methodically extricate information with data arrays that are too composite for traditional data-processing program. Big data and IoT are technologies being adopted in every sector. Big data are being adopted at an accelerated rate globally. Big data analytical tools are configured to pull information from huge data depot and make it reachable to participants involved in the construction procedure, including contractors, designers, suppliers, and clients spreading at an implausible rate. IoT, then ensures that in a typical construction site, the tools, resources, and employees are synced to a principal server that standardises and surveil their activity in concurrence ensuring compliance to the up-to-date standard and safety. In this survey, a comprehensive overview of the applications and trends of big data and IoT was provided. Audition and summing up of the upswing of big data applications, and phases explicitly concentrating on the IoT research span in construction. The research likewise recognize and summarize current trends and research area in relation to big data and internet of things. It has been establish that the incorporation of big data and IoT is anticipated to make various prospects. Such techniques provide construction professionals and stakeholders with a precision of approximately 90% when adopted appropriately into consideration.

Drivers of the Adoption of Machine Learning Applications in the Construction Industry

Matthew Ikuabe (University of Johannesburg), Clinton Aigbavboa (University of Johannesburg), Ayodeji Oke (University of Johannesburg), Babatunde Ogunbayo (University of Johannesburg), Andrew Ebekoziem (University of Johannesburg) and Joseph Balogun (University of Johannesburg).

Stakeholders in the construction industry have over the years made frantic efforts in seeking solutions to the problems facing the industry. The advent of technological innovations such as machine learning applications seek to abate some of these challenges by modernizing construction processes and activities, and ultimately improving on construction projects delivery. This study seeks to examine the propelling factors for the adoption of machine learning applications in the construction industry. Data gathered was subjected to appropriate data analysis techniques. Findings from the study revealed that the most significant drivers for the adoption of machine learning applications are the fast changing, and field based and project nature of the construction industry. Also, it was revealed that there is no difference among the different professionals' view of the drivers of machine learning applications in the construction industry. The study made recommendations that would aid the integration of machine learning applications in construction activities for better and more efficient processes in construction project delivery.

Blockchain Implementation in Nigeria; Appraisal of Drivers and Level of Adoption in the construction industry

Ebunoluwa Akinrata (Bells University of Technology), Ayodeji Oke (Federal university of technology Akure) and Modupe Mewomo (Durban University Technology).

This paper is intended to appraise various drivers influencing blockchain adoption in the construction industry using Nigeria as a case study, with a view to demonstrate possible areas where its value in the construction industry is needed most. Survey design method was used adopted in this study, while the opinion of professionals in the construction industry were sampled across major cities through structured questionnaire. Descriptive statistical tools like Means Item Scores (MIS) and Explanatory Factor Analysis (EFA) were used in analyzing data gathered from the 219 respondents. To verify the reliability of the instrument used, Cronbach α test was utilized. It was established from the study that blockchain technology implementation is marginally low in Nigeria. The intention to adopt and use of blockchain technology, nature of work, type of company, governance structure are the major drivers influencing full implementation of blockchain technology in the construction industry. This paper presents a factual reflection of drivers behind

blockchain adoption in construction industry and its recommendations can to a large extent promote of blockchain technology adoption in Nigeria and also other developing countries where construction tasks are being performed through similar approach, technique and style.

CHALLENGES ENCOUNTERED BY BID EVALUATORS ON SELECTION OF ENGINEERING, PROCUREMENT AND CONSTRUCTION(EPC) CONTRACTORS IN THE NIGERIAN OIL & GAS EPC CONTRACTS.

Ejovi Dsilvia Ogbevire (FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE, ONDO STATE, NIGERIA) and Najimu Saka (FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE, ONDO STATE, NIGERIA).

