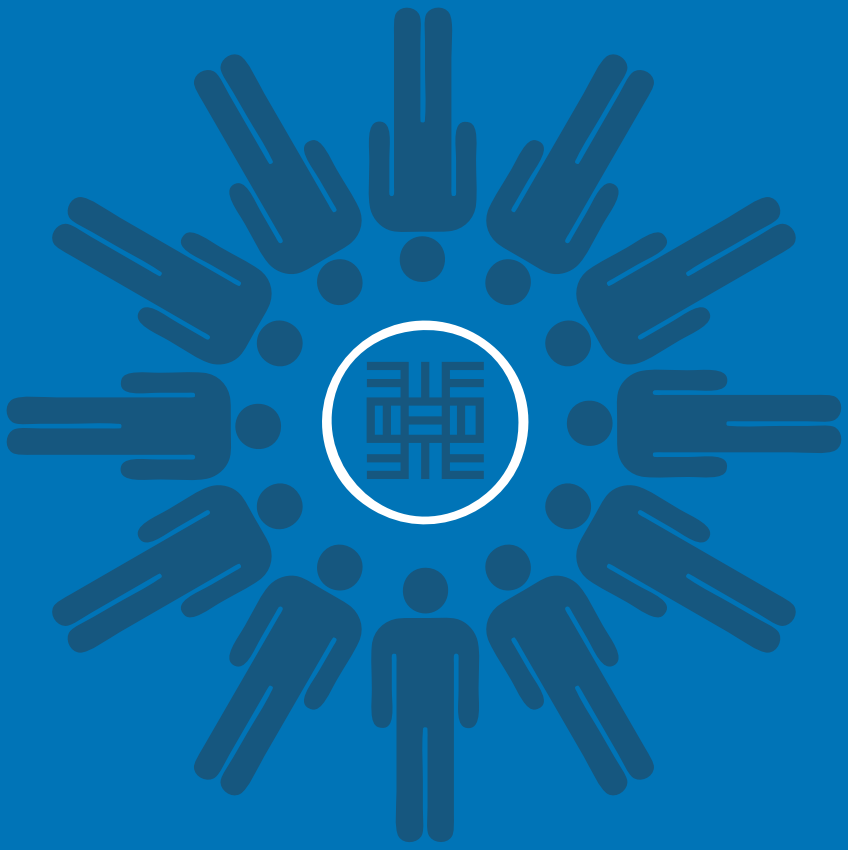
WABER CONFERENCE

10th Anniversary Conference



BROCHURE AND BOOK OF ABSTRACTS

Editors:
S. Laryea
E. Essah

5-7 August 2019
Ghana Academy of Arts and Sciences
Accra, Ghana

WEST AFRICA BUILT ENVIRONMENT RESEARCH (WABER) CONFERENCE

Knowledge, Interaction, People & Leadership

10th ANNIVERSARY BROCHURE AND BOOK OF ABSTRACTS FOR THE WABER 2019 CONFERENCE

5th-7th August 2019
Ghana Academy of Arts and Sciences
Accra, Ghana

EDITORS

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Wits University, South Africa

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Declaration

All papers in this publication have been through a review process involving initial screening of abstracts, review of full papers by at least two referees, reporting of comments to authors, revision of papers by authors and re-evaluation of re-submitted papers to ensure quality of content.

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The full papers can be found on the WABER Conference website www.waberconference.com and are also published in the Crossref database to facilitate international visibility of the papers

BROCHURE

10th Anniversary Brochure

West Africa Built Environment Research Conference

Knowledge, Interaction, People and Leadership

2009 – 2019
10th Anniversary
www.waberconference.com

August 2019

Brochure Content

We hope you enjoy reading this 10th anniversary brochure in which we provide you with information on our story and success over the last ten years. The content of this brochure is as follows.

It has been a great honour for us to serve and make a positive impact in the lives of approximately 4,100 people who have participated in our 45 events since 2009. We a truly grateful to everyone who has been part of our story and success in our first ten years. Thank you.

1.0 OUR HISTORY AND DEVELOPMENT

The West Africa Built Environment Research (WABER) Conference began as an initiative of the School of Construction Management and Engineering, University of Reading, UK. The original objective was to provide an opportunity for doctoral students and early career built environment academics in West Africa to develop their research work and skills through face-to-face interaction with experienced international academics, and thereby help to develop the built environment field.

The idea that led to the birth of the WABER Conference came from Prof Will Hughes in November 2008 when he sent a message to Sam Laryea, then his PhD student at the University of Reading, to explore the possibility of a visit to West Africa to do a research workshop for PhD students. At the time, Will Hughes was the Head of the School of Construction Management and Engineering as well as the Editor-in-Chief of the *Construction Management and Economics* journal. The stature of these two institutions coupled with that of the team from Reading provided us with good momentum for take-off, but, as the saying goes, "the devil is in the detail".

It is one thing to have an idea; quite another to bring it to life. Led by Sam Laryea, we began the groundbreaking process of mobilising people in built environment departments in West African universities to achieve our dream. The end result of this laborious process was a very vibrant and successful research workshop held at the British Council in Accra on 2-3 June 2009. The success of the event surpassed our expectations. The turnout was excellent, and there was a lot of enthusiasm for the event as it was the first of its kind in the region. Over the course of two days, 32 PhD researchers and prospective PhD students presented their work to an audience of at least 90 people from Nigeria and Ghana, as well as a panel of academics comprising Professor Will Hughes, Dr Roine Leiringer and Dr Samuel Laryea. We shared views and knowledge about the research process and how academic research can be applied to the practical problems of management in the construction industry. The event's success and the positive feedback from participants thus encouraged us to host similar events after the initial workshop. We must thank senior academics in the region like Prof Kabir Bala, Prof KT Odusami, Prof Bola Babalola, Prof Emmanuel Achuenu, Prof G.W.K. Intsiful, Rev. Prof Frank Fugar and Prof Stella Zubairu who attended the first workshop and provided us with critical support in the beginning stages. Since the workshop in 2009, almost 900 people have participated in our research conference series and we have published more than 800 research papers in our conference proceedings and in our official journal - the *African Journal of Built Environment Research*. The value and impact of this conference is seen in the positive feedback from several people who have narrated the positive impact of this conference on their academic development and career progression.

While the first event was funded by the University of Reading, the future development of the initiative required strong leadership and enterprise. WABER was developed into an independent organisation after the first event and registered in Ghana. We put together a team to provide the infrastructure and leadership required to take it forward. Sam Laryea has led this team, which has been refreshed with new members from time to time, to propel the growth of the organisation from small beginnings to its current position as an established organisation that has become part of West African academic life in the built environment field. We enjoy a positive reputation in academia and industry settings.

To sustain WABER and enhance our growth and impact, one initiative we embarked upon in 2013 was the extension of our activities to include professional development events for lecturers in higher education institutions and for built environment professionals. Initially this offering was developed around the conference but was expanded to other times of the year later on, facilitated by persons recruited for the purpose. The success of these CPD events have surpassed our expectations. The 42 CPD events offered since 2013 have been extremely successful and have played a significant role in sustaining our growth and development. They have expanded our network and influence significantly through participants from over 160 companies in different sectors of the economy. More than 3,200 people have participated in our CPD events, which include our Construction Law Seminars, Workshops on Infrastructure Procurement and Delivery Management, and our academic practice development workshops. We have delivered in-house academic practice development programmes to higher education institutions such as the Ghana Institute of Management and Public

Administration (GIMPA), University for Professional Studies (UPSA), Koforidua Technical University, Kwame Nkrumah University of Science and Technology (KNUST), Ho Technical University, University of Health and Allied Sciences (UHAS) and Zenith University College. We invite internationally leading facilitators to deliver our CPD events and this has been a great source of credibility and high-quality learning for participants. The feedback has been very positive, with many repeat participants.

We are very proud of the success that WABER has become, and of the positive impact we have made in the lives of approximately 4,100 people who have taken part in our research conferences and CPD events. We are also proud to have been accorded the honour of hosting several high-profile dignitaries at our events. They include Vice Chancellors, Justices, Members of Parliament, and Ministers of State. The Ministers of State who have attended our events are Prof Naana Jane Opoku Agyemang (former Minister of Education), Prof Kwesi Yankah (Minister of State in Charge of Tertiary Education) and Dr Edward Omane Boamah (former Deputy Minister for Environment, Science and Technology). We have hosted two Justices of the Court of Appeal of Ghana, Justice Gertrude Torkornoo and Justice Mabel Agyemang. Honourable Samia Nkrumah, a former MP for Jomoro Constituency gave the closing address at our Conference in 2013. Three Vice Chancellors have presided over the opening ceremonies of our conferences, namely Prof Mohammad Audu (Vice Chancellor of Federal University of Technology, Minna, Nigeria), Prof Ernest Aryeetey (Vice Chancellor of University of Ghana, Legon) and Prof Kwasi Adarkwa, the then Vice Chancellor of Kwame Nkrumah University of Science and Technology (KNUST) who presided over the opening ceremony of our inaugural event in 2009.

In closing this account on our history and development, I would say that the first ten years of WABER have been extremely successful. The challenge now lies in sustaining and taking what we have achieved to the next level. This requires stronger vision, leadership and teamwork.

Going forward, we will continue to seek the progress of our field in West Africa, which is a region that has produced prominent academics like Prof George Ofori and Prof Chimay Anumba. Both of them have played an instrumental role in the development of the WABER Conference. I would like to thank them sincerely for their contribution and hope that they will continue to support us to pursue the following activities that are necessary for the progress of the built environment field in our region and continent:

1. We will promote quality research and recognise those who do quality research.
2. We will use the WABER Conference as a platform to create opportunities for those who want to develop their research skills and work, particularly early career researchers.
3. We will use the WABER Conference as a platform to promote interaction between experienced academic leaders and the built environment community in West Africa.
4. We will aim to enhance interaction, collaborative work, research leadership and professional development among more experienced academics.
5. We will build partnerships and engage with people in the field and support initiatives that help to develop the built environment field here and elsewhere.
6. We will continue to provide opportunities for researchers to publish their research through our conference proceedings and our journal, the *African Journal of Built Environment Research*.
7. We will use the WABER Conference as a vehicle to develop the built environment field in our region and contribute to global initiatives to develop the field more generally.
8. Finally, we will continue to draw upon the wisdom and capabilities of our colleagues to enhance our work and ensure responsiveness to people's needs.

I see the next ten years as an exciting period for consolidation and strategic growth. We must improve and strengthen the resilience of the organisation. We must find new ways to take our success to a new level. We must also identify new ways to promote quality research, forge closer relationships of mutual benefit with academic departments and industry groups, and strengthen our collaboration with our colleagues in the mainstream social and natural sciences disciplines.

We must continue to provide a platform of interaction between those with aspiration and those with the knowledge and experience required to make it happen. We must continue to let WABER

inspire knowledge and excellence. This is a collective responsibility and we need new people to join in helping to continue making things happen. If we continue to advance and improve what we have done in the last ten years, we can create a world-class conference that international researchers aspire to attend, we can create world-class built environment departments where international students aspire to study, and we can do leading research that is cited internationally and used to inform what is being done elsewhere in the world. Do we have the aspiration, imagination, creativity and attitude to make this happen? I believe we do! Do we have what it takes? I believe we do! Thank you and let's make it happen.

Sam Laryea
University of the Witwatersrand, Johannesburg, South Africa
Chairman of WABER Conference
August 2019

1.1 ACKNOWLEDGEMENT OF THOSE WHO HAVE CONTRIBUTED TO OUR STORY AND SUCCESS

It is people who make things happen!

As we mark 10 years, it is necessary to acknowledge and thank key people who have, at different times, worked and provided the commitment necessary to help us in getting to where we are today: *Sam Laryea, Will Hughes, Roine Leiringer, Sena Agyepong, Chris Harty, Emmanuel Essah, Eziyi Ibem, Afolabi Dania, Belinda Osei-Danso, Jonathan Ntsiful, Araba Baidoo, Florence Laryea, Kwesi Kwofie, and Samuel Boakye Yiadom*. The success story of WABER is a credit to the contributions made by these individuals at different times.

In addition to the individuals who have been the force behind our success, we would not be where we are today without the generous support of some organisations and we would like to acknowledge and thank them: University of Reading School of Construction Management and Engineering, Pinsent Masons, Diagonal Projects (Pty) Africa, A-Kon Consults Ltd, Infrastructure Options (Pty) Ltd, Project Management and Procurement Consultancy (PPMC) Ltd, EPP Books Services Ltd, Association of Researchers in Construction Management (ARCOM), Icandoworld Services, Dataware Ghana, Webber Wentzel Attorneys and Lawyers, and Hans Ivan Legal Consult. Thank you for your help.

The work that we do revolves around knowledge. We cannot do what we do without the expertise of several experienced academics and industry experts who serve as our resource persons. We have acknowledged each of them in the list of events in the next section of this brochure. We value the contribution of each resource person at our research conferences and CPD events over the last 10 years. The success of our events has been largely due to your cutting-edge expertise and engagement with our participants. Thank you and we invite you to share in our success and 10th anniversary celebration!

Finally, we would like to thank each of the approximately 4,000 people who have participated in our 45 research conferences and CPD events and your organisations. Thank you for your support.

2.0 THINGS WE HAVE DONE SINCE 2009

In the last ten years, we have successfully delivered 45 events that have impacted positively on approximately 4,100 lives. Our events can be grouped into four categories:

- 8 Research conferences
- 25 Continuing professional development (CPD) events for academic practitioners
- 15 Continuing professional development (CPD) events for industry practitioners
- 6 Corporate social activities

The details of these events are narrated as follows.

2.1 RESEARCH CONFERENCES

Over 900 people have participated in our research conferences since the first one in June 2009. Below are details of our research conferences and the invited speakers who came and helped to make each conference a successful one. These conferences have impacted positively on many people particularly early career researchers and academic departments in the West Africa region.

WABER 2019 Conference
5-7 August 2019, Ghana Academy of Arts and Sciences, Accra, Ghana

Invited Speakers:
Professor Kwesi Yankah, Minister of State for Tertiary Education, Ghana
Professor SN Odai, Vice Chancellor, Accra Technical University, Ghana
Professor Roger Flanagan, University of Reading, UK
Professor Kabir Bala, Ahmadu Bello University, Nigeria
Associate Professor Kathy Michell, University of Cape Town, South Africa
Associate Professor Carmel Lindkvist, Norwegian University of Science and Technology, Norway
Professor PD Rwelamila, UNISA, South Africa

WABER 2017 Conference
16-18 August 2017, University of Ghana, Accra, Ghana

Invited Speakers:
Professor Kwesi Yankah, Minister of State for Tertiary Education, gave the opening address
Professor Jason Shaw, Hong Kong Polytechnic University & Editor-in-chief of Academy of Management Journal
Prof Oluwole Morenikeji, Deputy Vice Chancellor (Academic), Federal University of Technology, Minna, Nigeria
Professor Will Hughes, University of Reading, UK
***We presented Professor Kabir Bala, Professor of Construction Management and the then Deputy Vice Chancellor (Administration) of Ahmadu Bello University, Nigeria with a Citation to honour his role as a "Distinguished Academic Mentor"*

WABER 2015 Conference
10-12 August 2015, University of Ghana, Accra, Ghana

Invited Speakers:
Professor Ernest Aryeetey, University of Ghana Vice Chancellor gave the welcome address
Professor Naana Jane Opoku Agyemang, Minister of Education gave the opening address
Professor George Ofori, National University of Singapore, Singapore
Professor Koshy Varghese, Indian Institute of Technology, Madras, India
Dr Roine Leiringer of University of Hong Kong, Hong Kong
Dr Ron Watermeyer, Infrastructure Options (Pty) Ltd, South Africa
***We presented Dr Gibrine Adam, President of Zenith University College, Ghana and CEO of EPP Books Services, with a Citation to honour his role as a "Distinguished Educator, Entrepreneur and Philanthropist" for many years*

WABER 2013 Conference
12-14 August 2013, British Council, Accra, Ghana

Invited Speakers:
Professor Chimay Anumba, Penn State University, US
Dr Ron Watermeyer, Infrastructure Options (Pty) Ltd, South Africa

Dr Roine Leiringer of University of Hong Kong, Hong Kong
Honourable Samia Nkrumah gave the closing address

WABER 2012 Conference
24-26 July 2012, Merit Award House, Abuja, Nigeria

Invited Speakers:
Professor Mohammed Audu, Vice Chancellor of FUT Minna gave the welcome address
Dr Roine Leiringer (University of Hong Kong, Hong Kong)
Dr Chris Harty (University of Reading, UK)
Professor Roger Flanagan (University of Reading, UK) by video conference
Professor Stella Zubairu (Federal University of Technology, Minna, Nigeria)
Professor Will Hughes (University of Reading, UK)

WABER 2011 Conference
19-21 July 2011, British Council, Accra, Ghana

Invited Speakers:
Honourable Nat Nunoo Amarteifio, Former Mayor of Accra
Professor George Ofori, National University of Singapore, Singapore
Dr Roine Leiringer, University of Reading, UK
Professor Will Hughes, University of Reading, UK
Dr Chris Harty, University of Reading, UK

WABER 2010 Conference
27-28 July 2010, British Council, Accra, Ghana

Invited Speakers:
Dr Edward Omane Boamah, Deputy Minister for Environment, Science and Technology
Mr Moses Anibaba, Director of the British Council, gave the welcome address
Professor George Ofori, National University of Singapore, Singapore
Dr Roine Leiringer, University of Reading, UK
Professor Will Hughes, University of Reading, UK
Dr Chris Harty, University of Reading, UK

WABER 2009 Workshop
2-3 June 2009, British Council, Accra, Ghana

Invited Speakers:
Professor Kwasi Kwafo Adarkwa, KNUST Vice Chancellor, gave the opening address
Professor Will Hughes, University of Reading, UK
Dr Roine Leiringer, University of Reading, UK
Dr Sam Laryea, University of Reading, UK

2.2 CONTINUING PROFESSIONAL DEVELOPMENT (CPD) PROGRAMMES FOR ACADEMIC PRACTITIONERS

1. **Research Paper Writing Workshop and Retreat**, 30 July – 1 August 2019, KNUST, Kumasi – Resource persons: Prof Celia Popovic (York University, Canada and Prof Sarah Hayes (University of Wolverhampton, UK)
2. **Workshop on research grant proposal writing, reviewing and evaluating research grant proposals**, 23-25 July 2018, KNUST, Kumasi – Resource persons: Dr Charmaine Williamson and Dr Gaelle Ramon (attended by ~100 people)

3. **Teaching and Learning in Higher Education Workshop**, 9-10 July 2018, British Council, Accra, Ghana – Resource persons: Prof Carmel McNaught and Prof David M. Kennedy (attended by 38 people)
4. **Workshop for Graduate Research Students**, 6 July 2018, British Council, Accra, Ghana – Resource persons: Prof Carmel McNaught and Prof David M. Kennedy (attended by 80 people)
5. **Academic Leadership Workshop**, 5 July 2018, British Council, Accra, Ghana – Resource persons: Prof Carmel McNaught and Prof David M. Kennedy (attended by 42 academic leaders)
6. **Workshop for Research Supervisors**, 4 July 2018, British Council, Accra, Ghana – Resource persons: Prof Carmel McNaught and Prof David M. Kennedy (attended by 48 people)
7. **Academic Writing and Publication Workshop**, 3 July 2018, British Council, Accra, Ghana – Resource persons: Prof Carmel McNaught and Prof David M. Kennedy (attended by 80 people)
8. **Workshop for Research Supervisors**, 18 August 2017, University of Ghana, Accra, Ghana – Facilitated by Prof Jason Shaw (Hong Kong Polytechnic University, Hong Kong) and Prof Will Hughes (University of Reading, UK (attended by ~60 people)
9. **Academic Writing and Publication Workshop**, 18 August 2017, University of Ghana, Accra, Ghana – Facilitated by Prof Jason Shaw (Hong Kong Polytechnic University, Hong Kong) and Prof Will Hughes (University of Reading, UK) (attended by ~180 people)
10. **1-day workshop on Writing for Academic Publication**, 6 April 2016, Central Hotel, Accra, Ghana, Prof Gina Wisker, University of Brighton, UK
11. **Senior Academics Professional Development Programme**, 30 March – 1 April 2016, Central Hotel, Accra, Facilitator: Prof Gina Wisker, University of Brighton, UK
12. **1-day workshop on Supervising research students and examining research projects**, 24 March 2016, Koforidua Technical University, Koforidua, Ghana, Facilitated by Dr Amy Burge, Institute for Academic Development, University of Edinburgh, UK (in-house)
13. **2-day workshop on Teaching and learning in higher education**, 22-23 March 2016, Koforidua Technical University, Koforidua, Ghana, Facilitated by Dr Amy Burge, Institute for Academic Development, University of Edinburgh, UK (in-house)
14. **1-day workshop on Supervising research students and examining dissertations**, 17 March 2016, KNUST, Kumasi, Ghana, Facilitated by Dr Amy Burge, Institute for Academic Development, University of Edinburgh, UK
15. **3-day workshop on Teaching and learning in higher education**, 14-16 March 2016, KNUST, Kumasi, Ghana, Facilitated by Dr Amy Burge, Institute for Academic Development, University of Edinburgh, UK
16. **3-day course on Teaching and Learning in Higher Education**, 21-23 March 2016, University of Health and Allied Sciences (UHAS), Ho Technical University, Ghana, Facilitated by Prof Carmel McNaught (In-house)
17. **3-day course on Teaching and Learning in Higher Education**, 14-16 March 2016, Ho Technical University, Ghana, Facilitated by Prof Carmel McNaught (in-house)
18. **Introduction to University Teaching and Learning**, 9-11 March 2016, Central Hotel, Accra, Ghana, Facilitated by Prof Carmel McNaught
19. **1-day workshop on Supervising research students and examining dissertations**, 8th March 2016, Accra, Ghana, Facilitated by Prof Carmel McNaught (attended by over 60 participants from different institutions)
20. **2-day in-house training programme on "Academic research and publications''**, 26-27 November 2015, Zenith University College, Accra, Ghana, Facilitated by Prof Sam Azasu
21. **3-day staff development training in Teaching and Learning in Higher Education**, 23-25 November 2015, GIMPA, Accra, Ghana, Facilitated by Prof Carmel McNaught (in-house)
22. **Teaching and Learning in Higher Education Course**, 16-18 November 2015, KNUST, Kumasi, Ghana, Facilitated by Prof Carmel McNaught
23. **Teaching and Learning in Higher Education Course**, 12-14 November 2015, Ghana College of Physicians and Surgeons, Accra, Ghana, Facilitated by Prof Carmel McNaught
24. **3-day course in Teaching and Learning in Higher Education**, University of Ghana, 13-15 August 2015, Facilitated by Kristina Edstrom from KTH, Sweden
25. **4-day course in Teaching and Learning in Higher Education**, UPSA, Accra, 11-14 August 2015, Facilitated by Prof Carmel McNaught, Emeritus Professor of Learning Enhancement

2.3 CONTINUING PROFESSIONAL DEVELOPMENT (CPD) PROGRAMMES FOR INDUSTRY PROFESSIONALS

1. **Seminar on Engineering, Procurement and Construction (EPC) Contracts**, Labadi Beach Hotel, 13-14 August 2019, Speakers – Rob Morson, Jeremy Glover, Greg Jones, Finlo Paish, Justice Gertrude Torkornoo
2. **Construction Law Seminar 2019**, Fiesta Royale Hotel, 9-10 April 2019, Attended by 150 people, Speakers – Rob Morson, Jeremy Glover, Ron Watermeyer, Edward Melomey, Christopher Fynn, Justice Gertrude Torkornoo, Williams Nimako, Kojo Bentsi-Enchill (attended by ~160 people)
3. **In-house training on FIDIC Contracts for GOIL**, Fiesta Royale Hotel Accra, 20-22 March 2019, Facilitated by Coenraad Snyman
4. **Workshop on Preparing procurement strategies and contract documents**, in collaboration with the Ghana Institution of Engineering, 13 March 2019, Engineers Centre, (attended by 40 people)
5. **Workshop on Construction Specification Writing**, in collaboration with the Ghana Institution of Engineering, 12 March 2019, Engineers Centre, (attended by 40 people)
6. **In-house training for GOIL**, 20-22 March 2019, Fiesta Royale Hotel, Accra, Ghana, Resource person: Coenraad Snyman
7. **Half-day Seminar on new editions of the FIDIC Contracts (2017 editions)**, 18 March 2019, Hillcrest Hotel, Takoradi, Ghana, Facilitated by Coenraad Snyman, Attended by ~180 people
8. **3-day Seminar on FIDIC Contracts**, 5-7 November 2018, African Regent Hotel, Accra – Ghana, Facilitated by Coenraad Snyman, (attended by ~50 people)
9. **1-day Seminar on new editions of the FIDIC contracts (2017 editions)**, 6 August 2018, Fiesta Royale Hotel, Accra, Ghana, Attended by 185 people, Resource persons: Rob Morson
10. **Construction Law Seminar 2018**, 25-26 April 2018, British Council, Accra, Ghana, in collaboration with Pinsent Masons and AB & David Africa – Resource persons: Rob Morson, David Ofosu-Dorte, Ferdinand Adadzi, Rockson Dogbegah, Justice Gertrude Torkornoo, Dr Ron Watermeyer (attended by ~200 people)
11. **Workshop on Infrastructure Procurement and Delivery Management**, 17-18 August 2017, British Council, Accra, Ghana, Facilitated by Dr Ron Watermeyer (Director of Infrastructure Options (Pty) Ltd & Chairperson of the ISO Technical Sub-committee on Construction Procurement (attended by ~60 people)
12. **Construction Law Seminar 2017 (Part 2)**, 14-15 August 2017, British Council, Accra, Ghana, in collaboration with Pinsent Masons and Bentsi-Enchill, Letsa & Ankomah – Resource persons: Rob Morson, Rob Wilkins, DKD Letsa, Elizabeth Ashun, Rockson Dogbegah, Dr Ron Watermeyer (attended by ~190 people from organisations in three different countries)
13. **Construction Law Seminar 2017 (Part 1)**, 26-27 April 2017, British Council, Accra, Ghana, in collaboration with Pinsent Masons and Bentsi-Enchill, Letsa & Ankomah – Resource persons: Rob Morson, DKD Letsa, Rockson Dogbegah, Justice Gertrude Torkornoo (attended by ~180 people from organisations in Ghana, Nigeria, Liberia and Ivory Coast)
14. **2-day course in Construction Procurement and Supply Chain Management in Infrastructure Delivery**, 13-14 August 2015, ISSER Conference Complex, University of Ghana, Legon, Facilitated by Dr Ron Watermeyer
15. **1-day course in construction procurement and supply chain management in infrastructure delivery**, 15 August 2013, Coconut Groove Hotel, Accra, Ghana, Facilitated by Dr Ron Watermeyer Procurement (attended by ~35 people)

2.4 CORPORATE SOCIAL ACTIVITIES

We have carried out activities to support social development in our local communities and the development of our built environment professions. Examples of our corporate social activities include:

1. Supporting the 49th Ghana Institution of Engineering (GhIE) Annual Conference on 27-30 March 2019 by providing an international speaker, Dr Ron Watermeyer, who spoke on "The future of the engineering education - where to from here?"
2. Hosting a free educational seminar on new editions of the FIDIC contracts (2017 editions) for construction professionals in Takoradi, Ghana on 18th March 2019. We also invited final year civil engineering and building technology students in Takoradi Technical University to take part of the Seminar and use it as an opportunity to prepare for their professional careers. Each student received free food and certificate of attendance.
3. Donating a set of jerseys and kits to the football team of King Edward Preparatory School in Gbawe, Accra in 2013 to support the academic and physical development of the pupils there
4. Donated books to six Technical Universities (previously Polytechnics) in Ghana in 2011 to contribute our 'widow's mite' to built environment education in our tertiary institutions
5. Visiting six universities in Nigeria in 2011 to interact with colleagues in those universities
6. Donating a Projector and soccer kits to St Bernadette School in Dansoman, Accra in August 2011 to support the school and academic development of the pupils there

3.0 TESTIMONIALS FROM SOME OF OUR PARTICIPANTS

There is an old proverb which goes like this: "The proof of the pudding is in the eating". We have always found it important to know the experiences of those who participate in our events. We have a summary of experiences of our participants on our websites www.waberconference.com and www.waberprofessionaleducation.com

Here, we provide a few testimonials from some of our participants.

