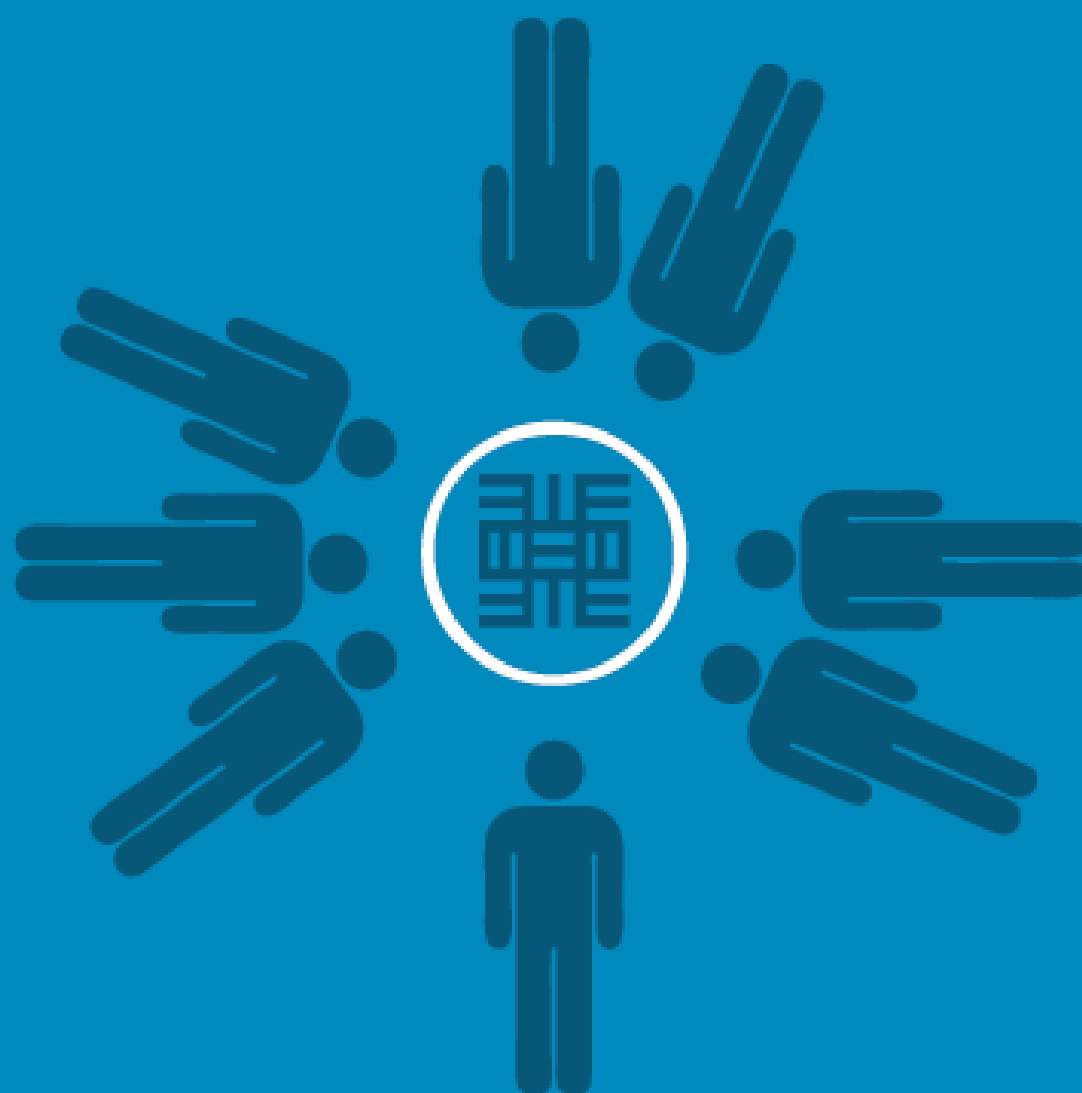


BROCHURE AND BOOK OF ABSTRACTS



WEST AFRICA BUILT ENVIRONMENT RESEARCH CONFERENCE

Editors
Samuel Laryea
Roine Leiringer

10-12 August
Accra, Ghana



West Africa Built Environment Research (WABER) Conference 2015

**10-12 August 2015
University of Ghana
Accra, Ghana**

Brochure and Book of abstracts

**Editors
Samuel Laryea
Roine Leiringer**



**Accra, GHANA
2015
10-12 AUG.
University of Ghana**

Brochure and Book of abstracts of the West Africa Built Environment Research (WABER) Conference 2015

10th - 12th August 2015 in Accra, Ghana

Editors

Samuel Laryea, University of the Witwatersrand, Johannesburg, South Africa
Roine Leiringer, The University of Hong Kong, Hong Kong

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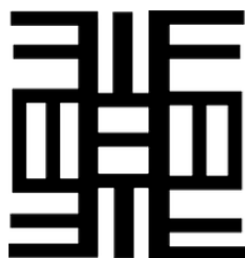
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Declaration

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.

TABLE OF CONTENTS

Table of Contents	i
Foreword	iii
Copyright Statement	v
Declaration of peer review and scientific publishing policy	vii
Review Panel	ix
Scientific Committee	xi
WABER Committee	xiii
Sponsors and Partners	xv
Prizes to be awarded at the WABER Conference 2015	xvii
WABER interacts with previous winners of Best Paper Prize	xix
Profile of Keynote Speakers	xxxi
Programme for WABER Conference 2015	xxxvii
List of papers in WABER 2015 Conference Proceedings	xlvi
Keynote Addresses	- 1 -
Conference Papers	- 13 -
Index of Authors	- 97 -
Index of Keywords	- 99 -



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FOREWORD

It is a pleasure to welcome you to our 6th WABER Conference taking place at the University of Ghana in Legon, Accra. Thank you for coming, and a very warm welcome to Accra and the beautiful campus of the University of Ghana. I know some of you have travelled long distances to get here. Some of you have also made considerable sacrifices to mobilise the resources required to be here. We appreciate your efforts. We hope the conference meets your expectations and provides you with valuable experience and developmental opportunities for a productive and rewarding career.

We are grateful for the presence of the Minister for Education – Professor Naana Jane Opoku-Agyemang – at the Opening Session of this conference. Thank you for kindly accepting our invitation to come and open the conference for us. We are equally grateful for the presence of the Vice Chancellor of University of Ghana – Professor Ernest Aryeetey – whose leadership and distinguished academic career serves as an inspiration to many. Professor Aryeetey leads a University which has recently been ranked by Thompson Reuters as the 10th best university on the African continent. We are proud to host our conference here and thank you for accepting our invitation to come and give a Welcome address. Thank you also to our other special guests – particularly leaders of academic institutions and industry – for joining us. The presence of industry practitioners and leaders of the built environment professions provides an opportunity for us to critically explore practical solutions to existing problems in our built environment like flooding, fire, building collapse, poor construction, health and safety of workers, environmental pollution, land management, development control, impact of construction on the environment, inclusive design, waste management, traffic on our roads and congestion in our cities. We believe that such interactions provide a much needed opportunity to start to bridge the proverbial gap between academia and industry.