The purpose of this study is to evaluate the various challenges encountered by bid evaluators in Engineering, Procurement and Construction (EPC) contract bid evaluation, A case study survey-based design was used for this study, the case study was conducted on professionals such as Architects, Project Engineers and Quantity Surveyors working in selected Oil and Gas institutions in the Niger Delta Region of Nigeria. The limitation of this study indicates that the study is prone to impact limitation, whereby the selected field is conducive to incremental findings due to the fact that enough data was not generated. The implication of this study entails inadequate time allotted for bid evaluation to bid evaluators, in which stake holders needs to enable adequate time based on the complexity of the project. From the result of this study, it was found that, Inadequate amount of time provided to evaluate tenders at the entry level, and the number of people involved in the evaluation process at the entry level, are the two (2) biggest challenges faced by bid evaluators on EPC Projects,

EVALUATION ON THE CRITERIA FOR CONTRACTOR SELECTION IN OIL & GAS ENGINEERING, PROCUREMENT AND CONSTRUCTION (EPC) PROJECTS

Ejovi Dsilvia Ogbevire (FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE, ONDO STATE, NIGERIA) and Najimu Saka (FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE, ONDO STATE, NIGERIA).

Contractor selection for a project is an important decision, one for the project time and cost, next for the quality obtained by the project. The aim of this study is to evaluate the criteria for contractor selection on Engineering, Procurement and Construction (EPC) contracts. A case study survey-based design was used for this study, the case study was conducted on professionals such as Architects, Project Engineers and Quantity Surveyors working in selected Oil and Gas institutions in the Niger Delta Region of Nigeria. Previous studies on this study are limited based on the fact that the study is mainly focused on Engineering, Procurement and Construction (EPC) contracts in the Nigerian Oil and Gas sector. One major implication of this study indicates that technical and managerial criteria are prominent in terms of EPC contractor selection criteria, there fore these aforementioned criteria should be highly considered when selecting contractors for EPC projects. From the study carried out, the criteria for contractor selection on Oil and Gas EPC Projects, are; Technical Criteria and Managerial Criteria.

A Bibliometric Analysis on Artificial Intelligence Techniques and ICT Applications in Green Buildings

Favour David Agbajor (Durban University of Technology) and Modupe Cecilia Mewomo (Durban University of Technology).

Abstract Purpose The research cynosure on green buildings towards achieving sustainable development goals have witnessed intense accentuation in previous decades. Nonetheless, there are sparse studies on artificial intelligence (AI) and ICT-based green building (GB) research as the construction industry of the present era is increasingly shaped by digital revolution. This study uncovers the trends and applications of these digital technologies in GBs through a bibliometric analysis. **Design** This study employed a review using the bibliometric data from AI-ICT-based GBs research articles on Scopus database within 2004-2022, and were further analysed using the VOSviewer and CiteSpace tools **Research Limitations and implications** This study is strictly restricted to journal articles on AI-ICT-based coverage on GBs within the construction engineering and management fields and avert irrelevancies on the subject matter. **Findings** The results reveal the top regions, institutions and authors, predominantly the Global North, have embarked on the topic alongside a steady rise in applied AI in GBs since 2016. **Practical implications** An understanding on the status quo and future directions of digital technologies in GBs is presented to researchers and stakeholders the built-environment thereby, promoting the application of these models relevant to sustainable building performance

Advocating for an enabling policy environment and supportive stakeholder attitudes towards the uptake of 3D printing of houses in South Africa

Precious Lukhele (Department of Science and Innovation), Tshepang Mosiea (Department of Science and Innovation), Ephraim Phalafala (Department of Science and Innovation), Jeffrey Mahachi (University of Johannesburg), Nicolean Reynecke (University of Johannesburg) and Luxien Ariyan (University of Johannesburg).

