Adaptations and Innovations: A Panacea to Challenges Faced by Builders after Subsidy Removal in Nigeria

[*]Ijigah E.A. & Alake O.
Department of Building, Federal University of Technology, Akure
[*]Corresponding author: eaijigah@futa.edu.ng
[*]Orcid ID numbers: https://orcid.org/0009-0002-9038-7001

Received: 3/05/2024 **Revised: 26/07/2024** **Accepted: 14/03/2025**

Builders play a pivotal role in ensuring successful operation of construction projects. The impact of subsidy removal in Nigeria introduced a complex landscape with both challenges and opportunities for Builders. This research aims to assess adaptations and innovations to challenges faced by Builders after subsidy removal in Southwest, Nigeria. Quantitative research approach was adopted, and structured questionnaires were administered to 128 building professionals registered with the Nigerian Institute of Building (NIOB) in the selected States of Ekiti, Ondo, and Osun. Ninety-eight (98) questionnaires were retrieved from the respondents representing (76.56%) which were analysed using descriptive and inferential statistics. Findings from the study shows that the challenges faced by Builders after subsidy removal are increased construction material cost (M= 4.66; S.D.=0.98; t = 78.10), difficulty in negotiating contracts with suppliers and subcontractors (M= 4.16; S.D.=0.86; t = 46.55), difficulty in attracting investors (M= 3.92; S.D.=0.88; t = 40.42), disputes between Builders and clients (M= 3.90; S.D.=0.84; t = 44.49), and higher loan servicing cost (M= 3.90; S.D.=1.08; t = 42.44). Adaptation and innovative practices mostly ranked in the study are optimization of material usage (M= 4.10; S.D.=0.93; t = 78.10), construction waste recycling and reusing (M= 4.09; S.D.=0.92; t = 46.55), use of cement admixtures (M= 4.09; S.D.=0.93; t = 40.42), and green building technology (M= 4.08; S.D.=0.89; t = 44.49). The study recommended that these adaptive and innovative practice should be encouraged and disseminate on knowledge-sharing platforms to improve the resilience of the construction industry to policy changes like subsidy removal.
Keywords: Adaptation, Builders, challenges, construction, innovations, subsidy

Introduction

A Builder is a professional in the construction industry responsible for overseeing and managing the construction of buildings and structures. They are instrumental in bringing construction projects from conceptualization to completion. According to Oke *et al*. (2024), Builders play a pivotal role in the construction industry by serving as the driving force behind the realization of architectural, mechanical, structural, and electrical designs. Builders also carry out project management functions and ensured project compliance to regulations. They enforce quality assurance, risk management, communicate and collaborate with other professionals to meet project objectives (Ebie & Ewumi, 2022). Builders are responsible for translating blueprints into tangible structures, overseeing every phase of construction, from initiation to completion stages of building projects. According to Moshood *et al*. (2024), Builders ensure efficient project management, coordinate subcontractors, and adhere to safety standards, ultimately shaping the built environment. Jones and brown (2020) and Neto and Amaral (2024) emphasised the pivotal role of builders in coordinating various aspects of a construction project and ensuring synergy among different teams. The influence of Builders is also evident in the building sector, urban development, infrastructure development, economic growth, and societal progress. Affordable housing projects, supported by the government and Builder's would have provided accessible housing options for the populace (Akinwande & Hui, 2024). But despite pivotal roles of Builders and government, the construction industry in Nigeria faces challenges such as inadequate infrastructure, regulatory bottlenecks, and funding constraints (Mgbolu *et al*., 2024).

Subsidy is an amount of money given by the government to particular enterprises, industries, or individuals to encourage or support economic activities deemed beneficial to society (Rahman *et al*., 2024). This financial aid aims to reduce the cost of goods or services, stimulate economic growth, and alleviate financial burdens on targeted sectors. There are many different kinds of subsidies, such as direct cash grants, tax benefits, or low-interest loans, and they play a crucial role in shaping economic policies worldwide (Smith, 2020). Ijigah and Omeize (2024) recommended subsidy for construction industry to boost the economy and infrastructure. Historically, subsidies have played a significant role in supporting industries, stimulating economic growth, and infrastructural developments (Gana & Bashar, 2024).