The WABER Conference keeps growing each year. For this, I would like to thank our delegates and partners. Thank you for the contributions you have made to the life and success of this conference. As some of you know, this conference began in 2008 as an initiative of the School of Construction Management and Engineering at University of Reading. Over the years, colleagues including Prof. Will Hughes, Dr Roine Leiringer, Dr Chris Harty, Dr Sena Agyepong, Dr Emmanuel Essah, Prof. George Ofori and myself have formed a solid foundation for the development of the conference, which so far has proven to be successful. We have sustained the success through the provision and facilitation of appropriate academic infrastructure and leadership. Most importantly, the academic recognition and continued support we receive from delegates has been the key to our development. Indeed, the most important people in the growth of WABER are the conference delegates, and we take great pride in the high number of repeat participants. Let me focus now on this year's conference and our activities.

The delegates at this year's conference come from 64 different academic institutions spread across eight different countries. There is a real opportunity here for rich exchange of academic, social and cultural ideas. Please take every opportunity to interact, exchange ideas and develop collaborations with colleagues from other institutions.

From an initial submission of 165 abstracts, we eventually accepted 92 papers for presentation at this year's conference. Congratulations to the authors of accepted papers. Thank you for the hard work put into doing the research and writing the papers. The papers being presented at this year's conference are written by authors from six main academic backgrounds and disciplines namely: architecture, building, construction management, estate / property management, quantity surveying, and urban and regional planning. As such, the conference truly reflects an international gathering of built environment academics. We also have some mainstream academics and industry practitioners here who will contribute to the richness and quality of deliberations.

More than 50 reviewers from 12 different countries were involved in the peer review process for this conference. I would like to express sincere gratitude to each reviewer for the great job done. Without the dedication and expertise of our referees, this conference will not be as successful as it is. So thank you to all reviewers for your contributions to the success of this conference. I particularly wish to thank Dr Wisdom Kwawu, Dr Roine Leiringer and Prof Will Hughes for your significant contributions in this regard.

It is important to appreciate the roles and efforts of the following people for significant contributions made towards the successful organization of the conference: Florence Laryea (for among other things, formatting and typesetting the papers in this conference proceedings), Dr Sena Agyepong, Jonathan Ntsiful, Dr Emmanuel Essah, and colleagues at Scatterlings Conference and Events. It is always a mammoth task to mount an event of this nature successfully.

Our keynote speakers who have travelled long distances to come and share their time, knowledge and expertise with us deserve our profound gratitude: Professor George Ofori (National University of Singapore); Professor Koshy Varghese (Indian Institute of Technology, Madras); Dr Roine Leiringer (University of Hong Kong); and Dr Ron Watermeyer (Infrastructure Options Pty Ltd, South Africa).

I finally wish to thank our sponsors and partners who support us in diverse ways. In particular, John Rixs Construction and EPP Books Services / Zenith University College.

We aspire to provide a vehicle for the advancement of built environment research in Africa; and create opportunity for built environment academics, particularly those in the early stage of their career, to develop their research work and skills through constructive interaction with experienced international academics. Therefore, the future of this conference needs to be properly architected and sustained through innovative ideas, academic enterprise and leadership. The WABER conference values are knowledge, interaction, people and leadership. We have developed with a clear sense of purpose since 2008 and made significant impact on the research landscape in West Africa. We plan to continue our growth by serving the built environment community in our region. Plans for the publication of our African Journal of Built Environment Research are now firmly established. Two issues will be published within the next year. We are awaiting feedback on our application for indexing of the WABER Conference proceedings in the Thomson Reuters Conference Proceedings Citation Index. A positive outcome will facilitate greater scientific recognition of our work and dissemination of our research outputs in global databases like Scopus and the Web of Science collection. Our activities going forward will include: facilitating access to scientific literature, providing opportunity for experienced/leading international academics from elsewhere to interact with the built environment community in Africa, providing a forum for quality scientific engagement and interactions, facilitating the development of research skills and publications among built environment academics particularly those in the early stages of their careers, supporting the development of researchers in our academic institutions, and creating opportunity for people in different institutions to connect for exchange of ideas and collaborative work.

I thank you once again for coming to this conference. Enjoy it, engage in the exchange of ideas, build new relationships for the future, and have a safe journey back home. We wish you all the best in your endeavours and hope to see you again in the future.

Samuel Laryea, PhD

Chairman of WABER Conference, Associate Professor at Wits University School of Construction Economics and Management, Fellow of the Higher Education Academy

August 2015

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DECLARATION

PEER REVIEW AND SCIENTIFIC PUBLISHING POLICY STATEMENT

10th August 2015

TO WHOM IT MAY CONCERN

I confirm that all papers in the WABER 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 by the Scientific Committee 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 scientific and peer review process involving examination by at least two referees who are knowledgeable in the field. A paper is only accepted for publication in the conference proceedings based on the recommendation of the reviewers and the Scientific Committee.

The names and affiliation of members of the Review Panel and Scientific Committee for WABER Conference 2015 are published in the WABER Conference Proceedings and on our website www.waberconf.com

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

Yours Sincerely,



Samuel Laryea, PhD
University of the Witwatersrand, Johannesburg, South Africa
Chairman of WABER Conference

REVIEW PANEL

We would like to express gratitude to the following people who conducted thorough scientific reviews of more than 100 papers submitted for WABER Conference 2015 and provided authors with constructive comments.

Dr Wisdom Kwawu, University of the Witwatersrand, South Africa
Dr Roine Leiringer, The University of Hong Kong, Hong Kong
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Prof George Ofori, National University of Singapore, Singapore
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WABER COMMITTEE

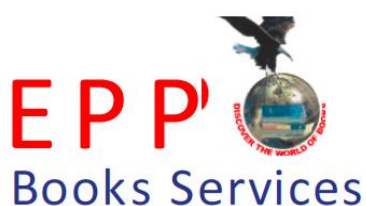
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The main responsibility of the WABER Committee is to provide the infrastructure and academic leadership for developing the WABER conference.

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Thank you to all sponsors and partners of the WABER Conference.



More information about our sponsors and partners can be found on our website www.waberconference.com / waberconf.com

PRIZES TO BE AWARDED AT THE WABER 2015 CONFERENCE

- **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 Industry-Related Research**

This prize is awarded to recognize an industry-related research paper which tackles a significant subject of relevance to construction practitioners and provides conclusions that are likely to help in resolving / improving a problem in practice. The paper should contain impactful research that is both scientifically rigorous and practically relevant.

- **Best 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.

- **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.

WABER INTERACTS WITH PREVIOUS WINNERS OF BEST PAPER PRIZE

We are constantly interested in the development of each and every WABER Conference delegate. Our aim is to make the conference a valuable experience and developmental opportunity for each delegate. We recently interacted with previous winners of the WABER Best Paper prize about their experiences and current endeavours. The interviews with Dr Kulomri Adogbo, Dr Stephen Oluigbo and Dr Cynthia Adeokun are shared in this section. We are proud of these individuals and wish them great success in future endeavours. We hope they continue to be shining examples of academic and professional excellence and continue to contribute the built environment research in West Africa.

