Built environment academics for 21st-century world of teaching: stakeholders' perspective

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Abstract

Purpose – Research reveals that the built environment graduates are not matching the needs of the 21st century construction industry. Evidence shows that the built environment academics (BEA) struggle to reskill and upskill to meet the industry's demand. Studies about Nigeria's BEA's perceived barriers in meeting the 21st-century industry demands are scarce. Thus, the paper investigated the perceived barriers and measures to improve BEA in Nigeria's 21st-century world of teaching. The outcome intends to enhance teaching practices and increase employability in the built environment disciplines.

Design/methodology/approach – Data were sourced from elite virtual interviews across Nigeria. The participants were well informed about Nigeria's built environment education and the possible barriers hindering 21st-century teaching from improving employable graduates in the built environment professionals (BEP). The researchers adopted a thematic analysis for the collected data and supplemented the data with secondary sources.

Findings – The study shows that BEA needs to improve BEA's teaching mechanism. Improving BEA will enable the built environment graduates to meet the minimum standards expected by the 21st-century industry. Findings categorised the perceived 22 barriers facing BEA into internal stakeholders-related barriers, external stakeholders-related barriers, and common barriers. Also, findings proffered practicable measures to improve BEA in the workplace via improved industry collaboration and technological advancement.

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Research limitations/implications – The research is restricted to the perceived barriers and measures to improve BEA in 21st-century teaching in Nigeria via a qualitative research design. Future research should validate the results and test the paper's proposed framework.

Practical implications – The paper confirms that the BEA requires stakeholder collaboration and technological advancement measures to improve teaching in the 21st century, leading to enhanced employability graduates. The paper would stir major stakeholders, especially BEA, and advance the quality of employable graduates in the Nigerian built environment professions.

Originality/value – The thematic network and proposed framework could be employed to stimulate Nigeria's BEA for better service delivery. This intends to create an enabling environment that will enhance stakeholders' collaboration and technological advancement for the BEA to produce better employable graduates in the 21st century.

Keywords Barriers, Built environment academics (BEA), Digital technology, Nigeria, Stakeholders, Teaching

Paper type Research paper

1. Introduction

Globally, the need for built environment professionals (BEP) is crucial, given the continuous investment in infrastructure. Infrastructure is one key component that advances the people's economic growth and national prosperity. The built environment industry is responsible for constructing these facilities and generating large employment that cuts across many sectors (Ebekozien *et al.*, 2021a, b). Exploring how built environment disciplines will evolve to meet these demands (Savage *et al.*, 2010) via equipping the built environment academics (BEA) concerns stakeholders. Davis and Savage (2009) found engaging students as one of the greatest future challenges in built environment education. Though BEP governs the industry's performance (Kuoribo *et al.*, 2021), the level of skills taught by BEA in higher education is pertinent. Savage *et al.* (2010) identified quantity surveying, estate management, architecture, construction management, urban planning, project management, and civil engineering as the main built environment disciplines. Majority of these disciplines play a segregation role. But the rapid complexity of the built environment industry has expanded their roles. The study adopted quantity surveying, architecture, construction management, and civil engineering as the built environment disciplines. This is in line with Ebekozien *et al.* (2022). The authors adopted these disciplines when they studied the built environment students' perception of generic skills in South Africa. The 21st-century built environment industry has witnessed dynamic nature and trending smart construction project complexities. Addressing the needs of the industry has become a challenge to higher education institutions, especially in developing countries. The expanded construction and engineering projects and innovative ideas in the 21st century are huge challenges to improved construction outputs delivery (Aliu and Aigbavboa, 2020). Thus, the sector's need for trained and skilled graduates cannot be over-emphasised. The nature of construction work in the sector is changing, and this collaborated National Research Council (2013) assertion. The Research Institute asserted that the industry recruits employees who possess 21st-century skills. From the traditional approach to automated fabrication in the 21st-century, it will require a workforce with different skills and training that focusses less on manual skills and more on interaction with digitalisation mechanisms.

Research reveals that sciences-related graduates do not match the 21st-century industry (Barak, 2013; Stehle and Peters-Burton, 2019; Oviawe and Uwameiye, 2020; Ebekozien *et al.*, 2021a, 2022). The latter authors affirmed that the BEA struggle to reskill and upskill to meet the industry's demand through the "train the trainers' scheme." Stehle and Peters-Burton (2019) affirmed that students are not successfully engaged in technology and engineering. The BEA requires proactive action to address the built environment profession (architecture, engineering, and construction). Proffering measures to improve BEA teaching and turn out built environment graduates who are pleasingly fortified with the right skills and sound academic abilities may have encountered barriers. In Nigeria, Olatunji's paper, as cited in

Oviawe and Uwameiye (2020), reported that 20% of potential employees are employable. It was an assertion by Mr Sam Egwu (former Minister of Education). This collaborated with Professor Charles Soludo's claim that about 60% of potential employees are unemployable globally (Ajuluchukwu, 2012). One major reason is the poor quality of education. Hence, BEA desires critical attention in the 21-century, especially in developing countries. They are essential in the 21st-century sustainable urban planning and development because of the theory and practice of learning start from them. Studies about BEA's perceived barriers in meeting the 21st-century industry demands are scarce. Therefore, the study intends to evaluate BEA's current teaching standard and investigate the perceived barriers facing Nigeria's BEA in the world of teaching. Also, the study proposed measures to improve BEA in the 21st-century world of education. Findings from the investigation intend to enhance teaching practices in the built environment disciplines. The researchers will fill the emerged theoretical gap through the following objectives:

(1) To evaluate BEA's current teaching quality in the 21st century.

(2) To investigate the perceived barriers facing Nigeria's BEA in the world of teaching.

(3) To proffer measures to improve BEA in the 21st-century world of teaching.