"The course was very insightful and interactive. The lecturer was extremely knowledgeable and put the training in a practical context to make it more applicable. The manual is comprehensive and will serve as a good reference for me."
– Participant from Teaching and learning course

"Very exciting and rewarding because it is going to be helpful in my ongoing PhD program"
– Participant from Academic writing for publication course

"It has opened a whole new generation of ideas, techniques and strategies I can adopt to successfully pursuing my procurement objectives and duties"
- Participant from Construction procurement and supply chain management in infrastructure delivery course

"In 2009 I attended a conference which held at the British Council, Accra 2nd and 3rd of June. The conference was the first of its kind in West Africa. I presented a proposal/paper titled "An Investigation into Female Construction Undergraduates' Expectations Towards Practice". I was nervous that day and had very little confidence and I think all the butterflies took residence in my stomach. I had just registered for a PhD and I was groping in the dark (so to speak) but the feedback I got at that conference gave me the much needed confidence boost and motivation. Will Hughes, Roine Leiringer and Sam Laryea were the resource persons and their inputs in all the presentations were valuable. Ten years later and several conferences later we will be gathering once again at Accra 5th to 7th August 2019. My story will not be complete without WABER and I can tell you it is always an unforgettable experience. We'll be making history once again and I intend to not just be a part of it but I intend to make it happen!!"
- A/Prof Kulomri Adogbo, Ahmadu Bello University, regular WABER Conference participant

4.0 PHOTOS FROM SOME OF OUR KEY EVENTS

Some photos from our Research conferences

WABER 2009 Conference

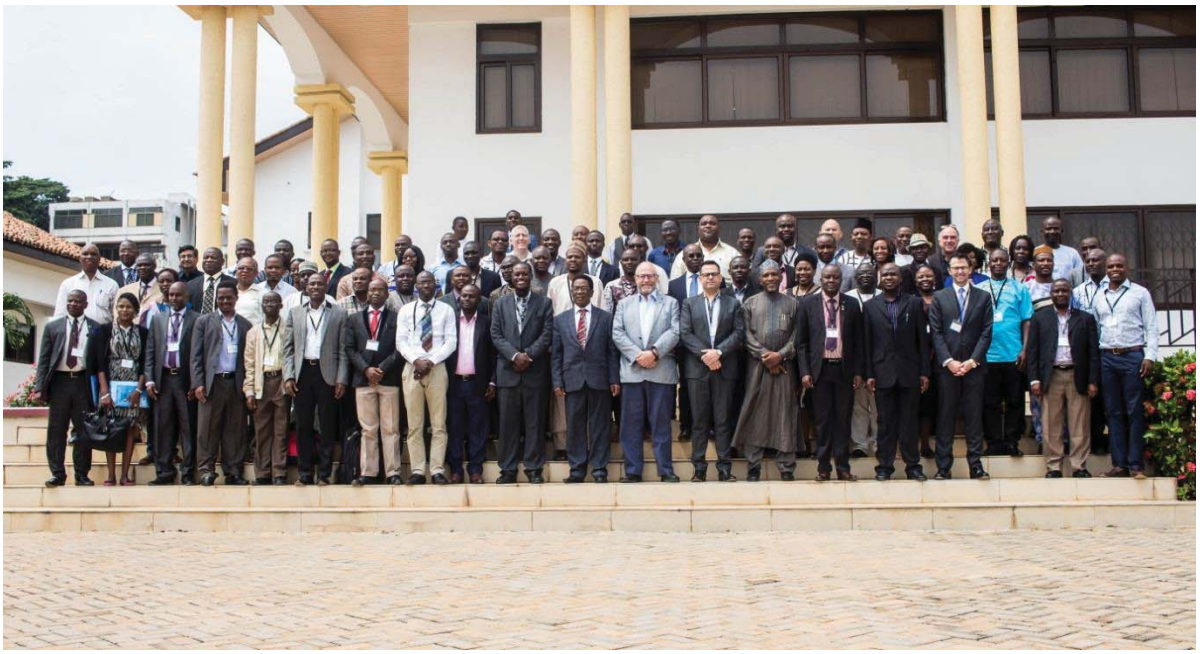
WABER 2010 Conference

WABER 2011 Conference

WABER 2012 Conference

WABER 2013 Conference

WABER 2015 Conference



WABER 2017 Conference

Workshop session @ WABER 2017 Conference

Workshop for Research Supervisors & Poster presentation session @ WABER 2017 Conference

Some photos from our CPD events for industry professionals

Construction Law Seminar April 2017

Construction Law Seminar 2018

Construction Law Seminar August 2017

Construction Law Seminar August 2017

Seminar on new editions of the FIDIC Contracts, Accra, August 2018

Construction Law Seminar in April 2019

In-house training for GOIL

Seminar on FIDIC Contracts

Seminar in Takoradi, March 2019

Two workshops focusing on Specification Writing and Procurement strategies in collaboration with Ghana Institution of Engineering (GhIE) in March 2019

Workshop on Infrastructure Procurement and Delivery Management in 2017

Some photos from our CPD events for lecturers

Academic Leadership Workshop at the British Council in Accra on 5th July 2018

Workshop for Research Supervisors at the British Council in Accra on 4th July 2018

80 academics at one of our workshops on Academic writing for publication on 2nd July 2018

Workshop for Graduate Research Students on 6th July 2018

Teaching and Learning in Higher Education Course held in Accra on 9-10 July 2018

Two participants demonstrating application of their newly acquired knowledge

Training for Lecturers at Ho Technical University in 2016

Workshop in Accra for Research Supervisors from different universities

Training for Lecturers at GIMPA in 2015

Training in Accra for lecturers from different universities

Training for lecturers at Koforidua Technical University

Training for lecturers from different universities

Workshop on Research grant proposal writing at KNUST, Kumasi in July 2018

Teaching and learning in higher education course in Kumasi in 2015

Training for UPSA Lecturers in 2015

Training for Lecturers at UHAS in 2016

Teaching and learning in higher education course in Accra for lecturers from different universities, November 2015

Some photos from our corporate social activities

Donation of soccer kit to football team of King Edward Prep. School in Gbawe, Accra

Visit to St Bernadette School in Dansoman, Accra to donate Projector and soccer kit

Visit to Tamale Technical University to interact and make a donation in 2011

Donation to Takoradi Technical University in 2011

Donation to BT Department at Accra Technical University in 2011

Donation to BT Department at Sunyani Technical University in 2011

5.0 CELEBRATORY MESSAGES

We are delighted to share celebratory messages from three of our important partners:

- Professor Will Hughes, University of Reading, UK
- School of the Built Environment, University of Reading, UK
- Pinsent Masons (the world's largest construction and infrastructure law firm, and winner of Law Firm of the Year and Energy & Infrastructure Team of the Year at the Legal Business Awards 2019).

We recognise the cardinal importance of these partners in WABER's success. Professor Will Hughes is essentially the one who conceived the idea of the WABER Conference. His role in the initial conferences lent a lot of strength and credibility. The School of Construction Management and Engineering, now part of the School of the Built Environment at the University of Reading, provided the initial support which made it possible to realise the dream. Finally, Pinsent Masons have been a constant source of support for our events and activities since 2016. This support has been instrumental in helping to achieve our aims and serve our purpose.

5.1 MESSAGE FROM PROFESSOR WILL HUGHES

Ten years of WABER: a personal reflection

One Sunday afternoon in Reading, sitting in my study at home after a pleasant lunch, I was listening to the music of Toumani Diabaté's Symmetric Orchestra. I have long been fond of the music of West Africa. I had heard his music before, but this was new. The Symmetric Orchestra includes musicians drawn from across West Africa and its name reflects Toumani's feeling that they are all equal, with no one style dominating another. I was reading on the sleeve of the CD that they performed every Friday evening in Bamako and reflecting wistfully on how wonderful it would be to go there and listen to them. It seemed impossible that I would ever get the chance of doing that.

My PhD student, Samuel Laryea, was in the final stages of his study and we often chatted online with some software called AOL Instant Messenger (AIM), which was a popular precursor to WhatsApp, back in 2008. It suddenly crossed my mind that there was nothing preventing me from going to West Africa! Rather than try to make my own way there as a tourist, my connections built up over years of academic life could furnish a professional reason for going there. I put the idea to Sam that we should organize a research workshop in the region and invite everyone from the area who was doing a PhD in a built environment topic. I had access to some funding in the University of Reading, which could cover the cost of a venue, catering, printing and production of the proceedings and the provision of support for the venture. I also had experience of organizing international academic conferences and seminars. Foolishly, I imagined there would be a few dozen people at most. So, I knew, basically, what to do, even though I had little authentic experience of the region. With Sam's incredible network of contacts, we were able to invite people from every built environment University department in the region. All we needed was a name – West Africa Built Environment Research – and WABER came into existence. That was 2008 and there was much work to do between the idea and the actual workshop.

We had settled on Accra as the ideal location for the workshop and needed a venue that was neutral in relation to competing and valid claims of different Universities to be the ideal location. We wanted this event not to be identified with one University, so we chose the British Council as a venue. We had also got some of our Reading colleagues involved in coming along to help form a

panel of experienced academics to lead the questioning and supply the essential feedback in the workshop, Roine Leiringer and, later, Chris Harty. When we wrote to the British Council in January 2009, we had formed an overall picture about what we were seeking to achieve and our request to use their premises included this paragraph:

The purpose of the workshop is to provide an opportunity for the researchers to present their work to an international panel of experienced academics and to get constructive feedback and suggestions about their research. The event also affords a networking opportunity for the built environment community in West Africa.

Sam worked tirelessly through his extensive network to invite the heads of built environment departments in the region to chair sessions as well as high profile dignitaries like Professor Kwasi Adarkwa, then Vice Chancellor of KNUST, to provide a suitably grand opening for the event. He put together a team of enthusiastic Ghanaians who committed to working long hours to overcome any and every obstacle that was in our way. They were so professional and accomplished that it was some time before I fully realised just how much they had all done. They were the real reason that WABER worked so well from the earliest days. That first workshop, in 2009, was a startling success! Approximately 32 PhD students presented their work to an audience that was attentive, interested, challenging and totally engaged. There were at least 90 people in the auditorium at any time and we had a very stimulating workshop, despite occasional power cuts and many speakers' nervousness about presenting to such an audience and being questioned and probed on aspects of their work that had previously been unexplored.

That workshop taught me a lot about how much there was to be done in relation to developing the academic base in this region. But it also taught me that this was fertile ground for new ideas and different ways of thinking. The built environment departments were rather focused on the practicalities of doing construction work and developing vocational programmes for aspiring professionals.

I had seen the same thing in Britain in the 1980s when I started my academic career. In my time as Editor of *Construction Management and Economics* and in my work with the *Association of Researchers in Construction Management*, I had learned that too many of us were chasing the idea that construction required its own set of theories and research techniques that did not draw heavily from other academic areas. As experts in construction, we tended to make the science of construction the beginning, middle and end of every research question. But this never seemed to get us anywhere as the problems we faced were the same problems faced in every industry and we were not making adequate progress in the early days of our research as we were stuck with the primacy of industry experience over theoretical insights. It was not only me that recognised this. Indeed, the *Science Engineering Research Council* (subsequently renamed the *Engineering and Physical Sciences Research Council*) had commissions and Specially Promoted Programme at the time, investing in the development of a strong research base for this industry. I was fortunate in being employed as a Research Fellow in one of those early projects and that provided me with opportunities to learn about how to apply organizational analysis and management science to the construction sector. We had learned about some of these management writers from the 1960s and 1970s business school literature. However, most people in built environment research when I was young simply repeated the mantra that construction was not manufacturing and, therefore, none of the social science developed in business schools was relevant to us. Fortunately for me, I did not listen to that kind of emerging wisdom because I had a job to do – the application of organizational analysis techniques to construction project case studies! The specially-promote programme was a tremendous success as the research community that built up around these themes resulted, in 1983 in the inauguration of two separate initiatives: *Construction Management and Economics* (CME&E) and the *Association of Researchers in Construction Management* (ARCOM). I was not involved in

setting up either of these things as I was a junior researcher at the time, even though I was keenly aware of them. However, they soon formed the bedrock of my academic life and they both became the most important institutions of my academic career.

As my career developed, especially through my work within CM&E and ARCOM, my main task seemed to be to confront the idea that construction management, construction economic or construction law were somehow separate from the study of management, economics and law. Our academic community carried out excellent engineering research, using physics, chemistry, maths, material science, fluid dynamics and so on, with many great successes. But those same people could not invent management, economic and law from first principles. These social sciences were not at the heart of construction departments, since construction had always been a practical subject based on the natural sciences. I recognised this same phenomenon in what was, to me, an entirely different and far more complex nexus of cultures, languages and history that I met in West Africa.

After that first WABER Workshop was over in 2009, just when I was expecting everyone to leave, a large group of West African academics rearranged the furniture in the main auditorium and sat down to discuss their experiences and feelings. During this energetic exchange of ideas they invited me and my colleagues to join in their discussion, which was about doing this again next year. It had not crossed my mind that this was going to become a regular event. However, despite still not having travelled to Mali to listen to music, I had discovered something far more interesting, complex and rich – the built environment research community in West Africa! The energy and enthusiasm, the receptiveness to criticism and the heartfelt welcoming of guidance all combined to make this one of the most rewarding and worthwhile experiences in my career. Having started this, we could not simply walk away. So we promised that we would think about how to come back and do this again and this is how the annual event started, transforming from a workshop to an annual conference series.

The growth of WABER was amazing; it exceeded all our expectations. Here is what the first four years looked like:

- 2009 – 32 abstracts, 90 delegates
- 2010 – 68 papers, 120 delegates
- 2011 – 95 papers, 150 delegates
- 2012 – 125 papers, 148 delegates

It is with great pride and humility that I was able to acknowledge that this organization was not dependent on me for its survival. I never did get to Bamako to listen to Toumani. But I got infinitely more satisfaction and enrichment than I could ever have imagined. The music of the kora was eclipsed by the never-ending warmth and fervour of the academic community in this part of the world. I am left feeling grateful to all those who engaged immediately and fully with this idea. You have given me so much optimism for the prospects of this part of the world. Your dignity, integrity and diligence continue to be an example for the rest of us to follow.

Thank you.

Will Hughes
Professor of Construction Management and Economics
School of Construction Management and Engineering
University of Reading, UK

5.2 MESSAGE FROM SCHOOL OF THE BUILT ENVIRONMENT, UNIVERSITY OF READING, UK

Over 10 years ago, colleagues in the School of Construction Management and Engineering at the University of Reading made real an ambition to engage with doctoral researchers in West Africa and the first WABER conference was born.

One year later, WABER provided my first experience of the fantastic city of Accra, and West Africa more generally, an experience I was lucky enough to repeat for the next two years. Over that period WABER grew in scale, ambition and professionalism.

It did not stop there, and it is incredible to think that from small beginnings with three academics and 32 PhD students, WABER is now established as a successful, vibrant and above all intellectually important part of West African academic life in the Built Environment disciplines. It holds at its centre the desire to enable open and honest academic debate regardless of rank or region, and perhaps it is that which has enabled such success.

I wish everyone a fruitful and productive 10th Anniversary WABER, and I hope to see you all soon.

Best Wishes,

Chris

Professor Chris Harty
Head of School
School of the Built Environment
Architecture | Construction | Energy | Environmental Engineering
University of Reading

5.3 MESSAGE FROM PINSENT MASONS

Happy 10th birthday

Pinsent Masons is proud to continue our support of and to be associated with the West Africa Built Environment Research (WABER) Conference.

As a firm with a long history advising our clients from our 25 offices spread across five continents, we know the value of milestones. Pinsent Masons congratulates WABER on it's ten year anniversary. We look forward to partnering with you for many more.

Pinsent Masons

6.0 CONNECT AND STAY IN TOUCH WITH US

Thank you for taking the time to look at our brochure, we invite you to connect and stay in touch with us.

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PROGRAMME

WABER 2019 Conference

10th Anniversary Conference

5th – 7th August 2019
Ghana Academy of Arts and Sciences, Accra, Ghana
08:30am – 17:30pm

Theme:
"Seeking innovative and sustainable African development solutions"

Main Speakers

Prof Kabir Bala
Ahmadu Bello University, Nigeria

A/Prof Kathy Michell
University of Cape Town, South Africa

Prof Roger Flanagan
University of Reading, UK

Prof PD Rwelamila
UNISA GSBL, South Africa

A/Prof Carmel Lindkvist
Norwegian University of Science and Technology, Norway

Conference Programme

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DAY 1 - MONDAY, 5TH AUGUST 2019

Time	Event	Venue /Chair
07:30 – 08:45	**Registration** Register and collect your conference materials Welcome tea and coffee and koko Social interaction, Viewing of Posters, and Short video on WABER over the years while we get ready for the Welcome Session	Reception area Main Auditorium
08:45 – 09:00	**Welcome Session** Welcome remarks, Introduction of our Main speakers, Acknowledgement of sponsors and partners, Programme for the day	Main Auditorium Sam Laryea
09:00 – 10:00	**Paper presentation session for doctoral researchers** • Built environment education for green building development in Nigeria, Comfort Olubunmi Ade-Ojo, Federal University of Technology, Akure, Nigeria • Making a case for modular integrated construction in West Africa: rethinking of housing supply in Ghana – Wuni, I. Y. and Shen, G. Q. • Transaction costs characteristics effects on contracting business in Nigeria - Yahaya, M. L. and Oyediran, O. S. • Understanding building price forecasting based on organisational behaviour – Yakubu Michael Zaki, Baba Adama Kolo, Yakubu Gimson Musa-Haddary, Ibrahim Biye Abdullahi Constructive feedback will be provided on each presentation by a panel of experienced international academics led by Professor PD Rwelamila, Joint Coordinator of CIB W107 Construction in Developing Countries and Professor at Graduate School of Business Leadership, UNISA, South Africa	Main Auditorium Chaired by Prof PD Rwelamila, UNISA GSBL, South Africa
10:00 – 10:30	**Refreshments break**	**Outside lawn**
10:30 – 11:00	Plenary session on tropical building design **Re-examining the appropriateness of current tropical design practices** **Mr Ben Adarkwa PGDIP.ARCH, RIBA** Principal at Benson Architects	Main Auditorium Chaired by Prof GWK Intsiful, KNUST, Ghana
11:05 – 11:45	1st Keynote Session **The next generation of African Built Environment Professionals** **Prof Kabir Bala** Professor of Construction Management, Ahmadu Bello University, Nigeria	Main Auditorium Chaired by A/Prof Kathy Michell, UCT, South Africa
11:50 – 13:00	**Official Opening Session of WABER 2019 Conference** Introduction of invited guests and dignitaries by Sam Laryea, Conference chair **Welcome address by Chairman of the Opening Session – Prof SN Odai, Vice Chancellor of Accra Technical University** **Special address by Minister of State in Charge of Higher Education – Prof Kwesi Yankah** Cutting of WABER 10th Anniversary Celebration Cake Official WABER 2019 Group Photograph	Main Auditorium Prof SN Odai, VC of Accra Technical University, Ghana
13:00 – 14: 00	**Lunch Break**	**Dining Room**

14:00 – 15:30	**Paper Presentations (three Parallel Sessions)**			Three separate rooms
Parallel Sessions	**STREAM 1** **Auditorium** **Chair: Dr Cynthia Adeokun, Colman Architects, UK**	**STREAM 2** **Seminar Room 1** **Chair: Dr Sena Agyepong, Ashesi University, Ghana**	**STREAM 3** **Seminar Room 2** **Chair: Prof GWK Intsiful, KNUST, Ghana**	
14:00 – 14:10	The nexus of the infrastructure sector, employment and economic growth – Dlamini, S. and Root, D.	Assessing the skills and competency required of Nigerian quantity surveyors in practicing sustainability advisor in the construction industry - Ali, A. A., Ayobami, I. F., Christian, B. and Salawudeen, A.	An appraisal of the maintenance management practices of high rise residential buildings in Nigeria - Opara, V. I., Idowu, F. O., Hungbo, A. A. and Akinsanya, K. O.	
14:10 – 14:20	Performance benchmarking system for the Nigerian construction industry - Akinradewo, O., Aigbavboa, C. and Oke, A.	Students' perception on the quality of teaching of architecture in south-east Nigeria - Chukwuma-Uchegbu, M. I.	Improving maintainability of public buildings in Owerri Nigeria - Okpoechi, C. U. and Nwankwo, S. I.	
14:20 – 14:30	**Q&A**	**Q&A**	**Q&A**	
14:30 – 14:40	Effect of internal environment and project-related determinants on business strategy of small and medium construction enterprises in Nigeria - Akinkunmi, O. A., Idoro, G. I., Ameh, O. J. and Zakariyyah, K.I.	The leaky pipeline between construction education and women in the construction industry - Moraba, Y. and Babatunde, O.	Establishment of baseline data for deformation monitoring of administrative block of Waziri Umaru Federal Polytechnic, Birnin Kebbi, Kebbi State, Nigeria – Bello, M. N. and Umar A. A.	
14:40 – 14:50	Dominant innovations of successful construction micro, small, and medium enterprises (CMSMEs) in northern Nigeria - Tsado, A. J., Shakantu, W. M. and Alumbugu, P. O.	Explaining the factors' influencing young females' interest in the construction industry using Maslow's hierarchy of needs - Rasheed, E. O., Yu, J., Hale, S., Booth, N. and Shahzad, W.	Dampness pattern in halls of residence in selected educational institutions in Lagos, Nigeria - Zakariyyah, K. I., Faremi, O. J., Soyingbe, A. A., Ajayi, O. O., John, I. B., Aregbesola, G. T., Aderogba, M. A., Tijani, M. S., Simeon, R. D. and Bolajoko, A. T.	

14:50 – 15:00	**Q&A**	**Q&A**	**Q&A**	
15:00 – 15:10	Cost of construction projects in Nigeria -challenges and ways forward- - Ojo, S. M.	Challenges confronting the quantity surveying profession in Nigeria: perspective of the education system – Awolesi, J. A.	An exploratory study of the relationship between urban form and travel behaviour in Kaduna, Nigeria - Bununu, Y. A.	
15:10 – 15:20	Premature project closure: the role of consultants and contractors - Akinshipe, O., Aigbavboa, C., Thwala, W. D. and Madidimalo, M.	Quantity surveying education for sustainable development: industry perception - Adekunle, S. A., John, I. and Aigbavboa, C.	Sustainable urban development and the challenges of urban sprawl in 'Abuja' the federal capital city of Nigeria - Hussaini, I. U., Abubakar, S. K., Danmaraya, M. A., Sumaila, S. A. and Ibrahim, S. K.	
15:20 – 15:30	**Q&A**	**Q&A**	**Q&A**	
15:30 – 16:00	**Refreshments break**			**Outside lawn**
16: 00 – 17:30 Includes 25 mins for Q&A	WABER 10th Anniversary Public Lecture **Imagination, inspiration, innovation: the challenge for design and construction teams in Africa** **Professor Roger Flanagan** Professor, School of Construction Management and Engineering, University of Reading, UK			Main Auditorium Chaired by Mr. Rockson Dogbegah, President, Institute of Directors, Ghana
17:30	Close for day 1			Main Auditorium

DAY 2 - TUESDAY, 6TH AUGUST 2019

Time	Event			Venue /Chair
07:30 – 08:30	**Registration and welcome tea and coffee and koko**			
08:30 – 08:45	**Video highlights of Day 1 and orientation to day 2**			Main Auditorium
08:45 – 10:45	1st Research Skills Workshop **Modern ways to conduct literature reviews and use theory in research** **Associate Professor Carmel M. Lindkvist** Norwegian University of Science and Technology, Norway			Main Auditorium Chaired by A/Prof Kulomri J. Adogbo, Ahmadu Bello University, Nigeria
10:45 – 11:15	**Refreshments break**			**Outside lawn**
11:15 – 12:00	2nd Keynote Session **Sustainable urban development and management in African cities** **Associate Professor Kathy Michell** Head of Department of Construction Economics and Management, University of Cape Town, South Africa			Main Auditorium Chaired by Prof GWK Intsiful, KNUST
12:05 – 12:40	Panel discussion on affordable housing in African cities **Critical rethink of affordable housing understanding and initiatives in African countries** **Question for the panel discussion: How do we address the challenge of affordable housing for lower and middle income workers in African countries?** **Andrew Chimpondah**, Managing Director of Shelter Afrique (15 minutes presentation) **Sammy Amegayibor,** Executive Secretary of Ghana Real Estate Developers Association (10 minutes presentation) Q&A (10 minutes)			Main Auditorium Chaired by Prof GWK Intsiful, KNUST / Dr Cynthia Adeokun, Colman Architects, UK
12:40 – 13:25	**Lunch break**			**Dining Room**
13:30 – 14:00	Plenary session on research in the Nigerian built environment **Trumping our Game: Refocusing current challenges in the Nigerian construction industry into national discourse** **Dr Joy Maina** Assistant Dean, Faculty of Environmental Design, Ahmadu Bello University, Nigeria			Main Auditorium Chair: Rev. Dr Joseph Buertey, Pentecost University College, Ghana
14:00 – 16:00	**Paper Presentations (three Parallel Sessions)**			Three separate rooms
14:00 – 16:00	**STREAM 1** **Auditorium**	**STREAM 2** **Seminar Room 1**	**STREAM 3** **Seminar Room 2**	

PARALLEL SESSIONS	Chair: Prof PD Rwelamila, UNISA	Chair: Dr Sitsabo Dlamini, Wits University	Chair: Dr Stephen Agyefi Mensah, Cape Coast Technical University	
14:00 – 14:10	Effects of motivation of operatives on productivity in the Nigeria construction industry - Opara, V. I., Apete-Adebola, L. A., Sofolahan, O. and Akinsanya, A. Y.	Tenant's demand for structural attributes in residential properties: the case of Ede, Nigeria – Chiwuzie, A. et al.	Influence of organizational sub-culture on total quality management practices in Nigerian construction firms - Olaleye, Y. O., Ibrahim, Y. M., Ibrahim, A. D. and Adogbo, K. J.	
14:10 – 14:20	The use and effects of cannabis among construction workers in South Africa: a pilot study - Haupt, T. C., Akinlolu, M. and Raliile, M. T.	The influence of GDP on rental growth of residential properties in Ede, Nigeria - Chiwuzie, A., Dabara, D. I., Prince, E. M. and Aiyepada, G. E.	Identifying barriers to total quality management implementation in the construction industry using the delphi technique - Ansah S.K., Thwala D. W. and Aigbavboa C.O.	
14:20 – 14:30	**Q&A**	**Q&A**	**Q&A**	
14:30 – 14:40	Development of sustainable training models from task characteristics for improved performance of site supervisors in construction firms – Ijaola, I. A. and Idoro, G. I.	Real estate investment trusts in Nigeria and the structure-conduct-performance paradigm – Dabara, D. I. and Ogunba, O. A.	Assessing the level of adoption of TQM practices in Nigerian construction firms - Olaleye, Y. O., Ibrahim, Y. M., Ibrahim, A. D. and Adogbo, K. J.	
14:40 – 14:50	Overexertion-related construction workers' activity recognition and ergonomic risk assessment based on wearable insole pressure system - Antwi-Afari, M. F., Li, H., Luo, X. E., Edwards, D. J., Owusu-Manu, D., and Darko, A.	Pricing of property valuation services in Nigeria: an evaluation - Oladokun, S. O. and Mooya, M.	Quality control in Abuja mass housing – Dadu, D. W., Stanley, A. M., Usman, J., Sa'ad, M. M. and Ogunsanya, K. I.	
14:50 – 15:00	**Q&A**	**Q&A**	**Q&A**	
	Chair: A/Prof Emmanuel Essah, University of Reading	**Chair: Prof GWK Intsiful, KNUST, Kumasi, Ghana**	**Chair: Rev Dr Joseph Buertey, Pentecost University College**	

15:00 – 15:10	Sustainable urban green infrastructures as a remediation tool for enhanced environment and local air quality for metropolitan Lagos - Uduma-Olugu, N. and Adesina, J. A.	Innovative architecture for flood resilience: a response to submerged Nigerian cities – Durowoju, A. T.	Strategies for enhancing extended producer responsibility enforcement: a review - Mwanza, B. G. and Mbohwa, C.	
15:10 – 15:20	Barriers of implementing green walls in the urban environment in developing countries - Terblanche, R.	Size and adequacy of living space in the home: an evaluation of public apartments in Cape Coast, Ghana, based on space per person (SPP) - Agyefi-Mensah, S. and Kpamma Z. E.	Information and Communication Technology (ICT) application on construction supply chain management: evidence from Nigeria - Amade, B., Ononuju,C. N., Adu, E. T. and Ogbu, J. M.	
15:20 – 15:30	**Q&A**	**Q&A**	**Q&A**	
15:30 – 15:40	Evaluating the impact of climate change on the quality of ground water – case study of a coal enriched environment in Enugu Urban - Nnaemeka-Okeke, R. C., Eze-Steven, P. E. and Ugwu, C. C.	Industrialized building systems: prospects and problems within the Nigerian construction industry - Emma-Ochu, C. A. and Onwuka, E. O.	Assessing the strategic supply management capabilities of public clients for construction procurement in developing economy - Kolo, B. A. and Bala, K.	
15:40 – 15:50	An investigation into energy consumption profile of University of Lagos students' hostel - Faremi, O. J., Ajayi, O. O., Zakariyyah, K. I., John, I. B., Alimi, O. M., Oginni, O. A. and Adegoriola, M. I.	Challenges and enhanced measures for implementation of industrialized building system in Lagos metropolis - Ajayi, O. O., Faremi, O. J., Zakariyyah, K. I., John, I. B., Anifowoshe, F. A., and Alimi, O. M.	Assessment of stakeholders' perception of risk factors associated with the adoption of e-procurement in the Nigerian construction industry - Gambo, M. M., Dodo, M. and Yusuf, H	
15:50 – 16:00	**Q&A**	**Q&A**	**Q&A**	
16:00 – 16:30	**Refreshments break**			**Outside lawn**
16:30 - 17: 30	3rd Keynote Session **New frontiers of risk in delivering successful projects for clients and profits for constructors** **Prof Roger Flanagan** Professor, School of Construction Management and Engineering, University of Reading, UK			Main Auditorium Chaired by Mrs. Rosemargaret Esubonteng, Vice President of GhIS
17:30	Close for day 2			Main Auditorium
18:45 – 21:30	**WABER 2019 Conference Dinner**			