Dr Kulomri Jaule Adogbo

Department of Quantity Surveying, Ahmadu Bello University, Nigeria



Dr Kulomri Adogbo receiving her Best Presentation Prize in June 2009. The title of her presentation was “An investigation into female construction undergraduates' expectations towards practice”

Q. Please tell us a bit about yourself

A. I am a Lecturer in the Department of Quantity Surveying at Ahmadu Bello University, Zaria, Nigeria. I obtained my first degree in Quantity Surveying

in 2001 and in 2006 I got a Masters degree in Construction Management from ABU, Zaria. I started working in the Department of Quantity Surveying in April 2007 and in 2009 I registered for a PhD in Quantity Surveying. This is significant because that was the first year that I attended the WABER conference. At the time I had a rather vague idea of what I wanted to do. The feedback I received on my presentation gave me direction and encouragement. I went on to complete the research successfully and received my Doctor of Philosophy degree in July 2013. My journey to the PhD took a firm root at the 2009 WABER Doctoral workshop and that is one reason why I always want to be at every WABER conference.

My Doctoral research was on women in construction looking at the experiences of women at the threshold of graduation and at the point of entry into practice. My interests in gender studies are wide and include the education of girls in STEM, under-representation of women and their career impediments in the construction industry in Nigeria, the experiences of women in Quantity Surveying, challenging stereotypes about women in professional practice; professional and international networking / collaboration / partnership for, and by, women and role models, mentoring and career counselling – these interests have one all-encompassing aim i.e. improving the participation of women in the construction workplace.

My personal interests outside of work are reading and music.

Q. How would you describe your academic / professional experiences so far?

A. My academic experience has been interesting so far with a lot of learning and growing. I have found it to be fulfilling and it is work that I look forward to. I simply love academic work. I love interacting with students and watching them grow, get educated and graduating. It is gratifying when I meet with graduates of the Department and I see them making a difference in their lives.

Q. How did you get into an academic career?

A. I had a lecturer during my undergraduate studies that always encouraged me and told me that one day when I graduate I would take over his table. It is interesting to note that as I write this interview sixteen years later, I am using the same desk that Hassan Aminu Kano used as a lecturer.

Q. What courses do you teach and what does your job entail?

A. The first course I taught was Construction Technology. Since then I have found myself teaching courses in two broad areas of Finance and Accounting, Management and Law. Apart from teaching I do a lot committee work and some of my administrative duties include: Post Graduate programmes coordinator and Budget and Expenditure control Officer.

Q. What is your typical day in the office like?

A. I usually start my days at 8.00a.m and my practice to check my mails and reply them, respond to any pending issues from the Head of Department or other authority. My lectures are usually scheduled between 9am and 1pm at the latest (I hate afternoon lectures!). The afternoon hours are usually spent attending to students' supervision, preparing reports or other submissions for the Department. Somewhere in between I attend Departmental meetings, Faculty Board meetings and Postgraduate Board meetings among others.

Q. How did you first hear about the WABER Conference and what made you decide to attend?

A. The first time I heard about the WABER Conference was through the mails posted on CNBR by Samuel Laryea. My Head of Department at the time encouraged a number of us to attend particularly those of us registered for PhD programmes. The first WABER Conference was organised primarily for Doctoral candidates and I decided to attend because I wanted to hear what others would think about my work (I did not have a lot of confidence in my work at the time).

Q. What has been your experience of attending the WABER Conference?

A. Attending the WABER Conference over the years has been an enriching experience. I got some objective and very, very resourceful feedback that put me on a path of success for my PhD. One year I attended the conference with my six month old son Daniel and the organisers were very supportive and helpful with childcare. Ahmadu Bello University has a policy of sponsoring each academic staff to one academic conference per annum. I utilised my options on WABER. The money is never sufficient in any case but I was happy to supplement just so I could attend.

Q. How did you feel when you won the best presentation prize in 2009?

A. I won the prize for best presentation in 2009. Frankly, it was a surprise. I felt happy because it validated my research idea and it gave me some much needed confidence. The recognition also gave me notoriety (in a good way) and it made me a 'legend' of sorts in my Department/Faculty!

Q. How has winning the prize influenced your academic development?

A. The award of the WABER prize has made me more confident in my abilities and I understand that it was an affirmation which instilled in me a sense of dignity and respect. I try to encourage my students too and give them positive feedback and affirm them publicly because it adds a degree of self-worth to them as individuals.

Q. What research papers / projects are you working on at the moment?

A. Currently I have a couple of papers on gender that I am working on and some other subjects with my students – Infrastructure development, the use of BIM and also labour productivity.

Q. What are your future aspirations and what do you need to do to get there?

A. I love academic work and I hope to be able to travel to other institutions on short term basis to experience different learning environments and to learn lessons that can be shared/transferred at home. If I must get there I need to overcome my greatest personal limitation, ‘fear of the unknown’!

Q. What advice will you give to early career academics aspiring to develop their academic profile?

A. For early career academics who wish to develop their academic profile, I would recommend that they be willing to step out of their comfort zone and open up their work for discussion. No one is an island and the only way to grow is to grow both inside and outside of our locality - enough of being ‘local champions’.

Q. From your experience, what are the most difficult challenges facing built environment academics in our environment?

A. The most difficult challenges facing built environment academics in Africa is access to resources and materials for research. Quite often we find it hard to prioritise. For example I find myself bogged down half of the time with administrative work and attending to students that I barely have time to sit and write a good paper. What develops my academic profile are the papers I publish but most often than not it ends up very low on my list of priorities.

Q. Can you share some of the practical ways you have used to overcome the challenges?

A. I have had to learn to ask for help from colleagues and sometimes from my students! Also I have found that collaborating with other like-minded colleagues helps because it creates a sense of urgency in me. I have also found too that having a mentor helps – in my own case the people who have a lot of interest and influence in my academic growth hold me accountable and I find myself hard pressed not to disappoint them.

Q. What is your idea of good research and how can our academic institutions in Africa support lecturers like yourself to do and publish good research?

A. My idea of good research is a research that ‘makes sense’ and answers relevant issues in both academia and practice. There are research outcomes

which sound so ‘scientific and academic’ but have little or no significance to practical problems facing Africa. Some studies are all well and good in China or Australia but our system in Africa is different and we need to find what works for us here rather than try to fit ourselves into an unworkable system.

It is important for universities to provide an enabling environment for its academics. This includes providing ready financial resource but more than that they could also sponsor regular conferences and seminars; provide relevant e-resources for academics to gain access to research materials; encourage and support staff to go for exchange programmes; sometimes they may need to penalise academics who do not meet up with minimum requirement and on the flip side it will be useful to reward those who show initiative to do the right things.