2. Literature review

2.1 Built environment education

The built environment education incorporates several activities drawn from design, architectural, environmental, and arts education (Million *et al.*, 2018). Knowledge from the built environment education enhances the link between sustainable development and quality of life. It is on record that urban design through the built environment education alone may not solve economic and social issues, including inequality and urban poor; its role in mitigating complex urbanisation encumbrances cannot be over-emphasised (Kamalipour and Peimani, 2019). Thus, the global competence of the built environment graduates is pertinent. There is a need to ensure that intending graduates are proficient in 21st century skills. It would make them fruitful in their new personnel (Bybee, 2013). Partnership for 21st-Century Learning (2016) affirmed that apart from helping the students formally, these skills enhance persons to thrive in an ever-changing world. Keleher *et al.* (2011) avowed that the basic competence is characterised by a graduate's ability to demonstrate proficiency in the field of study, assimilate easily into work environments, exhibit skills and knowledge, and communicate confidently. Partnership for 21st Century Learning (2016) identified the 21st-century skills in technology and science-related disciplines. This includes using digital technology for learning, collaboration, knowledge construction, and self-regulation. In Savage *et al.* (2010), improving courses that would prepare graduates for the stride, diversity, and flexibility of contemporary practices is pertinent to improving the employability of the built environment graduates. Achieving this task would include the cooperation of academics and professionals (industry). Savage *et al.* (2010) found that graduates' influence the quality of the transition-to-work experience. Upgrading the academics to give the best to the built environment graduates and shaping the courses to meet the industry needs were suggestions by Savage *et al.* (2010).

Asiyai (2015) identified poor funding, inadequate infrastructure and academic staff, attitude towards research, and lax institutional policy as factors enhancing Nigerian higher institutions' unemployability. The built environment graduates are not excluded. This indicates a link between the quality of academics and graduates' employability. Poland has good experience in fostering the idea of built environment education, especially architectural education programme (Martyka, 2020). The 21st-century built environment needs skills to match the competitive world. Griffin and Care (2015) affirmed that structural unemployment

scenarios in many countries seemed to support the call for change. This calling is higher in developing countries, Nigeria included. Griffin and Care (2015) emphasised the need to identify the relevant 21st-century skills and develop the means to teach them to the students in higher institutions. Afolabi *et al.* (2017) identified the built environment craft skill acquisition but found inadequate technicians/technologists, lack of tools and practical facilities, hindering the teaching in Nigerian higher institutions.

Asiyai (2013, 2015) emphasised improving higher education training in Nigeria. This includes the built environment professions. Ratcliffe (2007, 2008) identified raising issues of common concern such as climate change, highlighting dangers and choices that require attention, such as construction sustainability, and identifying the dynamics to sustainability, amongst others, as the role expected from the stakeholder in the 21st century, especially the built environment academic institutions. In Nigeria, Umeokafor and Windapo (2018) affirmed that the contribution from government agencies such as Tertiary Education Trust Fund (TETFund), established by the TETFund Act 2011, needs to be overhauled. Funding has been an issue, and the demand is increasing daily. Currently, TETFund focusses on improving, managing, and disbursing tax to Nigerian public tertiary institutions, including built environment disciplines (TETFund, 2011, p. A255). Also, the agency sponsors international conferences related to research and postgraduate programmes for academic staff of public higher institutions.

2.2 Barriers in the 21st-century world of teaching

Stakeholders are concerned regarding the quality of unemployable graduates from higher institutions of learning (Asiyai, 2015). Freestone (2012) identified inadequate skills for the knowledge economy and insufficient dynamic action planning as possible barriers. In Poland, Martyka (2020) identified lax national coordination of architectural policy and how it influences built environment education. Asiyai (2015) classified the stakeholders into internal and external stakeholders. The governing council, staff, students, and government belong to the internal stakeholders. The regulatory agencies such as the National Universities Commission, National Board for Technical Education, professional bodies, non-government organisations, industries, parents, alumni associations, and development agencies local and international belongs to the external stakeholders. The author identified the quality of teachers employed to teach students, inadequate infrastructure and instructional facilities, and institution environment (i.e. hostel, laboratory, lecture halls, etc.) as possible barriers in the 21st-century teaching world. Insufficient integration within the curricula and high costs for intensive training were identified as barriers to architecture education (Maina, 2018). The impact of TETFund in training higher institutions' academic staff has not been able to meet the demand (Umeokafor and Windapo, 2018). Teachers can find adopting 21st-century skills difficult because of the dearth of example lessons. But there is a paucity of literature concerning perceived barriers facing Nigeria's BEA in the teaching world. The study is germane because the professions' components are interrelated in the built environment industry. It is one of the gaps that this paper will fill from the stakeholders' perspective. Afolabi *et al.* (2017) found a lack of tools and practical facilities, low commitment from stakeholders, low interest from students, inadequate curriculum to cover the area, lack of technicians/technologists, insufficient funds, and much emphasis on theory as the barriers to the built environment craft skill acquisition. Wood (1999) found three main issues facing interdisciplinary working within built environment education. The author's study focussed on the Faculty of Health and Environment, Leeds Metropolitan University. The issues are course structures, teaching and learning, and further developments. The present study does not address interdisciplinary issues, though learning together is an important component of education policies and programmes. Morris (2007) discovered that professional knowledge might resist substantial restructuring. The author suggested that institutions need to insist on implementing positive change in line with research outcomes for productivity and efficiency.

2.3 Measures to improve BEA in the 21st-century world of teaching

The 21st-century built environment requires upskilling and reskilling training of the workforce. The role of BEA is pertinent to achieving this goal. Keleher *et al.* (2011) identified the need for institutional support and review, assessment, and creating an enabling research opportunity for academic careers with technological skills. Wood (1999) and Bolger (2021) emphasise teamwork within the BEA to appreciate many facets of design/construction issues and offer integrated solutions via interdisciplinary research. Stehle and Peters-Burton (2019) encouraged a platform for knowledge construction and real-world problem-solving. The term "knowledge construction" describes a scenario where undergraduates generate new ideas rather than replicating information (Prettyman *et al.*, 2012). The latter is about students learning to resolve issues with no current answer using their approach/method. It is also known as project-based learning (Warin *et al.*, 2016). Collaboration and constant reskilling and academic staff training would improve the higher education system (Asiyai, 2015). Borg and Turner (2016) suggested integrating industry in academic learning with references to the industry.