	Presentation of WABER 10th Anniversary Recognition and Awards	**Atrium, Ghana Academy of Arts and Sciences**

DAY 3 - WEDNESDAY, 7TH AUGUST 2019

Time	Event			Venue
07:30 – 08:30	**Registration and welcome tea and coffee and koko**			Main Auditorium
08:30 – 09:30	**One-on-one mentoring session** Professional and career development one-one-one sessions in different areas of academic practice development (Coordinated by A/Prof Emmanuel Essah, University of Reading, UK)			Main Auditorium
09:30 – 11:00	2nd Research Skills Workshop **Doing qualitative research (collecting and analysing qualitative data appropriately)** **Dr Carmel M. Lindkvist** Norwegian University of Science and Technology, Norway			Main Auditorium Chaired by Dr Cynthia Adeokun
11:00 – 11:30	**Refreshments break**			**Outside lawn**
11:30 – 13:30	**Paper Presentations (three Parallel Sessions)**			Three separate rooms
11:30 – 13:30 **PARALLEL SESSIONS**	**STREAM 1** **Auditorium** **Chair: A/Prof Kathy Michell, University of Cape Town**	**STREAM 2** **Seminar Room 1** **Chair: Dr Gabriel Nani, KNUST, Ghana**	**STREAM 3** **Seminar Room 2** **Chair: Dr Joy Maina, Ahmadu Bello University**	
11:30 – 11:40	Conceptions of sustainability amongst post graduate (MSC) construction management students - Doamekpor, N. A. A-M. and Duah D.	Study on influence of different curing regimes on the mechanical properties of metakaolin based geopolymer concrete - Alhaji, M. A., Tersoo, K. E., Aliyu, L. M. and Almustapha, T.	Building collapse in Nigeria and development control, the missing link - Okeke, F. O., Okeke, F. I. and Sam-Amobi, C.	
11:40 – 11:50	Appropriate drivers for sustainable construction practices on construction sites in Nigeria - Omopariola, E. D. , Albert, I., and Windapo, A.	Strength properties of locally produced reactive powder concrete with unrefined metekaolin - Ibrahim, A. G., Garba, M. M., Okoli, O. G., Zubairu, I. K., Dahiru, D. and Usman, J.	Crime prevention through environmental design: what works and what does not? - reflections from a Nigerian city - Adzande, P.	
11:50 – 12:00	**Q&A**	**Q&A**	**Q&A**	

12:00 – 12:10	Sustainable building practice: an assessment tool for Ghana – Ako-Adjei, J. T. and Danso, H.	Factors affecting the use of Expanded Polystyrene (EPS) for sustainable housing construction in Nigeria - Mansir, D., Gambo, M. M., YarAdua, F. H. and Abduljabbar, K. F.	Assessment of internal marketing relationship of quantity surveying firms in southwestern Nigeria - Ojo G.K and Ebunoluwa E.I	
12:10 – 12:20	Sustainable materials and role of professionals in built environment sustainability - Ajala, A. O., Kashim, I. B., Akinbogun, T. L. and Aramide, F. O.	Factors influencing consumer preference for ceramic sanitary ware in south-west, Nigeria - Fadairo, O. O., Akinbogun, T. L. and Kashim, B. I.	An appraisal of effective organization processes in integrated change control performance for public construction project - Abdullateef, A. J., Ilias, S., Adegboyega, A. A., Muhammed, E. A. and Inuwa, B.	
12:20 -12:30	**Q&A**	**Q&A**	**Q&A**	
	Chair: A/Prof Kathy Michell, University of Cape Town	**Chair: Dr Cynthia Adeokun, Colman Architects, UK**	**Chair: Dr Sarfo Mensah, Kumasi Technical University**	
12:30 – 12:40	Sustainable solid waste management in Nigeria: reviewing the contributions of social networks in informal solid waste collection activities - Kwaghsende, F. K.	Evaluation of clay roof tiles produced with makuba as a binder - Lawal, M. A., Kasim, A. and Alhaji, M. A.	Automation in construction materials handling: the case study in north central Nigeria - Alumbugu, P. O., Shakantu, W. W. M., Tsado, A. J. and Ola-Awo, A. W.	
12:40 – 12: 50	Knowledge and awareness on Plastic Solid Waste (PSW) management in Zambia: where are we? - Mwanza, B. G. and Mbohwa C.	Enhancing the performance of walls built with laterite-cement bricks: a conceptual design and specifications writing approach - Alao, T. O. and Ogunbode, E. B.	An investigation into the performance of Dutse (Nigeria) as a growth centre of Jigawa State - Jolaoye, A. A.	
12:50 – 13:00	**Q&A**	**Q&A**	**Q&A**	
13:00 – 13:10	Framework for sustainable infrastructure development in border communities of Akamkpa local government area Nigeria	A structural analysis of an adjustable docking system for multiple aircraft	Assessment of internal marketing relationship of quantity surveying	

	- Onyekwere, E., Okpoechi, C. U. and Ajom, S. K.	models: case study – Mushiri, T., Maswera, M. and Mbohwa, C.	firms in southwestern Nigeria - Ojo G.K and Ebunoluwa E.I	
13:10 – 13:20	Rethinking the challenges to attaining sustainable cities and communities: lessons from social norms and status quo bias - Hammond, S. F., Gajendran, T., Maund, K. and Savage, D. A.	Design of a composite timber-concrete footbridge across Sakubva River, Mutare. Case of Nyanhongo Village Dora. – Mukura, T. E., Mushiri, T. and Shumba, S.	An appraisal of effective organization processes in integrated change control performance for public construction project - Abdullateef, A. J., Ilias, S., Adegboyega, A. A., Muhammed, E. A. and Inuwa, B.	
13:20 – 13:30	**Q&A**	**Q&A**	**Q&A**	
13:30 – 14:15	**Lunch Break**			**Dining Room**
14:15 – 14:50	4th Keynote session **Making Sense of the Ailing African 'Elephant' – New perspectives for a more sustainable pathway into the future** **Professor PD Rwelamila** Joint Coordinator of CIB W107 Construction in Developing Countries and Professor at UNISA Graduate School of Business Leadership, South Africa			Main Auditorium Chaired by Prof Victor K.B. Micah, Takoradi Technical University, Ghana
15:00 – 16:15	5th Keynote Session **Trends shaping the global construction industry: the race to the future** **Prof Roger Flanagan** Professor, School of Construction Management and Engineering, University of Reading, UK			Main Auditorium Ing. Kwabena Agyepong, Executive Secretary of Ghana Institution of Engineers (GhIE)
16:15 – 16:45	**Refreshments break**			**Outside lawn**
16:45 – 17:20	**Closing Session** Conference summary Vote of thanks and Appreciation of WABER 2019 keynote speakers Presentation of prizes and certificates			Main Auditorium Sam Laryea, Chairman of WABER Conference
17:20	Close			

ABSTRACTS OF PAPERS

Edited by:

Samuel Laryea, Wits University, South Africa

Emmanuel Essah, University of Reading. UK

CONTENTS OF THIS SECTION

FOREWORD

I would like to thank and commend the authors of all 84 papers in this Conference proceedings. If the research paper writing process was compared to a marathon, the authors of the 84 papers in this publication would be adjudged as the ones who have endured and finished the race.

We opened the call for papers for this Conference in September 2018 and 176 abstracts were submitted by authors. However, it is one thing to propose to write a paper, and it is quite another thing to actually write the paper. Therefore, I would like to congratulate all authors who succeeded in completing the process of getting published in this conference proceedings.

To enhance visibility and keep in line with current scientific publishing trends, one of the important steps we have taken in the past year is to register WABER Conference as a member of Crossref. Since the beginning of this year, we have been assigning Crossref DOIs to all papers we publish (journal papers and conference papers) in our two main outlets:

- African Journal of Built Environment Research (AJOBER) www.waberjournal.com
- WABER Conference Proceedings www.waberconference.com

We register the metadata of all our journal and conference papers with Crossref. The metadata is then distributed widely by Crossref, helping with discoverability of your papers online. The metadata of all papers in the WABER 2019 Conference proceedings have been registered with Crossref and it is our expectation that this step will provide greater online visibility to all our authors.

This year's conference is our special 10th anniversary conference.

It is befitting that we have an excellent range of interesting topics in the 84 papers to be discussed at this conference.

We are honoured to welcome Professor SN Odai, Vice Chancellor of Accra Technical University, to give us a welcome address. We are also honoured to welcome Professor Kwesi Yankah again to give an opening address for this special 10th anniversary conference.

In the three days of this conference, we will be addressed by five experienced international academics. It is a pleasure to welcome you and I thank each of you sincerely for being with us.

- Professor Roger Flanagan, University of Reading, UK
- Professor Kabir Bala, Ahmadu Bello University, Nigeria
- Associate Professor Carmel Lindkvist, Norwegian University of Science and Technology, Norway
- Professor PD Rwelamila, University of South Africa
- Associate Professor Kathy Michell, University of Cape Town, South Africa

In addition to our five main speakers, we have several other speakers addressing various topics that should be of interest to many of us.

WABER Conference is about knowledge, interaction and leadership around research matters. I hope that you enjoy the conference, interact with colleagues to develop relationships, and engage with our exciting speakers and the diverse topics and over 150 people expected here for this 10th anniversary conference.

Sam Laryea
University of the Witwatersrand, Johannesburg, South Africa
Chairman of WABER Conference
August 2019

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5th August 2019

TO WHOM IT MAY CONCERN

The scientific information published in peer-reviewed outlets carries special status, and confers unique responsibilities on editors and authors. We must protect the integrity of the scientific process by publishing only manuscripts that have been properly peer-reviewed by scientific reviewers and confirmed by editors to be of sufficient quality.

I confirm that all papers in the WABER 2019 Conference Proceedings have been through a peer review process involving initial screening of abstracts, review of full papers by at least two referees, reporting of comments to authors, revision of papers by authors, and re-evaluation of re-submitted papers to ensure quality of content.

It is the policy of the West Africa Built Environment Research (WABER) Conference that all papers must go through a systematic peer review process involving examination by at least two referees who are knowledgeable on the subject. A paper is only accepted for publication in the conference proceedings based on the recommendation of the reviewers and decision of the editors.

The names and affiliation of members of the Scientific Committee & Review Panel for WABER 2019 Conference are published in the Conference Proceedings and on our website www.waberconference.com

Papers in the WABER Conference Proceedings are published open access on the conference website www.waberconference.com to facilitate public access to the research papers and wider dissemination of the scientific knowledge.

Yours Sincerely,

Sam Laryea, PhD
Chairman of WABER Conference

SCIENTIFIC COMMITTEE AND REVIEW PANEL

WABER Conference is very grateful to each of the following persons for your expert review of papers during the peer review process. Thank you.

Assoc. Prof. Sam Laryea, Wits University, Johannesburg, South Africa
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SHELTER AFRIQUE
Financing Affordable Housing for Africa

SHELTER AFRIQUE PROFILE

Shelter Afrique is a pan-African finance institution that exclusively supports the development of affordable housing in Africa. A partnership of 44 African Governments, the African Development Bank (AfDB) and the Africa Reinsurance Company, Shelter Afrique builds strategic partnerships and offers a host of products and related services to support the efficient delivery of affordable housing in Africa.

Shelter Afrique products includes the following:

Institutional Lending: Shelter Afrique provides lines of credit, corporate loans and credit guarantees to financial institutions and specialised housing institutions for on-lending, in local and foreign currencies, to developers and individuals for new mortgages, refinancing of existing mortgages, and construction finance.

Trade Finance: Shelter Afrique trade finance products help developers and financial institutions involved in the construction sector support the procurement cycle of building materials and equipment. Through our trade finance solutions, Shelter Afrique supports financial intermediaries, manufacturers and exporting and importing companies, by providing pre-export or import finance, medium term supplier and buyer credits, issuance and confirmation of short term letters of credit and guarantees.

Public Private Partnerships (PPP): Innovative financing strategies through PPPs are a key strategic focus of Shelter Afrique towards achieving the organization's vision for affordable housing delivery in Africa.

Shelter Afrique's PPP product is designed to support government and government agencies wishing to partner with credible private sector players to deliver affordable housing units and related urban development at scale.

The Shelter Afrique PPP product is designed in two phases:

- Pre-development Advisory Services
- Project Implementation

In line with these, the PPP housing delivery model provides a set of unique opportunities which aligns with the organization's 2019 – 2023 strategic goals in terms of financing, technical advisory and advocacy; As such strategically positioning the organization in providing innovative solutions to the housing and urban challenges facing the African region.

Microfinance Housing Initiative: Shelter Afrique has partnered with the Terwilliger Centre for Innovation in Shelter (TCIS) Habitat for Humanity towards providing Housing Microfinance Solutions in Africa.

TCIS facilitates efficient and inclusive housing market systems for making affordable housing possible.

Habitat for Humanity formally launched the TCIS at the historic Habitat III, which took place in Quito, Ecuador, in October 2016. The TCIS is one of Habitat's key commitments toward the implementation of the United Nation's member states' New Urban Agenda.

The TCIS consolidates more than a decade of experience in developing market-based solutions for housing, through the TCIS, Habitat for Humanity will accelerate and facilitate better functioning inclusive housing markets to enable more than 8 million people access to improved shelter solutions by 2020.

The collaboration between Shelter Afrique and TCIS majorly focuses on the following:

- Establishment of a Housing Microfinance Fund for Africa
- Capacity Building in Housing Microfinance
- Technical Assistance Facility

Some of Shelter Afrique's Success Stories

- **Karibu Homes:** 1,074 housing units and related infrastructure located at Athi- River, Machakos County, Kenya.
- **Richland Pointe:** 240 housing units and related infrastructure services located in Kamiti, Nairobi, Kenya.
- **Izuba Project:** 304 housing units located in the Gasabo suburb of Kigali, Rwanda.
- **Rehoboth Project:** 103 housing units with related infrastructure located at Oyarifa, Greater Accra Region, Ghana.
- **Sifma S.A. Project:** 350 housing units with related infrastructure located at Bamako, Mali.
- **Sebel Invest S.A Project:** 120 housing units located at Dakar, Senegal.

PRIZES TO BE AWARDED AT THE WABER 2019 CONFERENCE

We normally present four awards at our Research Conference. However, as this year is our 10th anniversary, we are presenting some additional awards to recognise and encourage quality research

10th Anniverary Awards

- **Outstanding Researcher Award**

The purpose of this award is to recognise built environment academics in West African institutions who have made an outstanding contribution to research in their field. Many West African universities structure their built environment departments around six academic disciplines and the nature of research in each discipline may vary so the pragmatic approach taken is to identify outstanding researchers in each of the following six disciplines: Architecture; Building Construction / Technology; Construction Project Management; Estate Management/Real estate; Quantity Surveying; Urban and Regional Planning

- **Outstanding Postgraduate Researcher Award**

We have two categories for this award

- Masters
- PhD

- **Outstanding Msc Researcher Award**

The main thing we are looking for in determining a recipient for this award is evidence of a Researcher who has identified a topic that is of significant interest to academic or industry practitioners, demonstrated knowledge of the relevant literature and formulated a structured problem statement and a central research question, and conducted a methodologically rigorous study underpinned by theory to arrive at meaningful conclusions that provide a basis to address the research problem originally identified. For design-based Masters dissertation, we are looking for evidence of proper identification and articulation of an architectural design problem and how it was systematically addressed in an architectural design project. Therefore, the following criteria apply for the nomination of candidates for this award

- Only Masters students who studied in a West African university are eligible
- Must have done the Masters in a built environment discipline
- Must have completed within the last 3 years. We will also consider those who have recently submitted their research dissertation and are awaiting graduation
- The Masters dissertation must contain all of the essential elements outlined above including a demonstrated ability to select suitable methods of scientific investigation and analysis
- Publication of a research paper out of the Masters research will be advantageous but not an essential criteria

Outstanding PhD Researcher Award

A PhD is about rigorous application of scientific methods to make a contribution to knowledge. The main thing we are looking for in determining a recipient of this award is evidence of a researcher

who has generated a research question that is of significant national or international interest, and formulated a robust methodology to conduct a comprehensive study which provides new insights of international significance. The following criteria apply for the nomination of candidates for this award

- Only PhD students who studied in a West African university are eligible
- Must have completed the PhD research degree within the last 5years. We will also consider candidates in the process of completion who have already published a journal article from their PhD research
- •Must have produced at least one published article from the research
- The PhD must contain all of the essential elements outlined above including a demonstrated ability to select suitable methods for conducting robust scientific investigation and analysis
- •Evidence of a growing h-index is advantageous but not an essential criteria

Regular Awards

- **Best Research Paper**

This prize is awarded to recognize the author(s) of an original piece of research which contributes a better understanding of the research question/problem investigated and demonstrates a high degree of scientific quality and innovative thought. This prize was created to acknowledge the continuing importance of high quality research to academic institutions, a researcher's reputation and the development of the built environment field.

- **Best Oral Presentation**

This prize is awarded to recognise the presentation which is the most coherent, clearly enunciated, well-paced, easy to understand, and effective. The award is given on the basis of quality of the presentation and not the written paper. It recognizes the best presentation based on communication of the content of a paper and the ability of the speaker to deliver an impactful, authoritative and engaging presentation. The award looks to encourage researchers to put as much effort as possible into the presentation of their work.

- **Best Poster Presentation**

This prize is awarded to recognise the poster which presents the most effective snapshot of the work being reported. The award is given on the basis of the quality of the poster presentation and not the written paper. The award is to be presented to the poster that provides the best snapshot of researcher's work, which engage colleagues in a dialogue about the work, and provides a summary that will encourage the reader to want to learn more about the study. The award looks to encourage researchers to put as much effort as possible into their poster presentation.

- **Gibrine Adam Promising Young Scholar Award**

This prize is awarded to recognize and encourage exceptional young researchers. The recipient should be a young academic who demonstrates promise, such that he/she is likely to become established as a research leader. The prize is provided by Mr Gibrine Adam – President of Zenith University College and CEO of EPP Books Services – who has made significant contributions to the education sector through his educational establishments and philanthropic work. Awarding this prize each year will serve as an important inspiration for young African built environment academics.

MEET OUR SPEAKERS FOR WABER 2019 CONFERENCE

We would like to thank our keynote speakers for accepting our invitation to come and interact with delegates at the WABER Conference 2019. A brief profile of each keynote speaker is given in this section.

ROGER FLANAGAN

Professor of Construction Management

School of Construction Management and Engineering

University of Reading, UK

ROGER FLANAGAN is one of our most notable academics in the built environment field internationally. He is a Professor of Construction Management at the School of Construction Management and Engineering, University of Reading, UK. He is a Visiting Professor at Tsinghua University, Beijing and Chongqing University, Chongqing, China as well as at the Universiti Teknologi Malaysia, and University of New South Wales, Australia. He has previously been a Visiting Professor in Hong Kong, USA, Sweden, Norway, Kenya, South Africa, Turkey, and Croatia. He was President of the Chartered Institute of Building in 2007. Roger's industrial experience includes previously being a member of the Board of Directors of Skanska AB and a non-executive member of the Board of Directors of Halcrow Group. He has been a member of Board of Directors and Advisory Board member in USA, Hong Kong, South Africa, Switzerland, Canada, and UK. He has undertaken studies for the development of the construction industry in the UK, Canada, Malaysia, South Korea, Japan, China, Sweden, Norway, Libya, and Estonia.

KATHY MICHELL

Associate Professor

Department of Construction Economics and Management

University of Cape Town, South Africa

KATHY MICHELL is Head of the Department of Construction Economics and Management at the University of Cape Town. After graduating with her undergraduate degree, Kathy worked as a quantity surveyor. She joined the University of Cape Town as a Lecturer at the beginning of 1995. She has a Master of Philosophy degree, awarded with distinction, in cost and systems engineering from the University of Cape Town and a Doctorate in property and facilities management from the University of Salford. She is a core member of the Urban Real Estate Research Unit at UCT. Her research area is in sustainable urban development and management. She serves on the editorial board of a number of international journals and is the regional editor (Africa) for the Journal of Facilities Management. Kathy is the immediate Past-President of the South African Council for the Quantity Surveying Profession and recently completed a four year term as a Council Member on the Council for the Built Environment in South Africa. She is also a member of The Royal Institution of Chartered Surveyors, the Association of South African Quantity Surveyors and the South African Facilities Management Association.

KABIR BALA

Professor of Construction Management

Department of Building

Ahmadu Bello University, Nigeria

KABIR BALA is a Professor of Construction Management from Ahmadu Bello University Zaria, Kaduna State Nigeria. He graduated with B.Sc. (Hons) Building in 1985 from the Department of Building, Ahmadu Bello University, Zaria. He worked briefly at Amana Development Company in Kaduna before joining the Department of Building as a Graduate Assistant in 1987. He obtained Masters of Science Building Services in 1990, another Masters in Business Administration in 1998 and Doctor of Philosophy (PhD) in Construction Management in 2001; all from Ahmadu Bello University. He was at the Department of Civil Engineering, Surveying and Building, University of Alberta, Dundee Scotland as a Visiting Scholar in 1995. He rose through the ranks and was appointed Professor of Construction Management in 2007. He has taught and examined several undergraduate and postgraduate courses and has successfully supervised over 10 PhDs and over 30 M.Sc. candidates to graduation. He has over 80 publications in national and international academic journals and referred conference proceedings to his credit; with at least 40% published after attaining the rank of Professorship. He is the former Deputy Vice Chancellor (Administration) at Ahmadu Bello University, Nigeria

CARMEL M. LINDKVIST

Associate Professor

Department of Architecture and Planning

Norwegian University of Science and Technology, Norway

CARMEL LINDKVIST has spent fourteen years working in the Norway (NTNU) and UK (University of Reading) researching and publishing on facilities management and sustainable approaches to building/infrastructure projects. She draws on organizational management theories to understand the interplay of practices, clients, facilities managers and end users involved in the construction industry. Her portfolio of research projects includes +Cityxchange (EU funded Smart City Project), EU FP7 Near Zero Energy Neighborhood (renovation on neighbourhood scale to reduce energy demand) and London 2012 (data handover from design to operations). Much of her work in research takes a qualitative perspective and she is interested in methods that enable the researcher to go behind the scene of a given topic. She has published in many journals which include Engineering Project Organization Journal and Technological Forecasting and Social Change. In addition to her research, she lectures on facilities management and research methods at NTNU.

P. D. RWELAMILA

Professor of Project Management and Procurement

Graduate School of Business Leadership

University of South Africa (UNISA)

P. D. RWELAMILA is a National Research Foundation (NRF) rated researcher and Professor of Project Management and Procurement in the School of Business Leadership, University of South Africa (UNISA). He is joint co-ordinator for CIB W107 – Construction in Developing Countries. He formerly taught at University of Zambia and Copper Belt University in Zambia, University of Botswana and University of Cape Town in South Africa. Professor Rwelamila has also taught during short periods in several universities including: The Royal Institute of Technology in Sweden; University of Manchester, University of West of England and University of Bath in the United Kingdom; Queensland University of Technology in Australia; and Heriott Watt University – Dubai Campus. Professor Rwelamila has authored more than 200 peer reviewed journal and conference proceeding publications, research and study reports. He is a Past President of The South African Council for Project and Construction Management Professions (SACPCMP) (2005 -2009); and Past Vice President, Chartered Institute of Building (Africa). In 2005 at the CIB W92 Conference -University of Arizona, USA, Professor Rwelamila was named as the second most cited researcher in project procurement in the world.

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SECTION 1: KEYNOTES AND RESEARCH SKILLS WORKSHOPS

West Africa Built Environment Research (WABER) Conference
10th Anniversary Conference, 5-7 August 2019, Accra, Ghana
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ISBN: 978 – 9988 – 2– 6010 – 1
DOI: https://doi.org/10.33796/waberconference2019.85

THE NEXT GENERATION OF AFRICAN BUILT ENVIRONMENT PROFESSIONALS

Professor Kabir Bala[1]
Department of Building, Ahmadu Bello University, Nigeria

The academia is a veritable source of transformative knowledge and ideas, and the built environment sector is a major determinant the of quality of life. The Sustainable Development Goals (SDGs) and the African Union's Agenda 2063 provide a minimum benchmark of the standards to attain in the not so distant future. These include interventions in infrastructure, technology, housing, sustainable and resilient environment, economic growth and standards of living, all of which are linked directly or indirectly to the built environment. In this regard, built environment academics on the African continent should be playing a leading role in ground breaking research that could transform the poor indices that characterize many African nations. However, evidence from the output of the ivory towers indicate that there is yet a long way to go in terms of research, despite some encouraging output in terms of education. It is important to identify research drivers and barriers, while also charting a course to ensure that African academics not only find their place of pride in this world, but most importantly, actively engage in finding solutions to the local problems that plague our built environment. This keynote addresses some of the key areas of intervention that should define our academics and their institutions, and also relevant research areas that should dominate our output in order to build a better sustainable, resilient and innovative Africa. It is therefore recommended that at the meso-level, our Universities need to emphasise more on research alongside teaching. At the micro level, researchers need to improve their digital footprint and literacy skills and be more creative with their approaches to research methodologies adopted in finding solutions to local problems. Three main areas of research intervention would be data (including big data), project financing and innovation.

Keywords: sustainable development goals, research

[1] balakabir@abu.edu.ng

Bala, K. (2019) The next generation of African built environment professionals In: Laryea, S. and Essah, E. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 5-7 August 2019, Accra, Ghana, 1

West Africa Built Environment Research (WABER) Conference
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IMAGINATION, INSPIRATION, INNOVATION: THE CHALLENGE FOR DESIGN AND CONSTRUCTION TEAMS IN AFRICA

Roger Flanagan[1]
School of Construction Management and Engineering, University of Reading, UK

The focus will be upon some of the remarkable achievements in the global construction industry from design, manufacture, and site production. Consideration will be given to how Ghanaian companies can exploit new ideas, new ways of delivering projects, and using new technology to deliver smarter, safer, and higher quality construction projects. Companies, big and small, need to learn from each other. Construction activity across Africa is growing in scale and becoming more complex, with more rules, regulations, and compliance requirements; are the regulations getting in the way of working? The need is to deliver projects on time, on budget, and to be profitable for all the companies involved. Imagination and inspiration are the keys to success. The choice is disrupt or be disrupted- you choose.

Keywords: global construction industry, innovation

[1] r.flanagan@reading.ac.uk

Flanagan, R. (2019) Imagination, inspiration, innovation: the challenge for design and construction teams in Africa In: Laryea, S. and Ibem, E In: Laryea, S. and Essah, E. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 5-7 August 2019, Accra, Ghana,

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MODERN WAYS TO CONDUCT LITERATURE REVIEWS AND USE THEORY IN RESEARCH

Carmel M. Lindkvist[1]
Department of Architecture and Planning, Norwegian University of Science and Technology, Norway

The workshop covers the purpose and different approaches of conducting literature reviews. There is a lot of information available on different topics, but how to refine a research area and make best use of literature review is challenging. The workshop will cover how to refine searches of the different sources of literatures which includes using mind-maps, systematic literature reviews and reference searching. The workshop will link how the use of theory leads to different perspectives of understanding a topic and how the use of theory building and theory testing leads to a contribution to knowledge. The workshop requires active participation where delegates will practice approaches such as mindmapping in groups.

Keywords: literature review, research, theory

[1] carmel.lindkvist@ntnu.no

Lindkvist, C. M. (2019) Modern ways to conduct literature reviews and use theory in research In: Laryea, S. and Ibem, E In: Laryea, S. and Essah, E. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 5-7 August 2019, Accra, Ghana, 3

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SUSTAINABLE URBAN DEVELOPMENT AND MANAGEMENT IN AFRICAN CITIES

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Introduction: The contextual landscape of African cities

Cities across the globe are facing rapid urbanisation and are expected to be at the frontline of addressing issues of global sustainability (UN-Habitat, 2016; UN, 2018). The majority of the world's population growth is expected to be concentrated in the urban areas of what is considered to be the 'global south'2. Cities across Africa in the main are characterised by multiple forms of poverty, growing inequality, environmental degradation, slums and informal settlements, social and economic exclusion, and spatial segregation.