Dr Stephen Nwabunwanne Oluigbo
Department of Architecture, Ahmadu Bello University, Nigeria



Dr Stephen Oluigbo receiving his Best Paper Prize in July 2011. The title of his paper was “Sustainable tourism architecture: User evaluation of Argungu fishing village”

Q. Please tell us a bit about yourself

A. I am a native of Nkwerre, Imo State, in South-East Nigeria. I attended a number of primary and secondary schools; however, my primary education was concluded at FESTAC Universal Primary Education (UPE) School II, Festac Town, Lagos and my secondary education at Federal Government College Odogbolu, Ogun State, Nigeria.

My academic qualifications comprise of an Ordinary National Diploma (OND), at Yaba College of Technology in 1990, and BSc, MSc and PhD in Architecture in 1995, 1998, and 2011, respectively, from Ahmadu Bello University, Zaria, Nigeria, where I am presently employed as a Senior Lecturer. I am also a registered architect with the Architects Registration Council of Nigeria (ARCON).

My research interests are: Passive environmental design strategies, eco-centric sustainable architecture, socio-culturally sustainable architecture, and sustainable tourism architecture. I spend my spare time, when I find any, in do it yourself repairs in my residence, watch a few movies, and also composed and sing choral music though there has been little time for that recently.

Q. How did you get into an academic career?

A. Though I graduated with the best grades in my BSc class, my career in academics was not preconceived. Many of my peers thought I was best suited for academia, while to others; I was very practical and should be in practice. However, my greatest weakness with respect to full professional practice is the fact that I am not at peace with a number of compromises required in my local practice environment in Nigeria. On the other hand, I love imparting knowledge, so I applied for employment based on suggestions by a number of my senior colleagues in the university, and was employed.

Q. What courses do you teach and what does your job entail?

A. Presently I teach architectural research at the PhD level, Research Methodology at the Masters level, Environmental Science and Architectural Design at the undergraduate level. I am also engaged as a visiting lecturer at two other universities in Nigeria.

Being an academic in architecture requires a lot of patience and commitment. This is because the architecture programme requires constant and close interaction with students. It also involves a little bit of almost every type of knowledge and a lot of some. My job comprises of teaching theoretical courses, research, studio work, site visits, supervision, administrative responsibilities, and community service.

Q. What is your typical day in the office like?

A. My typical day in the office begins in the morning with either a lecture or a review of students' works of thesis/ project reports. At about midday I spend most of the time on interaction with students on their research, while most afternoons are spent in the studio. Lunch break is usually between 12 noon and 2pm but I rarely have time for that, and in most instances I send for lunch or make do with some junk food such as meat pie and a bottle of coke. This I am working on stopping.

Q. How did you first hear about the WABER Conference and what made you decide to attend?

A. I heard about WABER from Badiru Yunus, my colleague in the Department of Architecture, Ahmadu Bello University Zaria, followed by a few other colleagues. This was an opportunity I was not willing to miss. It is interesting to note that WABER 2011, at which I was given the prize, was my first conference attendance outside Nigeria. Partial funding was provided by my employer, while the remainder came from my pocket.

Q. How has winning the prize influenced your academic development?

A. Participating in the conference was an avenue for me to test my ability against my peers from other institutions, network, and make a few friends. Winning the prize was a source of encouragement and boosted my confidence.

I was not aware there was going to be a prize until the conference commenced. This was good for me because all I did was to present what I came for without any pressure.

Q. What research papers / projects are you working on at the moment?

A. My current research papers include:

Sustainable built environment: Mitigating the urban heat island effect in Nigerian cities;

Innovations in sustainable housing: Case studies from Nigeria;

Sustainable and humane settlements: Examination of place-making in housing neighbourhoods in Abuja, Nigeria.

Q. What are your future aspirations and what do you need to do to get there?

A. My aspiration is to get better in what I am doing and to be the best I can. This requires more focus and attention to continuous education and expansion / improvement of my research skills. Of course family cannot be sacrificed for any reason.

Q. What advice will you give to early career academics aspiring to develop their academic profile?

A. My advice to early career academics is that they should spend more time on reading and acquisition of diverse research skills. Then focus on their specific areas. Exposure is also very important, beginning with local conferences and then international.

Q. What is your idea of good research and how can our academic institutions in Africa support lecturers like yourself to do and publish good research?

A. A good research should focus on current and relevant issues. It should be original and creative in its approach to a problem, and not just a direct application or replication of the procedures used in other researches. Research requires motivation and funding. Motivation can be enhanced by recognition of academics for their researches. This should be matched by prompt approval of funding for academics who have demonstrated their ability to produce good results. Our institutions need to do better.

Dr Cynthia Omolola Adeokun
Department of Architecture, Covenant University, Nigeria



Dr Cynthia Adeokun receiving her Best Paper Prize in August 2013. The title of her paper was “The Orowa House: A typology of traditional Yoruba architecture in Ile-Ife, Nigeria”

Q. Please tell us a bit about yourself

A. I am an ARB (UK) registered architect with over 15 years professional experience in sports, retail and education architecture gained working in the UK, Kenya and Nigeria. In addition, I have a Ph.D. in Architecture (research focus: Domestic Space) from the University College London (2007). I speak fluent English and Yoruba, Conversational Brazilian Portuguese, and basic Italian, and I enjoy working with young and the elderly, travelling, and learning languages.

Q. How would you describe your career experiences so far? How did you get into academia?

A. I have enjoyed both my professional and academic career so far. I spent over 13 years working in private practice on a variety of really interesting projects, such as the All England Lawn Tennis Club (Centre Court Refurbishment), Wimbledon, Wembley National Stadium and Emirates Stadium, in the UK and in Kenya. I decided to take up an academic post about 3 years ago, because a wonderful opportunity came up in my home country Nigeria.

Q. What courses do you teach and what does your job entail?

A. I teach Design Studio, Acoustics and illumination, and Human Settlements at undergraduate and post-graduate levels, and I also supervise M.Sc. and Ph.D. students.

Q. What is your typical day in the office like?

A. A typical day in the office revolves around preparing lecture notes, lecturing, and dealing with my students on a one-on-one context, which I find most enjoyable. Students can provide unusual insights once one gains their confidence. The private university where I work is a Christian university where every lecturer is encouraged to take on an in loco parentis role, which I actually find quite rewarding (for the most part).

Q. How did you first hear about the WABER Conference and why did you decide to attend?

A. I first heard about WABER from a colleague at Covenant University (I think), and I decided to attend because I quite liked the idea of being connected to a network of Researchers who work in the West African/African context.

Q. What was your experience of attending the WABER Conference?

A. The first conference that I attended was WABER 2012 (Abuja). I was quite satisfied with the fact that I met many researchers from different universities in West Africa. I found some of the papers presented to be quite interesting and of good quality. However, I had to self-fund my participation in the conference which was a bit expensive, and as a result I stayed for 2 days (1 night) instead of 2 nights.