The study modified Freestone (2012) model. The author developed a three-horizon time frame for sustainable intervention in confronting challenges of the 21st-century facing education and research. Horizon 1 (implementable now) focussed on maximum use of existing technologies. Horizon 2 (implementable over the next 3–10 years) focussed on combining technology, regulatory environment, governance, and modified policy to drive sustainable intervention. Lastly, horizon 3 (implementable 15–20 years) focussed on new planning concepts and technologies to mitigate major barriers. The new concepts and technologies should be different from the existing ones. Maina (2018) corroborated Russell *et al.* (2007). The authors affirmed that information technology enhances learning and increases engineering and science-related education efficiency. Maina (2018) suggested more digital-related courses and tutorials for students, research funding for higher institutions, and basic infrastructure in institutions' environments. Also, the integration of 21st-century skills into the curriculum is pertinent. The Singaporean model has six core values (harmony, care, respect, resilience, integrity, and responsibility) nested within the competencies. The skills are grouped into three. This includes critical and inventive thinking skills, information and communication skills, civic literacy, global awareness, and cross-cultural skills (Singapore Ministry of Education, 2010). Griffin and Care (2014) and Ebekozien *et al.* (2021a) collaborated on the latter author's summation. The authors affirmed that 21st-century skills include creativity, critical thinking, problem-solving, collaboration skills, and information technology skills. Afolabi *et al.* (2017) suggested a policy-driven approach that will integrate construction craft skills acquisition programmes in the built environment curriculum via a collaboration with the National University Commission and other stakeholders in Nigeria's education sector. This has become pertinent because the Students Industrial Work Experience Scheme (SIWES) via the Industrial Training Fund (ITF) (Uwaifo, 2009) has failed to yield the needed outcome. Dawson and Osborne (2020) suggested an industry-designed curriculum, redefining the purpose of higher education institutions, restructuring governance and resource, amongst others, as measures to re-shape the built environment of higher institutions in England. Iyer-Raniga and Andamon (2016) suggested transformative learning, interdisciplinary learning rather than discipline-based, and industry input enhance graduates' employability as key factors to the built environment education sustainability. The authors emphasised that the professionals (academia and practices) have a key role in integrating sustainability in the built environment education.

3. Theoretical framework

This paper is anchored on Stakeholder Theory (ST) and Neoclassical Growth Theory (NGT) and supports the proposed framework. Xia *et al.* (2018) asserted that ST usage in project management has proved that stakeholder management is vital to the productive

implementation of various projects, including academic projects. The theory was developed by Rhenman (1964). The underlying principle of stakeholder theory is that large groups, such as BEA, recognise stakeholder interests and constantly build and reimagine these connections to generate more value for better performance (Freeman *et al.*, 2004; Strand and Freeman, 2015). The theory comprises a collection of various stakeholders' expressions, ideas, and metaphors connected to the central notion. In this instance, the central notion is employable 21st-century built environment graduates and complemented with technological advancement. The Neoclassical Growth Theory focusses on how BEA can obtain knowledge, upskills or reskills, and competency for improved teaching in line with the global standard. The theory (NGT) combines three driving variables (labour, capital, and technology). The latter concept, "technology," is one of the justifications for utilising this model to support the proposed framework. The National Bureau of Economic Research (n.d.) opined that in 1957 Robert Solow identified the uniqueness of the technology and incorporated it into the model, as presented in Figure 1.

Economic Themes (2016) avowed that the model has proven that technological change tailored towards training and digital innovation would generate economic growth. Stakeholders' collaboration and technological advancement by BEA to teach may have challenges. Thus, the need to identify the perceived barriers and propose measures to improve the 21st-century BEA workplace. One of the possible outcomes will be employable built environment graduates that can compete with their counterparts globally. Its model aligns with Plume and Mitchell (2007) and Becerik-Gerber and Rice (2010) commendations. They recommended that construction, engineering, and management instructors teach basics linked to digital technology concepts in the architectural, engineering, and construction (AEC) curriculum. The paper intends to encourage stakeholders' collaboration and technological advancement for the BEA to enhance their teaching in the 21st century. The study intends to improve the quality of employable graduates in the Nigerian-built environment professions.

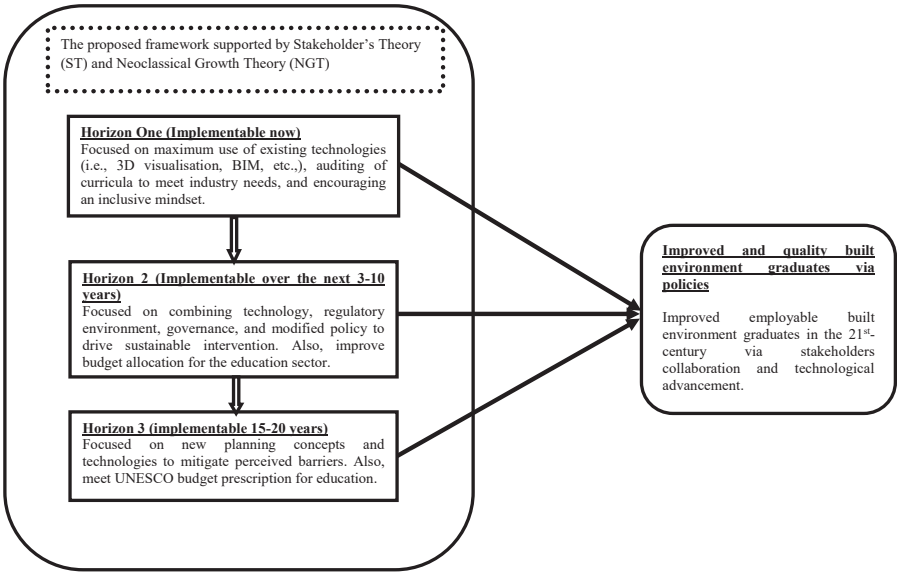

Figure 1.
Proposed framework to improve BEA in the 21st-century world of teaching