In this regard, African cities are facing significant challenges in terms of both planning for and coping with rapid population growth and urbanisation (UN-Habitat, 2014; OECD, 2016). The challenges we face in Africa are specifically centered around high levels of poverty; high levels of inequality; spatial separation of residential areas from access to economic opportunities; and burgeoning informal settlements that lack the adequate infrastructure and services to sustain human life in the long term (Robinson, 2008; UN-Habitat, 2014). It is important to note that cities of the global south display the most acute forms of ecological degradation, economic disparity and spatial apartheid when compared to their counterparts in Latin America and South East Asia (Dawson and Edwards, 2004; van Dijk, 2006; UN-Habitat, 2014).

An additional challenge that faces African cities, is the existence of a dual approach by governments across the continent in their spending policies. The duality occurs where African cities are promoted in the global economy in order to stimulate investment and development in a particular country or urban region but at the same time governments have a spending policy that is aligned with the upliftment of the urban poor (Lemanski, 2007). Both of these of objectives should be viewed in a positive light, but it creates an unmanageable tension for governments where on the one hand they are driving economic opportunity in being globally competitive, but on the other hand are creating an environment for the continued exclusion of the urban poor and a resultant continuation and steady growth in the social and spatial segregation of those

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[2] The term 'cities of the global south' refers to countries that do not have fully industrialized economies i.e., in postcolonial terms it refers to countries that have experienced some form of colonial domination which has left a permanent mark on their economic, cultural and political landscape. Source: Pieterse (2010)

communities most in need of assistance (Lemanski, 2007; Ding, Lai and Wang, 2012; Watson, 2013; Currie and Musango, 2016).

Moreover, many African cities are characterised by varying levels of institutional under-development and an inability to facilitate the development and management of sustainable cities. Brass (2014) highlighted that the unintended consequence of this has resulted in a significant growth in the number of non-state actors playing a key role in service delivery mechanisms to the urban poor, a situation that is not unique to cities of the global south. The challenge with the prevalence of these 'non-state actors' is twofold. Firstly, it has the potential to overlay a form of urban governance that may not necessarily serve the interests of the majority of the local populace (Reckhow, Downey and Sapotichne, 2019). Secondly, it has the potential to replicate historical Westernised development paradigms that are seen to be a significant contributor to economic and social exclusion and the declining quality of life in our cities (Wolfram, 2017; 2019).

The rapid rate of urbanisation in African cities brings with it additional challenges for national and local policy-makers across the continent in that they now need to mediate between rapid and unregulated urbanisation and achieving sustainable development (Zetter and Watson, 2016). These issues remain significant obstacles to sustainable development on the continent. The built environment sector has a meaningful role to play in addressing these challenges via the effective planning, designing, financing, developing, governing and managing of property in human settlements, urban precincts and cities.

Sustainable urban development and management – what does it mean?

Sustainable development and management may be seen to be the defining challenge of the 21st Century. The concept of sustainable development was conceived through the Brundtland Report, which defined it as development that "*. . . seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future*" (Brundtland, 1987, p. 39). Essentially, this report sought to reconcile environmental considerations and with that of human development. As human development is concentrated in urban areas, global sustainability needs to be addressed at the urban and sub-urban levels. The challenge with the relying on the Brundtland definition is that epistemologically it is grounded in the 'triple bottom line' (people, planet, profit) and that in relation to the urban poor, the concept of sustainability is too narrowly defined. In African cities, the need to address the widespread socio-economic crises is a more urgent priority than that of urban environmentalism (Mchunu, 2016; Punekar, 2016). Hence, it is essential that urban sustainability in cities of the global south focus primarily on the socio-economic concerns related to urban poverty.

Allen (2002) and Pieterse (2010) argue that there are five dimensions to sustainable urban development: social, economic, environmental, physical and political. Where:

- *Social sustainability* refers to the creation of communities and equitable access to the utilisation of the natural and built environment,
- *Economic sustainability* pertains to the ability of a local economy to sustain itself,
- *Ecological/Environmental sustainability* is primarily focused on the impact of urban production and consumption on the integrity and health of the local environment,
- *Physical sustainability* focuses on the ability and capacity of man-made structures and the urban built form to support productive activities and the capacity for human life, and,
- *Political sustainability* concerns an understanding of the tension that exists in achieving the optimal balance between the social, economic, environmental and physical (i.e., institutional and governance frameworks that regulate the performance of the other four dimensions).

The above five dimensions to sustainable urban development are encapsulated in The Habitat III – New Urban Agenda which makes significant strides in addressing the narrower definition of sustainability. What the majority of this work fails to do is to articulate the actual implementation of these policies and strategies. More often than not the policies also fail to articulate how the sustainable developments are to be managed and more importantly, do not require built environment professionals to be cognizant of the management of property and urban precincts in the development phases of projects. What is needed are frameworks that are capable of accommodating the uniqueness and complexities of different urban environments in a way that focuses on mobilising community resources and social capital. More importantly, what is required are innovative new ways to promote urban sustainability within cities of the global south need to be developed. It is critical that these frameworks draw on the experiences of local stakeholders to generate participatory, collaborative and integrated initiatives to drive sustainability and alleviate urban poverty whilst remaining grounded in good governance that is characterised by decentralisation, responsiveness and flexibility (Tanner et al., 2008). Furthermore, these frameworks need to be founded on the premise that the built environment disciplines cannot operate and exist independently, especially when driving urban sustainability. The systemic nature of the issues associated with sustainability requires unity and collaboration in the pursuit of equitable and environmentally conscious development (Stephens, 2000).

Towards a framework for sustainable solutions

This raises a question as to how one begins to pull the sustainable development agenda into a management framework that can begin to provide a holistic response to the challenges outlined above. Research to date has highlighted a series of imperatives that we 'need to get right' in order to achieve sustainable urban development and, more importantly, sustainable urban management. These are depicted in Table 1 below with the associated possible policy implications.

Table 1: Imperatives for sustainability frameworks (Source: Adapted from Boyle, Michell and Viruly, 2018, p. 14)

Imperative	What is required	Policy implications
Nature of the framework	Flexible, neighbourhood-sensitive frameworks; introduce time dimensions so that assessment is continuous, iterative, and remains relevant.	Disassociate policy development from prescriptive, mechanistic tools toward dynamic, iterative assessment and analysis. This entails allowing better articulation and experimentation with policy at local level.
Environmental, Socia & Economic Criteria	Focus frameworks to better represent a balanced approach toward sustainability that sees aspects as interacting and codependent, and better able to incorporate local socio-economic conditions.	Overcoming environmental bias requires mandating an increased role of civil society in the design and implementation processes. Thus, encouraging inclusive collaboration for development and management.
Expertise Required	Create a balance between expert-knowledge and local-knowledge by relying less on technical/data driven outcomes. Divorce policy from the idea that standardisation offers widespread solutions.	Embed more qualitative/culturally oriented methodologies into sustainable urban development and management frameworks i.e., use less comparable "softer" data, such as sense of well-being, to influence policy.
Market-Driven	Shift focus away from sustainability frameworks as the "final goal", place emphasis on collaborative and inclusive engagement. Thus, representing a shift from "market-driven" to "civic-driven".	Offering grant prioritisation, density bonuses, and other incentives for projects that display more meaningful urban governance and management practices.
Recognise Complexity & Institutional Aspects	Frameworks should look specifically at the processes, trade-offs, decision-making, and actors involved in order to develop holistic approaches to both the development and management of urban precincts.	Introduce policy that prioritises projects that can provide evidence of collaborative approaches and consider holistic strategies that consider a multitude of stakeholders across various sectors.

Challenges we face going forward

The challenges are numerous and what is proposed in this keynote is not the panacea for the problems we face in African cities. It is clear that it is imperative in meeting the challenges we face in African cities that sustainable urban development would need to embrace the five dimensions to sustainable urban development. Another critical aspect to achieving sustainable urban development and management would be the need to approach property development and management in an inclusionary, safe, resilient and sustainable manner. This requires active mechanisms on the part of governments and built environment professionals to assist in the planning, financing, developing, governing and managing of the property development process and the subsequent urban precinct and/or city. It is only in taking this holistic view of the development process and the subsequent management of the product that the developer and society as a whole are able to capture the

true social, economic and environmental value embedded in the sustainable development and management process.

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NEW FRONTIERS OF RISK IN DELIVERING SUCCESSFUL PROJECTS FOR CLIENTS AND PROFITS FOR CONSTRUCTORS

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The countries in Africa want to transform and modernise its construction sector, to make it more competitive, safer, more productive, and capable of achieving higher quality, by developing a labour force that has modern skills, with projects delivered on budget and on time. The aims are right; the challenge is recognising that there are many new frontiers of risk that must be managed. Construction projects involve complexity, with risk underpinning all aspects of design, procurement and delivery. The talk will put forward the proposition about the need to develop better competencies and tools for the management of risk for construction projects in African countries, recognising the dynamics of risks and their interconnectedness and interdependencies. The focus will be on the reality of construction, which needs to discard its traditional image of being very risky for companies and the people working in the industry..

Keywords: construction, projects, risk

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DOING QUALITATIVE RESEARCH (COLLECTING AND ANALYSING QUALITATIVE DATA APPROPRIATELY)

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Qualitative research is a non-numerical approach for collecting and analyzing data with the aim to see through the eyes of the participants of the study and interpret the context. The value of qualitative research is obtaining a detailed understanding of a problem or topic. The workshop will cover the different qualitative research methods with particular focus on qualitative interview studies and how to develop questions for interview guides. Qualitative data is primarily text based and the workshop will cover tips and systematic ways to synthesize the information and draw out findings. The workshop will provide opportunities for participants to practice the ideas being presented..

Keywords: qualitative data, qualitative research

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MAKING SENSE OF THE AILING AFRICAN 'ELEPHANT' – NEW PERSPECTIVES FOR A MORE SUSTAINABLE PATHWAY INTO THE FUTURE

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A befitting metaphor of the greater African Construction Industry is an 'African Elephant'. An 'African Elephant' which could only be described as an ailing 'Elephant' – a clear description of the state of the greater African Construction Industry development – a 'sick and limping Industry'. The works of Gale and Fellows (19990); Ofori (1990), just to mention a few, bear testimony to the challenges which were and still facing the greater African Construction Industry, acknowledged as infinitely more fundamental, more serious and more complex, and their solution much more pressing than those confronting industrialized countries of the North. The second cohort of the challenges facing the greater African Construction Industry comes from a synthesis of the nine regional position papers by du Plessis (Ed.) (2001). These challenges are well known by various stakeholders across the African continent and those interested in African development in the diaspora. Briefly this paper reflects on these challenges and embraces a paradigm shift by providing new perspectives to find a cure for this important 'African Elephant'. The foundation for proposing the cure is premised on a more sustainable pathway into the future of the 'African Elephant'. When we celebrate 10 years of WABER Conference, it is hoped that the objectives of this African noble grouping should be expanded across the African continent by focusing on finding new and creative ideas to achieve change in an African context. The paper strongly recommend that the proposed solutions should allow African built environment stakeholders to adopt different lenses in understanding the challenges and use appropriate tools to achieve more sustainable pathway of the African built environment into the future.

Keywords: addressing challenges, Africa, construction industry development, greater African construction industry, new perspectives

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TRENDS SHAPING THE GLOBAL CONSTRUCTION INDUSTRY: THE RACE TO THE FUTURE

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The global construction marketplace continues to grow with annual construction output now approaching US$9 trillion. As infrastructure and building opportunities emerge, new players enter the market, and ways to win work evolve. The new players are smarter, and not hidebound by tradition, but they face new governance requirements that can be challenging. How will technology develop as both a disruptor, and an enabler to transform the traditional ways of working? There is a world of opportunity, and a world of risk. Nobody forecast the speed of growth of construction in China, nor how fast large Chinese companies winning overseas work. The world of construction has changed; nobody is immune from change, and winning work with tight profit margins based on the low-cost bid is causing a radical re-think about how work is secured. The future is not bleak, it is different; it requires innovation, integration, collaboration and an understanding of the trends that will shape the global construction industry and its game plan. Ghana can adopt new ideas by asking what kind of construction industry it wants in 2020 and beyond.

Keywords: global construction

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SECTION 2: PLENARY SESSION PRESENTATIONS

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RE-EXAMINING THE APPROPRIATENESS OF CURRENT TROPICAL DESIGNS

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The issue is 'we are seemingly unable to design buildings that respond appropriately to our tropical climate and constructed in a way that requires less reliance on energy and artificial cooling systems'. However, the new 'Termites Design Concept—Sustainable, Affordable and Self-Cooling Homes' (SASCH) asserts that we can design buildings that respond to our specific tropical needs, buildings that can 'self-cool', requiring no artificial cooling systems provided we can apply the principles of sustainability backed up by scientific research and underpinned by inspiration from nature. After all, if anthropoids can achieve passive-cooling in Eco-friendly manner as found in 'Termites Mounds' it would be expected that humans can to do better.

Sustainability is 'meeting the needs of the present without compromising the ability of future generations to meet theirs'. It has become a relevant way of life because of global warming and associated climate change and cannot be ignored. There is no single silver bullet to solving problems caused by anthropogenic emissions. Sustainability is a multi-faceted approach requiring collective global participation. However, Africa as always is waiting to play catch-up, when in fact, on this round, it is in the direct line of fire itself. Let it be known that the catastrophic effects of climate change will be felt in greater intensities in tropical zones than anywhere else on the planet. Predictably, scorching heat, violent storms droughts etc. will increase in frequency. The mission is to put tropical Africa at the heart of the awareness conversation, to demand buildings that can live up to the challenges of global warming.

'Sustainability' and 'Affordability' are familiar terms that occupy the two extreme ends of the cost spectrum. While sustainability requires initial capital outlay which could be recovered during the operational phase of a building, affordability on the other hand is relative, depending on where you live, here in Ghana, it could mean 'Chamber and Hall' built with mud and costing next to nothing. The proposal attempts to narrow this gap making sustainability affordable. Natural 'Self-cooling' is unfamiliar design concept and first application of its kind in human habitation, but seen to be common and well-practiced in the termite's world.

Termites are shy but intelligent creatures who live in the underworld of a mound. It could be baking hot outside while inside the mound could be up to 12o C cooler. The rationale behind this termite wonder is to protect, on one

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hand their food source which is basically fungi that can only thrive below certain temperatures and on the other hand their queen and nursery at the core of each colony. Termites rely on the buoyancy of hot air to rise and provide natural ventilation through the holes in the mound as well as harnessing cool night air to flush the mound and replace hot stale air when temperatures drop at night. This feat is achieved by plugging and unplugging the holes in the mounds, working round the clock. It was a secret uncovered with the help of modern technology using thermal imagery and air sensors placed strategically inside termite's mounds. Further, the mound is constructed out of a mixture of clay, termite saliva and dung and known to have better thermal resistance properties (U-value) than most building materials.

This study focuses on buildings design practices in the Tropics of Africa and re-examines:

1. The appropriateness of building materials, their usage and availability
2. The indiscriminate use of certain architectural forms in the tropical zone
3. The energy footprint and adoption of an ingenious termite's cooling strategy

With such inspiration from nature, it is hoped that by imitating members of the wild community in our Eco-system, coupled with the application of environmental science principles, the 'SASCH' Project would lead the way forward to building environmentally friendly dwellings in African as well as adoption of sustainable living standards. Instead of dependency on unreliable energy sources for artificial cooling, the air-condition which brought us the 'Sick Building Syndrome', we must focus on reduction of energy consumption to decrease global warming potential of our Built Environment.


INSPIRATION FROM NATURE
Sustainable, Affordable and Self-Cooling Homes
REAR VIEW SASCH
FRONT VIEW SASCH
SECTION THROUGH SERVICE DUCT
SECTION THROUGH STAIRCASE
GROUND FLOOR PLAN
FIRST FLOOR PLAN
SECOND FLOOR PLAN
ROOF PLAN
[Academic use only]

PANEL DISCUSSION ON AFFORDABLE HOUSING UNDERSTANDING AND INITIATIVES FOR LOWER AND MIDDLE INCOME WORKERS IN AFRICAN COUNTRIES

Panel discussion on affordable housing in African cities
Critical rethink of affordable housing understanding and initiatives in African countries

Question for the panel discussion: How do we address the challenge of affordable housing for lower and middle income workers in African countries?

Andrew Chimpondah
Managing Director of Shelter Afrique
(15 minutes presentation)

Sammy Amegayibor
Executive Secretary of Ghana Real Estate Developers Association
(10 minutes presentation)

Q&A (10 minutes)

Much of the discourse on 'affordable housing' in many African countries deos not articulate the meaning of affordable housing and there is little research on what the appropriate cost of housing should be in order for ordinary lower and middle class citizens to be able to afford it and own a home. This session focuses on a critical re-think of affordable housing understanding and initiatives" for lower and middle income workers in African countries. It can be argued that the majority of currently existing initiatives do not constitute "affordable housing" for the lower and middle class without a recourse to corrupt means.

There is an increasing demand for affordable housing on the African continent. However, the existing offerings are not suitably matched to the income levels of the majority of the African populace. How should African governments and those in the housing development business approach the challenge of affordable housng in African countries? What innovations are required to achieve a more affordable provision of housing for the working class population on the African continent?

Keywords: affordable housing

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TRUMPING OUR GAME: REFOCUSING CURRENT CHALLENGES IN THE CONSTRUCTION INDUSTRY INTO NATIONAL DISCOURSE

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The Built Environment and Construction Industry in Nigeria is faced with pressing challenges, notably building collapse, professional proficiency issues, lack of synergy between allied disciplines, urban degradation, falling standards of educational training, construction management and the economy, to mention a few. Research related to these challenges are often fragmented, lacking adequate collective focus to impact national policy and effective public discourse. This plenary session explores possibilities and opportunities in research for re-focusing these challenges into national debates towards public engagement and government intervention in future...

Keywords: construction industry

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SECTION 3: CONFERENCE PAPERS

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A STRUCTURAL ANALYSIS OF AN ADJUSTABLE DOCKING SYSTEM FOR MULTIPLE AIRCRAFT MODELS: CASE STUDY

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A docking system was designed for the company under study. Since all movements in the dock will be achieved by the use of actuators initially probed by a central control unit, precise design was necessary. Distance is a critical issue in the operation of the platform. Two adjacent platforms must not attempt to get in contact with each other while there are people working on the lower platform of the two. The platform must not under any circumstance get in contact with the aircraft to avoid collision and damage of the aircraft. A mechanical Prototype was developed to illustrate the working principal of the dock and is working well to demonstrate this docking system. The implementation of this research paper can result in huge savings to the airline which can be seen in the long run. With further programming, information on several aircraft can be loaded into the docking system and once the aircraft name has been inputted in the appropriate field, the dock can automatically adjust to fit the dimensions of the aircraft under docking. The dock can also be developed to incorporate the lifting of heavy materials which will be loaded on or off the aircraft. 800N weight of human being was considered in this design. von Mises stresses were analysed to determine when failure can occur and some possible areas of concentration were shown to avoid breakdown of structure whilst in use. The stress is useful for one to be careful not to exceed limits.

Keywords: adjustable docking system, aircraft, automated; case study, design.

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AN APPRAISAL OF EFFECTIVE ORGANIZATION PROCESSES IN INTEGRATED CHANGE CONTROL PERFORMANCE FOR PUBLIC CONSTRUCTION PROJECT

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The rate at which changes happen due to additional works, modifications, improvements, and amendments to project works and its designs at various stages is not new to construction professionals. A lot of inherent challenges characterize the changes in projects delivery in construction. Change request require an organizational design to ensures efforts are coordinated. Virtually all project works are not change-free. The aim of this study is to explore the significance of perform integrated change control to organization processes for public project delivery. The main objectives for this study are to characterize the level an organizations has attend of knowledge in integrated change control performance and to determine the importance of integrated change control performance to organizations. The primary data collected using questionnaire were analysed using descriptive statistics, including likert scale and relative importance index and ranking. It was found out that the level of knowledge on perform integrated change control of construction professionals and even the various organizations is at an "entry level". It was also found out that the integrated change control per factors is "high" for one out of the three factors is "very high" (RII > 0.80). It is "high" for the remaining two RII <0.80 it is "very important" for any organization to operate and apply a change control process. Conclusively, for effective control of changes, the construction industry need to operate integrated change control performance particularly in the public projects.It is recommended that construction professionals should seek knowledge of integrated change control, also, a dedicated change control should be used for costs saving and quality delivery benefits.

Key words: construction, integrated change control, organization, process, public projects

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AN APPRAISAL OF THE MAINTENANCE MANAGEMENT PRACTICES OF HIGH RISE RESIDENTIAL BUILDINGS IN NIGERIA

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An excellent maintenance management is greatly needed to increase the life cycle of the building and to minimize unexpected breakdown or deterioration effects. Therefore, the performance of maintenance management practices has to be continuously reviewed and analyzed in order to ascertain a high quality service. The aim of this research is to appraise the maintenance management practice of high rise residential buildings in Nigeria. The objectives are to identify the maintenance management practices used in the maintainability of high rise residential buildings and identify the challenges encountered when undertaking maintenance activities of high rise buildings. Data were collected from both secondary and primary sources. The secondary data were journals and conference proceedings from archives while primary data were from 28 structured interviews conducted on maintenance managers and facility managers and 122 questionnaires administered on occupants, owners, maintenance managers, facility managers, estate managers as well as public administrators. The data collected were analyzed using measures of frequency and measures of central tendency of descriptive statistical method. The study revealed that most of the respondents carry out one form of maintenance activities or the other. That emergency maintenance ranked 1st with a Relative Significant Index of 0.88 and routine maintenance ranked 2nd with a Relative Significant Index of 0.82, are the mostly used or practiced in the maintainability of high rise residential buildings. Accessibility to the property ranked 1st with RSI value of 0.879, as mostly Challenge encountered when carrying out maintenance work on high rise residential buildings. The study recommends that to improve the maintenance management practices of residential high rise buildings, awareness of discernable maintenance culture to users, consideration for future maintenance requirement and adequate funds should be provided for effective maintenance practices.

Keywords: building maintenance, high rise residential buildings, maintenance activities, maintenance management, management practices

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AN EXPLORATORY STUDY OF THE RELATIONSHIP BETWEEN URBAN FORM AND TRAVEL BEHAVIOUR IN KADUNA, NIGERIA

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A major component of sustainability and sustainable development as it relates to cities is the interaction between urban form and transportation patterns. This study employed regression analysis in order to determine the relationship between urban form and travel behaviour. Urban form was quantified as land use mix and population density while travel behaviour was measured by vehicle miles travelled (VMT). The relationship between the urban form and travel behaviour was determined using regression analysis. The results show that population density with a p-value of 0.000 has a statistically significant relationship with the dependent variable, VMT while land use mix with a p-value of 0.48 has no statistically significant relationship with the dependent variable at 5% level of significance. The results obtained for Kaduna are comparable with results obtained by similar studies in cities in Europe, USA, Latin America, Australia and Asia. This suggests that the urban form and travel behavior relationship in Kaduna can be used in developing sustainable urban land use and transportation systems as has been demonstrated in other parts of the world. The paper concludes by suggesting further research that would improve on this exploratory one to cover other known urban form and travel behaviour variables such as mode choice, accessibility, trip frequency, neighbourhood design and travel demand management.

Keywords: land use patterns, regression analysis, sustainability, travel behavior, urban form

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AN INVESTIGATION INTO ENERGY CONSUMPTION PROFILE OF UNIVERSITY OF LAGOS STUDENTS' HOSTEL

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The task of resource management is tougher in public tertiary institutions especially in Nigeria where government allocation to education continues to dwindle. A major cost centre for public institutions is the cost of providing energy for classrooms, offices and residences. Expenditure on energy sometimes account for up to 35% of the overall annual budget of most organisations, the percentage is most likely to be higher in most developing and under-developed countries especially in countries where power supply from the national grid is epileptic and have to be heavily complimented by diesel power generating sets. The study investigates the energy consumption profile of students' hostel at the University of Lagos Nigeria with a view to making recommendations for energy conservation and optimization practices. Through a cross-sectional survey, purposive sampling of 130 students living in the hostels was conducted. Electrical appliances and gadgets used by the respondents were also audited. The audit assessed the power ratings and duration of use of the appliances and gadgets. The data collected were analysed using descriptive and inferential statistical tools comprising frequency tables, bar chart, sum and mean scores, correlation and ANOVA analysis respectively. The results indicated that electric hot plates, pressing irons and fans are the topmost energy-consuming appliances in the students' hostels. The study shows a significant correlation between hostel characteristics and energy consumption profile. The study concludes that the annual energy consumed in the students' hostel is approximately 35GW. The study recommends that the university management should define power wattage threshold for appliances to be used by students in the hostels as a major active energy optimization drive.

Keywords: consumption, energy, hostel, students

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AN INVESTIGATION INTO THE PERFORMANCE OF DUTSE (NIGERIA) AS A GROWTH CENTRE OF JIGAWA STATE

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The study area, Jigawa state has an economy that is largely characterized by informal sector activities with agriculture as the major economic activity. Most of the population engage in subsistence farming and animal husbandry while trade and commerce are undertaken on the small and medium scale. With this peculiarity, efforts to transform the economy such as the establishment of Dutse International Airport, Federal University, and some other capital projects have been put in place. Despite this, the economy has been noted to remain relatively unimproved. Considering the redundancy in the state economic development, this research work attempts an investigative analysis of the performance of the capital city (Dutse) as the propelling force for the state economic emancipation. This has been attempted by probing some key elements of the growth centre in a purely spatial dimension. The categorical impacts of the state capital in the region were investigated. This includes direct, indirect and induced effects. The particular issues of interest to the research are population movement, (migration and commuting), industrial linkages/interference, labour recruitment, and shopping patterns. In order to carry out the research, a scientific approach was adopted to find the answer to the following questions: i) To what extent does the growth centre attract migration within the state. ii) To what extent does such migration originate beyond a commuting range of the growth centre? iii) To what degree do firms in the growth centre make use of materials within the region? iv) To what extent do employees in the growth centre spend their income within the region in the purchase of materials and services for their use? Three distinct types of questionnaires were administered. Each of the types was administered on different category of respondents. The categories of the respondents were the city's dwellers, the industrialists, and their employees. This was done in order to effectively gather the primary data required for the various aspects of the study. Arising from the above, a total number of one thousand and twenty (1020) questionnaires were administered out of which nine hundred and twenty –seven (927) were retrieved and analyzed. Descriptive analysis was adopted while the findings was presented in chart and tabular forms. Among some other key findings, the study reveals that more than half of the industrialists' employees (labour) were from Dutse Capital (the growth centre). This reduces the economic impacts of the growth centre on some other setlements within the region in term of the spendings that could emanate from the employees of the industrialists. It was also discovered that the unstable government administrative policy has brought about an irregular rate of influx of the masses to the growth centre over time. The regional movement discontinuity has implication for regional growth. Some vibrant settlements such as Kano and Mai'adua play the role intervening opportunity for the industrialists in sourcing for raw materials. This has notably reduced the effectivenes of economic vibrancy within the region.

Keywords: growth centre, industrial linkage, population movement, region, trickle-down effect

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APPROPRIATE DRIVERS FOR SUSTAINABLE CONSTRUCTION PRACTICES ON CONSTRUCTION SITES IN NIGERIA

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Sustainable construction practices are associated with the profitable and competitive construction industry, enhancement of quality of life, improved client satisfaction, provision of desirable natural and social environments, and efficient use of resources. However, due consideration is not being given to sustainable construction practices in Nigeria. Therefore, this study aims to identify the unsustainable construction practices on construction sites and establish the barriers to and appropriate drivers for sustainable construction practices on construction sites in Nigeria. A questionnaire survey of 50 construction sites in Abuja, the Federal Capital Territory of Nigeria was conducted with construction professionals as the specific target, out of which only 43 construction sites have at least a construction professional present at the site. 43 filled questionnaires from the respondents was used for analysis in this study. The findings of the study show that misuse of natural and human resources are the most significant unsustainable construction practices in Nigeria. The findings also show that the use of conventional construction is a major barrier to sustainable construction practices on construction sites. The study identified education and training, sustainability assessment system, and availability of the National Building Code as the appropriate drivers of sustainable construction practices in Nigeria. The study concludes that sustainable construction practice is lacking consideration in Nigeria as a result of the use of conventional construction system, poverty, lack of expertise for sustainable construction, and unavailability of National Building Code.