Q. How did you feel when you won the best paper prize in 2013?

A. I was so thrilled to find out that I had won the best research paper at the West Africa Built Environment Research (WABER) Conference in August 2013. To be honest, a part of me initially thought that the WABER Chairperson who phoned to inform me was pulling my leg 😊

Q. How has winning the prize influenced your academic development?

A. Winning the prize had such a strong impact on me, particularly when I found out that the 'reward' for winning the WABER best paper prize included the ARCOM 2013 Travel Grant! The recognition and prize have definitely lent credence to my fledgling academic career, and encouraged me to continue to strive for excellence in my writing endeavours.

Q. What research papers / projects are you working on at the moment?

A. I am currently working on a couple of papers/projects – one is on the link between the recruiting and learning process in architectural education and retention levels in the profession, and the other is on Innovative construction procurement in developing countries.

Q. What are your future aspirations and what do you need to do to get there?

A. My future aspiration is a perfect balance between working in academics and also in private practice on complex design projects. I certainly need to find a supportive private architecture firm that will allow me to divide my time between my two loves – practice and academics.

Q. What advice will you give to early career academics aspiring to develop their academic profile?

A. Get involved with attending international conferences, find a couple of academic mentors, who will help hone your writing skills.

Q. From your experience, what are the most difficult challenges facing built environment academics in our environment?

A. Getting free access to articles in high impact journals can be quite a problem (many universities do not provide free subscriptions to their staff), being able to afford the cost of attending international conferences (few universities fund such trips), accessing data about basic information about the built environment.

Q. Can you share some of the practical ways you have used to overcome the challenges?

A. Some conferences such as WABER already provide opportunities for researchers working in African institutions. Establishing databases for the built environment at a few host universities across the continent that is freely accessible to other institutions (improve publicity about existing data sources). Universities need to prioritise funding for both junior and senior researchers to attend relevant international conferences.

Q. What is your idea of good research and how can our academic institutions in Africa support lecturers like yourself to do and publish good research?

A. Good research must be based on a clearly defined premise, strong theoretical basis, clear methodology that is replicable and research outputs that are relevant to the immediate context, and well publicised particularly in terms of getting it into the hands of policy makers. Universities in Africa and the government sponsors must prioritise funding for such research. The link between good research and policy making must be strengthened.

PROFILE OF KEYNOTE SPEAKERS

Thank you to our keynote speakers for accepting our invitation to come and interact with delegates at the WABER Conference 2015. A brief profile of each keynote speaker is given in this section.

Dr Roine Leiringer, University of Hong Kong

Dr Roine Leiringer has been part of the WABER Conference since its inception and has made significant contributions to the conference development. He has participated in all our conferences since the start and been our custodian for research quality. Roine reviews at least 10 of the papers submitted for each year's conference and contributes to editing of the conference proceedings. Through this constructive engagement, he is able to identify the challenging areas for authors when it comes to navigating the contours of good scientific research and paper writing. This unique position offers him the understanding and platform to share ideas with delegates on issues of research quality and development from an international, as well as context-specific, perspective.



Bio

Dr Roine Leiringer is an Associate Professor in the Department of Real Estate and Construction at The University of Hong Kong. He holds an MSc in Civil Engineering and a PhD in Industrial Economics and Management from KTH Royal Institute of Technology, Sweden. In 2010 he was awarded the academic grade Docent at Chalmers University of Technology, Sweden. In research, Roine is committed to critical perspectives. Early research interests were in the areas of Public-Private Partnerships and innovation. Recently much of his research has been in the following four areas:

- 'service-led construction projects', investigating the strategic implications for firms shifting from product manufacturing to being providers of through-life service offerings;
- The impact of government policy and reform initiatives on firms and actors active in the creation of the built environment;a
- Sustainability, in particular how individuals in construction organisations are incentivized (or not) to incorporate sustainability into their daily work;
- Client capabilities – what capabilities do public sector clients need in order to effectively procure and manage their capital projects?

Roine is: co-editor of Construction Management and Economics; a former committee member (Secretary) of the Construction Researchers on Economics and Organisation in the Nordic region (CREON) Network; past joint coordinator of CIB Task Group 84 on 'Construction Reform'; and co-founder and co-director of the West Africa Built Environment Research (WABER) conference series. He is currently a Professor Visitante at Universidad ORT Uruguay (Montevideo, Uruguay).

Professor George Ofori, National University of Singapore

In the league of built environment academics, Profesor George Ofori is a leader with several international accomplishments. Professor Ofori will speak on "Developing your academic career" and "A research agenda for the built environment". Both topics are relevant for every academic in the built environment field. He is available for the first two days of the conference to engage wih delegates and exchange ideas with particulary early career academics wishing to develop successful academic and research careers.



Bio

Prof. George Ofori, B.Sc., M.Sc., Ph.D., D.Sc. is a Professor in the Department of Building at National University of Singapore. He is married with four children. Formerly, Senior Quantity Surveyor, G.A. Takyi and Partners,

Accra, Ghana; Senior Lecturer, 1983-91 and Associate Professor, 1991-99, National University of Singapore. Prof. Ofori has been Head of Department of Building (2002-05), Co-ordinator, Working Commission 107 of International Council for Research and Innovation in Building and Construction (CIB) on Construction in Developing Countries (1997-2007), Consultant to international agencies and governments on construction industry development, and construction management and economics since 1978, undertaking assignments in various countries including Botswana, Ghana, Malawi, Singapore, South Africa, Swaziland and Tanzania. Prof. Ofori is especially interested in the improvement of the construction industries of developing countries.

Professor Koshy Varghese, Indian Institute Of Technology, Madras

Prof Koshy Varghese is a leading international academic in the area of ICT in Construction. His keynote address will provide insights on applications of ICT in large construction projects in India and elsewhere in the world to integrate the processes of planning, design, construction and operation. Koshy will be available throughout the conference to share ideas with delegates on current developments in ICT and automation in construction. He will also be part of our research skills workshop where he will contribute to discussions on quantitative/technology research in construction and also how qualitative methods can complement quantitative techniques to strengthen research contributions.



Bio

Prof. Koshy Varghese is a Professor of Building Technology and Construction Management at the Department of Civil Engineering, Indian Institute of Technology Madras, India. He earned his Doctoral Degree from the University of Texas at Austin, USA with a specialization in Computer Integrated Construction and is currently a member of the editorial board of several journals in the area. Prof. Koshy Varghese is a recipient of the prestigious American Society of Civil Engineers (ASCE) best paper award for

Journal of Computing in Civil Engineering for 2011. He was conferred the Tucker-Hasagawa award for 2012 by International Association for Automation and Robotics in Construction (IAARC) for his contributions to Automation in Construction. The Project Management Institute (PMI) awarded him the Distinguished Scholar Award for 2012 for his research and practice based activities in the area of Project Management. He is currently the President of the International Association for Automation and Robotics in Construction.

Dr Ron Watermeyer, Director of Infrastructure Options (Pty) Ltd and Chair of ISO/TC 59/SC 18 Construction procurement

The design and adoption of innovative procurement systems in infrastructure delivery is a necessity in today's complex and challenging construction environment. Dr Watermeyer will speak on current developments and recent examples of projects involving design and adoption of alternative and innovative procurement systems. The keynote will outline how intended outcomes and value for money can be achieved through procurement strategy.