The removal of all forms of subsidy in Nigeria on May 29th, 2023 has floated the economy and created another challenge for the construction industry and stunted the initiatives within the construction industry to address housing deficits (Omotosho & Yang, 2024). Builders, clients, and other stakeholders are confronted with research on strategies that will be adopted to adequately manage construction projects to

meet the project time, cost, and quality without abandonment or collapse of construction projects. The removal of subsidies in Nigeria has also far-reaching implications for the construction industry, affecting various facets of its operations and outcomes. The impact of subsidy removal, however, introduces a complex landscape with both challenges and opportunities. The challenges faced by builders after subsidy removal are increased construction material costs (Alinta-abel, 2025); lack of financial incentives (Ijigah & Omeize, 2024); workforce instability (Deep *et al.,* 2024); dispute between Builders and client (Ejiofor & Akabudike, 2024; Mohammed *et al*., 2024.); reduced profit (Ifeoma *et al.,* 2024); delay in project completion (Isiofia *et al.,* 2024); increased competition among professionals (Oke *et al.,* 2024); compelled to navigate a swiftly evolving terrain (Naguib, 2024); reduced investment in new construction technologies (Zhao *et al.,* 2024); difficulty in protecting health and safety of workers (Neto & Amaral, 2024); (Selvaraj & Chan, 2024); project abandonment (Guo *et al*., 2024); difficulty in management of cash flow (Liu *et al.,* 2024); and difficulty in negotiating contracts with suppliers and subcontractors (Deep *et al.,* 2024; Kim & Rhee, 2024).

These challenges also offer chances for adaptations and innovations like creativity, public-private partnerships, and advancements in construction technology. Adaptive and innovative ways that will enhance performance of Builders in the industry are cost management (Musarat *et al*., 2024); hiring of specialized expertise (Aslam & Baffoe-Twum, 2024); client education and collaboration (Johnson & Muir, 2021); investment in quality reusable tools (Mayer, 2024); construction of simple roof system (Turner & Walker, 2017); lean construction practices (Najafi *et al.,* 2024); adoption of polished concrete floor (Ambily *et al.,* 2024); green building technology (Love *et al.*, 2021); use of cement admixtures (Kang *et al*., 2024); construction waste recycling and reusing (Love *et al.*, 2020); real estate crowdfunding (Ling *et al.*, 2021); and skill development (Partington *et al.,* 2024). Builders can embrace these multifaceted roles and equip themselves to secure the construction industry's resilience after subsidy removal. Their adaptability, management, and commitment to project performance through sustainable construction methods will shape the industry's future.

The study is modelled on an assumption that the removal of subsidies will be a concern as construction quality and safety standards may be compromised due to financial constraints. The purpose of this study is to overcome the challenges posed with subsidy removal while at the same time assess adaptations and innovative ways Builders will meet higher performance of construction projects.

Literature Review

Roles and challenges of builders in the construction industry

The roles of builders in the execution of construction projects includes budgeting and cost management, quality management to meet project specifications, and project management of construction works (Chartered Institute of Building, 2017*;* Mendes, 2017; Wysocki, 2019; Wick *et al.,* 2019). After subsidy removal many Builders on construction projects find it difficult to perform these roles because of increase in construction materials, lack of financial incentives, and delay in project completion which sometimes results to dispute between the Builder and the client (Ejiofor & Akabudike, 2024; Mohammed *et al*., 2024; Alinta-abel *et al*., 2025; Ijigah & Omeize (2024; Isiofia *et al.,* 2024). Other roles of Builders that are faced with challenges are compliance with building codes and regulations (Kumar *et al*., 2024), coordination of resources, project planning, scheduling, monitoring and control (Construction Industry Institute, 2013). Supervision and coordination of workers, and ensuring that all worker on site comply with health and safety regulations which are affected by subsidy removal (Gambatese & Hallowell, 2018). According to Liu *et al.,* (2024), Deep *et al.,* (2024), and Gue *et al.* (2024), difficulty in management of construction project cash flow, negotiating contracts with suppliers and subcontractors, and project abandonment are major challenges faces by construction professionals after subsidy removal. Neto and Amaral (2024), reported that builders find it difficult to protect health and safety of workers because most of the workers wants to engage in extra work and earn more money after the subsidy was removed.

Builders in the construction industry also communication and collaboration with other professionals, carry out buildability and maintainability analysis, staffing on construction site, prepare construction blueprint, construction methodology, conduct risk assessment, and carry out expert witness in arbitration (Love *et al.*, 2020; Tezel *et al.,* 2020; Zhang *et al.,* 2021; Nguyen *et al*., 2024*;* Moradi *et al.,* 2020). All these functions of builders are challenged, due to increased competition among professionals and reduced investment in new construction technologies (Oke *et al.,* 2024; Zhao *et al.,* 2024).

Challenges faced by builders after subsidy removal

The removal of subsidies in Nigeria has far-reaching consequences on the construction industry that extend beyond immediate fiscal considerations. Understanding these effects is essential for grasping the complexities and challenges that Builders face in a post-subsidy removal environment. The challenges faced by builders are highlighted in Table 1. The interplay of economic, environmental, financial, and societal factors in the construction industry post-

subsidy removal is a dynamic field of study with far-reaching implications for builders, investors, governments, and the society at large. Additionally, regulatory changes and market volatility further contribute to the complexity of the post-subsidy environment. Identifying and comprehending these challenges is imperative for devising effective strategies and support mechanisms to ensure the resilience of builders in the face of subsidy removal.