The construction industry has remained fairly fixated on traditional construction methods whilst other industries embrace technological advancement in response to the Fourth Industrial Revolution. Alternative building technologies as 3D printing have a potential for wide spread adoption by the construction industry, and could improve the delivery of human settlements. However, innovative building technologies often receive high resistance by incumbent regime actors. The paper maps areas of interest convergence between technocrats, regulators, users, researchers and policy makers and their attitudes towards acceptance and scaling up of 3D printing technologies in the human settlements sector. The paper argues that the deliberate creation of a window of opportunity for 3D printing through opening up policies will stir the construction industry to embrace innovation. The study employs mixed methods approach. Surveys are used to assess perspectives and attitudes of actors and their respective interests on 3D printing versus conventional methods. A desktop study is also used to review the stance of key public housing policies. We find that although, there is a general appetite for innovation, contemporary policies informing public housing and human settlements in particular are themselves primarily conservative, they drive construction conventionalism by being mute on innovation. Furthermore, the paper finds that respondents' perceptions on conventional and 3D printed houses as influenced by the existing socio-technical system for housing. The paper lists recommendations and concludes that for change to be realized in the construction industry, policy ought to be radically oriented towards innovation.

Assessing Influence of Leadership Styles on Organisational Innovation in Construction Firms

Jefferson Chang Kisha (Ahmadu Bello University, Zaria), Hassan Adaviriku Ahmadu (Ahmadu Bello University, Zaria), Muhammad Abdullahi (Ahmadu Bello University, Zaria) and Victor Onoja Agada (Ahmadu Bello University, Zaria).

The construction industry embodies complexities, unknowns and uncertainties that affect performance of construction organisations. To improve performance therefore, construction organisations need to be innovative to be able to adapt to these complexities, unknowns and uncertainties. Studies have suggested that leadership plays a huge role in promoting organizational innovation. Leaders can motivate or influence their subordinates to have an innovative environment in their organisations. Nonetheless, the construction industry is yet to fully establish the relationship between leadership and organisational innovation at organisational level. This study hence assessed the influence of leadership styles on organisational innovation in construction firms. An extensive literature review was undertaken to identify seven leadership styles and dimensions of organizational innovation and their constructs. Thereafter, a questionnaire survey administered on 97 active construction firms within Nigeria, was used to obtain data relating to the identified leadership styles and dimensions of organizational innovation. The retrieved data was analysed using descriptive statistics and structural equation modelling (SEM). The study found that transactional leadership style significantly influences process innovation and behavior innovation, servant leadership style significantly influences behavior innovation, charismatic leadership style significantly influences market innovation and strategic innovation and finally, shared leadership style significantly influences market innovation and behavior innovation in construction firms. The study concludes that leadership styles have a significant influence on organizational innovation in construction firms.

Evaluation of levels of BIM tools for Project delivery by Architecture, Engineering and Construction firms in South Nigeria

C.C Ejidike (Federal University of Technology, Akure,), V.O. Akinola (Federal University of Technology, Akure,), S. A. Mekanjuola (Federal University of Technology, Akure,) and F.D. Agbajor (Federal University of Technology, Akure,).

Technology as a human innovation involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities. Building Information Modeling (BIM) is a revolutionary technology and process that has transformed the way buildings are designed, analyzed, constructed, and managed. The construction industry has witnessed low productivity compared to other industries, no thanks to medieval approaches that are error-prone, cost-inefficient, time-consuming, and deficient in meeting the rising trends. The objective of this study is to evaluate the level of BIM tools usage for project delivery in private construction firms in south West Nigeria. To identify the awareness level of BIM Tools usage for project delivery in Private Construction firms in South West Nigeria, and to identify the Rate of

BIM Tools usage for project delivery in private construction firms in South West Nigeria. Data were collected by administering a well-structured questionnaire to a private construction firm in South West Nigeria. Data retrieved were analysed using Mean Item Score (MIS). The analysis indicated that private construction firms in the South West were at the level of maturity usage (2D and 3D); the private firm was fully aware of Building Information Modeling (BIM) for project delivery in private construction firm in South West, Nigeria.

PROJECT CLOSE-OUT REPORT: ESTABLISHING EMERGING CONTRACTORS' STATE OF COMPLIANCE

Ayodeji Aiyetan (Durban University of Technology, Durban) and Chikezirim Okorafor (Durban University of Technology, Durban).