Keywords: built environment, environmental impact assessment, sustainability, sustainable construction, and sustainable procurement

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ASSESSING THE LEVEL OF ADOPTION OF TQM PRACTICES IN NIGERIAN CONSTRUCTION FIRMS

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Quality and quality management issues are topics that are receiving increasing attention worldwide. Several criticisms of lack of adherence to quality and standards have been directed to the Construction Industry in Nigeria. Organisations that are outcome oriented and are focused on improving products are likely to adopt Total Quality Management (TQM). The aim of this study is to assess the level of six latent variables of TQM practices adopted across construction firms in Nigeria. Profiles of the firms based on 3 criteria; Number of departments, type of construction undertaken by the firms and the turnover of the firms were used to classify the firms. The survey research designwas adopted and questionnaires were distributed to managers and heads of departments of the firms. A sample size of 659 was established, 418 responses representing 63% was analyzed. Descriptive statistics using SPSS version 21 was used to analyze the data collected. The findings are based on the profiles established and the results show that firms studied adopt the six latent TQM practices. The study concluded that construction firms in Nigeria are ready for the adoption and implementation of TQM. The study recommends that there is need for the creation of an entity exclusively responsible for assisting firms in the adoption and implementation of TQM.

Keywords: construction firms, quality management, total quality management

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ASSESSING THE SKILLS AND COMPETENCY REQUIRED OF NIGERIAN QUANTITY SURVEYORS IN PRACTICING SUSTAINABILITY ADVISOR IN THE CONSTRUCTION INDUSTRY

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As the sustainability issue in building construction phenomenon continues to grow and gain popularity, there is a need to better understand the pivotal attributes that professionals i.e. (quantity surveyors) in Nigeria should possess to manage and be able to stand as sustainable constructions advisers to their clients in construction industry. Despite numerous studies on sustainability, if not few but none have specifically examined; the skills and competencies required of Nigerian quantity surveyors in advising on sustainable construction. As a result, with the intent to enhance sustainability efforts within the professionals and the quantity surveying firms out large. This study aimed at assessing the skills and competencies required of medium Nigerian quantity surveying firms in advising on sustainable construction in construction industry. Objectives: (1) General awareness of sustainability advisor as a role in Nigeria construction industry (2) Identify the skills and competencies required of Nigerian quantity surveying firms in practicing as sustainability advisers globally; (3) Assess the skills and competencies identified globally. A Quantitative research approach was adopted. The total population of registered quantity surveyors firms in Nigeria is 318 number and the sampling size was calculated to be 67 number, using Kish (1965). The collection of data was through the use of semi-structured questionnaires, which was distributed among the medium professional quantity surveyors. A descriptive statistical tool was used for analyzing the data collected. The study conclude that Quantity surveying firms in the current market are very much aware and acquainted to sustainability related matters and also has a role to be played by them. The findings however proved that, from the evaluation of the required skills and competencies identified globally with the skills and competencies of Nigerian medium quantity surveying firms, the study therefore conclude that Nigerian medium quantity surveying firms has the required skills and competencies; Risk management with the mean of (1.27), followed by Cost management with the mean of (1.44) and whole life cost with the mean score of (1.46), in carrying out sustainability advisor in the construction industry. However, Nigerian institute of Quantity Surveyor (NIQS) should sensitize, motivate and commit the academia (both students and educators) to embark fully on practical application of sustainability practices for wider knowledge and understanding.

Keywords: construction industry, competencies, skills, sustainability

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ASSESSING THE STRATEGIC SUPPLY MANAGEMENT CAPABILITIES OF PUBLIC CLIENTS FOR CONSTRUCTION PROCUREMENT IN DEVELOPING ECONOMY

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Despite developing economies being at the centre of accelerating global economic growth, most public clients within these economies have had a bad reputation in achieving value-for-money in their construction procurement. Theoretically, achieving value-for-money by public clients is dependent on their strategic supply management (SSM) capabilities. There is a lack of empirical evidence on the SSM capabilities of public clients in developing economies, thus creating significant gap in the bid to improving their capacities to achieve value-for-money. This paper examines the SSM capabilities of public clients towards achieving value-for-money in their construction projects within the context of a developing economy. Three capability dimensions of the Cousin's SSM Framework were conceptualised: supply management maturity level, strategic consideration and alignment, and skills and competencies. The exploratory multi-case study research design was adopted for the study using interview to elicit information. Cases studied were drawn from tertiary institutions in Nigeria. This is a good representation of public clients, given their homogeneity of purpose and consistent engagement in public construction procurement over the last 20 years through deliberate Government funding interventions. Data were collected from 5 public universities. Data specific to each university was sourced from the head of the unit responsible for its construction procurement. It was discovered that public clients are: yet to attain the maturity level required for SSM; weak in both strategic considerations and strategic alignment across organisational levels; and more tactical in their supply management competencies and skills rather than strategic. This provides another reason amongst others for public clients' bad reputation in achieving value-for-money in their construction procurement. To correct these deficiencies and improve on their capacities to achieve value-for-money in their construction procurement based on SSM principles, strategic (i.e. long-term), innovative and sustainable approach to managing supply partners is suggested.

Keywords: public clients, supply management, value-for-money

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ASSESSMENT OF INTERNAL MARKETING RELATIONSHIP OF QUANTITY SURVEYING FIRMS IN SOUTHWESTERN NIGERIA

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Quantity surveying firms (QSFs) plays critical roles in the execution of construction project. Despite this, it ranked high among the least known professions in the competitive business environment. One of the reasons for this could be attributed to failure of the Institute to embrace marketing concepts. Marketing is all about creating value for client through healthy relationship. Marketing alone is not enough; it has to embrace internal company value (interaction between the firm and the employees) which is being termed as internal marketing that will invariably determine the success of external value. Therefore, this study focused on assessing the internal marketing relationship of quantity surveying firms with a view to improving services delivery. Data on expected attributes for healthy internal marketing were obtained through questionnaire administered on registered QSFs (46) and employee QS (85) in Southwestern Nigeria. Random sampling technique was adopted in selecting the respondents in the study area. The collected data were analyzed with the aid of Mean Response Analysis (MRA). Findings showed that, honesty and integrity, trustworthy, and, strong and good communication were the significant attributes expected of employees while trustworthy, recognizing and rewarding good work, and, creation of favourable working environment were the important attributes expected of firm (employer) for healthy internal marketing relationship. Additionally, the findings revealed that, employees displayed their attributes to some extent while firms' attributes were less displayed. From the obtained results, the study concluded that the expected attributes for healthy internal marketing relationship of QSFs were not found. Therefore, it is recommended that QSFs should see their employees as part of success story of the firm by displaying attributes expected of them to their employees. Equally, employees should display the attributes expected of them adequately. With this, external value (client satisfaction) will be achieved which will invariably promote the profession in a competitive business environment.

Keywords: employee QS, internal marketing, marketing, relationship, quantity surveying firms

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ASSESSMENT OF REGENERATIVE DESIGN PRACTICES FOR RESIDENTIAL HOUSING: A CASE STUDY IN AWKA, NIGERIA

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The purpose of this study is to assess existing regenerative design strategies applied in neighbourhood designs, with a view to deriving a framework of strategies that can be implemented in related developments across different geographical contexts. A design science research approach was applied, which is fundamentally solution-oriented and multi-stepped, and used mostly in architecture and engineering to define a building or an artefact. The study starts with a review of extant literature, followed by the development of a preliminary framework for proposed strategies. A residential housing neighbourhood was used as context for case study, to analyse the level of regenerative design practice, using the proposed strategies. Results of the case study were used to develop the strategies further, which were then refined and validated by being subjected to evaluation through a survey of construction professionals within the study context. The validated strategies were further tested for significance, as a final step. A key finding is the relative lack of regenerative design practice especially within the study context. However it can be promoted. Though it is a design-related concept and could be viewed as context-specific, findings indicate that some of the existing strategies could be effectively adopted in different geographical locations, irrespective of specific climate and environment. The study suggests a need for greater focus on the ecological implications of sustainable design and construction. The study adds value by organizing notions of relevant regenerative design strategies into a holistic picture, which is validated, in order to highlight the more relevant strategies, and critical aspects to consider in the implementation of regenerative design projects.

Keywords: neighbourhood design, regenerative design, regenerative development, strategies, sustainable design

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ASSESSMENT OF STAKEHOLDERS' PERCEPTION OF RISK FACTORS ASSOCIATED WITH THE ADOPTION OF E-PROCUREMENT IN THE NIGERIAN CONSTRUCTION INDUSTRY

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As the level of adoption of e-Procurement continues to increase in the Nigerian Construction Industry due to its perceived benefits in enhancing efficiency in project delivery, eliminating geographic barriers and enabling effective communication between project team members, the need for preparation of full participation of stakeholders' in e-Procurement arises. However, the industry becomes exposed to the potential risks associated with the adoption of this technology. Such exposure of the industry to the potential risks in adopting e-procurement is partly driven by the fragmented nature of stakeholders which increases the variability in the comprehension of risk in e-Procurement. Owning to such variability, this research assesses stakeholders' perception of the risks factors associated with the adoption of e-Procurement in the industry. The study adopted a quantitative research approach using structured questionnaire to assess the perception of key stakeholders' including Clients, Contracting and Consulting firms in the Nigerian Construction Industry. The data collected were analyzed using descriptive statistics. Furthermore analysis of variance (ANOVA) was used to assess the significant difference in the perception of the stakeholders'. Findings revealed that prominent risks factors associated with the adoption of e-Procurement include: lack of training on the adoption of e-Procurement techniques, unreliable Internet and telephone connectivity, lack of clear understanding of e-Procurement technologies and security. This study is expected to influence the policy makers strategies in improving the adoption and practice of e-Procurement in the Nigerian Construction Industry and also other developing and emerging markets.

Keywords: construction industry, e-procurement, Nigeria, risks

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AUTOMATION IN CONSTRUCTION MATERIALS HANDLING: THE CASE STUDY IN NORTH CENTRAL NIGERIA

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Automation in construction material handling system is a method of utilising material handling equipment. It could be the basis of cost reduction or wasteful expenses if not efficiently planned. However, there is limited understanding of construction material handling process utilised by the manufacturing industry in Nigeria. Thus, the aim of this study is to evaluate the efficiency of automation in material handling by the manufacturing industry in North Central Nigeria. A quantitative method and case study research approach was adopted, six construction material manufactured and distributed within the North-central region of Nigeria were selected for this study. A purposive sampling method was used for the selection of the ten construction material manufacturing companies used in the research. The study employed non -participant structured observation and measurement template for the data collection. The material handling processes observed includes, order picking method, material handling equipment, storage equipment, loading and offloading equipment. The descriptive method of data analysis was employed using percentage and results presented in a form of bar charts and interpreted directly. The study concluded low utilisation of automation in the combined processes of order picking, handling, storage, loading and offloading. But used more manual labour that involved multiple handling. This low adoption of automation in material handling by the manufacturing industry leads to inefficiency. This in turn have a negative influence such as poor management, low throughput, prone to error, long lead time and high labour cost. These have the implication of increasing construction cost and cause project delay. This study was conducted using observations which is one of the limitations of this study.

Keywords: automation, construction materials, efficiency, material handling, warehouse

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AXIAL COMPRESSION OF SOIL DEPOSIT IN SAKI OYO STATE UNDER AN ISOLATED FOOTING

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The axial compressions of soils under structural foundations are experimentally determined or numerically modelled based on geotechnical engineering principles. This study was carried out to evaluate axial compression or foundation settlement based on standard penetration test (SPT) data obtained from Saki, Oyo State in the South West region of Nigeria. The SPT data were used to correlate soil properties that were used to obtain the input parameters used for numerical modelling of foundation settlement. The study was aimed at evaluation of footing axial compression by both analytical and numerical modelling methods and compare the effectiveness of using numerical modelling software in predicting foundation axial compression with those of conventional methods. Five footing embedment depths of 0.6, 2.1, 3.6, 5.1 and 6.6 m with five applied foundation pressures of 10, 50, 100, 200 and 300 kN/m^2 were considered using an isolated footing dimension of 1.5 x 1.5 m^2. The numerical modelling finite element application package used was Plaxis 3D. A comparison of the axial compression results by the analytical methods considered in this study with those of numerical modelling showed that the empirical method proposed by Schultze and Sherif yielded good estimations of foundation axial compression. Based on the results of the study carried out, it was observed that the axial compression of foundations can adequately be numerically modelled using Plaxis 3D package.

Keywords: axial compression; foundation; numerical modelling; Plaxis 3D; standard penetration test.

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BARRIERS OF IMPLEMENTING GREEN WALLS IN THE URBAN ENVIRONMENT IN DEVELOPING COUNTRIES

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The purpose of this research is to determine the barriers of implementing green walls in the urban environment in developing countries. The built environment contributes to major global energy consumption and greenhouse gas emissions. Greenery systems such as green walls have been around for centuries and provide a sustainable solution to reduce and mitigate the negative impacts that the built environment has on the surrounding environment and biodiversity. Green walls could add a significant amount of vegetation in an environment without requiring any additional space. Green walls increase the albedo, lower temperatures, acts as an insulating layer, mitigate the heat island effect, lowers operational costs of building and saves energy, sequestrate carbon and capture pollutants, attenuate noise, increase positive emotions and is an aesthetic enhancement. Green walls are however, rarely seen in developing countries like South Africa. Green walls are defined as a greening vertical layer for adding greenery to the façade or internal walls of a building. A systematic literature review was done by researching all possible barriers and reasons for the lack of green walls in developing countries in journal databases and an online library database. The barriers identified includes lack of building regulations, lack of awareness of green walls, lack of standard costs, lack of understanding the benefits that comes with green walls, lack of knowledge in the construction industry and lack of emphasis on sustainability. By identifying the barriers in South Africa, recommendations are made in terms of addressing these barriers in order to accelerate and promote green walls within developing countries. Green walls can be categorised into green facades and living walls. Green facades can be sub-categorised into direct and indirect (with planter box or as double skin) green facades. Living walls can be sub-categorised into continuous living walls and modular living walls. Each type of green wall has certain advantages and disadvantages and costs that goes with it. To conclude, the direct green façade requires the least installation costs, expertise, maintenance and water usage and is the ideal starting point for developing countries. Even though there are numerous barriers to implement green walls in developing countries, there are solutions to overcome these barriers in order to promote and accelerate the implementation thereof.

Keywords: barriers, green building, green walls, sustainable, urban greenery

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BUILDING COLLAPSE IN NIGERIA AND DEVELOPMENT CONTROL, THE MISSING LINK

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A chain is only as strong as its weakest link. This analogy is also applicable to the building and construction industry. In Nigeria, the collapse of buildings is no more news as this happens very often. Given the frequency and devastating consequences of building collapse nationwide, it is apt to ask, what factors contribute to the reoccurring collapse of buildings? What laws and regulations are applicable to the building industry? What measures are taken by government, builders and end users? The study examines the root cause of frequent building collapse in Nigeria using Enugu as a case study. A structured questionnaire was prepared and distributed among the three planning approval offices within Enugu metropolis and the study employed a snowball sampling technique because the target sample population are involved in some kind of network with each other. The result of the survey indicates huge lapses in implementation of building regulations and laws. It also identifies that, there is inadequate staffing of skilled man power and professionals particularly architects to assess, scrutinize, and evaluate building document and supervise construction project. Furthermore the study reveals that no culprit of building collapse have ever been prosecuted by the relevant authorities. It concludes and recommends that government should take a proactive step and engage necessary professionals in her planning approval offices and also advocate that the laws must be strictly adhered to for the implementation and administration of justice. This will be an effective deterrent towards curbing the menace.

Keywords: building collapse, building industry, Enugu metropolis, environmental laws, town planning office

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BUILT ENVIRONMENT EDUCATION FOR GREEN BUILDING DEVELOPMENT IN NIGERIA

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The built environment is at the center of construction activity with its attendant problems the world over. Efforts to minimize the negative impact of the built environment include the development of green buildings. Therefore, the paper aimed at assessing the level of awareness of the requirement for green building development among built industry professionals in the Physical Planning Units (PPU) in Federal Tertiary Educational Institutions in South-West Nigeria. The LEED v4 Project checklist for New Construction and Renovation was adapted on a five points Likert's scale for data collection. The questionnaire survey was administered on built industry professionals through census. The Mean Item Score (MIS) was used to rank the level of awareness of the requirements for green building while Kruskal Wallis Rank Sum Test was used to determine the variation in the level of awareness. The Least Square Difference (LSD) was also used for Post-Hoc assessment to determine the significant variation from one professional to the other. The results showed that only three of the professionals have significant levels of awareness of green building requirements. The Kruskal Wallis Rank sum Test showed a significant variation in the level of awareness of the requirements among the professionals with 0.027 at 95% confidence interval. The paper concluded that there was a high variation in the level of awareness of the requirements among the professionals. The Post-Hoc test also proved that it would be difficult to achieve the integration and collaboration required for green building development among the built industry professionals in Nigeria. The paper therefore recommended the need for training and workshops by professional bodies to educate their members and develop requisite skills for green building development in Nigeria.

Keywords: built industry, green building, LEED, professionals, requirements

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CALIFORNIA BEARING RATIO PREDICTION OF MODIFIED BLACK CLAY USING ARTIFICIAL NEURAL NETWORKS

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Artificial neural networks (ANNs) is yet to be extended to soil stabilization aspect of geotechnical engineering. As such, this study aimed at applying the ANNs as a soft computing approach to predict the CBR values of Nigerian black clay. A soft computing approach using multilayer perceptrons (MLPs) artificial neural networks (ANNs) that are trained with the feed forward back-propagation algorithm was used in this study for the simulation of soaked and unsoaked California bearing ratio (CBR) of cement kiln dust-modified black clay. Eight input and two output data set were used for the ANN model development. The input data are the specific gravity (SG), linear shrinkage (LS), uniformity coefficient (C_u) coefficient of gradation (C_c), liquid limit (LL), plastic limit (PL), optimum moisture content (OMC) and maximum dry density (MDD). The output (target) been the soaked and unsoaked CBR. The mean squared error (MSE) and R-value were used as yardstick and criterions for acceptability of performance. In the neural network development, NN 8-8-1 and NN 8-17-1 respectively for soaked and unsoaked CBR that gave the lowest MSE value and the highest R-value were used in the hidden layer of the networks architecture which performed satisfactorily. For the normalized data set used in training, testing and validating the neural network, the performance of the simulated network was satisfactory having R values of 0.9986 and 0.991 for the soaked and unsoaked CBR respectively. These values met the minimum criteria of 0.8 conventionally recommended for strong correlation condition. All the obtained simulation results are satisfactory and a strong correlation was observed between the experimental soaked and unsoaked CBR values as obtained by laboratory test procedures and the predicted values using ANN.

Keywords: artificial neural networks; California bearing ratio; black clay; soil modification; cement kiln dust

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CHALLENGES AND ENHANCED MEASURES FOR IMPLEMENTATION OF INDUSTRIALIZED BUILDING SYSTEM IN LAGOS METROPOLIS

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Neat, time-saving and cost friendly infrastructure demand in modern society is actualized with accurate and standard construction methods capable of delivery within a short timeframe. This study investigates dynamic issues impeding the practice of industrialized building system (IBS) and way out in Lagos metropolis. A survey research design and referral sampling technique were espoused to gather the viewpoints of sixty-one construction professionals acquainted with the knowledge and have been involved in the use of the IBS method for building projects within the metropolis. The statistical methods employed for the study were frequency, percentage, mean score, Kendall's coefficient of concordance test and Kendall's tau_b correlation coefficient. The results of the study revealed that the practice of IBS was mired by varied issues. These included the need for large working space and storage facilities, lack of contractor's experience in handling IBS works and equipment for testing IBS components. The result indicated that there was an agreement among the respondents on the influential ratings of factors impeding IBS. Also, the result revealed that measures to enhance implementation of IBS include establishing legislative support for industrial development, importation of new technologies and innovation as well as marketing strategy development. The prominence of factors upsetting the practice of IBS and measures for IBS enhancement were captured.

Keywords: challenges, enhanced measures, implementation, Industrialized Building System (IBS) , practices

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CHALLENGES CONFRONTING THE QUANTITY SURVEYING PROFESSION IN NIGERIA: PERSPECTIVE OF THE EDUCATION SYSTEM

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The role of quantity surveyors in any economy is very vital as it serves in contract documentation and management among others. The incessant cost and time overrun on projects have been attributed to poor professional advice given by professional quantity surveyors. This study looks at the perceived poor performance of quantity surveyors from the perspective of their academic background with a view to see how improvement can be instituted. 80 questionnaires were administered to registered quantity surveyors in consultancy and academia in Lagos and Ogun states of Nigeria, using random sampling technique. The data collected were analysed using SPSS version 22. The mean score of the factors were obtained and used as the basis of ranking the factors. A Man-Whitney test was also carried out to identify if there was significant difference in the opinions of the respondents. The results of the analysis revealed that lack of practical class is the greatest challenge to quantity surveying profession in Nigeria. Inadequate funding and lack of provision for field trips are the most serious challenges to quantity surveying education in Nigeria. There is no statistically significant difference in the ranking scores of quantity surveyors in academia and consultancy at 95% level of confidence. Hence, the need to work on these challenges in our tertiary institutions in Nigeria is crucial and must be taken seriously to give adequate knowledge to our aspiring quantity surveyors. This will enhance the performance of quantity surveyors in the discharge of their duty.

Keywords: built environment, contract, documentation, human resources

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CONCEPTIONS OF SUSTAINABILITY AMONGST POST GRADUATE (MSC) CONSTRUCTION MANAGEMENT STUDENTS

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In Ghana, recent amendments to public procurement regulation and construction of sustainable buildings underscore the growing importance of sustainability in the construction industry. To align itself with such trends in industry, the Kwame Nkrumah University of Science and Technology (KNUST) has introduced sustainability related dimensions within its programmes including MSc construction management. This research investigates the variation in sustainability conceptions held by MSc construction management students of KNUST. The study explores if age and previous area of education relate to students' conception of sustainability. Appreciating what students actually know can inform what and how academics teach students about sustainability and ready them to influence sustainable construction in Ghana. Previous studies amongst undergraduate engineering students in other countries exist but students' conceptions of sustainability in Ghana is under-researched in spite of its relevance to sustainability education development. Questionnaires were employed to collect students' descriptions of sustainability and then the Structure of learning outcomes (SOLO) based analytical framework for mapping variation in student conception by Carew and Mitchell was used to classify the descriptions of sustainability. Student descriptions were also scrutinized for themes related to key principles of sustainable development (SD) by Gibson et. al., 2006. Results revealed that majority of construction management students' either did not know what sustainability was or provided broad, non-specific responses. Students also showed a narrow conception of sustainability with focus on environmental dimensions. Issues of sustainability related to precaution and adaption as well as immediate and long term integration are not mentioned at all. The study highlights the areas of sustainability that need to be emphasised in the course in order to develop graduates who have a balanced understanding of sustainability. It also brings to light the need for further research amongst Ghanaian students at all levels and in all fields to explore understanding within differing groups of students.

Keywords: construction management, sustainable development, sustainability, sustainability education

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COST OF CONSTRUCTION PROJECTS IN NIGERIA - CHALLENGES AND WAYS FORWARD-

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The persistent escalation of cost of both building and infrastructural projects in Nigeria is alarming. In other to improve upon the existing scenario, this study investigated and evaluated determinants of construction cost in Nigeria. The objectives of the study include: Comparative cost analysis of construction projects in Nigeria with that of some African countries, evaluation of construction cost matrix and suggestion to improve on existing scenario. Data obtained through stratified probabilistic sampling technique from 50 Nigerian Quantity Surveyors through structured questionnaire were analyzed quantitatively and the findings of the study revealed that high cost of construction materials, inflation, monopolistic market for construction materials, deliberate inflation of contract sum and kick back syndrome are major determinants of cost of construction in Nigeria. The study concluded that to curb this menace, measures outlined in the study must be implemented.

Keywords: construction, cost, issues, Nigeria, quantity surveyors, ways forward

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CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN: WHAT WORKS AND WHAT DOES NOT? - REFLECTIONS FROM A NIGERIAN CITY

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Increasingly, urban residents across the globe are adopting formal and informal means to prevent or reduce incidences of crime and victimization within their environments. While these efforts are widespread in Nigerian cities, it is not clear how effective they have been in controlling crime. This study attempts to find this out, using Makurdi, a medium sized urban centre in Central Nigeria. Data were sourced from the residents through a semi-structured questionnaire. The study employed a combination of stratified and random sampling to select the household heads that provided answers to the questions posed. The data collected on types of crime experienced by respondents and the crime control measures they use were subjected to a multiple regression analysis to determine the effectiveness of the measures in crime reduction. The study found that crime prevention and control measures such as fences, special locks and additional reinforcements, dogs, guards and avoiding late nights had different effects on crime reduction in the study area. Fences, special locks, dogs and guards had the propensity to minimally increase opportunities for the occurrence of armed robbery. Relatedly, there was a likelihood of higher levels of victimization and lower incidences of rape where there were higher percentages of residences with fences. Avoiding late nights was not effective in curbing incidences of assault. These findings reiterate the importance of crime analysis aimed at determining what works in crime reduction. This should be considered as requisite knowledge in the design and application of crime prevention and control measures in cities across the globe.

Keywords: crime, crime control, crime reduction, surveillance, target hardening

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DAMPNESS PATTERN IN HALLS OF RESIDENCE IN SELECTED EDUCATIONAL INSTITUTIONS IN LAGOS, NIGERIA

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Educational institutions in Nigeria be it public or private, old or new, require improvement on the buildings, facilities and infrastructure. Such improvement will not only enhance their performances and ranking but will also reduce the number of students aspiring for degrees in other countries with its antecedent effects on the society. Seeking improvement connotes reducing building defects/deterioration thereby creating a conducive environment that stimulates, supports and sustains learning, teaching, research and innovation. Dampness plagues both new and old buildings and contributes more than 50% of building envelopes' defect, discomfort or failure. This study therefore examined dampness in selected educational buildings in Lagos. The purpose was to identify the pattern of dampness in halls of residence with a view of providing data that will inform decisions to be taken by the stakeholders. The objectives were to evaluate the prevalent sources of dampness and the frequency of occurrence as well as the evaluation of the halls that have the highest effect of dampness. The study population comprised 11 out of the 13 under-graduates halls of residence in the study area. The research design involved visual inspection of the halls based on a number of indicators that characterise the different sources of dampness and the use of moisture meter and condensation test to get objective readings on some identified walls. This analysis was done using mean and percentage on excel sheets. The results revealed that all the five sources of dampness namely; condensation, ground water, penetration damp, pipe leakage and rising damp were prevalent in the halls. Symptoms of pipe leakage and condensation, however, were more prevalent. Out of the 11 halls of residence that were inspected, 4 of the halls showed severe effects of dampness. The readings from the moisture meter indicated rising damp at height of 560mm with condensation from the inner side of the wall. It was concluded that a larger percentage of the effects of the damages done by dampness in the halls originated from pipe leakages and condensation. In addition, the height attained by the rising damp on the external wall was as a result of pool of water at the foot of the wall. Building Surveyors need to be invited to conduct further investigation on the sources of the dampness and the consequences while the institution management needs to attend to the halls with high severity index in order to forestall further deterioration.

Keywords: dampness, defects, halls of residence, moisture meter, symptoms

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DECADE-LONG OPERATIONS OF CHINESE CONSTRUCTION COMPANIES IN AFRICA, 2009-2018

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The potential bandwagon effect of the growing concern on the presence of Chinese construction companies (CCCs) in Africa calls for inter-textual coherence. This study aimed to establish the presence of CCCs in Africa and influence of their firm- and country-specific ownership, location, and internalization (OLI) advantages on their operations in Africa. The scoping review methodology revealed that CCCs have varying presence in the African countries: very compelling in 9, major in 7, moderate in 2, minimal in 9, not compelling in 14, and none in another 14. Using Cohen's kappa interrater reliability, the 74.5% agreement between this study and another on the presence of CCCs in Africa was not significant, which confirmed the bandwagon effect. Mann-Whitney test performed on the data from 22 Chinese managers of CCCs based in Africa revealed no significant difference on the level of influence of the country-specific OLI advantages of the Chinese state-owned enterprises (SOEs) and private-owned enterprises (POEs). There were significant differences between the SOEs and POEs on the firm-specific location and internalization (L&I) advantages. The implications include a paradigm shift from generalizing working relationships for the SOEs and POEs as well as in-depth study of their core L&I advantages.