Source(s): Modified from Freestone (2012, p. 21)

4. Research method

The study employed a qualitative research design. Chandra and Shang (2019) and Jaafar *et al.* (2021) asserted that the qualitative research design is rooted in interpretivism. The researchers adopted a phenomenological perspective. The term "phenomenological" describes the lived experience of a phenomenon through collecting data from persons (Creswell and Creswell, 2018). The researchers adopted an elite semi-structured virtual interview approach across the six geo-political zones to collect data from the participants. It aligns with Umeokafor and Windapo (2018) and Bolger (2021). Bolger (2021) adopted interviews in a similar study investigating how the interdisciplinary study is allowed at research institutes. Umeokafor and Windapo (2018) suggested a qualitative approach for built environment research and affirmed that the approach could align to address societal issues. The semi-structured interview permits investigatory research (Creswell and Creswell, 2018). It will enable the researchers to probe the interviewees in-depth. Also, the research employed a purposeful elite sampling method. It allowed the study to capture interviewees from each participant's group purposively. Also, it allowed covering interviewees in practices and academics across the six geo-political zones. In the past, the purposeful elite sampling method has been used for sensitive matters such as corruption (Acar, 2016) and issues connected with professional courses such as Malaysia's building surveying (Abdul-Aziz *et al.*, 2020). Marshall and Rossman (2006) affirmed that elite sampling targets powerful, prominent, and well-informed interviewees in the subject matter. Tansey (2007) asserted that the reason for engaging elites is to unravel the unseen issues on the research world's front-burner. Regarding this, interviewees with BEA in the 21st-century background were used.

The engaged 40 participants were academic staff, professional practitioners in the disciplines studied (quantity surveying, architecture, construction management/building technology, and civil engineering), higher institutions, professional bodies regulatory agencies, and selected property developers, as presented with detailed background in Table 1. The study achieved saturation with 40 interviews. The study's saturation was

Participant	Rank/Firm	Years of experience	Geopolitical zone/Location & participant code SS	SW	SE	NW	NC	NE	Total
Built Environment Professionals in academics	Not below (NB) Lecturer 1 rank	NB 10 years	1–2	3–6	7–8	9–11	12–14	15	*15*
Built Environment Professionals in practice	Directors, Managing Partners, Partners	NB 25 years	16–17	18–21	22	23–24	25–29	30	*15*
Professional Elected/ Appointed Officials	Past and serving Exco National Members	NB 28 years	–	–	–	–	31–34	–	*4*
NUC/NBTE	NB Senior Staff	NB 15 years	–	–	–	35	36	–	*2*
Property Developers	Directors/ Operational Managers/CEO, Managing Directors	NB 27 years	37	38	–	–	39–40	–	*4*
Total									*40*

Note(s): SS = South-South, SW = South-West, SE = South-East, NW = North-West, NC = North-Central, and NE = North-East

Table 1. Summary of interviewees' background

established when "new data" perceptions from the investigation were no longer upcoming from the interviewees. This is in line with Braun and Clarke (2019) and avowed that when there is no evidence of more insight, then a saturation peak has arrived. The minimum and maximum duration were 45 and 90 min, respectively. In total, the average was 74 min. The interviews were conducted between early October and December 2021. The researchers concealed the identities and establishment of the interviewees. It is in line with the study's ethical policy, and saturation was achieved. The investigators sent an introductory letter to the participants who indicated an interest in participating in the brief research narration before the virtual interviews. For the details of the covering letter and a sample of the semi-structured interview questions, please refer to Appendix.

The study ensured that the six geo-political zones were represented to achieve acceptable coverage. The two critical parties (built environment professionals in academics and practices) were captured. They are critical to the study's outcome because of their role in higher education institutions' accreditation and professional practices. The essence was to ensure that findings could be generalised across the country. P35 and P36, respectively, represented the NBTE and NUC. The study engaged some past and serving national executive members of the built environment professional bodies (P31-P34), all based in Abuja, Nigeria. The virtual interviews were recorded with the permission of the participants. Four participants refused but were later convinced that their identities would be concealed. For clarity, participants were contacted for areas not cleared before transcribed to reflect their narrative accurately. In generating the codes, the study's codes were generated via a thematic analysis and manually analysed. The 40 interview transcripts were read numerous times amongst the study's investigators, who double as the coders to capture the interviewees' perceptions concerning the phenomenon. It aligns with Ebekozien and Aigbavboa (2021) and Jaafar *et al.* (2021) that employed the same approach of two phases to develop the initial coding scheme for their research. Saldana (2015) affirmed that the first phase is called open coding. The author asserted that the categories are used to re-read the transcript and discover the major concepts in the second phase. The last phase encompasses using the categories from the first phase to re-read the transcript and discover the concepts. From the patterns, three themes emerged. Triangulation, researcher reflexivity, and member checking were adopted as the validity methods (Creswell and Creswell, 2018). In line with Saldana (2015), the researchers utilised InVivo, theming, and narrative techniques.