Project close-out report depicts a summary of the delivered project, comparison of baseline plans and actual performance, project metrics, lessons learnt, and feedback from stakeholders which add value to the construction project performance. Following the incessant report on the under-performing nature of the emerging construction contractor's in Kwazulu-Natal South Africa and its effects. Various scholars have affirmed that the practitioner's neglect project close out report and consider it as overburden and worthless. To this end, a purposive sample was drawn amongst selective emerging contractors in Kwazulu-Natal South Africa to determine the state of compliance to this exercise. Consequently, the study revealed that various elements in the project close-out report were seldom practiced. This finding has implications on the emerging contractors as it provides evidence that suggest dearth in their quest for enhancing competitiveness and sustainability in their practice.

TACKLING ENVIRONMENTAL DETERIORATION: ABT AS A FIRST-RATE STRATEGY FROM THE CONSTRUCTION INDUSTRY

Yusuf Dangor (University of Johannesburg), Olushola Akinshipe (University of Joahannesburg) and Clinton Aigbavboa (University of Joahannesburg).

Indeed, the construction sector is a vital investment-driven industry that substantially impacts every economy worldwide. Despite its valuable role, the industry has been infamously branded as wasteful and significantly contributes to environmental degradation. The construction industry is leading the way in implementing sustainability measures by employing environmentally friendly technology to solve various global environmental issues. The current study set out to assess how Alternative Building Techniques can facilitate sustainable construction to address the environmental deterioration in South Africa. A well-structured questionnaire was used to obtain data from construction professionals using a quantitative research technique. The retrieved data were analyzed and ranked using descriptive statistics. The findings indicated that minimal waste output, promotion of rapidly renewable, low emission resources, and efficient construction process are the most eminent benefits of adopting ABT's to the environment. This study recommended that institutions should create awareness of construction impacts on the environment, the concepts of sustainable construction, and the various benefits of implementing ABT usage.

THE PERCEIVED BENEFITS OF GREEN ROOFS IN GHANA

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Green roof systems are living vegetation installed on the roofs and could contribute positively to the reduction of urban heat, enhancement of building thermal and environmental performance. This study highlights the perceived benefits and areas of buildings where green roofs can be constructed in Ghana. A field survey was conducted using questionnaires to collect data from consultancy firms in Kumasi. The data collected was analyze using descriptive statistics. Quantitative approach was used to find out the perceive benefits of using green roofs. The findings show that the topmost benefits are: it reduces heat transferred into the building and decrease the cost of energy demand for cooling. It also helps to reduce air pollution, serves as job creation opportunities for manufacturers and installers, restoration of the natural environment and serve as place for recreation. Green roof can be partially or entirely covered with vegetation. Its construction can be at the edges, middle, fully back page or fully front parts of the building. It is recommended that, governmental projects should adopt green roofs to motivate the other developers in the country. Consultancy firms should create awareness, assist and advice clients to implement this type of roof. Governmental agencies should conduct outreach programs to sensitize more people to enjoy green roof benefits.

Understanding Construction Claims through Activity and General Systems Theoretical Lenses

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This study aims to understand construction claims through the theoretical lenses of both the cultural-historical activity theory (CHAT) and general systems theory (GST). A theoretical narrative literature review was undertaken to get an overview on the causes of construction claims and the foundational principles of both the activity and systems theories. Literature not older than five years was identified in science direct, EBSCOhost and google scholar using this abstract keyword. The limitations of this study are that being a narrative literature review, the findings are subjective and thus call for supplementing of the theoretical findings with pragmatic primary data collection. The findings revealed that both CHAT and GST promote the necessity of humans and technology as mediators through which claims as a comprehensive system and an activity can be understood for more practical resolution in the 21st century. This study also uncovered the vital aspect of facilitating information exchange between individuals through technological tools, stressing the importance of understanding the historical, structural and functional aspects of construction claims for pragmatic resolution.