Table 1: Challenges Faced by Builders in The Construction Industry

S/No	Challenges Faced by Builders	References
1	Increased construction material costs	Ofori (2019); Chamarande *et al.* (2024); Alinta-Abel *et al*. (2025); Sahu et al. (2024)
2	Workforce instability	Deep *et al.* (2024)
3	Financial risks and uncertainties	Ijigah and Omeize (2024)
4	Lack of financial incentives	Chen *et al.* (2016); El-Diraby and Bensalem, (2019); Ijigah and Omeize (2024)
5	Dispute between Builders and clients	Ejiofor and Akabudike (2024); Mohammed *et al.* (2024). Kayastha *et al*. (2024)
6	Delay in project completion	Wang *et al.* (2018); Isiofia *et al.* (2024)
7	Reduced investment in new construction technologies	Zhao *et al.* (2024)
8	Difficulty in protecting health and safety of workers	Neto and Amaral (2024); Selvaraj and Chan (2024)
9	High insurance cost	Selvaraj and Chan (2024)
10	Difficulty in negotiating contracts with suppliers and subcontractors	Deep *et al.* (2024); Kim and Rhee (2024)
11	Reduced profit	Ifeoma *et al.* 2024
12	Increased competition among professionals	Oke *et al. (*2024)
13	Reduced investment in new construction technologies	Zhao *et al.,* (2024)
14	Project abandonment	Guo *et al*., (2024)
15	Difficulty in management of cash flow	Liu *et al.,* (2024
16	Compelled to navigate a swiftly evolving terrain	Naguib, (2024).

Innovations and adaptations of builders to subsidy removal

The role of builders in adapting to subsidy removal in the construction industry is pivotal in ensuring the continued growth and sustainability of the sector. Adaptive and innovative ways that will enhance performance of Builders in the industry are highlighted in Table 2. Builders can embrace these multifaceted roles equipment in securing the construction industry's resilience after subsidy removal. Their adaptability, management, and commitment to project performance through sustainable construction methods will shape the industry's future.

Table 2: Innovations and Adaptations of Builders to Subsidy Removal

S/No	Challenges faced by Builders	References
1	Cost management	Musarat *et al*. (2024)
2	Hiring of specialized expertise	Aslam and Baffoe-Twum (2024)
3	Client education and collaboration	Johnson and Muir (2021)
4	Investment in quality reusable tools	Mayer (2024)
5	Construction of simple roof system	Turner and Walker (2017
6	Lean construction practices	Najafi *et al.* (2024)
7	Adoption of polished concrete floor	Ambily *et al.* (2024)
8	Green building technology	Love *et al.* (2021)
9	Use of cement admixtures	Kang *et al*. (2024)
10	Construction waste recycling and reusing	Love *et al.* (2020); Kurniawan *et al.* (2024)
11	Real estate crowdfunding	Ling *et al.* (2021)
12	Skill development	Partington *et al.* (2024).
13	Optimization of material usage	Santos *et al.* (2024); Asghari and Memari (2024).

Research Methodology

Data for the study were collected and collated through a quantitative research approach while a structured questionnaire was administered to Builders in three Southwest States in Nigeria. The three Southwest states (Ekiti, Ondo and Osun State) were selected because, several infrastructural developments are carried out by the States and some Builders were involved to execute the projects. Three hundred and twenty-seven (327) Builders were registered with the state chapter of the Nigerian Institute of Building (NIOB) in the selected States. A sample size of one hundred and twenty-eight (128) was drawn from the total number of registered Builders that are within the selected States (Ekiti, Ondo and Osun) using Yamane's formula (Charles & Don-Baridam, 2024). Hardcopy of the questionnaire were distributed by hand to the respondents during their States (NIOB) end of month meetings while e- copies were send to builders that were absent from the meeting. A total of 128 questionnaires were distributed but 98 (76.56%) of the data were retrieved while thirty questionnaires 30 (23.44%) were not retrieved and are not used in collations of the results. Table 3 represents information of the registered Builders, the number of questionnaires distributed, number of questionnaires retrieved, and the percentage retrieved. Challenges faced by Builders after subsidy removal, and policies put in place to cushion the effect of the challenges were assessed. The study's data were processed and examined using Statistical Packages for the Social Science (SPSS 27.0). Frequency, mean, standard deviation and t-test were used to arrive at the conclusion.