Bio

Dr Ron Watermeyer's qualifications include: DEng, CEng, PrEng, PrCM, PrCPM, FSAICE, FIPStructE, FICE, FSAA. He is a renowned international expert on construction procurement and has been at the forefront of many development initiatives in South Africa since the early 1990s including the reinterpretation of building regulations, the classification of sites in terms of geotechnical characteristics and building practice, changing construction methods, technologies and practices to facilitate socio-economic development imperatives and the development of construction procurement procedures and practices. His work on procurement has formed the basis for not only South African standards for construction procurement but also the recently published ISO 10845 family of standards. He has in recent years piloted the implementation of target contracts and framework agreements for the

delivery of civil engineering and building projects within the public sector. He has also led the development of documented procurement and delivery management system for a number of South African public sector bodies. He served as the South African Institution of Civil Engineering's 101st President in 2004. In 2009 he obtained a senior doctorate (Doctor of Engineering) from the University of the Witwatersrand for his engineering development work which has significantly contributed to the delivery of infrastructure for the advancement of a changing South African society. In 2010 he was awarded the Institution of Civil Engineer's International medal for his contribution over time in the delivery of enabling engineering mechanisms for the UN Millennium Development Goals. He has published more than 70 papers and articles on various aspects on the delivery of infrastructure.



PROGRAMME FOR WABER CONFERENCE 2015

DAY 1	MON.	10th AUGUST 2015	
10.08.15	07:30-09:00	REGISTRATION	
	09:00-10:00	OPENING SESSION (MAIN AUDITORIUM)	
	09:00-09:10	Welcome and Introduction of Guests – Samuel Laryea, Chairman of WABER Conference	
	09:10-09:20	Remarks by Chairman of Opening Session – Prof. Ernest Aryeetey, Vice Chancellor of University of Ghana	
	09:20-09:45	Conference Opening Speech by the Guest of Honour – Prof. Naana Jane Opoku-Agyemang, Honourable Minister for Education & Former Vice Chancellor of the University of Cape Coast, Ghana	
	09:45-09:50	Recognition of Mr Gibrine Adam for contributions to education	
	09:50-10:00	Vote of thanks and WABER 2015 Group Photograph	
	10:00-10:20	SOCIALISING BREAK	
	10:20-10:45	KEYNOTE ADDRESS A research agenda for the built environment – Prof George Ofori, National University of Singapore, Singapore	
	10:45-10:55	Q&A	
	11:00-13:15	PARALLEL SESSION	
		STREAM 1 (MAIN AUDITORIUM)	STREAM 2 (SEMINAR ROOM)
	Chair	Dr Roine Leiringer, University of Hong Kong, Hong Kong	Dr Frederick Addo-Abedi, Kaff University College, Ghana
	11:00-11:10	Enhancing architecture in Nigeria through research: bridging the gap between academic and practice-led research - Elizabeth T. Dassah and Z.	User satisfaction with space flexibility in offices of selected tertiary institutions in Niger State, Nigeria - Olatunde Folaranmi Adedayo, Anthony Ikechukwu

	A. Uji	Anunobi, Stephen Ayodele Oyetola, Oluwatoyin Abiodun Adebayo and Lynda Catherine Odine
11:10-11:20	Facilities management for African urban marketplaces: attitudes toward waste management - Adeni Abigo, Kassim Gidado and Paul Gilchrist	Staff perception of relaxation spaces in offices of tertiary institutions of Niger State - Bridget Nneoma Onwuka
11:20-11:30	Q&A	Q&A
11:30-11:40	Determinants of office rents in Accra, Ghana - Noah Kofi Karley	Wayfinding in multi-level buildings: a study of the senate building, Ahmadu Bello University - Joy Joshua Maina and Bello Oben' Umar
11:40-11:50	Influence of property market cycle on commercial office property in Victoria Island, Lagos State, Nigeria - Adejoke R. Oladapo	Equal access to Accra shopping malls - Anthony Kwame Danso and Eric Paul Tudzi
11:50-12:00	Q&A	Q&A
12:00-12:15	REFRESMENTS BREAK	
12:15-12:25	Factors influencing the performance of housing market in Nigeria - Matthew Oluwale Oyewole	Remedial approach of securing land-title and development permit: case study of the Ogun State home-owner charter programme - Nurudeen Akinsola Bello, Babatunde Adekoyejo Jolaoso and Musiliudeen Omotunde Kilasho
12:25-12:35	A conceptual cost contingency estimation model: a risk modelling approach - Joseph Ignatius Teye Buertey	Estate Surveyors and Valuers perception of land acquisition problem in Kwara State - Moses Idowu Atilola, Adenle Akindele Olaniyan and Olaitan Ayodeji Olowoleru
12:35-12:45	Q&A	Q&A
12:45-12:55	Project management competencies of indigenous contractors in Nigeria - Patience F. Tunji-Olayeni, Timothy O. Mosaku, Olabosipo I. Fagbenle and Lekan M. Amusan	Qualitative adequacy of purpose built hostels in Wa - Elvis Attakora-Amaniampong, Stephen Ameyaw and Wise Akortsu
12:55-13:05	Architects and interdisciplinary research: reflections from ethnographic and measured fieldwork - Joy Joshua Maina	User's preferences in mass housing estate in Niger and Kwara states of Nigeria - Folaranmi Olatunde Adedayo
13:05-13:15	Q&A	Q&A
13:15-14:00	LUNCH	

	14:00-14:30	KEYNOTE ADDRESS Information and Communication Technology in Construction – Prof Koshy Varghese, Indian Institute of Technology, Madras, India	
	14:30-14:40	Q&A	
	14:45-15:45	PARALLEL SESSION	
		STREAM 1 (MAIN AUDITORIUM)	STREAM 2 (SEMINAR ROOM)
	Chair	Dr Sena Agyepong, Ashesi University College, Ghana	Dr Wisdom Kwawu, University of the Witwatersrand, South Africa
	14:45-14:55	Prudence practice among construction project managers in Nigeria - Wasiu Adeniran Bello and Emmanuel Andenyang	Exploring health and safety practices on some Nigerian construction sites - Baba Shehu Waziri, Mansur Hamma-adama and Bukar Kadai
	14:55-15:05	Due process practice on construction projects in Lagos State, Nigeria - Oluwaseyi Ajayi and Bamidele Mafimidiwo	Appraisal of health and safety management practices of Nigerian construction SMEs - Abdullateef A. Shittu, Ahmed D. Ibrahim, Yahaya M. Ibrahim and Kulomri J. Adogbo
	15:05-15:15	Q&A	Q&A
	15:15-15:25	An empirical study of the magnitude of construction claims in building projects - Akinradewo O.F., Ogunsemi D.R., Dada M.O. and Aje I.O.	Demographic attributes influence on health and safety practices for small and medium construction enterprises - Justus Ngala Agumba and Theo Conrad Haupt
	15:25-15:35	Management of project-elements retention fee in residential building projects in Nigeria - Lekan M Amusan, Joy Nkolika-Peter, Ayo K. Charles, Afolashade Oluwatobi, and Ignatius O. Omuh	Enhancing Safety: Lessons from Senior Managers in the Nigerian Construction Industry – T. Zuofa and E.G. Ochieng
	15:35-15:45	Q&A	Q&A
	15:45-16:00	BREAK	
	16:00-17:30	RESEARCH SKILLS WORKSHOP Methodologies for collecting and analysing quantitative data – Facilitated by Dr Martin Tuuli and Dr Aaron Anvuur (Loughborough University, UK)	
	17:30-17:30	CLOSE	