IMPLEMENTATION OF AUTOMATION AND ROBOTICS: BENEFITS TO THE CONSTRUCTION INDUSTRY

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With the advancement of technological equipment, understanding how technology influences the construction industry is essential. South Africa is expanding its use of technological innovation in the construction sector, primarily to solve issues particularly on building sites such as decline in quality and productivity, material wastage, injuries, project delays and poor working conditions. A solution to these issues is the adoption of implementation strategies of automation and robotics technologies, which have the potential to increase productivity, safety, and quality in the construction industry. This study aimed at evaluating the benefits of the implementation strategies of automation and robotics in the South African Construction industry. Corresponding literatures were reviewed, and a detailed quantitative research methodology was adopted to analyse the relationship between the variables. The cluster sampling technique was used and a survey questionnaire was distributed to a total of 111 valid construction professionals, who were situated in the Gauteng province of South Africa. The data collected presumed that the implementation of automation and robotics in the construction industry is beneficial as it increases productivity and efficiency. This was because technologies are generally more efficient than labourers as they can execute more work precisely without getting 'tired' as well as perform tasks well under hazardous conditions. The study concluded that the increase in productivity and efficiency by automation and robotics can reduce construction project delays and can ensure that certain goals are met during all phases of construction projects.

An assessment of alternative financing mechanisms for municipal infrastructure projects in South Africa

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This research sought to the alternative financing mechanisms for municipal infrastructure in District and Local Municipalities in South Africa. The main objective of the study was to assess challenges and constraints faced by district and local municipalities in procuring alternative finance for infrastructure development. The study made use of a descriptive cross-sectional survey. Data was collected through self-administered questionnaires from a representative subset, made up of municipal officers in district and local municipalities in Gauteng, South Africa. The findings of the study reveal that municipal infrastructure is largely funded through grants and partly through own revenues. Another major finding was that district and local municipalities face challenges in procuring municipal infrastructure through alternative mechanisms. Public-Private Partnerships for instance are complex and take long to unlock. As a result, there is limited consideration for alternative financing mechanisms. Nevertheless, there seem to be a willingness from municipalities to embrace alternative financing mechanisms. There is a need to cultivate a culture of exploring alternative financing mechanisms beyond PPPs. Such efforts would require National Treasury to educate and empower

Academic Training Evaluation of Building Technology Programme

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Training evaluation is one method used by tertiary institutions to assess the efficacy of the training provided to students in preparedness for the workplace. However, evaluation processes by several tertiary institutions have been limited to assessment in tests and examinations without taking into account the knowledge and competencies acquired by students through training in meeting the demands of the workplace. Hence, the study evaluated the training received by Building technology graduates in construction management and construction technology courses. The study adopted the Kirkpatrick model's first two stages of training evaluation (reaction and learning levels) with a questionnaire distributed to purposively selected Building technology graduates from two polytechnics in Southern west Nigeria using a snowball sampling technique. Data obtained were analyzed using descriptive statistical tools. The study's findings show that respondents were satisfied with the training acquired and possess the basic competency from the training. However, the graduates lack sufficient knowledge of laws and regulations governing construction work, the use of computer programme for project planning and scheduling and the ability to use tools and equipment for construction work. This implies that without additional training, building graduates would be unable to work adequately in the construction industry, putting enormous strain on construction firms in re-training them to meet their expectations. Tertiary institutions need to revamp their training strategies and methods for students to improve their competency to strive in the construction industry.