For the study's validity and reliability, Table 2 summarised the quality assessment strategies of the qualitative data. In line with Plano-Clark and Creswell (2015), the credibility, including the study's validity and reliability in qualitative research, depends on the researcher's ability as the instrument. Seventy codes were generated. This includes infrastructure and instructional facilities, institution environment (lecture halls, lab), staff

Table 2.
The study's quality assessment strategies

Method	Assessment strategies	The phase of research including techniques used
Reliability	Consistent structure to interview	Data collection
	Consistent interviewer (The lead Researcher)	Data collection
Validity	The utilisation of recognised approach	Data collection
	Semi-structured virtual interview	Data collection
Credibility	Pattern matching using themes approach	Data analysis
Dependability	Developing interview guidelines	Research design
	Ease of independent review of data collection trial	Research design

Note(s): Data collection/analysis

Source(s): Modified from Yin (2014, p. 34) and Ebekozien (2019, p. 103)

development programme, ICT facilities, current curricula, and education sector funding. Others are research and development policies, policy implementation, social vices, schooling overseas, investment in research, supervisory from professionals, reskilling and upskilling, academic programme development, industry-based collaboration, 4IR technologies, curricula upgrading, and skills integration, amongst others. They were re-grouped into eight categories. This includes internal stakeholders' barriers, external stakeholder barriers, and common barriers, amongst others. Three themes finally emerged (current teaching standards, perceived barriers, and possible measures) from the eight categories. The study's aim guided the outcome of the three main themes.

5. Findings and discussion

This section presents the BEA for the 21st-century world of teaching main findings and discussion. Figure 2 illustrates the thematic network of potential barriers and possible measures to improve BEA in the workplace. The study's aim was achieved via three themes as follows:

5.1 Theme one: BEA current teaching standard

Examining the teaching standard of the BEA has become pertinent because of the built environment professionals' relevance in infrastructure development. The participants across the board agree that for the built environment professionals to be more productive in the 21st century, the role of the BEA cannot be over-emphasised. Major findings across the six zones reveal that the quality of teaching standards is deteriorating yearly. This concerns stakeholders and the challenges facing the BEA's digitalisation and 21st-century skills. It is time to identify the root causes and proffer measures to improve the quality of teaching. The globalisation will be an advantage to Nigerian-built environment graduates if well taught in higher institutions by the BEA. This is presently missing and stirred a part of the study's motivation. Participant P27 says, "[. . .] *the outputs of the teaching pattern of recent as evident in one of the staff we managed to recruit calls for concern. My experience from the interview section with the shortlisted job seekers indicated lax collaborative problem solving across the*

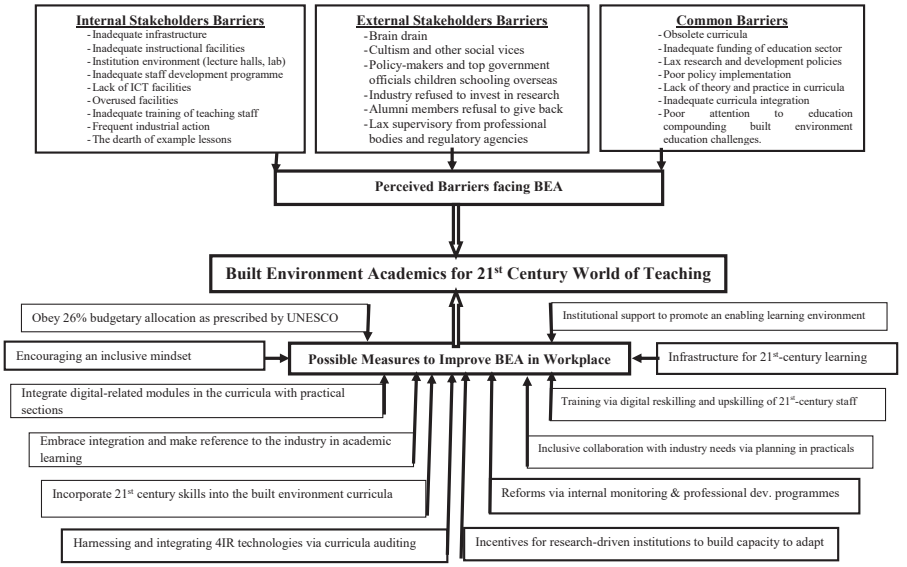

Figure 2.
Thematic network of BEA for 21st-century world of teaching

candidates. These were candidates from different higher institutions within the built environment professions and covered three geo-political zones [. . .]."

Findings show that many BEA in Nigerian higher institutions lack the techniques for developing new mechanisms in educational and learning environments (P5, P13, P19, P25, and P40). Participants P1, P14, P30, P36, and P38 opine that the educational and learning environments in the 21st century are characterised by the use of fourth industrial revolution (4IR) technologies. 4IR is enabled by digital applications such as three-dimensional printing (Hirschi, 2018; Ebekozien and Aigbavboa, 2021). In the opinion of Participant P5, "[. . .]. *the application of 4IR technologies in teaching built environment courses will build the probationer professionals skills in many respect of learning. It will simultaneously improve the students' problem-solving, creativity, collaborative, and critical thinking skills* [. . .]." Findings agree with Griffin and Care (2014) and Afolabi *et al.* (2017). The latter authors found issues with the Nigerian higher institutions-built environment curriculum. They affirmed a lacuna in the craft skill acquisition, and ITF has failed to meet the expected results. Griffin and Care (2014) avowed those digital technologies would assist in building 21st-century skills. Also, it will improve information to teachers for policy development. This is missing, and the need to investigate the perceived barriers facing Nigeria's BEA in teaching cannot be over-emphasised.

5.2 Theme two: perceived barriers

Theme two presents perceived barriers facing BEA in teaching in Nigerian higher institutions. Findings across the board agree that perceived barriers hinder optimal service from the built environment teachers in this 21st century. The emerged perceived 22 main barriers were grouped into internal stakeholders-related barriers, eternal stakeholders-related barriers, and common barriers, as presented in Figure 2. Findings disagree with Wood (1999) in the grouping. This may be because the latter author focussed on issues facing interdisciplinary working within built environment education. The present study's common barriers are connected directly or indirectly to internal or external stakeholders' barriers. Classifying the 22 main perceived barriers into three main groups in the BEA in Nigeria's higher institutions context is one pertinent point from this study. In terms of internal stakeholders-related barriers, findings identify inadequate infrastructure, inadequate instructional facilities, lack of ICT facilities, and inadequate training of teaching staff emerged as the major internal barriers. Other issues are an unfriendly institutional environment and overused facilities (i.e. dilapidated lecture halls, laboratory, offices, etc.) (P1-P15, P29, P33, and P36), and inadequate staff development programme (P11, P14, P16, P19, and P29). Also, frequent industrial action (P8, P12, P15, P30, P34, and P40) because of stakeholders' insensitive, especially government not keeping to the rule of the agreement and dearth of example lessons (P13, P14, P32, and P36) may hinder BEA 21st-century learning. Participant P5 says, "[. . .]. *the industry should not expect BEA to perform magic on the students when a class that was supposed to accommodate a maximum of 30 students for the lecture is being occupied by more than 100 students* [. . .]."