Table 3: Number of Builders Registered in the State Chapters in the Study Area

State	Number of Builders	Number of Questionnaire Distributed	Number of Questionnaire Retrieved	Percentage retrieved
Ekiti,	145	58	43	74.14
Ondo	95	37	32	86.49
Osun	87	34	23	67.65
Total	327	128	98	76.56

Results and Discussion

Demographic characteristics of the respondents

Table 4 displayed the breakdown of the demographic characteristics of the respondents in the study area. The data in Table 4 showed that 77.6% of the respondents are male, 22.4% are female. 72.4% of the respondent are above the age of 40, 18.4% are 30-39 years while only 9.2% are within the age range of 20-29. The highest educational qualification of the of the respondents recorded that HND representing 29.6% of the respondents, PGD represented 12.3%, those with BTech/BSc represented 30.6 %, MSc represented 20.4% percent and the respondents with PhD are 7.1%. Table 2 also represented years of practicing experience of the respondents in the construction industry. 16.3% of the respondents have practiced for 1-5 years, 40.8% have practiced for 6-10 years, 18.4% have practised building profession for 11-15 years, while 24.5% of the respondents have practised building profession represented professionals with 16-20 years. Table 4 also assessed the roles of builders in the construction industry, 25.5 % of the respondents are building contractors, 12.3% are building consultants, 24.5 % are academician, 7.1% are suppliers while 9.2% of the respondents are building sub-contractors. From the findings, the respondents possessed the necessary understanding to provide input on challenges faced by builders during subsidy removal and innovations put into place to cope with the changing subsidy landscape.

Table 4: Demographic Characteristics of the Respondents

	Respondents	Freq.	Per cent		Respondents	Freq.	Per cent
Sex	Male	76	77.6	**Age**	20 – 29	9	9.2
	Female	22	22.4		30 – 39	18	18.4
	Total	**98**	**100**		Above 40	71	72.4
					Total	**98**	**100.0**
Years of	1-5 years	16	16.3	**Highest**	HND	29	29.6
Experience	6-10 years	40	40.8	**Educational**	PGD	12	12.3
	11-15 years	18	18.4	**Qualification**	B.Tech./B.Sc.	30	30.6
	16-20 years	24	24.5		M.SC	20	20.4
	Total	**98**	**100.0**		Ph.D.	7	7.1
					Total	**98**	**100.0**
Roles of	Contractor	25	25.5				
Builders	Consultant	12	12.3				
	Academician	24	24.5				
	Supplier	7	7.1				
	Sub-contractor	9	9.2				
	Total	**98**	**100**				

Challenges faced by builders after subsidy removal

Table 5 presented the results of the challenges faced by builders after subsidy removal. The result of Table 5 shows that increased in construction material costs with a mean score of 4.66 was ranked highest. The result implies that subsidies often helps to regulate the cost of building material. The removal of subsidy leads to a spike in prices of essential building materials such as cement, steel, and lumber (Sahu *et al.*, 2024). The result of the finding in in agreement with the study by Alinta-Abel *et al*. (2025) that the removal of subsidy increased the cost of building materials. Second on the list was difficulty in negotiating contracts with suppliers and subcontractors with a mean of 4.16 ranked second. Kim and Rhee (2024) affirmed that Builders find themselves in difficult negotiations, trying to strike a balance between securing necessary materials and services while maintaining profitability and competitiveness in the market. The result of the finding is also in agreement with the study of Ifeoma *et al.* (2024) that subsidy removal reduced the profits on construction projects which sometimes leads to project abandonment as stated by Guo *et al*., (2024). The third on the list of challenges faced by builders after subsidy removal as presented in Table 4, was builders struggle to attract investors with a mean of 3.92. Investors are reluctant to commit funds to projects facing uncertain or escalating costs, particularly if profitability projections are impacted by increased material expenses (Chamarande *et al.*, 2024). Contract disputes between builders and client, Higher borrowing/loan cost and pressure on building safety standard with a mean of 3.90 respectively ranks forth, difficulty in implementation of health and safety of workers with a mean of 3.84 ranks fifth, contract dispute between builders and client with a mean of 3.77 ranks sixth and Increase in insurance cost with a mean of 3.74 ranks seventh. Untimely project completion with a mean of 3.73 ranks eight, management of cash flow issues with a mean of 3.70 ranks ninth, unforeseen disruptions and risks with a mean of 3.66 ranks tenth. Increased project competition with a mean of 3.63 ranks eleventh, increase property management and maintenance cost with a mean of 3.61 ranks twelfth, Increase utility costs with a mean of 3.59 ranks thirteenth, reduced profit with a mean of 3.58 ranks fourteenth, reduce investment in new construction technologies and removal/lack of financial incentives with a mean of 3.47 respectively ranks fifteenth, staffing on construction site with a mean of 3.36 ranks sixteenth.