Keywords: bandwagon, Chinese construction companies, interrater reliability, OLI advantages, scoping review

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DESIGN OF A COMPOSITE TIMBER-CONCRETE FOOTBRIDGE ACROSS SAKUBVA RIVER, MUTARE. CASE OF NYANHONGO VILLAGE DORA

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The research focused on the design of a composite timber-concrete footbridge on Sakubva River in Nyanhongo Village, Dora, Mutare, Zimbabwe. There is no safe crossing facility as the existing footbridges are no longer serving their purpose. A composite timber-concrete footbridge has been proposed for the area because of the low construction and maintenance costs. The objective of the study include determination of the soil properties and geological formations by means of geotechnical investigations, investigating causes of failure of the existing footbridge and design of the composite timber-concrete footbridge using British Standards (BS), South African National Standards (SANS) and other relevant design standards. The contour map of the proposed area and the catchment area of Sakubva River was obtained by processing the Digital Elevation Model for the area using QGIS and ILWIS software. Geotechnical investigations were conducted soil parameters such as bearing capacity and shear strength. Trial pits were dug for the assessment of the soil profile and collecting samples for laboratory tests. The tests done include the Dynamic Cone Penetration Test (DCP), particle size analysis, soil indicator, compaction, shear strength and California Bearing Ratio (CBR) tests. An assessment was made of the state of the current pedestrian bridge at Sakubva River. The proposed design of the bridge was done using the design standards, AutoCAD and SOLID WORKS software. A clear span of 29 m with three panels and a clear width of 1.8 m was proposed for the design. Locally available sawn timber of dimensions 200 mm by 300 mm was used with vertical steel bars as shear connectors. The composite timber-concrete system was based on the Gamma Method which is dependent on the effective bending stiffness of the materials bonded together. . The deck of the footbridge, at the end of the work consists of a concrete slab and timber beams, connected together by shear connectors (screws) to have the composite action. From the geotechnical investigations the soil was found to be poorly graded sand. The percentage CBR was found to be 28.5 corresponding to bearing capacity of 250 kPa with a founding depth of 1.6 m. Bridge scour was found to be the main cause of failure of the existing footbridge and the suspension cables were being eroded. The research concludes that composite timber-concrete is the sustainable material for pedestrian bridge deck design in the event of a bearing capacity of 250 kPa. It is recommended to use rip-rap to prevent bridge scour and penetrating water proofer as the main seal to protect the timber.

Keywords: bridge scour, composite timber concrete; shear connectors

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DEVELOPMENT CONTROL STRATEGIES FOR SUSTAINABLE AND RESILIENT URBAN DEVELOPMENT IN SUB-SAHARAN AFRICA

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Globally, development control (DC) is considered as an effective means for achieving the objectives of public health, safety, harmonious development and minimizing future expected losses in the built environment. However, efficient and effective controls remain a major fault line for countries in Sub-Saharan Africa (SSA). The challenges include haphazard developments, growth of slums, increased number and impact of disasters and chronic risk. Many researchers have explored various tools and strategies for ensuring orderly developments and the creation of sustainable and resilient neighbourhood. Through literature review, the study explores the major weaknesses in the implementation of key DC strategies in SSA and the barriers to their potentials in ensuring sustainable urban development. From the study, land use planning and building regulatory governance were identified as remarkable development strategies that could be leveraged as a means of ensuring safety and encouraging sustainable and resilient urban development. Inadequate Funding, Outdated Legislation, Inordinate delays, Weak Enforcement, Lack of Awareness, Corruption and Minimal use of ICT were recognized as key factors that account for ineffectiveness of DC in SSA. It was established that increased private sector participation, use of technology and contemporary urban management systems will benefit from the use of building regulations for sustainable and resilient urban growth in SSA. The paper therefore recommends the use of novel governance approaches such as smart building regulatory governance for sustainable and resilient urban development in Ghana and other countries in SSA.

Keywords: development control, regulatory governance, resilience, sustainable development

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DEVELOPMENT OF JOB SATISFACTION INDEX FOR CONSTRUCTION EMPLOYEES IN DEVELOPING COUNTRIES BASED ON FREDERICK HERZBERG'S MOTIVATION THEORY

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Individuals exhibit different levels of job satisfaction and is mostly expressed subjectively. This has made the concept of job satisfaction complex, multifaceted, and generally difficult to measure. Using the fuzzy synthetic evaluation approach, this study aims to develop an index that quantifies the job satisfaction level of construction professionals. This study is based on Herzberg's two-factor theory of motivation. Adopting a 58-item job satisfaction list grouped into ten categories, a questionnaire survey was conducted with 63 construction professionals across six regions to develop the job satisfaction index. After applying the fuzzy synthetic evaluation, the resulting index consisted of eight critical job satisfaction categories. The study found that supervision is the most critical category, followed by the work itself, interpersonal relations, responsibility, achievement, recognition, advancement/growth, and working conditions. To considerably improve the job satisfaction levels of construction professionals, a supportive supervisory environment should be held as a top priority by the management/client. Top managers/clients in developing countries can use the developed index to determine the status of job satisfaction of construction professionals in their organizations/projects. In addition, the index provides the platform to compare relative job satisfaction of construction professionals in a project portfolio for benchmarking purposes. The developed index further eliminates any abstract notion of the concept of job satisfaction, since it can be measured.

Keywords: construction professionals, developing countries, fuzzy synthetic evaluation, Herzberg's motivational theory, job satisfaction index

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DEVELOPMENT OF SUSTAINABLE TRAINING MODELS FROM TASK CHARACTERISTICS FOR IMPROVED PERFORMANCE OF SITE SUPERVISORS IN CONSTRUCTION FIRMS

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The need to develop a sustainable solution to the issue of performance of construction site supervisors cannot be ignored. Previous research identified training as a sustainable way of improving performance of site supervisors. Thus, training of site supervisors is germane for effective performance. However, issues relating the characteristics of site supervisors' tasks to training have not been adequately researched. Thus, there is need to develop a sustainable training model from task characteristics of site supervisors for effective performance. The aim of the paper is to develop a sustainable training model from task characteristics of site supervisors with the view to improving their performance. Based on literature review, a conceptual framework consisting of ten task characteristics variables and four training variables was developed. The research design adopted was cross-sectional survey research design and the research approach was quantitative. A total of 257 questionnaires were purposely distributed to site supervisors working in construction firms in Nigeria and 218 valid questionnaires were returned and use for analysis. The result shows that there is a significant positive relationship between task characteristics and training and that task characteristics is a predictor of training. Based on this, sustainable training models were developed from the task characteristics of site supervisors. It was therefore concluded that the prevalent nature of site supervision task can be used to predict sustainable training practice in construction firms. Construction firms should therefore adopt the sustainable training model as policy for improved performance of site supervisors and for effective human resource development.

Keywords: construction firms, performance, professionals, sustainable, task characteristics, training procedure

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DIFFERENCES IN NAVIGATION BEHAVIOUR BASED ON LITERACY LEVELS WITHIN A TERTIARY HEALTHCARE COMPLEX IN NORTHWEST NIGERIA

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Navigation and wayfinding behavior pose significant problems especially in large healthcare institutional complexes worldwide. Such problems are aggravated by factors such as complexity, ageing, disease, gender, familiarity as well as literacy levels. Most studies regarding these problems are conducted in western healthcare environments, with little research efforts in developing countries such as Africa. This study evaluates navigation behavior based on literacy levels at Ahmadu Bello University Teaching Hospital Shika-Zaria, a large tertiary institution in Northwest Nigeria employing a questionnaire survey of 213 adults. Literacy is defined in this context as the ability to read and write in English. Respondents were requested to rate 20 navigation behaviors on six-point Likert scales. Results were analyzed in SPSS v21 for descriptive statistics and differences in ratings based on literacy using independent samples Mann-Whitney tests. Results reveal that overall, literate and illiterate respondents employ route mapping behaviors related to memory recall, use of shortcuts and verbal descriptions more than other categories. Apart from basic navigation steps for known routes ($p=0.387$), the remaining categories record significant differences based on literacy levels (route mapping $p=0.005$, spatial orientation $p=0.016$, route perception $p=0.029$), with the most significant difference recorded for basic navigation steps for new routes ($p=0.001$), which rely on reading signs and symbols, asking for verbal directions and using instinct. The results also reveal that literate respondents employ basic navigational steps and spatial orientation more than route mapping and route perception, which record higher mean ratings by illiterate respondents. To cater to all users, design solutions need to enhance and encourage elements of basic navigation and spatial orientation such as use of landmarks, clear positioning of help desks, placement and design of context specific signage and symbols as well as clear entrances and exits.

Keywords: healthcare complex, literacy, navigation, northwest Nigeria, wayfinding

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DOMINANT INNOVATIONS OF SUCCESSFUL CONSTRUCTION MICRO, SMALL, AND MEDIUM ENTERPRISES (CMSMES) IN NORTHERN NIGERIA

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Micro, small and medium enterprises (MSMEs)/ construction micro, small, and medium enterprises (CMSMEs) are reported to be responsible for considerable number of innovations across the world. However, the predominant types of innovations among surviving and successful CMSMEs, and the impacts of such innovation(s) on the success of the CMSMEs is unclear. This paper aims at exploring the predominant types of innovations among the successful construction micro, small, and medium enterprises in northern Nigeria. The research employed qualitative research method to exploratively determine the types of innovations. Recorded interviews constituted the research data from 17 CMSMEs spanned through 14 states out of the 19 states constituting northern Nigeria. While semi-structured interview with opened ended questions were used to collect data through judgemental and snowballing sampling technique at stage 1 and 2 respectively. Data were transcribed, open and axial coded and analysed. The result reveal product innovation as the predominate type of innovation among other types of innovation and mostly responsible for the success of the CMSMEs studied. The result of the research enriches body of knowledge in respect of common types of innovations within CMSMEs and implies that successful CMSMEs in Northern Nigeria pay more attention to product innovation to trigger their success and other forms of innovations. Furthermore, the result of the research suggested failing CMSMEs can survive when they concentrate on product innovation.

Keywords: CMSMEs, success, types of innovation

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EFFECT OF INTERNAL ENVIRONMENT AND PROJECT-RELATED DETERMINANTS ON BUSINESS STRATEGY OF SMALL AND MEDIUM CONSTRUCTION ENTERPRISES IN NIGERIA

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The construction business environment is characterized by high levels of competition and dynamism. This is especially challenging to small and medium construction enterprises (SMCEs) in terms of the formation of strategies that enhance performance. These strategies are products of the environment under which the SMCEs operate. This study, therefore, investigates the effect of the selected internal environment and project-related determinants on the business strategies of SMCEs with a view to promoting the adoption of appropriate strategies for improved competitiveness. Lagos, which has the highest concentration of construction firms was selected as the study area. A sample of 80 construction firms in the SME category, selected randomly from the population of construction firms operating in Lagos was used. Data collection was by structured questionnaires. 70 questionnaires were returned but only 50 was found usable. Thirty-four determinants of business strategy from previous studies were identified and categorized into seven groups namely: Owner, Firm, Technical, Financial, Project, Client and Procurement-related. Data analysis was done using percentage, mean score and t-test. The findings revealed that project and procurement determinants constitute the top three determinants of the SMCEs' business strategies. Further results show that the effects of the project and procurement-related determinants are the same. Owner-related determinant has the least effect on SMCEs business strategy. The study concluded that the preferred business strategy of SMCEs in Nigeria is a differentiation strategy. The study recommends that SMCEs should promote a deeper understanding of project details, adapt their strategies to procurement methods and engage qualified and competent employees to enhance their competitiveness. The research will promote the knowledge and adoption of appropriate business strategies for SMCEs improved competitiveness.

Keywords: business strategy, business strategy determinants, construction industry, Nigeria, SMCEs

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EFFECTS OF MOTIVATION OF OPERATIVES ON PRODUCTIVITY IN THE NIGERIA CONSTRUCTION INDUSTRY

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The construction industry in Nigeria is labour intensive and it is the highest employer of the nation's workforce. Hence, the effective management of human resources is the key towards achieving the higher construction workforce productivity, thus accomplishing the construction projects within their predefined limits. Therefore this research is aimed at investigating the effects of motivation of operatives on productivity in the Nigeria construction industry. The objectives are to examine the factors which motivate operatives towards improved productivity and to ascertain the effect of motivation of operative's on productivity in the Nigeria construction industry. Data were collected from both secondary and primary sources. The secondary data were journals and conference proceedings while the data from primary sources were those collected through questionnaires administered on construction industry professionals, i.e. architects, civil/structural engineers, mechanical/electrical engineers, builders and quantity surveyors, as they are to list the features required for employable operatives to be hired in the organization in order to perform optimally towards the realization of organizational goal. The data collected were analyzed using descriptive and inferential statistical tools. The study revealed that intrinsic factors have an edge over extrinsic factors when it comes to motivation of operatives and that the most important motivational intrinsic factor is "the work itself" (when a task offers the employee the opportunity to self-expression, personal satisfaction, and meaningful challenge, then the employee will undertake the task with enthusiasm), followed by extrinsic factor of "increase in salary". Inadequate planning was ranked the most problem associated with motivation of workers. The research revealed that the most significant effect of motivation of operatives on productivity is that it leads to higher performance and productivity. The study recommends that management of construction firms should consider the significance of proper understanding of the motivational needs of construction industry workers.

Keywords: extrinsic motivation, intrinsic motivation, motivation, operatives, productivity

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ENHANCING THE PERFORMANCE OF WALLS BUILT WITH LATERITE-CEMENT BRICKS: A CONCEPTUAL DESIGN AND SPECIFICATIONS WRITING APPROACH

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The long term performance characteristics of buildings built with laterite-cement bricks to satisfy functional requirement of walls is desirable, particularly where walls are not rendered externally or not plastered internally. The paper aims to address performance enhancing issues arising from conceptual design solutions including component mixture selection to enhance better performance of laterite-cement bricks. The methodology adopted used a building surveying procedure to assess selected two failed housing schemes whose main load bearing walls failed as a result of poor component mixture specifications including selected buildings with identifiable conceptual design flaws within the study area. The development of the appropriate domain of mixture combinations to enhance better performance was developed using the Mixture Method developed by Scheffe to be able to select component mixture proportions for meeting prescribed requirements for both strength and durability. This study is applicable to the hydraulically compressed M7-Twin Hydraform machine exerting a compactive force of 10 MN/m^2. The study has shown that eliminating conceptual design flaws and component mixture selections within a cement content of 8-20 percent would enhance better performance of walls built with laterite-cement bricks

Keywords: conceptual design, laterite-cement bricks, mixture design, specified requirements

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ESTABLISHMENT OF BASELINE DATA FOR DEFORMATION MONITORING OF ADMINISTRATIVE BLOCK OF WAZIRI UMARU FEDERAL POLYTECHNIC, BIRNIN KEBBI, KEBBI STATE, NIGERIA

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Deformation monitoring refers to the observation of changes a deformable structure or a body undergoes in its shape, dimension and position. Movement happened as a result of changes in the bedrock properties, change in weight of the material properties or surrounding activities. The aim of this research is to establish reliable survey control networks for future deformation monitoring. The study was conducted at Central Administrative block of Waziri Umaru Federal Polytechnic, Birnin Kebbi, Kebbi State. Ground-based geodetic techniques (use of traditional surveying equipment like high accurate levelling instrument and Total station) was adopted where by fully coordinated control points were established around the study area, deformation points on the engineering structure for horizontal observation, and steel plates were fixed at a height of 1.5m above the ground level on the walls for vertical observations. In the end, absolute base line data was obtained as reduced horizontal angles for horizontal movement control and reduced levels for vertical movement control.

Keywords: baseline, deformation, geodetic, monitoring, structure

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EVALUATING THE IMPACT OF CLIMATE CHANGE ON THE QUALITY OF GROUND WATER – CASE STUDY OF A COAL ENRICHED ENVIRONMENT IN ENUGU URBAN

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Climate change has been an issue of focus especially as it affects the quality and quantity of groundwater. This study evaluates the impact of climate change on the quality of groundwater within areas of Independence Layout, Abakpa, and Uwani in Enugu metropolis. A physiochemical analysis of 12 deep wells was carried out from April 2018 to March 2019 using the weighted arithmetic index method was used to transform the parameters into a single indicator value which represents the water quality level. Results showed that the groundwater resources were weakly acidic which might be as a result of pyrite in the weathering of coal and rainfall charged by chloride ions. There was a significant variation in the parameters of the water samples, in dry and rainy seasons. 1% of the well water samples were excellent, 58.3% were good, and 29.1% were poor water while only 8.3% of samples were very poor.

Keywords: climate change, coal, groundwater, water quality index, water supply

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EVALUATION OF BARRIERS TO VALUE MANAGEMENT APPLICATION IN CONSTRUCTION PROJECTS

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Value Management (VM) initiatives have been recognized as beneficial to the construction industry of most developed and developing countries. The Society of American Value Engineers (SAVE) has reiterated that the application of VM methodology would enhance the quality and performance of construction projects. Though a number of countries apply the VM technique, a developing country like Nigeria seems to have a limited application. This study therefore evaluates the critical barriers to VM application in the Nigerian construction industry. Data collection was based on self-administered questionnaires from construction professionals, while data analysis techniques employed include: descriptive analysis, normality test; reliability test; validity test using Kaiser-Meyer-Olkin (KMO) and Barlett's test of sphericity; factor analysis; and structural equation modelling (SEM). Lack of VM experts, lack of awareness on VM among clients, poor working relationship among stakeholders, inadequate facilitation skills/training, and absence of local VM guidelines are the major barriers to VM practice. Fifteen (15) barriers were validated under four major classifications (People, Government, Environment, and Methodology). The implication of this study is to assist construction practitioners, researchers, and academics to focus on the important concerns that are necessary to support the application of VM in developing countries in order to enhance the value of construction projects.

Keywords: barriers, construction industry, construction professionals, Nigeria, structural equation modelling, value management

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EVALUATION OF CLAY ROOF TILES PRODUCED WITH MAKUBA AS A BINDER

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Building materials is beyond the affordability of the medium/low-income group of the society. This has become a huge challenge because of the huge capital outlay required to do so. Thus, acquisition of indigenous roof tiles using laterite, saw dust and makuba as binder has being suggested to reduce the cost of building material by 50%. The aim of this study is to determine the suitability of clay, saw dust and makuba as binder in the production of roof tiles for use in low cost building construction. Clay was the primary material; Laterite was added to reduce shrinkage; saw-dust serves as a filler to reduce the density of the roof tile. Makuba was used as a binder in the mix matrix. Absolute volume method of mix proportioning was adopted in the design of the mix. The water/binder ratio used in the production of all the clay roof tiles was 0.7. The methodology adopted was by means of laboratory test through which primary data was obtained. Preliminary tests such as specific gravity and bulk density tests were conducted on clay, sawdust and Makuba. Physical and mechanical properties such as water absorption, abrasion resistance and flexural strength test were equally undertaken on the clay tiles. Indoor curing was adopted for all the clay roof tiles. Findings revealed that the Abrasion resistance result indicated that 2.5% Makuba clay roof tiles produced in this study have higher resistance to abrasion. The best result in terms of water absorption is 2.5% Makuba clay roof tile with the percentage weight gain of 1.41%. Finally, Finding also revealed that flexural strength of clay roof tiles made with 2.5% Makuba meet the average failure load of 498N as specified by BS 47390(1967.) The study therefore concluded that the performance of Makuba at 2.5% is satisfactory on clay roofing tiles products for discontinuous laying on pitched roofs.

Keywords: building materials, clay roof tiles, makuba, sawdust.

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EXPLAINING THE FACTORS' INFLUENCING YOUNG FEMALES' INTEREST IN THE CONSTRUCTION INDUSTRY USING MASLOW'S HIERARCHY OF NEEDS

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The study reported in this paper is part of a project that is aimed at increasing the interest of female high school students in construction-related careers in New Zealand. In this paper, the factors influencing career choice and causing barriers to young females pursuing a career in the construction industry were examined. Based on Maslow's hierarchy of needs theory, a literature review was carried out to discuss prevalent factors that influence a young female's interest in pursuing a career in the construction industry. This review was supported with a questionnaire survey of years 12 and 13 female students in Auckland city, New Zealand on the significance of Maslow's hierarchy of needs on their career choice. The findings showed that physiological and security needs were most influential on young females' decisions to pursue a career in the construction industry. Recommendations were made such as active collaboration amongst stakeholders and the engagement of potential young female construction professional in the process. The findings of this study contributes to the higher retention of females in the construction education sector and industry.

Keywords: career choice, construction industry, education, Maslow's hierarchy of needs, young females

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FACTORS AFFECTING THE USE OF EXPANDED POLYSTYRENE (EPS) FOR SUSTAINABLE HOUSING CONSTRUCTION IN NIGERIA

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The goal of sustainable construction has always been underpinned by producing buildings with materials that are economically, socially and environmentally efficient. Over the years, the quest to achieving such goal has driven the use of different materials such as Expanded Polystyrene (EPS). While matters on housing construction is a topical issue in Abuja in particular and Nigeria in general, efforts on alternative construction methods to the conventional have been propagated particularly in the use of sustainable construction materials especially those materials proven to foster sustainable construction in other parts of the world. As a quest to bridge such ongoing efforts, this study investigates the factors affecting the use of EPS as a sustainable construction material with particular reference to its use in housing construction. The study identified Citec Estate, Mbora as a housing project in Abuja Nigeria that used EPS. Using purposive sampling, a total of 39 questionnaires were distributed to the professionals of Citec construction limited that were involved in the construction of Citec Estate Mbora project that used EPS. The Relative Importance Index (RII) is used to Rank the factors affecting the use of EPS. Among the 9 factors of EPS studied, while the re-usability potential of EPS ranked highest, its resistance to sound ranked lowest. The study reveals that EPS is perceived to exhibit better use for hot weather resistance than cold weather resistance. This finding indicates the probable sustainability in the use of EPS primarily because Abuja is considered a temperate climate. Furthermore, findings from this study reveal that 'economic factors' ranked higher than 'functional performance factors' in using EPS as a sustainable construction material. This study informs that although the use of EPS relative to its performance to fire and sound insulation needs to be improved, EPS has potential benefits to be used as a sustainable construction material for housing construction in Nigeria and other developed countries towards achieving sustainable housing needs.

Keywords: Expanded Polystyrene (EPS) , housing, Nigeria, sustainable construction

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FACTORS CAUSING INEFFICIENCY IN INFRASTRUCTURE PROCUREMENT AND DELIVERY MANAGEMENT IN SOUTH AFRICA

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Infrastructure projects should be procured efficiently to achieve the intended outcomes and value for money. However, the research literature indicates that many infrastructure projects end up with a wide gap between the intended and actual outcomes. This problem may partly be due to inefficiency in the infrastructure procurement process and this puts value for money for a project at risk. Research is needed to develop a better understanding of the factors that contribute to inefficiency in infrastructure procurement. This study analyses factors responsible for inefficient infrastructure procurement and delivery management in South Africa using a focus group discussion method. Data was generated from 14 groups created from 81 professionals. Performance audit[2] reports on two infrastructure projects were given to the groups to analyse why the problems identified in the performance audit reports arose in the first place. The factors identified by the groups were analysed and categorised. The significant ones were funding challenges, poor governance and leadership role of the client, lack of client skills and technical capacity, and poor contract management. The findings have implications for clients, academic departments and professional bodies. The findings can inform the development of appropriate interventions to enhance capacity and resolve problem areas. The value of this paper lies in providing technical insights into the causes of inefficient infrastructure procurement and delivery management beyond the four broad factors identified in the Auditor-General's performance audit report.

Keywords: focus group discussion, infrastructure procurement, performance audit, procurement inefficiency

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[2] A performance audit is an independent audit process to evaluate the measures taken by the management of a state entity to ensure that resources were procured economically and used efficiently and effectively.

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FACTORS INFLUENCING CONSUMER PREFERENCE FOR CERAMIC SANITARY WARE IN SOUTH-WEST, NIGERIA

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Inordinate disposal of human waste is considered outdated, offensive and unacceptable in most civilized communities, because it disrupts environmental order. Different Sanitary wares products have been designed to hygienically dispose human fecal waste by separating man from disease causing filths. This paper examined the performance of Ceramic Sanitary Ware (CSW) in terms of user preference when compared with other waste management alternatives and factors influencing their choice. Questionnaires were administered to end-users of CSW to collect relevant data on the study. The data was later processed using statistical tools. Consequently, the relative importance index revealed that ease of cleaning (0.98), functionality (0.97), durability (0.97), price (0.96) and coziness (0.96) were the major factors influencing the choice of CSW by end-users in the study area.

Keywords: end-users, fecal, functionality, sanitary, toilets

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FOREIGN DIRECT INVESTMENT AND TECHNOLOGICAL ADVANCEMENT IN THE CONSTRUCTION SECTOR OF DEVELOPING COUNTRIES: A CRITICAL PERSPECTIVE

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Foreign Direct Investment (FDI) inflows are commonly used in developing countries (DCs) to 'measure' technology transfer, and consequently as an indicator for the technological advancement of economic sectors. An implied assertion being that increased FDI in a sector means an increase in foreign technology and knowledge (T&K) in that sector and in effect, technological advancement in the recipient country. An effect of this assumption is an increase in attempts by DCs to attract more FDI through incentive-laden policy reforms. While these efforts have contributed to increase in FDI, particularly in the construction sectors of DCs in Africa; there is, however, scant evidence suggesting that the rising inflows resulted in technological advancements. Thus, construction industries in many DCs continue to lag behind those of advanced countries. This paper takes as a point of departure the relationship between FDI and technological advancement. It argues that reliance on FDI to estimate 'how much' technology has been transferred and as an indicator of attendant advancement has limitations. From a critical perspective, such an assessment is inaccurate and neglects specific nuances of T&K transfer and technological advancement in the construction sector. Examining the Ghanaian construction sector as a case with coeval data, the paper unpacks the blind-spots inherent in the assessment of technological advancements that are heavily reliant on the use of FDI inflows. Insights from the paper contribute to the literature and policy regarding interrelations involving FDIs, the transfer of T&K and technological advancement in the construction sector in DCs.

Keywords: construction sector, developing country, foreign direct investment, policy, technological advancement

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FRAMEWORK FOR SUSTAINABLE INFRASTRUCTURE DEVELOPMENT IN BORDER COMMUNITIES OF AKAMKPA LOCAL GOVERNMENT AREA NIGERIA

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Many border Communities are far from city centers and obscured from the mainstream of development. This can foster environments where insecurity, criminality and certain anti-state activities thrive unabated, thereby posing a real danger to the sovereignty of the Nigerian State. Akamkpa Local Government Area in Cross River State is one of such border territories. This research studied the border communities in Akamkpa local government area to assess the contributions of government driven infrastructure intervention projects in the development of the communities. The study is aimed at evolving an appropriate strategy for integrating border communities into the mainstream of development in Nigeria. Four border villages closest to the Cameroon border with Nigeria were chosen for the study through purposive sampling. Primary source of data collection was through questionnaire survey, which was administered randomly to forty household heads in the communities studied. Analysis of data was by a combination of simple descriptive statistics and inferential statistics. The findings of the study showed that provision of basic infrastructure and services in the study area have remained grossly deficient, notwithstanding the government infrastructure intervention policy currently in place. The results of the survey further showed that the residents would like to have a say in infrastructure planning and delivery in their communities, which is presently not the case. The study concludes by proposing a strategy of community participation in a sustained regime of infrastructure and services provision by relevant agencies. This is believed to have the potential to positively impact their livelihoods, improve security and integrity of the borders, and create the right atmosphere for patriotism to thrive.

Keywords: border communities , community-driven , development strategy , livelihood , sustainable development

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IDENTIFYING BARRIERS TO TOTAL QUALITY MANAGEMENT IMPLEMENTATION IN THE CONSTRUCTION INDUSTRY USING THE DELPHI TECHNIQUE

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Total Quality Management (TQM) has been suggested in principle to improve the performance of an organization but its implementation in practical terms involves several challenges. This study therefore identifies the barriers that affect TQM implementation in the construction industry. Delphi survey technique was adopted to retrieve data for this study. The Delphi survey technique is a research technique which consist surveys conducted in two or more rounds and affords the participants in the second round with the results of the first, so that they can amend the original assessments if they want to, or stick to their earlier opinion. Based on the comprehensive analysis of the Delphi survey, the study identified twenty (20) barriers that affect TQM implementation in the construction industry. All the twenty identified barriers were considered by the experts to have reached good consensus and therefore could be considered as potential barriers to TQM implementation in the construction industry. The six most significant/ potential barriers among the twenty identified barriers in order of ranking were: lack of commitment from management, reluctance to change old management technique, lack of interest in the application of TQM, lack of efficient TQM management system, unavailable TQM policy, and limited knowledge of TQM. Hence, understanding these identified factors that are likely to impede the TQM implementation, will enable managers to develop more effective strategies for improving TQM implementation in the construction industry. It is recommended that further research should be carried out by using empirical fieldwork (questionnaire survey) to validate the finding of this study since Delphi survey technique is limited to few experts.