Teaching institutions of higher learning with a lack of information communication technology facilities is like sending a farmer without a hoe/digger/cutlass to the farm to plant yam seeds. The productivity and outputs cannot be compared with a farmer with sufficient farm equipment (P23). This is the daily experience of most of the built environment faculty. This is complicated with inadequate facilities such as an automation lecture hall, laboratory, epileptic power supply, and lecturers or instructors (P5, P8, P19, and P23). Findings agree with Asiyai (2015). The author found a lack of ICT facilities and infrastructure, such as science laboratories, students' residences, workshops, and libraries, amongst others, as factors that negatively affect the quality of education. These factors may hinder BEA from performing to the optimal (majority). Findings disgrace with Morris (2007). The latter author

discovered that professional knowledge might resist substantial restructuring in built environment education in Hong Kong. The issue was not identified amongst the barriers facing Nigerian BEA. It indicates that BEA may be willing and ready for a change to become more relevant in the 21st century because the world has become a global village.

There are brain drains for the external stakeholders-related barriers because of the desire for greener pasture and government attitude to academic staff, industry refusal to invest in research, and cultism and other social vices emerged as the major external barriers. Other issues are policymakers and top government officials' children schooling overseas (P1-P15, P22-P27, P34, and P37), alumni members refused to give back to the system (P10, P13, P24 and P31), and lax supervisory from professional bodies and regulatory agencies (P31, P34, and P36). Participant P12 says, "[. . .] *brain drains become cancer not only in the academic sector in Nigeria. I would not blame them because a Professor in Nigeria earns less than NGN420,000 monthly (US$1/NGN550). In South Africa, the same Professor earns more than 250% of his counterpart in Nigeria. Migration for greener pastures may be mitigated if the government treats academics with respect* [. . .]." Findings agree with Onda (2021). It was reported that the Academic Staff Union of Universities (ASUU), Lagos State Chapter, claimed that no professor in Nigeria earns above NGN416,000 as a monthly salary. Findings reveal that top government officials and policy-makers attitudes toward public higher education influenced them not to encourage their children to acquire higher academic qualifications in Nigeria. "[. . .] *How many National House of Assembly members, permanent secretaries, government agency directors, top politicians, etc., do you know their children that acquired higher education in Nigeria. If there is, maybe a well-known private Nigerian university [. . .],*" Participant P7 queried. Investigation reveals that many top government officials and high-ranked politicians' children study overseas. This is not good leadership by example. The financial source may be there, but a good leader ought to give the needed attention to the education sector and ensure their wards and children pass through the same system for a better evaluation and monitoring (P2, P7, and P23). Findings agree with Ify (2019), and it was discovered that Nigerian politicians send their kids to foreign schools. Some start from the elementary level and are not deterred by Nigeria's education sector.

As previously explained, the common barriers are directly or indirectly linked to internal and external stakeholders' barriers. Obsolete curricula, inadequate education sector funding, lax research and development policies, and poor policy implementation emerged as the major common barriers. Other common barriers are lack of theory and practice in the curricula (majority except for P8, P25, and P33), inadequate curricula integration, and poor attention to the education sector are compounding built environment education challenges (majority). Funding is one significant issue that has severely affected the education sector and the BEA. The BEA is part of the education sector. Over the past decade, funding has not been encouraging. This is far below the UNESCO 26% minimum budgetary allocation (P1, P4, P14, P33 and P36). Findings agree with Ololube (2016), Amoo (2018), and Olufemi (2020). Ololube (2016) reported that between 2012 and 2016, the highest budget was 10.63% in 2014, and the least was 8.44% in 2016. Amoo (2018) reported that in 2018 and 2019, the education sector was allocated 7.04 and 7.02%, respectively. And lastly, Olufemi (2020) reported that in 2021, Nigeria's education sector received 5.6% of the total budget. The latter is far below the recommended benchmark by UNESCO and the lowest allocation in 10 years. In summary, the perceived barriers facing BEA in the workplace are listed in Figure 2.

5.3 Theme three: possible measures to improve BEA in the workplace

Theme three presents the proposed measures to improve BEA in the 21st-century world of teaching. The summary of possible measures to enhance BEA in the workplace is presented in Figure 2. Findings across the board agree that BEA should embrace stakeholders'

collaboration and technological advancement for a better service delivery that will match the industry's needs in the 21st century. Participant P20 says, "[. . .] *there should be a working relationship between the academia and the industry. Nigerian higher institutions should embrace the integration of industry in academic learning because the industry will engage these students [. . .].*" Findings agree with Iyer-Raniga and Andamon (2016). The authors affirmed that the professionals (academia and practices) have a key role in integrating sustainability in the built environment education. Thus, integrating sustainability and practice into the built environment curricula cannot be over-emphasised. Findings show that collaboration between higher institutions, industry, and government may facilitate seamless knowledge transfer via digital tools. One of the possible outcomes is BEA optimal service delivery to meet the needs of the 21st-century industry. Findings agree with Ojo *et al.* (2019). The author discovered that the collaboration of BEA and other key stakeholders would enhance the discharge of digital technology skills to the prospective built environment employees.