Table 5: Challenges Faced by Builders After Subsidy Removal

Challenges	M	D.f	S.D	T-test	Sig. (2-tailed)	Rank
Increased construction material costs	4.66	97	0.98	78.10	0.000	1
Difficulty in negotiating contracts with suppliers and subcontractors	4.16	97	0.86	46.55	0.000	2
Struggles to attract investors	3.92	97	0.88	40.42	0.000	3
Disputes between builders and client	3.90	97	0.84	44.49	0.000	4
Higher borrowing/loan cost	3.90	97	1.05	42.44	0.000	4
Pressure on Building safety standard	3.90	97	1.13	44.00	0.000	4
Difficulty in implementation of health and safety of workers	3.84	97	0.88	46.14	0.000	5
Contract dispute between builders and client	3.77	97	0.89	45.11	0.000	6
Increase in insurance cost	3.74	97	0.75	40.60	0.000	7
Untimely project completion	3.73	97	0.86	48.65	0.000	8
Management of cash flow issues	3.70	97	0.91	44.99	0.000	9
Unforeseen disruptions and risks	3.66	97	0.80	40.43	0.000	10
Increased project competition	3.63	97	0.85	30.33	0.000	11
Increase property maintenance cost	3.61	97	1.02	37.15	0.000	12
Increase utility costs	3.59	97	0.70	33.63	0.000	13
Reduced profit	3.58	97	0.87	38.44	0.000	14
Reduce investment in new construction technologies	3.47	97	0.83	29.86	0.000	15
Removal/lack of financial incentives	3.47	97	0.86	55.45	0.000	15
Staffing on construction site	3.36	97	0.78	52.67	0.000	16
Reduced Client confidence	2.95	97	0.59	42.57	0.000	17

Adaptations and innovations that will reduce the effect of subsidy removal

Results of adaptations and innovations inculcated by Builders in other to cope with the changing subsidy landscape is presented in Table 6. From the result, optimization of material usage with a mean of 4.10 was ranked first. The result of the finding indicated that the removal of subsidy lead to higher material costs and builders should optimize their material usage. The result is in agreement with the study by Santos *et al.,* (2024) who said that builders can optimize their material usage, employ efficient design techniques, and accurate estimate of materials to minimize waste during construction. From the result in Table 6, construction waste recycling and reusing and polished concrete floor with a mean of 4.09 respectively ranked second. Construction waste recycling and reusing is a cost effective, sustainable, and environmental friendly practice of material management on construction sites. The practice with the use of polished concrete floors will reduce construction cost and enable builders to manage construction projects after subsidy removal. The study is in agreements with the research study by Kurniawan *et al.* (2024) who stated that in response to subsidy removal, builders have adopted practices such as recycling and reusing of construction waste which involves segregating and sorting materials such as concrete, wood, and metal for recycling purposes. Kurniawan *et al.* (2024) also claimed that materials reused in subsequent projects, reduces the need to purchase new materials and lower the overall cost of construction projects. Use of cement admixtures and green building technology with a mean of 4.08 respectively ranked third. Cement admixtures are additives used to enhance the properties of concrete, such as workability, strength, and durability, by incorporating admixtures into concrete mixes, builders can achieve desired performance characteristics while potentially reducing the overall cement content. This not only optimizes material usage but also helps mitigate the impact of increased cement prices resulting from subsidy removal

Investment in quality reusable tool with a mean of 4.05 ranked forth, use of Ferro cement and Skill development with a mean of 3.94 respectively ranked fifth, energy efficient design and building information modelling with a mean of 3.93 respectively ranked sixth and purchasing of materials in bulk and higher only expert both with a mean of 3.90 ranked seventh. Real estate crowdfunding and simple roof system with a mean of 3.89 both ranked eight, use of bamboo as reinforcement of 3.88 ranked ninth, prefabrication and modular construction with a mean of 3.84 ranked tenth, and lean construction practice with a mean of 3.82 ranked eleventh. Others are opting for local material sourcing with a mean of 3.64 ranked twelfth, sustainable finishes with a mean of 3.59 ranked thirteenth while value engineering with a mean of 3.55 ranked fourteenth.