Application of Green Building Technologies in Lesotho

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The construction industry is thought to be the largest contributor to greenhouse gas emissions (GHG), which harm both humans and the environment. As a result, it is critical that buildings be built and operated in an environmentally friendly manner, with 'Mother Nature' and future generations in mind. Despite numerous measures taken by countries around the world to introduce green building initiatives (GBIs), less developed countries continue to lag in adopting green building technologies (GBTs). Therefore, the study aims to improve the current state of the Lesotho construction industry's green building initiative and to raise awareness that will influence and promote the use of GBTs in the Lesotho construction industry. The qualitative research approach was adopted, and interviews were conducted, posing a series of questions to the construction stakeholders. The respondents were selected purposively based on their availability and willingness to participate in the study. The findings from the study revealed that there is limited knowledge amongst the construction role players. Furthermore, the introduction of mandatory policy and standards as the first step in regulating the construction industry is a strategy that could be used by both the public and private sectors. Based on the findings, it is recommended that a green building professional body be established to aid in the promotion of green building initiatives by regulating the Lesotho construction industry. It is also recommended that the government set the example by implementing green building technologies (GBTs) in state-owned buildings to facilitate the smooth implementation of the practice to improve the sustainability and energy performance of buildings.

Mode of executing infrastructure projects and employment opportunities

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Purpose: The triple problems of unemployment, underemployment and the lack of skills development in developing economies can be addressed significantly through infrastructure development. Infrastructure development facilitates the blend of educational training and workplace experience for skills development. Therefore, it requires crafting a suitable flow of procurement instruments to achieve these objectives. This research evaluated the execution of three infrastructure projects, Projects 1, 2 & 3, with the objective of identifying the most suitable mode of execution that provided the highest employment opportunities. Design: The multiple site case study method of qualitative research was adopted. The data were obtained through contextual analysis and evaluation of project operation documents, published articles and the comparative analysis of the organisational structure of the construction companies. Research limitations:

At the time of this research, all the projects examined had been concluded. It was not possible to interact with the project personnel and the research relied solely on available project operation documents. Findings: The findings revealed that Project 1 was executed by a single contractor, while Projects 2 & 3 were executed via the multiple contractor approach. The employment opportunities at all levels were higher in Projects 2 & 3 compared to what was achieved in Project 1. Practical implications: Therefore, adopting the concept of segmentation of a capital infrastructure project holds the potential of creating more employment opportunities. In doing so it will ameliorate the triple problems of unemployment, underemployment and the lack of skills development. Thus, this concept should be adopted for the execution of all types of infrastructure projects.

Urban Resilience for Sustainable Homeownership: The Role of Self-Help in the Ancient City of Benin, Nigeria

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Organised self-help approach has been proved as a successful mechanism for enhancing urban low-income earners' (LIE) homeownership in some developing countries. The technique possibly can enhance urban resilience for sustainable homeownership. There is a paucity of studies concerning sustainable homeownership for Nigeria's urban LIE through a self-help approach. The study investigated the housing needs of the urban LIE via organised self-help mechanisms and how it can enhance urban resilience for sustainable, low-cost housing provision in the Ancient City of Benin, Nigeria. Given the unexplored nature of the issue, 20 face-to-face interviews were conducted with experts and analysed through a thematic approach. Findings identified eleven barriers faced by the urban LIE. This includes access to housing finance, urban land scarcity, high property development costs, naira devaluation, high-interest rates and inflation, bribery and corruption, lax mortgage sub-sector, high cost of infrastructure, and government bureaucracy. The study's results will strengthen and offer a rich insight into how organised self-help mechanisms can enhance urban resilience for sustainable, low-cost housing provision in Benin City, Nigeria.

SWOT Analysis as a Strategic Tool to Develop Economic Sustainable Construction Business: A Case of Construction Contractors

Iruka Anugwo (Durban University of Technology).