Regarding technological advancement, findings reveal that academia and industry professionals globally embrace 4IR technologies, though there are challenges. In Nigeria, not every BEA knows how building information modelling operates. Findings agree with Russell *et al.* (2007). The authors affirmed that information technology enhances learning and increases engineering and science-related education efficiency. Participant P16 says, *"Nigerian lecturers/instructors/teachers in higher institutions need to reskill and upskill digitally as against obsolete ways of teaching. How can a teacher be teaching students how to ink tracing sheets, the manual approach of taking-off quantities from drawings, etc., in 21st-century of digitalisation?*" The study revealed that budget allocation to achieve reskilling and upskilling digitally cannot be over-emphasised. Nigeria is one of the few developing countries that budget far lower than the approved minimum 26% budgetary allocation prescribed by UNESCO (P35). If the Nigerian Government complies, the infrastructure and instructional support to promote an enabling learning environment will improve. Findings agree with Olafare *et al.* (2018). The authors recommended that budgetary funds should be provided to train digital technology trainers in higher institutions.

The lacuna and obsolete curricula in the built environment programmes have not helped. Findings show a need to integrate digital modules/courses in the built environment programmes with practical backgrounds. Thus, the need to have an industry-based curriculum. Findings agree with Dawson and Osborne (2020). Dawson and Osborne (2020) recommended an industry-designed curriculum, redefining the purpose of higher education institutions, amongst others, to re-shape higher institutions'-built environment. Participant P7 says, "[. . .] *we (BEA) need training via digital reskilling and upskilling of the 21st-century skills. Such training will give us the platform to harness and integrate 4IR technologies via curricula auditing [. . .].*" The proposed integration of 4IR technologies into Nigerian built environment education will deepen the knowledge and make the students more employable in the industry (P2, P7, P14, P19, P23, P29, P31, P36, and P37). Findings agree with Afolabi *et al.* (2017). The authors suggested a policy-driven approach via integrated construction craft skills acquisition programmes in the built environment curriculum needs to be revisited. This call is pertinent because of ITF failure via the Students Industrial Work Experience Scheme. Key stakeholders such as NUC, TETFund, public universities management, and industry-based practitioners should be engaged for a workable framework to achieve this task. Also, findings agree with Oesterreich and Teuteberg (2016). They asserted that 4IR technologies would improve collaboration, sustainability, productivity, and efficiency for the built environment professions. Also, policymakers in higher institutions should integrate modules/courses related to 4IR into the built environment education programmes in developing countries such as Nigeria. The proposed measures to improve BEA in the workplace are listed in Figure 2.

6. Contribution to theory and practice

This section presents the BEA for the 21st-century world of teaching contribution to theory, practice, and managerial aspects.

6.1 Theoretical contributions

Few related studies have been conducted about BEA in the 21st-century in Nigeria. These past studies, such as Asiyai (2015), and Ojo *et al.* (2019), did not focus on the built environment and the 21st-century world of teaching. Second, empirical measures to improve BEA in the 21st-century world of teaching were not well highlighted in previous studies. Besides, the study investigated the perceived barriers and proposed measures to strengthen the Nigerian BEA teaching mechanism. It intends to improve the employability of the built environment graduates. The proposed study's framework is not without some perceived hindrances, which this research investigated. The research established a theoretical gap. First, the proposed framework has proposed three-phase horizons to improve the employability of the built environment graduates via the proffering measures to the barriers facing BEA. The study revealed that an institutional support framework is needed to promote industry-based collaboration. The collaboration will integrate the academic learning environment with the industry and 4IR technologies-related modules/courses. The proposed framework, supported with Stakeholders Theory and Neoclassical Growth Theory, and an emerging thematic network of the major findings as shown in Figures 1 and 2, are part of the paper's theoretical implications. From a theoretical perspective, the paper explored the perceived barriers and proffered measures to improve Nigeria's BEA in the workplace via a proposed framework. Theoretically, the paper intends to help academic scholars in the built environment advance knowledge on employable skills for the students within the BEP. The outcome of the framework intends to improve teaching practices and produce employable graduates in the built environment disciplines. Technological advancement via 4IR technologies and stakeholders' collaboration to improve the built environment graduates strengthened the justification for the adopted two theories (ST and NGT). The ST emphasises stakeholders, and NGT uses technology to enhance performance. Also, the three grouped barriers are pertinent points that emerged as previously highlighted and are part of the study's theoretical contribution.

6.2 Practical implication

Regarding the study's practical implication, the study confirms that Nigeria's BEA needs stakeholders' collaboration and technological advancement. It will improve the current teaching state to meet the 21st-century standard. One possible outcome is improved employable graduates to meet the 21st-century industry's needs. Embracing stakeholders' collaboration and technological advancement by Nigeria's BEA will enhance the quality of the young BEP and the sustainability of the various professions in the built environment. Embracing more integration of industry in academic learning via stakeholders' collaboration will increase the quality of services and assist BEA in making a better efficient and well-informed decision based on practical training. The study intends to stir built environment stakeholders, especially BEA and government, to improve the budgetary allocation to the education sector. Availability of funds to operators of higher institutions will drastically mitigate potential barriers facing BEA. Thus, policymakers of the key stakeholders (lecturers/teachers/instructors, higher institutions managers, regulatory/accreditation bodies, industry, and professional bodies/regulators) should take advantage of the proposed measures to improve BEA in the workplace, as highlighted in the study's framework. Through a curricula reform, the paper may facilitate developing an institutional framework to integrate digital-related modules/courses and 21st-century skills into Nigeria's

built environment curricula across public higher institutions. Also, integrated construction craft skills acquisition programmes should be reconsidered in the built environment curriculum. It will brighter the chances for better performance and prepare the built environment graduates as sub-contractors or skilled professionals in specialist areas such as tiling, plumbing, aluminium fixer, electrical, painting, etc. Other developing countries where related built environment programmes are yet to embrace stakeholders' collaboration and technological advancement may adopt measures recommended from this research and acclimate. These are components of the study's practical implications. The summarised possible measures to improve BEA in the workplace, as highlighted in Figure 2, will assist policymakers, politicians (lawmakers), education-related agencies, and higher institutions' management teams with possible mechanisms/policies/programmes that could be used to improve the quality of built environment graduates.