Table 6: Adaptations and Innovations to Challenges Faced by Builders

Adaptations and Innovations Factors	M	D.F	S.D	T-test	Sig. (2-tailed)	Rank
Optimization of material usage	4.10	97	0.93	78.10	0.000	1
Construction waste recycling and reusing	4.09	97	0.92	46.55	0.000	2
Use of Cement admixtures	4.09	97	0.93	40.42	0.000	3
Green building technology	4.08	97	0.89	44.49	0.000	4
Investment in quality re-useable tool	4.08	97	0.90	42.44	0.000	5
Lean construction practice	4.05	97	0.88	44.00	0.000	6
Simple roof system	3.94	97	0.87	46.14	0.000	7
Skill development	3.94	97	0.87	45.11	0.000	8
Energy efficient design	3.93	97	0.86	40.60	0.000	9
Building information modeling	3.93	97	0.84	48.65	0.000	10
Purchasing of materials in Bulk	3.90	97	0.83	44.99	0.000	11
Higher only expert	3.90	97	0.84	40.43	0.000	12
Real Estate Crowdfunding	3.89	97	0.81	37.15	0.000	13
Use of Ferro Cement	3.89	97	0.81	30.33	0.000	14
Use of Bamboo as Reinforcement	3.88	97	0.76	33.63	0.000	15
Prefabrication and modular construction	3.84	97	0.75	38.44	0.000	16
Polished concrete floor	3.82	97	0.74	29.86	0.000	17
Opting for local material sourcing	3.64	97	0.74	55.45	0.000	18
Sustainable finishes	3.59	97	0.72	52.67	0.000	19
Value Engineering	3.55	97	0.68	42.57	0.000	20

Conclusion

The following conclusion were drawn from the result of the study; The critical challenges faced by builders after subsidy removal are increase in construction material costs and difficulty in negotiating contracts with suppliers and subcontractors, Other challenges are difficulty in attracting investors, disputes between Builders and client and higher borrowing/loan cost. The major adaptations and innovations to the challenges faced by builders after subsidy removal are optimization of material usage, construction waste recycling and reuse, use of cement admixtures, Other adaptations and innovations are application of green building technology and investment in quality re-useable tool. Based on the conclusions drawn from the study, the following recommendations were made to assist Builders to improve project performance after subsidy removal in Nigeria, Construction material costs should be regulated to enhance smooth negotiation of contracts with suppliers and subcontractors, The Nigeria government should regulate the construction industry to make more attractive for in investors. The government should also set-up an infrastructural bank with lower interest rate for builders and their client to avoid disputes. Builders and industry stakeholders should engage in material optimization by construction waste recycling and reusing. Also, Builders should encourage the use of alternative materials for cement like the use cement admixtures or other substitute for cement in building construction. Builders should invest in green building technology, re-useable construction materials like the use of steel fabricated formworks or other sustainable construction practices that will give the same value for money, and a reduced running cost

References

Akinwande, T. & Hui, E. C. (2024). Effective affordable housing provision in developing economies: An evaluation of expert opinion. *Sustainable Development*, *32*(1), 696-711.

Alintah-Abel, U. V., Okeke, F. N. & Enebe, E. C. (2025). Assessing the Effect of Subsidy Removal on Cost-Significant Material and Labour within Anambra State Construction Economy. *British Journal of Multidisciplinary and Advanced Studies*, *6*(2), 1-23.

Ambily, P. S., Kaliyavaradhan, S. K. & Rajendran, N. (2024). Top challenges to widespread 3D concrete printing (3DCP) adoption–A review. *European Journal of Environmental and Civil Engineering*, *28*(2), 300-328.

Asghari, N. & Memari, A. M. (2024). State of the Art Review of Attributes and Mechanical Properties of Hempcrete. *Biomass*, 4(1), 65-91.

Aslam, M. & Baffoe-Twum, E. (2024). Mitigating schedule overruns in pre-Stressed girder bridge Construction: Assessing risks and proposing mitigation strategies. *Ain Shams Engineering Journal*, 102673.

Chamarande, T., Etienne, E. & Mathy, S. (2024). Sizing isolated mini-grids in Kenya: risk transfer to deal with multidimensional uncertainties and constraints. *Renewable and Sustainable Energy Transition*, 5, 100078.

Charles, G. E. & Don-Baridam, L. Q. (2024). Employee Development and Effectiveness of Manufacturing Companies in Rivers State.

Chartered Institute of Building. (2017*). Code of Practice for Project Management for Construction and Development* Wiley.

Chen, Y., Wu, P. & Ying, K. (2016). A game theoretic model of cost overrun and financial incentive contract in project management. *Journal of Civil Engineering and Management*, 22(7), 945-954.

Construction Industry Institute (2013). Best Practices Guide: Effective Strategies and Tools for Construction Performance. *Construction Industry Institute*.

Deep, S., Gajendran, T., Jefferies, M., Uggina, V. S. & Patil, S. (2024). Influence of subcontractors strategic capabilities on power, dependence and collaboration: an empirical analysis in the context of procurement decisions. *Engineering, Construction and Architectural Management*, 31(2), 571-592.