Keywords: barriers, construction industry, delphi technique, experts, total quality management

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IMPROVING MAINTAINABILITY OF PUBLIC BUILDINGS IN OWERRI NIGERIA

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Public buildings project the character, ideals, and philosophies of the people that own and use them. This suggests that they should be well maintained so as to last long enough to justify the huge expenditures on them, and also kept in good enough condition to sustain expected heavy usage by the public throughout their life cycle. In Owerri, Nigeria, several public buildings are at different stages of deterioration. This has implications for environmental quality, quality of life, and overall well-being of the users. This research studied public buildings in Owerri, to determine levels of defects and the challenges to maintenance. The study was aimed at underscoring the role of design in improving maintainability in public buildings in Owerri. Four categories of public buildings were studied namely educational buildings, banks, administrative offices, and public activity centres. 42 copies of structured questionnaire were administered to targeted respondents. Each building had only one respondent who was either a managerial head of the building studied, or a technical person in charge of maintaining the building. Convenience sampling was used in selecting buildings for the study. Responses were analysed using simple descriptive statistics. Findings of the study showed a high prevalence of defects in all component parts of public buildings studied. The defects were observed regardless of building function, usage, design, or construction method. It also showed lack of any clearly articulated maintenance management strategy in the buildings, which accounted for high occurrences of defects in the buildings. Deductions from the research were that public buildings in Owerri should be designed to eliminate the need for frequent maintenance as a result of failing components and defective parts, especially in the light of current unstructured maintenance management practices. The study concluded by identifying designing for durability, a concept which must commence at the preliminary stages of the design process, as the most effective way of reducing frequency of maintenance, while still keeping the aesthetic and functional appeals of the buildings.

Keywords: building design, building maintainability, building maintenance, defects, public buildings

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INDUSTRIALIZED BUILDING SYSTEMS: PROSPECTS AND PROBLEMS WITHIN THE NIGERIAN CONSTRUCTION INDUSTRY

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The growing demands for affordable housing, use of more systematic and mechanized technologies, concern for energy-efficient buildings and need to be competitive in an increasingly global market have prompted construction players to move from the traditional method of construction to Industrialized Building System (IBS). This study is aimed at highlighting the prospects and problems of IBS with a view to developing strategies for its application in Nigeria. The study examines factors inhibiting the development and application of Industrialized Building System, evaluates problems and prospects of IBS, and appraises the level of awareness of IBS in the construction environment. The data for the study was collected in Owerri, Imo State, Nigeria with the aid of a structured questionnaire which was administered to the various professionals in the built environment i.e. Architects, builders, engineers, quantity surveyors, estate valuers working in construction sites in the state. The data retrieved from the questionnaire was analyzed by means of descriptive statistics such as frequency tables, percentages and 4-point Likert scale. From the analysis, the study revealed low level application of IBS in Nigeria. It further revealed that the factors inhibiting the application of IBS in Nigeria include initial start up cost, inadequate facilities for manufacturing, adaptation to standards and government policy,. The study concludes that IBS is a paradigm shift from the traditional construction methods, and its application in Nigeria construction environment is inevitable. The study recommends that construction workforce skills need to be upgraded to be involved in IBS, more informative and awareness programs should be organized to enlighten both the private and public sectors on its benefits and government should use IBS in its projects as well as find a way to assist construction firms in the initial start up cost which is a major inhibition.

Keywords:building, construction industry, housing, sustainable development

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INFLUENCE OF ORGANIZATIONAL SUB-CULTURE ON TOTAL QUALITY MANAGEMENT PRACTICES IN NIGERIAN CONSTRUCTION FIRMS

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Construction in Nigeria is characterized by lack of adherence to standard and lack of implementation of Quality management practices. Recent study in the field of TQM shows that there is increasing recognition of the influence of organisational culture on the success or failure of TQM implementation. This paper is aimed at examining influence of organisational subculture on Total Quality Management practices in Nigerian construction firms, and establishing the culture type(s) that could be strengthened to support TQM implementation. The survey research method was used for the study. The research was carried out by administering structured questionnaires to managers and heads of departments of construction organisations in Nigeria. A total number of 659 questionnaires were administered and 418 returned giving a response rate of 63%. The research was analysed using Structural Equation Modelling Smart PLS 3. The findings of the study revealed that only the Clan subculture has significant relationships with all the TQM practices. Strengthening the Clan subculture will improve the success of TQM implementation. The study recommends that any efforts that can be made to increase the presence of Clan subculture prior to commencing the formal implementation of TQM would be highly beneficial

Key words: organisational subculture, quality, total quality management

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INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) APPLICATION ON CONSTRUCTION SUPPLY CHAIN MANAGEMENT: EVIDENCE FROM NIGERIA

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With the advent of information and communication technology (ICT) these days, construction supply chain management (CSCM) related activities can be achieved seamlessly via real-time information dissemination and sharing with a view to reducing conflicts and delays. This study therefore, sorts to examine the effects of ICT on CSCM. To achieve the purpose of this study, a quantitative research approach was adopted for the study. Based on the outcome of the literature review, some hypotheses were proposed in relation with ICT and CSCM. Data for the study were collected from practitioners within the Nigerian construction industry via a purposive/convenience sampling technique. A total of 214 questionnaires were distributed based on the Krejcie and Morgan's method, while 203 were retrieved and used for further analysis. Structural equation modeling (SEM) was used to test the hypotheses. The results of the study reveal that ICT had a significant relationship with CSCM. The constructs associated with ICT, viz; deployment of web based & other software and portals, use of internet applications and web based technologies, use of mobile devices & personal digital assistants, and integrating radio frequency & identification (RFID) technology had a significant and positive relationship with CSCM. A better implementation of ICT is the key to enhancing the successful delivery of construction projects to fruition.

Keywords: construction projects, construction supply chain management, information and communication technology, Nigeria, structural equation modelling

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INNOVATIVE ARCHITECTURE FOR FLOOD RESILIENCE: A RESPONSE TO SUBMERGED NIGERIAN CITIES

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Prolonged rainfall and overflowing river banks have made flooding a common problem in Nigeria. Recent flood events in 2018 have been described as the worst in 40years. Available records show that more than 825,000 people have been affected across the country while properties worth billions of Naira have been destroyed. Climate change has induced significant impacts on Nigeria such as aggravating urban flooding exacerbated by human activities. In addressing this challenge, a strategic approach is required to enable communities to adapt to the consequences of flooding, create sustainable environments whilst developing technological and innovative solutions. This study utilizes secondary data from the National Emergency Management Agency [NEMA], research papers and newspaper articles to unravel the anthropogenic factors that contribute to the incessant floods. Key lessons were synthesized and the evidence suggests that there is recognition of the need to take action on the impacts of climate change. Going forward, innovative adaptation solutions should be incorporated into development management plans with all efforts geared towards sustaining livelihoods and assets of people. The research takes into account some examples as a tool for the development of innovative knowledge and concludes by recommending sustainable practical suggestions that could reduce the impact of flooding in the Nigerian built environment.

Keywords: climate change, flood, innovative architecture, resilience, sustainability

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INTERPRETATION OF RISK MANAGEMENT AMONG SMALL CONSTRUCTION ENTERPRISES

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The purpose of this study is to identify the perceptions of risk among small enterprises in the construction sector and explore the possibilities of using artificial intelligence (AI) as an enabler for improving their risk management practice. This paper is a theoretical study. A systematic literature search and an integrated purposive sampling approach were applied to review the relevant literature. The methodology aimed at identifying the level of awareness and competencies for traditional risk management among small enterprises, and their willingness to adopt related technologies as a way to improve their current practices. The focus was narrowed down to risk handling challenges for small enterprises, with a particular focus on business risks, and the concept of artificial intelligence in risk management. The significant limitation of the study is its theoretical nature at this stage. Findings from the review of extant literature demonstrate that small enterprises do not have a strategic way of handling their risks. They struggle with ranking risks that affect their business, thereby failing to mitigate such risks holistically. Nonetheless, the use of AI in business risk planning presents a possible solution to small enterprises. The paramount advantage of AI is the capacity for precision and the enablement for saving costs and time. Implications of findings include the need to establish the benefits of AI in risk management and decision making within the construction context, and to determine effective AI technologies that can be used by such enterprises to develop systematic risk management frameworks that are reliable. The study forms a basis for understanding current risk management practices of small enterprises, and the possibilities for improvements. This study is at its early stage of a more extensive research project and will be used as the foundation for empirical studies.

Keywords: artificial intelligence, business risks, risk management, risk perception, systematic risk management

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KNOWLEDGE AND AWARENESS ON PLASTIC SOLID WASTE (PSW) MANAGEMENT IN ZAMBIA: WHERE ARE WE?

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A number of stakeholders are involved in managing Solid Waste (SW) and the role of each stakeholder in Waste Management (WM) is important. However, achievement of Education for Sustainable Developments (ESD) requires imparting knowledge on WM issues to the stakeholders. In developing economies of Southern Africa, a number of goals for sustainable development have been adopted in order to combat a number of SW related issues. Nevertheless, WM challenges are still evident in most of these economies. A study was conducted in Ndola City, Zambia on the current state of Plastic Solid Wastes (PSWs) management. The purpose of the study included assessing the level of awareness and knowledge on PSWs. A survey of 445 households in the urbans of Ndola City was conducted. The results of the survey indicate that, 36.1% of the respondents have obtained college education. Further, the results on knowledge on PSWs recycling indicate that, 70.6% of the respondents are knowledgeable. Despite 70.6% of respondents being knowledgeable and aware about PSWs recycling, only 19.7% of the respondents participate in community PSWs recycling programs. Further only 19.8% of the respondents learnt about PSWs recycling in primary schools. The results from this survey provide relevant information to waste managers, educators and practitioners on the current state of knowledge on ESD in developing economies. The novel contribution of the study is that, there is urgent need for society to be educated on the relevance of recycling for sustainable development. People from whole walks of life should understand the importance of recycling processes especially in industries that utilize non-renewable resources. Further, strategies other than the provision of knowledge and awareness should be investigated in the contextually to promote optimal participation of citizens in recycling programmes.

Keywords: awareness, education, knowledge, sustainable development, plastic solid waste, management

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LOCAL CONSTRUCTION COMPANIES' CAPACITY BUILDING THROUGH FOREIGN COMPANIES' STRATEGIC PARTNERSHIP

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How the local construction companies in Africa can better manage the challenges they face through strategic partnerships with the foreign construction companies has been under-researched, both empirically and theoretically. Premised on the increasing presence of foreign construction firms in most African countries, this study investigated different approaches of strategic partnership for capacity building of the local construction firms by their foreign counterparts. Using Nigeria as a case study due to its sheer market size, an integrative literature review was used to identify 23 challenges facing local construction firms. 88 registered local client- and consultant-based construction professionals (85% response rate) participated in the cross-sectional survey using a web-based semi-structured questionnaire. Data were descriptively- and content-analysed. Results showed corruption, delayed payment, political instability, research and development, market forces/inflation, and modern innovation as challenges in the 25th percentile. The approaches most frequently recommended for the strategic partnerships centred around training and funding opportunities, laws and regulations for competition and technology transfer, and investments in research and development. This study concluded by flagging the potential downside of focusing on top-ranked challenges because of the systems nature of construction projects, hence the interconnectedness of the challenges. More so, in view of the inevitable broad thinking that characterises and distinguishes a strategic fit from a mere strategy.

Keywords: capacity building, challenges, Nigeria, strategic partnership, pragmatism

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MAKING A CASE FOR MODULAR INTEGRATED CONSTRUCTION IN WEST AFRICA: RETHINKING OF HOUSING SUPPLY IN GHANA

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Concomitant with the rapid population growth in West Africa is the increasing difficulty in providing adequate housing for the masses. As housing constitutes the most expensive individualized basic human need, the gap between incomes and rents for homeless households have created housing hardship of epic proportions. Meanwhile, there is housing glut in Ghana amid the deficit. These indicate that a practical solution must offer a quadruplet benefit of speed, quality, affordability and economy in the housing production. This research examined the failures of previous industrialized housing initiatives in Ghana and highlighted the prevailing opportunities and potential barriers to the delivery of industrialized housing systems (IHS) in Ghana. Methodologically, the paper draws on a review of policy and academic literature to establish strong support for the adoption of modular integrated construction (MiC) to deliver affordable IHS in Ghana. Despite the failures of industrialized housing production initiatives in the 50s and 70s, the research found that opportunities such as improved infrastructure and manufacturing power, existence of prefabricated construction market, government recognition of innovative housing projects in Ghana and the availability of wealth of experiences, lessons and MiC best practices are favorable conditions which render MiC and industrialized housing construction (IHC) feasible in Ghana. The research used two case studies to justify the feasibility of MiC and IHC in Ghana. However, the lack of substantial experience with MiC, failure of previous IHS initiatives, absence of MiC implementation framework, lack of MiC technical guidance, design codes and standards, higher initial capital cost, and the incomplete MiC supply chain are potential barriers to the adoption of MiC in Ghana. A multi-stakeholder framework is proposed to guide the implementation of MiC in Ghana. Thus, this research contributes to the praxis and practice of the affordable housing discourse in Ghana and West Africa.

Keywords: Ghana, housing deficit, modular integrated construction

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OVEREXERTION-RELATED CONSTRUCTION WORKERS' ACTIVITY RECOGNITION AND ERGONOMIC RISK ASSESSMENT BASED ON WEARABLE INSOLE PRESSURE SYSTEM

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Work related activities that led to overexertion are a major cause of work-related musculoskeletal disorders (WMSDs) among construction workers. However, existing risk assessment methods (e.g., self-reported and observational-based methods) have failed to fully recognize these activities and assess the corresponding risk level exposure to mitigate WMSDs. This study examines the feasibility of using acceleration and foot plantar pressure distribution data captured by a wearable insole pressure system for automated assessment of construction workers' activities and overexertion risk levels. The accuracy of five types of supervised machine learning classifiers was evaluated with different window sizes to investigate individual participant performance and further estimate physical intensity, activity duration and frequency information. The results showed that the Random Forest classifier with 2.56s window size achieved the best classification accuracy of 94.5% and 94.3% and a sensitivity of more than 90.1% and 88.4% for each category of activities. Overall, the proposed approach provides a non-invasive method and objective assessment of ergonomic risk level based on acceleration and foot plantar pressure distribution data captured by a wearable insole pressure system which could help other researchers and safety managers to: understand the level of workers' risks; and provide an effective intervention to mitigate the risk of developing WMSDs among construction workers.

Keywords: activity recognition; construction workers; overexertion risk; supervised machine learning classifiers; wearable insole pressure system; work-related musculoskeletal disorders

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PERFORMANCE BENCHMARKING SYSTEM FOR THE NIGERIAN CONSTRUCTION INDUSTRY

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Nigerian Construction Industry is large and plays a major role in the economic growth of the country's economy. Decision makers in the industry are always making efforts to ensure there is improved quality in the activities of the industry such as strategic planning, marketing, restructuring, financial management etc. Benchmarking as a viable instrument for making and also maintaining competitive advantage became popular among stakeholders and participants due to the growing competition in the construction industry. The objective of this research study was to understudy the implementation of performance indicators for construction industries for developed and developing countries with a view to giving an insight to the formation of a performance benchmarking system for the NCI. This research work reviewed benchmarking initiative scopes while identifying the benefits derived from its implementation and areas of improvement. The selected construction industries reviewed are Brazil, Chile, South Africa, USA and UK. From the reviewed literatures, it is clear that the NCI need to benchmark performance. The study concluded by highlighting that a clear understanding of performance which needs to be improved and why it should be improved must be established while the lessons learnt from these systems should be used in formulating the appropriate performance benchmarking system for the NCI.

Keywords: benchmarking, business competition, construction industry, performance indicators

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PREMATURE PROJECT CLOSURE: THE ROLE OF CONSULTANTS AND CONTRACTORS

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All projects regardless of complexity, have a documented start and end date. However, some projects may close prematurely because the predefined construction performance parameters cannot be achieved within the defined schedule. Construction projects can close prematurely as a result of negligence by one or more project stakeholders. The study, therefore, examines the part played by contractors and consultants that leads to premature project closure. In conducting this research, primary data was collected through a questionnaire survey of the construction consultants and contractors within Gauteng Province of South Africa. Collected data were analysed by ranking the examined factors using their mean item scores. Findings from the study revealed that inefficient management, improper planning and an incoherent relationship between various consultants, subcontractors and main contractor are the major factors that trigger premature project closure. It was therefore concluded that construction projects must be meticulously planned and proficiently managed by competent professionals in order to reduce and ultimately eliminate the risk of closing the project prematurely.

Keywords: construction consultants, construction contractors, construction projects, premature project closure; project life cycle

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PRICING OF PROPERTY VALUATION SERVICES IN NIGERIA: AN EVALUATION

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The pricing of professional service has been identified as one of the factors influencing the quality of service from professionals and clients' willingness to pay. However, the issue of service pricing is hardly seen as an object of discourse in real estate literature, especially among valuation studies, as it is obtainable in other fields. This study, therefore, examines how valuation services are being priced within the Lagos property market and the effect it has on the delivery of valuation services. This study assumes an interpretism paradigm by adopting a qualitative research approach. In-depth semi-structured interviews were conducted with 24 Estate Surveyors and Valuers (ESVs) practising in Lagos. Data collected were analysed using thematic analysis with the aid of Nvivo 12 software. This study finds that the pricing system for valuation services in the study area can broadly be categorised under 'negotiation' and 'fixed rate' systems while the use of the 'professional scale of charges' is more or less non-existent. The study also reveals the various forms by which these systems are practised, and issues associated with them as well as the effects they have on valuation practice. The results further reveal the factors responsible for the continuous striving of the present pricing system which include valuers' inability to enforce the professional scale, competition in the market, buyers' market syndrome, the game of numbers being played by banks, and banks' strategy to protect their customers. The study also finds that the low pricing of valuation service poses challenges to valuation practice and encourages unprofessional conduct that affects the quality of valuation output. This study serves as the research blueprint in giving research attention to the service pricing in property valuation practice.

Keywords: pricing, professionals, services, valuation, valuer

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PRIORITIZATION ASSESSMENT OF HOUSING DEVELOPMENT RISK FACTORS: A FUZZY ANALYTIC HIERARCHICAL PROCESS-BASED APPROACH

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The construction industry and housing subsector are fraught with risks that have the potential of negatively impacting on the achievement of project objectives. Political and legal risks, social risks, technical risks, financial risks and other similar risks inhibit housing development projects. The success or otherwise of most construction projects depends to large extent on how well these risks have been managed. The recent paradigm shift by the subsector to use of formal risk management approach in contrast to hitherto developed rules of thumb means that risks must not only be identified but also properly assessed and responded to in a systematic manner. The research aim at identifying and assessing risks associated with housing development projects with a view to prioritising the identified risks to provide basis for informed decision. The study used a three-step identification framework: review of literature for similar projects, expert consultation and questionnaire based survey to identify potential risk factors. Delphi survey method was employed in carrying out the relative prioritization assessment of the risks factors using computer-based Analytical Hierarchical Process (AHP) software. The results show that 19 out of the 50 risks factors significantly impact on housing development projects. The study concludes that although significant numbers of risk factors have been identified as having relevance and impacting to housing construction projects, economic risk group and, in particular, 'changes in demand for houses' is prioritised by most developers as posing threat to the achievement of their housing development objectives. Unless these risks are carefully managed their effects would continue to impede success in these projects. The study recommends the adoption and use of the combination of multi-technique identification framework and AHP prioritization assessment methodology as a suitable model for the assessment of risks in housing development projects.

Keywords: analytical hierarchical process, multi-criteria decision, risk assessment, risk identification

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QUALITY CONTROL IN ABUJA MASS HOUSING

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Houses constructed under the Abuja Mass Housing Scheme are faced with challenges of non adherence to quality which result in the defects of houses built under the programme. The study evaluated the common defects in 108 housing units by the administration of structured questionnaires and semi structured interviews. The questionnaires and interviews set up were based on the categorisations of defects adopted from Project Management Tool Kits 2008 for measurement of defects in buildings. The data obtained from the semi-structured interviews were transcribed and content analysis was used to determine the themes and constructs leading to the identification of various types of defects. Furthermore, the data obtained from the structured questionnaires were analysed using mean ranking analysis of factors associated with the causes of the various defects in the estates. The results and data generated were transcribed. The analysis and key findings indicated that the common defects in the housing included cracks and plaster failures occurring in all the houses studied. Further defects were observed were electrical fittings malfunctions; irregular water supply and leakages of connecting pipes in over 50% of the facilities. The study also indicated that there were no quality control supervisions on the project. The contractors who were engaged for the projects lacked experiences in construction works. The study thus, concluded that the defective works of the mass housing projects were as a result of lack Quality Management (QM) on the project. It is recommended that quality control operational techniques should be adopted for use in control and measurement of the quality of materials and workmanship for quality mass housing production.

Key words: Abuja mass housing, common defects , quality control

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QUANTITY SURVEYING EDUCATION FOR SUSTAINABLE DEVELOPMENT: INDUSTRY PERCEPTION

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Research has shown that a lacuna exists between the industry and tertiary educational institutions in terms of acquired competencies by Quantity Surveying graduates. It has also been found that there exists an absence of policy moderating the competency threshold for Quantity surveying graduates. Due to the aforementioned, employers of labor have overtime been left unsatisfied with the competency exhibited by graduates. This gap has not really been explored by researchers, thus the expectation of the industry is relatively undocumented. This study, therefore, is aimed primarily at bridging the gap by determining the industry expectations of Quantity surveying graduates and the competence acquired by the graduates. Thus the study is from the employers' perspective. It employed quantitative method of data gathering. Questionnaires were administered. Over 100 structured questionnaires were distributed through online platforms and 34 were returned with 33 fit for analysis and 1 was unfit for analysis. Therefore, a total of 33 questionnaires were analyzed. 17 number of competencies were highlighted as the competencies expected of QS graduates by employers. Analysis through SPSS was applied for the quantitative data. The study established the top ten preferred competencies by employers as trustworthiness, effective communication, team player, knowledge of construction technology, meticulousness, creative thinking, problem-solving, positive attitude, valuation of work done, and information literacy skills. It is evident that soft skills are preferred over professional competencies. The study concluded that for sustainable development to be a reality, the current curriculum must be revised to be competence driven and industry dynamism oriented.

Keywords: graduate competency, industry competency dynamics, sustainable development

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REAL ESTATE INVESTMENT TRUSTS IN NIGERIA AND THE STRUCTURE-CONDUCT-PERFORMANCE PARADIGM

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This study examined the correlations among the structure, conduct and performance of Real Estate Investment Trusts in Nigeria (N-REITs) with a view to providing information that will enhance and guide real estate investment decisions. The study population consisted of all the three REIT companies in Nigeria namely: Skye Shelter Fund, Union Home REITs and UACN Property Development Company (UPDC) REITs. Secondary data on dividends and share prices of N-REITs; Total Business Revenues (TBR) and Total Individual Expenditure (TIE) on conduct variables were sourced from periodicals of the respective companies covering the period from 2008 to 2016. The data series for the study were analyzed by means of the Granger Causality tests, Kwiatkowski-Phillips-Schimidt-Shin (KPSS) unit root tests, Philip-Perron (PP) unit root tests and the ordinary least square regression (OLS). The study showed a Herfindahl Hischman Index (HHI) that ranged between 41.81% (recorded in 2010) and 100% recorded in 2008. This suggested a high concentration in the N-REITs industry. Similarly, the study found that the returns on investment in the industry ranged between -0.24% and 22.07%. The Granger Causality Test conducted revealed a bi-directional causal relationship among the structure, conduct and performance of N-REITs. The study provided essential information for stakeholders in the real estate sector regarding the influence of structure and conduct on the performance of N-REITs. This information will be valuable for equipping asset managers, insurance companies, pension funds as well as individual real estate investors in making informed investment decisions. This study is unique as it is the first to draw a link between the structure, conduct and performance of REITs in an African emerging real estate market which was hitherto not considered in previous studies.

Keywords: conduct, investment performance, real estate, returns, market structure, property

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RETHINKING THE CHALLENGES TO ATTAINING SUSTAINABLE CITIES AND COMMUNITIES: LESSONS FROM SOCIAL NORMS AND STATUS QUO BIAS

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There is widespread agreement among building construction stakeholders about the need to reduce the negative environmental impact of construction activities. Globally, a wide range of policies has been instituted by governments to encourage the adoption of sustainable (green) technologies and practices to help in the attainment of sustainable cities and communities. However, building construction stakeholders are unwilling to adopt it. Several studies continue to proffer that the reasons behind this unwillingness are lack of knowledge and awareness, lack of regulations and codes, lack of financial incentives, high upfront cost amongst others. On the other hand, this paper takes a Behavioural Economics perspective to explain why there is a misalignment between the high-level consensus for the attainment of sustainable cities and communities, and the willingness of building construction stakeholders to adopt the sustainable (green) technologies and practices which can help in the attainment of this goal. The paper sought to identify the 'elements' that can impact building construction stakeholders' decision-making and bring about the tendency for them to prefer non-adoption to adoption. It was found that two elements, social norms and status quo bias, can impact building construction stakeholder's decision-making, and thus, two propositions were put forward. The aim of this paper was accomplished through a literature review. For policy-making, by explaining how social norms and status quo bias impact building construction stakeholders' decision-making in the context of green construction adoption, we make a case for the need to supplement existing policy mechanisms to make them more effective or employ more innovative policy tools. Theoretically, this paper provides a basis for welcoming the Behavioural Economics perspective into Construction Management research. In terms of further studies, there is the need for empirical investigations to be carried out to support, refute or modify the findings of this paper. Also, further research can be undertaken along the Behavioural Economics perspective to find the factors taken into account in the decision-making.

Keywords: barriers, behavioural economics, decision-making, green construction, sustainable construction, sustainable development

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SIZE AND ADEQUACY OF LIVING SPACE IN THE HOME: AN EVALUATION OF PUBLIC APARTMENTS IN CAPE COAST, GHANA, BASED ON SPACE PER PERSON (SPP)

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The size and adequacy of space in the home affects the quality of life of occupants in many important ways - physically, psychologically, socially and economically. But how much space is adequate, and on what basis may this be established? In view of the limitations of traditional overcrowding measures such as number of bedroom standard and room density, the UN now recommends the use of Space Per Person (SPP). Using the case of six designs in Cape Coast, this study evaluates the size and adequacy of living space in public apartments in Ghana, based on SPP. First, ISO 9836 – 2011 (E) intra-muros method of measurement is used to measure the useful floor areas of the apartment design obtained from the Architectural Engineering Services Limited (AESL). Structured interviews were then conducted with 115 households to obtain information about the household size. The mean dwelling sizes were then divided by the mean household size to obtain the SPP values. Compared with the provisions in the National Building Regulations as well as recommendations in other international standards used for architectural practice in Ghana, the study found that the size of rooms/spaces and the dwelling unit as a whole were generous. However, the SPP values were small due to the large household sizes. The study demonstrated and concluded that SPP is a more useful and robust measure for determining the adequacy of living space. This is because it is sensitive and responsive to the practical need of space for use in the home (that is for living and household activities) in different context against the backdrop of household size as a socio-cultural concept. This makes SPP useful in defining (in theory) and determining (in practice) the actual amount of space needed in the home in different social and cultural contexts.

Keywords: activities, adequacy of space, household size, space per person, space size.

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STRATEGIES FOR ENHANCING EXTENDED PRODUCER RESPONSIBILITY ENFORCEMENT: A REVIEW

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Packaging Wastes (PWs) management is a global environmental challenge especially in cities of developing economies. Globally, it is a growing and critical waste stream. In order to achieve sustainable recovery rates in this waste stream, strategies such as source separation schemes should be adopted with the consideration of other techniques. In developed economies, a number of strategies to sustainably manage PWs have been successfully implemented. One of the strategies is the implementation and enforcement of Extended Producer Responsibility (EPR) on the manufacturers and distributors of packaging products. The purpose of this study was to assess the EPR schemes enforced in developed economies for proposal to developing economies. The study focused on developed economies in order to identify the key strategies that have enhanced the application of EPR schemes on the manufacturers and distributors. A total of twenty (20) studies that have focused on the subject were reviewed. The study reveals some key strategies that enhance EPR schemes enforcement and these include; systems approach; information and awareness; monitoring systems and definition of the roles of the stakeholders. The study has highlighted a number of factors and strategies that can impact the enforcement of EPR schemes in developing economies. These factors and strategies are key to policy makers, manufacturers and waste managers in the different packaging industries globally.