DAY 2	TUE.	11th AUGUST 2015	
11.08.15	08:45-09:00	Video highlights of previous day	
	09:00-09:30	KEYNOTE ADDRESS Developing an academic career: what should you do, and how should you do it? – Prof George Ofori, National University of Singapore, Singapore	
	09:30-09:40	Q&A	
	09:45-11:45	PARALLEL SESSION	
		STREAM 1 (MAIN AUDITORIUM)	STREAM 2 (SEMINAR ROOM)
	Chair	Prof Kwabena Anaman, University of Ghana, Legon	Dr Emmanuel A. Essah, University of Reading, UK
	09:45-09:55	Factors responsible for mortgage default in Nigeria: a comparative study of commercial banks and primary mortgage institutions - Moses Idowu Atilola, Wasiu Oyewale Shittu and Olaitan Ayodeji Olowoleru	Bridging the urban-rural gap: key to sustainable development in Akure - Oluwayomi Akinrinmade and Odunwole Sogbon
	09:55-10:05	Effects of global financial crises on financial performance of selected indigenous construction firms in Katsina State, Nigeria - Sani Yar'adua Ibrahim and Dikko Kado	Highest and best use ideology for sustainable development of residential lands in metropolitan Lagos, Nigeria - Michael Adedayo Adebayo
	10:05-10:15	Q&A	Q&A
	10:15-10:25	Analysis of budgets for physical infrastructure for public secondary schools - D. O. Mac-Barango and I. Mbamali	Impact of residential property development patterns on sustainable environment in Akure, Nigeria - Bamidele M. Ogunleye
	10:25-10:35	Budgetary allocation to the housing sector and the price of some building materials - D. O. Mac-Barango and Abdullateef A. Shittu	Role of professional builder in achieving sustainable built environment in Nigeria - D. Dahiru, A. D. AbdulAzeez, K. Bala
	10:35-10:45	Q&A	Q&A
	10:45-10:55	Thematic analysis of challenges faced by small and medium construction companies in accessing credit in South Africa - Balogun O.A, Agumba J.N and Ansary N	Perception of Estate Surveyors and Valuers on users' preference for green building in Lagos, Nigeria - Markson Opeyemi Komolafe and Matthew Oluwole Oyewole
	10:55-11:05	Framework for assessing the effectiveness of	Incorporating environmental sustainability into

	competitive tendering process for works procurement at pre-contract stage in Chad Republic - Sazoulang Douh, Emmanuel Adinyira and Theophilus Adjei-Kumi	construction procurement at the district assembly level in Ghana - Harold Adjarko, Joshua Ayarkwa and Kofi Agyekum
11:05-11:15	Q&A	Q&A
11:15-11:35	BREAK	
11:35-13:00	PROFESSIONAL DEVELOPMENT SESSION Session 1 on Research Supervision (Main Auditorium) Session 2 on Doctoral research and postdoctoral activities (Seminar Room)	
	SESSION 1: RESEARCH SUPERVISION	SESSION 2: DOCTORAL RESEARCH AND POSTDOCTORAL ACTIVITIES
11:35-13:00	What are the elements of good research supervision? What are the critical points of the process and what strategies can be used for dealing with the critical points? This session will involve exchange of ideas and experiences on successful practices (Prof Koshy Varghese, Prof Kwabena Anaman, and Prof George Ofori will contribute to the interactions in this session)	How do you make a contribution to knowledge for the purpose of achieving a PhD? How do you develop from the PhD to becoming a recognised academic? This session on doctoral research and postdoctoral activities will be led by contributions from Dr Roine Leiringer, Dr Martin Tuuli and Dr Aaron Anvuur
13:00-13:45	LUNCH	
13:45-14:25	KEYNOTE ADDRESS Doing and publishing quality research – Dr Roine Leiringer, University of Hong Kong & Co-editor of Construction Management and Economics journal	
14:25-14:40	Q&A	
14:45-15:45	PARALLEL SESSION	
	STREAM 1 (MAIN AUDITORIUM)	STREAM 2 (SEMINAR ROOM)
Chair	Dr Kulomri J. Adogbo, Ahmadu Bello University, Nigeria	Dr Clinton Aigbavboa, University of Johannesburg, South Africa
14:45-14:55	Methods to assess the effectiveness of naturally ventilated classrooms in Gauteng, South Africa - E.A. Essah and W. Kwawu	Management of multi-tenanted properties in Abeokuta - Ibrahim T. Akogun
14:55-15:05	Designing equator-facing window for direct solar gains optimisation in buildings - Yaktor J. Inusa, Elizabeth Dassah, Pontip S. Nimlyat and Michael	An assessment of the conformity of housing standards in the rising urban development in Kaduna State - Y.M. Zaki and N.E. Suleman

		O. Ajufoh	
	15:05-15:15	Q&A	Q&A
	15:15-15:25	Combating the impact of collapse of building structures in Lagos Island, Lagos State, Nigeria - Oladimeji Oyanda	Analysis of spatial inequality and urban poverty traps in Akure - Odunwole Sogbon
	15:25-15:35	Assessing the effects of unauthorized buildings in the Sekondi-Takoradi metropolis, Ghana - Matthew K. Somiah, Joe Frederick Cobbinah and P. Kwaw	Performance of private sector participation in solid waste collection: a polycentric planning perspective - Samson Akinola
	15:35-15:45	Q&A	Q&A
	15:45-16:00	BREAK	
	16:00-17:30	RESEARCH SKILLS WORKSHOP Methodologies for collecting and analysing qualitative data – Facilitated by Dr Martin Tuuli and Dr Aaron Anvuur (Loughborough University, UK)	
	17:30-17:30	CLOSE	

DAY 3	WED.	12th AUGUST 2015	
12.08.15	08:45-09:00	Video highlights of previous day	
	09:00-09:30	KEYNOTE ADDRESS Dr Ron Watermeyer, Director, Infrastructure Options (Pty) Ltd, South Africa (Design and adoption of innovative procurement systems in infrastructure delivery)	
	09:30-09:40	Q&A	
	09:45-13:00	PARALLEL SESSION	
		STREAM 1 (MAIN AUDITORIUM)	STREAM 2 (SEMINAR ROOM)
	Chair	Dr Martin M. Tuuli, Loughborough University, UK	Prof Koshy Varghese, Indian Institute of Technology Madras, India
	09:45-09:55	Forecasting the duration for small span bridge construction projects using the Artificial Neural	A comparison of lightweight and heavyweight construction incorporating phase change materials for