6.3 Managerial implication

This study reaffirms the significance of the built environment disciplines and the need to improve its teaching mechanism in Nigerian higher institutions in the 21st-century. The findings proffered measures to the identified perceived 22 barriers that were grouped into three. They include internal stakeholders-related barriers, external stakeholders-related barriers, and common barriers. Some of the measures, such as collaboration and integration between industry and academic, harnessing and integrating 4IR technologies via curricula auditing, and incorporating 21st-century craft skills into the built environment curricula, amongst others, would assist the higher institutions management team in giving a better direction and more job opportunities for the students after graduation. The study's findings indicate that knowledge and skills-based BEA for 21st-century world of teaching would magnify the students' performance regarding employability and skills (generic, craft, and professional) to face their counterparts across the globe. This is part of the motivation for this paper. To achieve this feat requires industry collaboration and technological drive. The management team of higher institutions and other educational agencies such as NUC and TETFund should encourage BEA via incentives that will attract research-driven to build capacity. It is pertinent because developing economies need the research-driven capacity to develop and grow speedily. Nigeria's BEA may have to set the ball rolling for other disciplines to follow. The perception of research for promotion needs to change to innovative and novelty research. The outcome will be translated into the teaching and learning practices. This is part of the study's motivation, and other Commonwealth countries with similar issues may modify the study's findings and apply.

7. Limitations and areas for future study

The paper covered six geo-political zones in Nigeria but was conducted via a virtual interview approach. The qualitative research design method constrained the sample size to only 40 interviewees with evident saturation. The limited sample size does not destructively influence the outcome of the study's findings. Therefore, future research should validate the findings and test the paper's proposed framework. Also, a quantitative approach may be adopted for wider coverage and validation in the future.

8. Conclusion and recommendations

This research provided evidence regarding BEA's current teaching quality, perceived barriers, and proffered measures to improve BEA in the 21st-century teaching world. The findings show that the role of BEA cannot be over-emphasised, but the quality of teaching is deteriorating. It has affected the graduates in the 21st-century industry. The paper identified

22 major perceived barriers and categorised them into three main groups (internal stakeholders-related barriers, external stakeholders-related barriers, and common barriers). To improve the quality of services rendered by BEA, the study proposed measures to ensure graduates from the built environment professions are employable and meet the minimum requirement of the 21st-century industry. From the study, possible measures were recommended to improve BEA in the 21st-century world of teaching through the following major suggestions:

(1) The paper recommends developing an institutional support framework to promote more industry-based collaboration. The collaboration should integrate the academic learning environment with the industry and emphasis references made to the industry in learning. The various professional bodies have a key role in harmonising academic and industry stands for the betterment of BEP.

(2) Also, the paper recommends that BEA should embrace 4IR technologies in teaching-built environment courses. Thus, BEA should use the trainers' scheme to reskill and upskill digitally. The outcome will harness and integrate 4IR technologies-related modules/courses with practical-based via curricula auditing.

(3) The study suggests that the Nigerian Government should improve budgetary allocation to the education sector as prescribed by UNESCO in the next two decades. Many of the emerged barriers would have been avoided if sufficient funding was available and accessible for research development, infrastructure development, human capital development, training and re-training of staff and support staff, etc.

(4) Also, apart from integrating digital modules/courses in the built environment programmes, the study recommends that 21st-century skills such as critical thinking, mental flexibility, goals achievement, and self-awareness and self-management should be incorporated into the built environment curricula. Others are teamwork, digital fluency, mobilising systems, and effective communication.

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Appendix

Dear Participant,

Request for Short Virtual Interview

Research reveals that the built environment graduates are not matching the needs of the 21st-century construction industry. Evidence shows that the BEA struggle to reskill and upskill to meet the industry's demand. Studies about Nigeria's BEA's perceived barriers in meeting the 21st-century industry demands are scarce. Therefore, the paper's title is **Built Environment Academics for 21st Century World of Teaching: Stakeholders' Perspective**. Specifically, the researchers' will achieve the stated aim through the following:

(1) To evaluate BEA's current teaching quality in the 21st century.

(2) To investigate the perceived barriers facing Nigeria's BEA in the world of teaching.

(3) To proffer measures to improve BEA in the 21st-century world of teaching.

Kindly note that the virtual interview questions will be within the stated objectives. Responses provided by you will be collated and analysed together with that of other interviewees. It will make up the value and contribution to achieving the success of this work. Information provided will be treated with the greatest secrecy.

Hence, your valuable time and other answers to the questions will be highly cherished.

With regards.

Yours faithfully.

(Research Coordinator)

Basic questions for the participants

(1) Please, for record purposes, what is your organisation's name and state located?

(2) Please, what is your position in the organisation?

(3) Can you tell us your years of work experience?

(4) Please, are you knowledgeable regarding BEA and the expectation in the 21st century?

(5) If yes to question 4, from your perception, how can you describe the relevance of BEA to the built environment professionals (BEP)?

(6) As a stakeholder in the built environment sector, how can you evaluate the current teaching quality from the BEA?

(7) Do you think there are perceived barriers facing Nigeria's BEA in the world of teaching?

(8) If yes to question 7, what are the possible barriers?

(9) If no to Question 7, why do you think so?

(10) Please, what role can key stakeholders (government, professional bodies, government accreditation bodies, higher institutions, and the industry) play to improve BEA in the 21st-century world of teaching?

(11) In summary, do you think industry collaboration and technological advancement can improve the employability of the built environment graduates and meet the industry's minimum standard?

(12) If yes to Question 11, how can the feat be achieved?

(13) If no to Question 11, why do you think so?

About the authors

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