In the area of strategic business management, the application of SWOT analysis as a business tool is considered a classical approach but effective; it has continued to gain more traction in terms of analysing and determining critical internal strengths and weaknesses as well as external opportunities and threats of any given organisations. There are incessant and premature business failures across various sectors (especially the construction sector). The causes of premature business failure would be linked to the inability of start-ups or existing organisations to strategically undertake internal and external business analyses that would assist them in identifying business attributes of strengths, weaknesses, opportunities and threats in their business' operating environment. This paper was an attempt to assess and determine the synergistic effect and impact of conscious application of SWOT analysis to develop, grow and maintain sustainable economic business within the construction industry. This study utilised a systematic examination of relevant literature between the years 2002 to 2022 on the subject of SWOT analysis as a business tool to determine the critical factors for growing sustainable construction business. The study's analysis includes published 23 academic articles out of 65 articles initially extracted from Google scholar. The study findings indicated that through SWOT analysis as a business planning tool identified 13 factors (strengths), 11 factors (weaknesses), 6 factors (opportunities), and 10 factors (threats) which were considered as critical factors and business attributes for growing a sustainable business within the construction industry. Thus, conscious application of SWOT analysis among start-up and existing contractors in the construction industry would potentially minimise the incessant and premature business failure in the construction sector.

The Role of Learning Experiences on Career Choices for Built Environment Students

Mariam Akinlolu (Mangosuthu University of Technology, Durban).

This study sought to examine the role of learning experiences on the career preferences of undergraduate students in built environment programs in South Africa. To achieve the study objectives, a survey of 229 purposively sampled university students registered in built environment programs was conducted. Although results from the regression analysis showed that the career choices of students in this study to undertake a career in the built environment, were not directly related to their previous learning experiences, the questionnaire survey revealed that performance

accomplishment had a significant influence on students' persistence and career choices. Additionally, recommendations are made to improve the perception and attract students to built environment programs.

Stakeholder Integration in Management of Sustainable Construction: A Literature Review

Uzor Onyia (University of Nigeria), John Ebohon (London SouthnBank University) and Abimbola Windapo (University of Cape Town).

Construction is highly fragmented across multiple stakeholder expectations. Studies focusing on Stakeholder Integration (SI) in managing sustainable construction are still fragmentally evolving as well, hence the need to conduct a systematic literature review on SI across the management of planning, design, construction, maintenance, and demolition in the last 20years to identify the current trend and realistic management strategy. This study is segmented into two categories, pre-2015 (from 2002 - 2015) and post-2015 (2015 - 2022) era. Studies reveal that SI in Sustainable construction discussions is directly proportional to economic and environmental challenges. Conclusively, this study recognises complete SI across all management processes as a sustainable management strategy for sustainable construction. It also provides direction to both policymakers and researchers on SI in sustainable construction.

A Comparative Assessment of the Sanitary Facilities in IDP Camps with UNHCR and SPHERE Standard Provision

Emmanuel Nkeleme (Nelson Mandela University).

There are over 2.1 million Internal Displaced Persons (IDPs) who have been in camps and host communities due to the conflict between the Nigerian state armed group and non-state armed group. The provision of aides to reduce the suffering of these people, especially women and children have brought questions in terms of the adequacy and functionality of the Sanitary facilities in the IDP camps. According to UNICEF 2016 research to answer the performance questions are rarely carried out due to the complex nature of the conflict zone. The research against all odds sought to do a comparative assessment of the sanitary facilities in the IDP camps with the UNHCR and SPHERE standard provisions. It was conducted with the use of a structured checklist based on the UNHCR and SPHERE standards and was used to visually inspect and observe the camp's water, sanitation, and hygiene facilities in the 16 IDP camps studied. The research revealed among others that water provision is inadequate for the IDPs as observed in the camps visited. Also, the distance traveled, and time spent at a fetching point is none conforming to both SPHERE and UNHCR standards. The laboratory finding for water quality assessment indicates that there is the presence of physical, biological, and chemical contaminants harmful to health. The research findings from the camp defy the standard provisions for IDPs in both UNHCR and SPHERE. The research recommends that the Federal Ministry of Humanitarian Affairs, Disaster Management, and Social Development needs to enforce strict compliance with the humanitarian standards in the Nigerian national policy on internally displaced persons in Nigeria to enhance the better life of the IDPs in the formal and informal camps.