Ebie, E. & Ewumi, O. (2022). Electric vehicle viability: evaluated for a Canadian subarctic region company. *International Journal of Environmental Science and Technology*, *19*(4), 2573-2582.

Ejiofor, N. E. & Akabudike, P. O. (2024). Mitigating Professional Interference for Sustainable Growth in the Nigerian Construction Industry. *Journal of Engineering, Technology & Applied Science*, 6(2), 49-56. DOI: 10.36079/lamintang.jetas-0602.640

El-Diraby, T. E. & Bensalem, R. (2019). Analyzing financial incentives in construction projects using system dynamics. *Journal of Construction Engineering and Management*, 145(9), 04019062.

Ifeoma, I. O. M., Ikechukwu, N. M. & Obiora, O. A. Impact of Construction Material Wastage on Project Cost and Project Delivery in Nigerian Construction Industry. International *Journal of Advance Multidisciplinary Research Studies*, 4(1):1113-1119.

Gambatese, J. A., & Hallowell, M. R. (2018). Safety Leadership in Construction. *Journal of Construction Engineering and Management*, 144(3), 04017120.

Gana, I. M., & Bashar, N. M. (2024). Implications of fuel subsidy removal on Nigeria's sustainable development. *Nigerian Journal of Management Sciences Vol*, *25*, 1.

Guo, P., Tian, W., Chai, Q., & Zhu, J. (2024). Dynamic risk assessment of re-construction dust from abandoned industrial buildings: a human-dust interaction perspective. *Journal of Building Engineering*, 109410.

Ijigah, E. A. & Omeiza, I. D. (2024). Assessment of Subsidies for Construction Businesses in Nigeria: Evolution from an Oil-Based Economy to an Infrastructural-Based Economy. *Journal of Techno-Social*, 16(1), 66-80.

Isiofia, L. A., Ibem, E. O., Uzuegbunam, F. O. & Iloeje, A. F. (2024). Causes of time overrun in fixed price contracts of tertiary education trust fund (TETFund) building projects in Enugu State, Southeast Nigeria. *International Journal of Construction Management*, 24(11), 1201-1214.

Johnson, K. & Muir, D. S. (2021). Client Collaboration in the Post-Subsidy Removal Construction Industry: Best Practices and Case Studies. *International Journal of Construction Management*, 17(3), 67-82.

Jones, L., & Brown, P. (2020). Supply Chain Resilience Strategies in the Construction Industry. *Journal of Construction Supply Chain Management*, 15(1), 45-59.

Kang, H., Kang, S. H. & Moon, J. (2024). A comparative investigation of hydration reaction of Portland cement with the use of alkanolamine as a chemical admixture or grinding agent under laboratory condition. *Journal of Building Engineering*, *88*, 109214.

Kayastha, R., Kisi, K., Chitrakar, Y. & Bhattarai, S. S. (2024). Legal Disputes between Home Builders and Home Buyers in Sustainable Housing Construction. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 16(2), 02523006.

Kim, Y. W. & Rhee, B. D. (2024). Incentive-based coordination for scheduled delivery in prefab construction. *Construction Management and Economics*, 1-16.

Kumar, V., Ricco, M. L., Bergman, R. D., Nepal, P. & Poudyal, N. C. (2024). Environmental impact assessment of mass timber, structural steel, and reinforced concrete buildings based on the 2021 international building code provisions. *Building and Environment*, *251*, 111195.

Kurniawan, H. A., Susilowati, F., &Jannah, R. M. (2024). Study on implementation of construction waste management in minimizing construction material waste. *Journal Pensil Pendidikan Teknik Sipil,* 13(1), 1-12.

Ling, F. Y., Wong, F. K., & Teo, E. A. (2021). An overview of real estate crowdfunding: Opportunities and challenges. *Journal of Property Investment & Finance*, 39(3), 288-305.

Liu, W., Ge, L., Qu, C., & Yang, S. (2024). Bi-objective Optimization for Resource-constrained Robust Construction Project Scheduling. *KSCE Journal of Civil Engineering*, *28*(1), 15-28.

Love, P. E., Edwards, D. J., & Irani, Z. (2020). A review of building information modelling in lean construction. *Journal of Civil Engineering and Management,* 26(2), 130-142.

Mayer, M. (2024). Recycling Potential of Construction Materials: A Comparative Approach. *Construction Materials*, *4*(1), 238-250.

Mendes, L. D. S. (2017). Time management in construction projects. *Journal of Construction Engineering and Management,* 143(9), 04017050.

Mgbolu, A. K., Agom, U., Iteshi, V. & Ogar, C. (2024). Is housing for all in Nigeria a myth or reality? Examining the fundamental and regulatory challenges. *African Journal of Law and Human Rights*, *7*(2).