Keywords: extended producer responsibility, packaging wastes, policy, recovery, sustainability

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STRENGTH PROPERTIES OF LOCALLY PRODUCED REACTIVE POWDER CONCRETE WITH UNREFINED METEKAOLIN

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With the soaring need to use innovative and sustainable materials in the construction industry, a new concrete known as Reactive Powder Concrete (RPC) is currently a material of significant interest globally. The concrete constitutes cement, silica fume, fine sand, quart sand and fibre as its ingredients. However, silica fume and fibre are relatively expensive in Nigeria due to their non-availability. This paper examines the effects of unrefined Metakaolin (MK) as substitute to silica fume and Gear Inner Wire (GIW) as fibre on the properties of RPC. RPC specimens produced with up to 30% MK by weight of cement, and a constant GIW content of 0.25% by weight of concrete were subjected to compressive strength, tensile strength and flexural strength tests. Similarly, RPC produced with 20% silica fume as reference was tested. The results show that 20% MK is the optimum content to produce RPC with the compressive, tensile and flexural strengths values of 64.5N/mm^2, 4.7 N/mm^2 and 18.7 N/mm^2, respectively. These strength values are comparable with that of the reference. Therefore, Nigerian unrefined MK and GIW can be used as ingredients for the production RPC.

Keywords: gear inner wire, reactive powder concrete, strength, unrefined metakaolin

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STUDENT HOUSING REQUIREMENTS IN NEAR CAMPUS NEIGHBOURHOODS: A CASE STUDY OF SAMARU ZARIA, KADUNA STATE, NIGERIA

Angela Chinonso Awua-Imande[1], Joy Joshua Maina[2] and Musa Lawal Sagada[3]

Studies on the relationship between students' influx into near-campus neighbourhoods had focused on the negative impacts of studentification on the neighbourhoods, established residents and conversion of single-family housing into houses for multiple occupancy (HMO). But there has been limited understanding on the housing preference of students in near-campus neighbourhoods or how best to absorb the student population in these neighbourhoods. To this end the study attempts to highlight the housing needs of students in Samaru near-campus neighbourhoods (North-West Nigeria) using the Student Accommodation Preference Index (SAPI) instrument also considering neighbourhood attributes that would affect their housing needs. A questionnaire survey was used as means of data collection. 118 questionnaires were distributed and 109 were retrieved and analysed using SPSS V.21. results are presented in form of means (M), Relative Agreement Index (RAI) and Percentages. A reliability test was done to test the viability of the instrument for the study which was found to be reliable. Results show that the housing need of students were private room, bath, small fridge, kitchen, laundry, dry area, fire protection system, gated house, common room and waiting area. It also showed that provision of Automated Teller Machine (ATM) points, hospital, places of worship, recreation areas and bus park amongst others will improve quality of life of students within near-campus neighbourhoods. The findings are pertinent to design professionals, architects, planning authorities and developers as it gives insights on the housing needs of students which is helpful for effective planning and zoning of student housing within near-campus neighbourhoods.

Keywords: near-campus neighbourhoods, student housing preference, studentification

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STUDENTS' PERCEPTION ON THE QUALITY OF TEACHING OF ARCHITECTURE IN SOUTH-EAST NIGERIA

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The past decade has witnessed a decline in the quality of graduates from architecture schools in Nigeria in terms of knowledge and skills in architectural design and project execution on site. This notion supports the need to evaluate the distinctiveness of design education in these schools. This paper is a study carried out with the aim of determining students' perception on the quality of teaching of integrated architectural design considering the following assessment factors; learning experience, assessment of learning, curriculum content and lecturer quality of architecture schools in south-east Nigeria. The objectives include; to ascertain the specific assessment factors that students consider most important in the quality rating of lecture delivery of integrated architectural design and to determine if the overall teaching quality rating of students is dependent on the lecturer's gender. A set of questionnaires (totalling 120 copies) were evenly distributed to sort for information in the schools studied. The Cronbach's Alpha, used to determine the reliability of the sample size, revealed that the sample size is reliable and adequate. The Mean and Variance statistic were used in the test while Chi-square test of independence and ANOVA were carried out on objective two. The results show that the students perceive the relevance of their learning experience (exhibited in the lecturer's dedication, confidence, punctuality and knowledge of the course content) highly with a mean score of 4.08 in developing skills, knowledge and experience as the most important factor in their learning of integrated architectural design, closely followed by the curriculum content with a mean score of 4.04. The values obtained shows that the overall teaching quality rating by students is independent on the lecturer's gender. The study recommends that students' evaluation of teaching quality should be considered for the annual performance appraisal of lecturers' promotion so as to improve the quality of teaching in architecture schools. It further suggests that there is the need to review the curriculum and encourage continuous professional development (CPD) in order to make necessary changes to ensure quality delivery of the integrated design module.

Keywords: architecture, assessment factors, gender, quality of teaching, students' perception

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STUDY ON INFLUENCE OF DIFFERENT CURING REGIMES ON THE MECHANICAL PROPERTIES OF METAKAOLIN BASED GEOPOLYMER CONCRETE

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Concrete is one of the most widely used construction materials in the world. The major constituent material for production of concrete is cement. But, production of cement consumes natural materials which leads to environmental concerns in terms of high energy consumption and carbon dioxide (CO_2) emission this has brought about pressures for utilization of supplementary materials to substitute Portland cement in concrete production. An activating geopolymer can be utilized with an alkaline activator to produce concrete. However, curing regimes and the percentage contents of alkaline solutions have been reported to play very important roles in determining the strength properties of geopolymer concrete made from materials such as metakaolin. Therefore this research work is aimed at investigating the influence of different curing regimes with a view to establishing a suitable curing temperature for the production of Metakaolin Geopolymer Concrete (MKGPC). Metakaolin combined with an alkaline solution were used to form geopolymer paste instead of cement paste to bind the aggregates. A mix design was made for grade 25 MKGPC. The specimens of MKGPC were cast by using 8, 12 and 16 Molars of alkaline solutions and cured at ambient temperature, and also at 50°C, 70°C, 90°C, and 110°C for 24 hours by using hot oven. The specimens were used to test for compressive strength at the end of crushing periods of 3, 7 and 28 days, and also water absorption test was conducted at 28 days. The results of the research revealed that MKGPC specimens made with 12 M and cured at 70°C temperature has the highest compressive strength values as compared with 8 and 16 M cured at ambient temperature, and also at 50°C, 90°C, and 110°C. It is concluded that the best molarity and cure regime for the production of MKGPC using Argungu Kaolin deposits are 12 molarity and 70°C curing temperature. Thus, the study recommends the use of kaolin deposits from Argungu Local Government of Kebbi state, Nigeria for the production of MKGPC.

Keywords: alkaline activator, cement, curing regimes, geopolymer, metakaolin

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SUSTAINABLE BUILDING PRACTICE: AN ASSESSMENT TOOL FOR GHANA

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The emergence of sustainable building practices has promoted the development of sustainable building assessment tools. The study aims at analyzing the existing sustainable assessment tools and develop one for the Ghanaian construction industry. It also seeks to assess sustainability policies and challenges for effective delivering of sustainable buildings in Ghana. Data was collected from 146 construction professionals with questionnaire and interview guide. The questionnaire consisted of both closed-ended (with 4-point Likert scale) and opened-ended questions. The study revealed that policies backing sustainable building construction in Ghana are inadequate. The key challenges identified with sustainable buildings include: high initial and operational cost, lack of government support and financial incentives, lack of certification, inadequate skill training, and minimal commitment level and research. The study further revealed that the rating tool most used in Ghana is the Green Star Eco Homes which was adopted from Green Star Australia (GS A-v1) and South Africa (GS SA-v1). On the functions of assessment tools use in Ghana, it was observed that the rated tool needs to be updated or changed, the rating tool for office and commercial buildings should be different from that of a residential facility, and the tool should be modified to reflect conditions in Ghana. "Green Rating & Measurement System for Ghana (GRMSG)" was developed and proposed to be employed for use in Ghana, which comprises of 9 main categories, 40 criteria, 150 total accrued points, and 4 certification levels (Bronze, Silver, Gold and Diamond). The study therefore, concludes that policies on sustainable construction practices in Ghana are insufficient, there are key challenges that government need to address and the rating tool used should be modified to reflect conditions in Ghana. Ghana Green Building Council (GHGBC) should consider the adoption of GAMS for assessing and certifying green buildings in Ghana.

Keywords: Ghanaian construction industry, green rating tools, sustainable assessment tools, sustainable building practices, sustainability policies

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SUSTAINABLE MATERIALS AND ROLE OF PROFESSIONALS IN BUILT ENVIRONMENT SUSTAINABILITY

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Environmental sustainability challenges in maintaining a balance between 'greening' and environmentalism is fast becoming a major feature of modern building designs. Materials and other human factors that contribute to global warming are now being given the much needed attention in achieving environmental sustainability, in consonance with construction related sustainable development goals (SDGs). Material can be said to be a matter which may be shaped or manipulated in production or otherwise, particularly in the built environment. In recent times, sustainable Materials covers the sourcing, processing and characterization. It also deals with building materials in relation to ecosystem, the implications of materials choice at the design stage and, sometimes, the impact of materials on building users and their sustainability. Metals; Ceramics and Polymers; and the Alloys and Composites of these materials are the three categories discussed in this paper. The paper presented an overview of issues associated with the role of professionals in the selection of materials for sustainable construction. The strengths of Leadership in Engineering and Environmental Design (LEED), Excellence in Design for Greater Efficiencies (EDGE) and Building Information Modelling (BIM) in direct relation to innovative application of material, especially in the built environment were also reviewed.

Keywords: BIM, EDGE, ""green buildings"", LEED, polyvinyl, sustainability

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SUSTAINABLE SOLID WASTE MANAGEMENT IN NIGERIA: REVIEWING THE CONTRIBUTIONS OF SOCIAL NETWORKS IN INFORMAL SOLID WASTE COLLECTION ACTIVITIES

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Literature suggests that social networks in informal solid waste collection activities is making contributions to the challenge of municipal solid waste management in many developing countries. In spite of this, they do not seem to engage the attention of city authorities in Nigeria. Embracing it requires understanding whether this general trend applies to Nigeria. Currently, there is paucity of data and information on social networks in informal solid waste collection activities in Nigerian cities where urban solid waste management challenges persist amid high rates of population growth and urbanization. Annual urban population growth rate in Nigerian cities are estimated at 5.5% while projections suggest that urbanization level will reach 65% by 2020. This entails greater challenges in solid waste management amid acute financial limitations. This paper examined the contributions of social networks in informal solid waste collection activity in Makurdi and Lafia cities, North Central Nigeria. Survey research design was adopted, relying on primary and secondary sources of data. Stratified, purposive and random sampling methods were used to select the sample. Data was collected from 770 waste collectors using the questionnaire while interviews were conducted each with the chairmen of waste dealers association for Makurdi and Lafia. Similarly key informant interviews were also carried out on the heads of waste management agencies in Makurdi and Lafia cities. Data collected using the questionnaire were coded and entered into Statistical Package for the Social Sciences (SPSS) Computer Software to generate the Percentages and Means for analysis while excerpts of the interviews used content analysis to descriptively analyse the data. Findings indicated that the networks and their activities collect an average of 79.75kg of recyclables per day and that significant difference occurs in the mean weight collected between Makurdi and Lafia using 0.05 alpha values. Social connections sustaining the activity include personal ties with households ($\bar{x}$ = 3.87), private business institutions ($\bar{x}$ = 3.78) and the role played by waste dealers associations in giving security tips and providing financial assistance to members. The study concludes that although social networks in informal solid waste collection activity is contributing to solid waste management in the study area; it has not been engaged by formal authorities. The network and their activities call for inclusive planning decisions and policies to foster their contribution to solid waste management.

Keywords: social network, informal solid waste collection, solid waste management, urbanization, sustainability, urban governance

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SUSTAINABLE URBAN DEVELOPMENT AND THE CHALLENGES OF URBAN SPRAWL IN 'ABUJA' THE FEDERAL CAPITAL CITY OF NIGERIA

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The urbanization process in Africa and particularly in Nigeria has resulted in urban sprawl with attendant effects in socio-economic dimensions and environmental degradation. Such effects as loss in biodiversity, decrease in vegetation productivity, uncoordinated waste disposal, generation of heat islands, environmental pollution; and asocial menace are common leading to some socio-physical, mental and health concerns. Undoubtedly, the phenomenon of urban sprawl is having inauspicious effects in city development in Africa; and it is a complex pattern of land use, transportation, and social and economic development due to the rapid expansion of metropolitan areas. However, a sustainable city development process is driven by social, economic and environmental factors in a manner that does not harm or damage the environment, nor exhaust resources utilization for the present and future generations to thrive. To achieve this goal, the city will need to continue its process of transformation, encouraging economic and social regeneration through the new development of opportunities and environmental enhancement. In view of this, this study is undertaken with the aim of seeking ways of accomplishing sustainable urban development in African cities, Abuja in particular. The objective is to examine the current urban sprawling effects on Abuja capital city using textual analyses of the Federal Capital Development Authority's planning/development reports and extant research reports; and thereafter proffer sustainable approaches to its urban planning and development schemes. This is geared towards reducing the liable effects of sprawling such as air pollution, urban heat, automobile-related morbidity and mortality; and encouraging physical activity and promoting mental health and a sense of communal dwelling in the suburbs of the newly growing capital city of Nigeria.

Keywords: Abuja, development, environment, Nigeria, sustainability, urbanization, urban sprawl

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SUSTAINABLE URBAN GREEN INFRASTRUCTURES AS A REMEDIATION TOOL FOR ENHANCED ENVIRONMENT AND LOCAL AIR QUALITY FOR METROPOLITAN LAGOS

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Adopting a new paradigm in the urban planning process helps to create a resilient metropolitan city and functional urban open spaces. Lagos State Government is worried about the increasing volume of greenhouse gases emission in the metropolis, hence there is need to remedy the degrading settlements. Mitigation measures traceable to over reliance on hydrocarbon based facilities and equipment call for the redevelopment of the green corridors and wetlands. These green corridors are the existing thin strip of land within Lagos Mainland which are habitats for few wildlife and biodiversity. They include wetlands and canal routes which fall within the setbacks of Agidingbi, Opebi, Oregun, Maryland, Yaba and Iwaya rivers flood plain with a distance of about 17km. Urban development in the past has not articulated these sustainable components in the environmental design but this paper is guided by the use of afforestation and urban greening solutions. The study examine and identified the various land-uses existing in the study area with a view to evaluating their level of compliant to the Global Climate Change policies that addresses low carbon emissions through eco-friendly green infrastructures that enhances the environmental air quality for a more sustainable Lagos City. The study is underpinned by the ecological urbanism dictum. Following the qualitative and descriptive analysis of the on-site data collection, observations and evaluations, the developmental and adaptive strategies were mapped out through GIS based network mapping. The land use data were obtained from various analysis conducted by the use of Geographic Information Systems (GIS), used to take twenty six (26) Points at about 500m intervals along the green corridors and wetlands. The socioeconomic information and details were gotten through various observations, interviews and personal deductions. The wellbeing of a city cannot be separated from the wellbeing of its environment therefore the study recognised the role of a healthy ecosystem and a reduced reliance on fossil fuel, increased green open spaces, restoration of habitats, water and air purity. The study proposed carbon sequestration through restoration, conservation of existing wetlands and other strategic adaptive solutions toward a sustainable and resilient city development in the form of; urban green infrastructures, non-motorized transportation mode, urban agriculture along the wetlands, restoration of the wetlands and water ways, conservation and inclusive landscape regeneration of the open spaces and concludes by stressing the reality of sustainable low carbon philosophy within the landscape and built environment pedagogy.

Keywords: climate change; greenhouse gases; green corridors; landscape regeneration; urban green infrastructures

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TENANT'S DEMAND FOR STRUCTURAL ATTRIBUTES IN RESIDENTIAL PROPERTIES: THE CASE OF EDE, NIGERIA

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Structural attributes such as number and size of living rooms, bedrooms, toilet/ bathrooms and type of floor finishes have been identified as some of the factors that influence household's decisions when buying or renting a residential property. This study analysed the structural attributes of five categories of residential property in Ede, Nigeria with a view to providing information that will encourage investors to consider structural improvement that will enhance rental values. It examined among others tenant's desire for a particular attribute (and /or attribute's size); and tenant's willingness to pay more for the desired attribute(s). In order to determine responsiveness of willingness to pay, the study hypothesized that 90% of the respondent in each property types would express willingness to pay more for the desired attributes. Data for the study was collected through questionnaire administered to residential tenants in the study area. A total of 400 questionnaires were distributed out of which 278 were returned representing 69.5% response rate. Data collected were analysed using descriptive and inferential statistical tools such as percentile, bar charts, weighted mean score and Chi square. The result showed that larger bedroom was ranked very highly in terms of overall desire and would pay more for by all respondents. Beyond that, there were certain structural attributes that respondents across the property categories expressed willingness to pay more for. The chi-square result however revealed there is significant difference between "would pay more for" response and the expected proportion (p value < .05) for the entire selected structural attribute in all categories of residential property. The study concluded that there is evidence to suggest that 90% of tenants in Ede did not express willingness to pay more for the desired structural attribute. The study recommended that investors in the residential property submarket should take cognizance of these when making decision on house design so as to have a product that appeals to tenant's expectations while ensuring maximization of return from investment.

Keywords: Nigeria , residential properties, structural attributes, tenant's demand, willingness to pay

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THE INFLUENCE OF GDP ON RENTAL GROWTH OF RESIDENTIAL PROPERTIES IN EDE, NIGERIA

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Changes in rental values may occur in response to changes in economic conditions at all levels of an economy. Against the backdrop of recent unstable GDP growth rates in Nigeria, this study evaluated the influence of GDP on rental growth rates of residential properties in Ede, Nigeria with a view to providing information that will aid better understanding of the dynamics of residential property market for investment decisions. It analyzed the magnitude of growth in rental values of five residential property types comprising tenement room, one room self-contained, room and parlour self-contained, two bedroom flat and three bedroom flat to determine whether significant difference exist in the growth rates across the five property types; the extent of variation in the rental values of the properties types in Ede caused by GDP growth; and also, the relationship between GDP growth rates and rental growth rates of residential properties in the study area. The study utilized both primary and secondary data. Primary data used for the study was collected through structured questionnaire administered on landlords who rented their properties within the study period and comprised rental values of five residential property types between 2002 and 2017. Secondary data for the study comprised Nigeria's GDP figures between 2002 and 2017. Descriptive and inferential statistical techniques such as frequency table, chart, ANOVA and linear regression were used to analyse the data. The results revealed a mean yearly growth rates of 17.03%, 17.01%, 16.57%, 19.86% and 20.83% for tenement room, one room self-contained, room and parlour self-contained, two bedroom flat and three bedroom flat respectively; and the mean rental growth rates across the selected residential property types at 95% confidence level are not significantly different $F(4, 70) = 0.345$ $P = .847 > .05$. Furthermore, during the period under study, GDP values were found to have a strong positive relationship with rental values of residential properties in the study area and accounts for about 73%, 75%, 82%, 76% and 83% of variation in rental values of tenement room, one room self-contained, room and parlour self-contained, two bedroom flat and three bedroom flat respectively. The study however found no statistically significant relationship between GDP growth rates and rental growth rates of residential properties in the study area. Consequently, the study concluded that GDP growth rates do not have significant influence on rental growth rates of selected residential properties in Ede during period understudied.

Keywords: growth, influence of GDP, Nigeria, residential properties, rental value, trend

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THE LEAKY PIPELINE BETWEEN CONSTRUCTION EDUCATION AND WOMEN IN THE CONSTRUCTION INDUSTRY

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For many years, a critical area of concern within South Africa's built environment has been the untransformed nature and the persistent underrepresentation of women within it. At the university level, the number of females registering in the faculty of the Built Environment has experienced a steady increase over the years. This increase, however, is not reflected in the built environment's workplace despite the increase in the graduation of female students. This study investigates the career decisions made by graduating female students based on their perceptions of the built environment, and how their long-term decision affects the underrepresentation of women therein. The study uses an online questionnaire designed from the career construction theory and the leaky bucket theory, which was distributed to female students registered for BSc Honours in Quantity Surveying and Construction Management at a university in South Africa. Interviews with recent graduates in the same field were conducted. The findings from the study report on the factors that motivated female students to study a construction-related degree, the challenges experienced during their studies, and how the experienced challenges influence their long-term career decisions within the construction industry. Graduating female students remain a wasted and an untapped resource within the built environment. If the built environment continuously fails to attract and retain graduating female students, it will face a skills shortage within the industry.

Keywords: barriers, career decisions, construction education, factors, female postgraduates

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THE NEXUS OF THE INFRASTRUCTURE SECTOR, EMPLOYMENT AND ECONOMIC GROWTH

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The world is changing rapidly, in ways that leave many people behind. The discontent with economic growth in recent decades played an important role in the US election of 2016 and the Brexit referendum in the same year. Advances in technology over the recent years have suggested interventions that came with a promise to make everyone better off. Built infrastructure is considered a major sector of the economy throughout the world. Its sheer size and role in economic growth is used to justify its importance. The literature considered revealed that the construction sector is considered an investment sector. The endogenous growth theory is mobilized to explain the relationship of the built infrastructure sector to economic growth and employment. The fundamental dynamics of the built infrastructure sector are studied in relation to economic growth, with a view to ascertaining if there is a basis for national governments to stimulate economic growth and job creation through investment in infrastructure. This will enable policy makers to make better use of the built infrastructure sector. Cointegration analysis of time series total construction output (TCO), construction employment (CE) and GDP data for South Africa reveal that a positive short run relationship does exist between these variables, subject to other factors being equal. However, empirical evidence suggests that there is no obvious link between TCO, CE and GDP. While the endogenous growth theory show that construction influences investment, which is a major factor in determining economic growth, the growth process per se has been shown to be a complex phenomenon.

Keywords: cointegration analysis, economic growth, infrastructure, political economy

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THE ROLE OF PROJECT MANAGEMENT IN TETFUND CONSTRUCTION PROJECTS

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Tertiary Education Trust fund (TETfund) is an intervention agency that provides funding for the rehabilitation, restoration and consolidation of tertiary education in Nigeria. Despite the engagement of project managers in TETfund projects, there is empirical evidence that most often these projects fail in terms of cost, time and quality. Regulatory bodies such as RICS, APM and IPM have clearly defined generic processes of project management practice throughout the project life cycle. This research aimed to identify the project management responsibilities performed by project managers involved in TETfund projects. A quantitative research approach was adopted in this work. A structured questionnaire was designed to elicit the participation of project managers in TETfund projects. Respondents were sampled using the purposive sampling technique. Data collected was analyzed using both descriptive and inferential statistic. Results from the research shows that Architects and Quantity surveyors often serve as project managers on TETfund projects. More so, 92.3% of the respondents were engaged at the inception of the project life cycle and often served leadership roles on these projects. Respondents reported that project management responsibilities were provided at all stages of the project life cycle which include preparation, procurement, design, construction and handover. More so, 50% of the respondents were highly satisfied with the services they offered on the project as they had the opportunity of providing challenging project management services that was much more than anticipated. Findings of this research provides an insight to the level of engagement and role of project management in TETfund projects. Also, it provides empirical evidence on the understanding of the concept of project management in the Nigerian construction industry.

Keywords: engagement, management, project, responsibilities, TETfund

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THE USE AND EFFECTS OF CANNABIS AMONG CONSTRUCTION WORKERS IN SOUTH AFRICA: A PILOT STUDY

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There is increasing concern regarding the impact of the consumption of cannabis within the construction industry. Empirical evidence highlights issues of cannabis use and its connection with health and safety risk on construction sites. This study explores the use of cannabis and its behavioural, perceptual, physiological, emotional and cognitive effects on construction workers. The study further explores the decriminalisation of its private use and personal consumption in South Africa. The paper was developed based on a review of empirical and theoretical studies previously published in a wide range of journals and commissioned reports. Literature relating to drug and substance use in the construction workplace was obtained from research databases. The keywords "cannabis" and "construction industry" were used to search the databases. Of the number of related articles found, a total of 41 articles and reports were cited in the study. The study revealed that cannabis use has both short and long-term health effects on brain development and plays a significant role in the progression of respiratory diseases. Furthermore, the after effects of the use and abuse of cannabis by construction workers pose numerous threats to the workplace safety of the construction industry. The paper identified loss of concentration and low productivity on site, abnormal and irrational behaviour, absenteeism from work and poor work quality as impacts of cannabis use on construction sites. A pilot study was also conducted to further test the instrument based on the sensitivity of the topic and as a basis for the ongoing empirical study although the responses were invalid. Based on the literature findings, the study identifies the need for site supervisors and construction employers to introduce improvement mechanisms and appropriate intervention programs to control the use of cannabis on construction sites.

Keywords: cannabis, construction site workers, health and safety, substance use, South Africa

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THE USE OF PALM KERNEL SHELL ASH AS CEMENT REPLACEMENT IN CONCRETE

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The national housing policy of Ghana which was approved by cabinet in 2010, advocate the use of local building materials for the construction of buildings. It is against this background, that in recent years many studies has been conducted to find cheap but useful local building materials to replace the conventional ones which are to some extent expensive. Cement is one of the most important elements in building construction works which is relatively expensive, this research seeks to study the possibility of utilizing palm kernel shell ash (PKSA) as cement replacement in concrete production. The study aimed at finding the chemical composition of PKSA, strength and durability properties of concrete produced from OPC with partial replacement PKSA. The palm kernel shell was burn, sieved and was tested at a chemistry laboratory and then compared with the chemical composition of OPC. The PKSA was used to prepare concrete cubes at replacement levels of 0%, 5%, 10%, 15% and 20%, cured for 28 days. From the study, it was evident that PKSA contains chemicals such as SiO_2 (silicon), Al_2O_3 (aluminium), Fe_2O_3 (iron oxide), CaO (calcium oxide), MgO (magnesium oxide) and K_2O (potassium oxide) which are active ingredient in OPC but are not at the required levels. The PKSA replacement percentage in concrete mix improved workability but water absorption rate was comparatively high. Compressive strength declined as PKSA increases in the mix as well as density. The study showed an inverse correlation between compressive strength and PKSA percentage replacement levels. Following the high water absorption rate of PKSA concrete, it was not recommended for concrete works in waterlog areas. Despites the reduction in strength of PKSA concrete, 5% replacement is recommended for normal concrete works.

Keywords: compressive strength, concrete, PKSA, water absorption

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TRANSACTION COSTS CHARACTERISTICS EFFECTS ON CONTRACTING BUSINESS IN NIGERIA

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Various literatures in construction and project management deduced that transaction costs characteristics have impact on contractor's bids evaluation process. Aim of this study is to assess the level of impacts of transaction costs characteristics on contractor's bids evaluation process. Simple random sampling techniques was used in selecting fifty two (52) contractors within some selected states of the North-West zone of Nigeria that are registered in the Bureau of Public Procurement database of contractors, whom are being considered to participate in any federal government tendering process as respondents of the study. The data collected was analyzed using multi-attribute techniques, Relative Importance Index RII and ANOVA. Results of the study indicate that transaction costs characteristics effects among the five categories of factors identified from literature, predictability of owners behavior rank first, followed by project management efficiency (RII=0.698), contractors predictability behavior (RII=0.684), while uncertainty in the transaction environment (RII=0.662) and magnitude of the transaction cost (RII=0.647) rank fourth and fifth with low impacts on contractors' bids evaluation process. No significant difference was found between the effects of TCs characteristics of four factors on contractors' bids evaluation process. While there is a significant different in Uncertainty in the transaction environment factor x^2_{tab} = 17.67 > x^2_{cal} =17.06. Conclusions are that owners' behavior, contractor's behavior, project management efficiency and magnitude of the transaction have an impact on contractor's bids evaluation process in determining a successful tender among the various contractors' bids for a project by the client. The study recommends that contractors should adopt good decision making by reducing the amount of time-spent on disputes/disagreement, unbalance bidding, collusion and cheating that cause uncertainty in the bidding environment. Contractors should adopt experience based type when bidding for construction projects with regards to finance, schedules, manpower, equipment and other documentary evidence in their bidding process.

Keywords: bids evaluation process, contractor, Nigeria, transaction costs characteristics

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UNDERSTANDING BUILDING PRICE FORECASTING BASED ON ORGANISATIONAL BEHAVIOUR

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Public sector procurement laws require that building price forecast be established in-house at construction project initiation. Thus, building price forecasting is of significant importance within the context of organisational management and performance. Organisation performance is influenced by behaviours inherent in organisations. Hence, attempts at improving building price forecasting in public client organisations would require an understanding of the behaviours therein. Exploring the Robbins & Judge (2013) Organisational Behaviour model, this paper presents and discusses theoretical conceptions for understanding building price forecasting within public sector client organizations with a view to improving the process. The model conceptualises building price forecasting at the three levels of an organisation i.e. individual, group and organisation within the 'input-process-output' framework. The following aspects offer potential influences on building price forecasting: i) at the individual level – motivation, perception, and decision-making (processes); and task performance (outcome); ii) at the group level – structure, and group role (input); communication, leadership, politics and power, and conflict and negotiations (processes); cohesion and functioning (outcome); iii) at the organisation level – structure, and culture (input). The paper concludes by setting out an approach for more in-depth theoretical and empirical exploration to advance the frontier of research perspectives on building price forecasting in construction.

Keywords: building price forecasting, organisational behaviour, public sector client organisation.

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