Mohammed, Y., Mudashir, R., Abayomi, M. M., Yakubu, E. I., Idris, I., & Ayni, A. A. (2024). Evaluating the Causes and Control of Variation in Public Institutions' Buildings in Kwara State, Nigeria. *Journal of Built Environment and Geological Research*.

Moradi, S., Kähkönen, K. & Aaltonen, K. (2020). Project managers' competencies in collaborative construction projects. *Buildings*, *10*(3), 50.

Moshood, T. D., Rotimi, J. O. & Shahzad, W. (2024). Enhancing sustainability considerations in construction industry projects. *Environment, Development and Sustainability*, 1-27.

Musarat, M. A., Khan, A. M., Alaloul, W. S., Blas, N. & Ayub, S. (2024). Automated monitoring innovations for efficient and safe construction practices. *Results in Engineering*, *22*, 102057.

Naguib, A. (2024). Transforming Land and Home Ownership: Emergent Strategy and Community Cultural Wealth in Developing Community Land Trusts.

Najafi, M., Sheikhkhoshkar, M. & Rahimian, F. (2024). Innovation and lean practices for sustainable construction project management; emerging technologies, strategies and challenges. *Smart and Sustainable Built Environment*, 13(3), 473-478.

Neto, I. R. & Amaral, F. G. (2024). Teaching occupational health and safety in engineering using active learning: A systematic review. *Safety science*, *171*, 106391.

Nguyen, T. A., Do, S. T., Nguyen, V. T., Khuc, T. Q. & Quach, Q. T. (2024). Essential strategies for embracing Building Information Modeling (BIM) in public investment

projects: a case study in Vietnam. *International Journal of Construction Management*, 1-11.

Oke, A. E., Aliu, J., Ebekozien, A., Akinpelu, T. M., Olatunde, T. M. & Ogunsanya, O. A. (2024). Strategic drivers for the deployment of energy economics principles in the developing construction industry: A Nigerian perspective. *Environmental Progress & Sustainable Energy*, e14351.

Omotosho, B. S. & Yang, B. (2024). Oil price shocks and macroeconomic dynamics in resource-rich emerging economies under regime shifts. *Journal of International Money and Finance*, 144, 103082.

Partington, P., Major, G. & Tudor, K. (2024). Deaf students' perception of wellbeing and social and emotional skill development within school: A critical examination of the literature. *International Journal of Disability, Development and Education*, *71*(1), 55-68.

Sahu, A., Pahi, D., Dwibedi, P. & Mishra, A. P. (2024) International Perspectives on Green Building Adoption: The Interplay of Environmental, Social & Governance and Firm Characteristics. *International Perspectives on Green Building Adoption*.

Santos, P., Cervantes, G. C., Zaragoza-Benzal, A., Byrne, A., Karaca, F., Ferrández, D. & Bragança, L. (2024). Circular Material Usage Strategies and Principles in Buildings: A Review. *Buildings,* 14(1), 281

Selvaraj, S. & Chan, T. M. (2024). Recommendations for Implementing Circular Economy in Construction: Direct Reuse of Steel Structures. *Journal of Constructional Steel Research*, 214, 108439.

Smith, J. (2020). Impact of Subsidy Removal on the Construction Industry: A Case Study. *Journal of Construction Economics,* 22(3), 45-61.

Tezel, A., Aziz, Z. & Froese, T. (2016). Building Information Modeling (BIM) uptake: A systematic review. *Automation in Construction*, 72, 343-358.

Turner, J. R. & Walker, A. (2017). Roofing choices: A comparison of roofing systems for project managers. *International Journal of Project Management*, 35(8), 1416-1428.

Wang, H., Yi, W. & Wang, S. (2023). Facility planning and schedule design in the pandemic: Eliminating contacts at construction workplace. *Journal of Cleaner Production,* 395, 136394.

Wick, B., Ingason, H. T. & Lill, I. (2019). Role of Quality Assurance in Construction Projects. *Procedia CIRP*, 83, 357-362.

Wysocki, R. K. (2019). *Effective Project Management: Traditional, Agile, Extreme.* John Wiley & Sons.

Zhang, L., Fu, Y. & Lu, W. (2021). Contract enforcement for claimants' satisfaction with construction dispute resolution: Moderating role of shadow of the future, fairness perception, and trust. *Journal of Construction Engineering and Management*, *147*(2), 04020168.

Zhao, R., Peng, L., Zhao, Y. & Feng, Y. (2024). Coevolution mechanisms of stakeholder strategies in the green building technologies innovation ecosystem: An evolutionary game theory perspective. *Environmental Impact Assessment Review*, 105, 107418.