	Network (ANN) - Isaac Mensah, Theophilus Adjei-Kumi, Gabriel Nani, Anthony K. Danso	office buildings in a composite hot climate - Amina Batagarawa, Neveen Hamza, Steve Dudek and Rugayyah Tukur
09:55-10:05	Strategies to facilitate building information modelling adoption in the South African construction industry - George Kekana, Clinton Aigbavboa and Wellington Thwala	Factors influencing materials selection for housing projects in the Ghanaian construction industry: stakeholders' perspective - Samuel Kwame Ansah, Clinton Aigbavboa, Wellington Thwala and S.O. Ametepey
10:05-10:15	Q&A	Q&A
10:15-10:25	Project quality management practices in multinational and indigenous construction firms of Nigeria - Umar Saad Mohammed and Dahiru Dauda	Effect of crushed ceramics waste partially replaced with fine aggregate in hot mix asphalt - Abdulfatai Adinoyi Murana, Lawal Sani and Sani Abdulrahman Tolani
10:25-10:35	Construction professionals' perception on the prospect of adopting E.M.S ISO 14001 in Nigerian construction industry - Abdulkarim Mohammed Iliyasu and Muawiyya Abubakar	Use of crumb rubber as a partial replacement for fine aggregate in asphalt concrete mixes - Abdulfatai Adinoyi Murana, Lawal Sani and Sani Abdulrahman Tolani
10:35-10:45	Q&A	Q&A
10:45-10:55	Pareto analysis on the total quality management (TQM) status of Nigerian design firms - Dikko Kado and Kabir Bala	Evaluation of clay roof tiles produced with saw-dust, cassava starch and makuba - Aliyu Lawal Muhammad and M. I. Khalil
10:55-11:05	Factors affecting the application of total quality management approach in building maintenance practices - A.D. AbdulAzeez, A. Abbas, D. Dahiru, M. Abubakar	Ecological self-compacting concrete using gum arabic as a plasticizer - P.W. Zakka, O.F. Job and N.A. Anigbogu
11:05-11:15	Q&A	Q&A
11:15-11:30	BREAK	
11:30-11:40	Motivational factors of employee-consultant in Nigerian construction industry - Abubakar Darda'u Abdulazeez, Emmanuel Chukwuemeka Osuji, Dauda Dahiru and Dalhatu Abdussalam	Use of cocoa bean shells ash (CBSA) as a stabilizer in soil bricks production - John Kobina Fynn, Emmanuel Aseidu, Peter P. Yalley, Patrick Zieve and Kennedy Appiadu-Boakye
11:40-11:50	Measures to improve the performance of construction projects in South Africa - Mandisa Sibiyi, Clinton Aigbavboa and Wellington Thwala	Effect of African Locust Bean Waste Water on Soil Bricks for Masonry walling - Patrick Zieve, Peter P. Yalley, Emmanuel Aseidu and Kennedy Appiadu-

			Boakye
11:50-12:00	Q&A		Q&A
12:00-12:10	Perspectives of construction business marketing strategies: exploring the inherent challenges of marketing strategies of SME contracting firms in Ghana - Owusu-Manu, D., Badu, E. and Darko, A.		Effect of compacting rate on the strength properties of soil blocks - Humphrey Danso
12:10-12:20	Overview of road infrastructure development in Ghana - Joseph Ignatius Teye Buersey, Felix Atsrim and Stephen Kofi Asare		Influence of environmental variables on the mechanical properties of rice husk ash (RHA) blended cement concrete - Mohammed Hassan Nensok
12:20-12:30	Q&A		Q&A
12:30-13:15	LUNCH		
13:15-14:25	ACADEMIA / INDUSTRY FORUM Panel discussion on relevance of academic research to the needs of industry		
14:30-16:30	PARALLEL SESSION		
	STREAM 1 (MAIN AUDITORIUM)	STREAM 2 (SEMINAR ROOM)	
Chair	Dr Aaron M. Anvuur, Loughborough University, UK	Dr Cynthia Adeokun, Colman Architects Ltd, UK	
14:30-14:40	Gender perceptions of skill sets of female architects in north central Nigeria - Ebelechukwu Enwerekwe and Erekpitan Ola-Adisa	Putting research into practice: exploring the inherent challenges of research uptake in the built environment faculties in Ghana - Owusu-Manu, D., Badu, E., Agyekum, K. and Akom, J.B.	
14:40-14:50	Attrition of quantity surveying professionals in quantity surveying firms in Ghana - Emmanuel A. Awene, Gabriel Nani and F.D.K. Fugar	Management policies for accessible environment in senior high schools - Stephen Dwirah, Richmond Opoku, Loretta Asabea Obuobi, Tagritaa Pascal Saafaa, Francis Agyekum-Boateng, Eric Paul Tudzi	
14:50-15:00	Q&A	Q&A	
15:00-15:10	Theoretical link between organizational behaviour and cost advice function of quantity surveyors via project teams - Gaius Ishaya, Baba Adama Kolo and Kulomri J. Adogbo	Promoting education on inclusive design of the built environment at KNUST - Anthony Kwame Danso and Eric Paul Tudzi	
15:10-15:20	The role of Fadama activities on women empowerment in Ede North Local Government Area of Osun State, Nigeria. Osun State, Nigeria -	Education at the Confluence of Effective Building Information Modeling Integration to Building Industry in Malaysia - Badiru Yunusa Yusuf, Kherun	

	M.B. Gasu and A. A. Ajani	Nita Ali, Muhammad Rashid Embi and Abdul’Azeez Abubakar Darda’u
15:20-15:30	Q&A	Q&A
15:30-15:45	BREAK	
15:45-15:55	Use of computer tomography scan for non-destructive testing of concrete - Dauda Dahiru	Perception of employers on the performance of construction craftsmen trained in Nigeria - P. G. Chindo, A.D. Ibrahim, Y. M. Ibrahim and Y.G. Musa-Haddary
15:55-16:05	Performance level of accuracy measuring methods in classified remote sensing images as applied to the built environment - Zubayr Alhaji-Taihid Suleyman, Ifeanyi Chukwudi Onuigbo, Joseph Olayemi Odumosu, Oluibukun Gbenga Ajayi and Nanpon Zitta	An appraisal of entrepreneurship education in the Nigerian polytechnic programmes: A case study of architectural technology programme, Kano State Polytechnic - Abdullahi Abubakar
16:05-16:15	Q&A	Q&A
16:15-16:25	Barriers to implementation of construction innovations and measures of reducing these barriers - Arthur-Aidoo Bernard Martin, Aigbavboa C. O. and Thwala W. D.	Capacity building for the Nigerian architectural educators to meet the challenges of the 21st century - Abdullahi Abubakar and Nghai Ezekiel Suleman
16:25-16:35	Use of knowledge management in the Nigerian construction industry - M. Abdulrazaq , A. J. Abdullahi and A. D. Ibrahim	Virtual reality and the built environment curriculum - Muhammad Zia-ul-haq Muhammad and Mansir Dodo
16:35-16:45	Q&A	Q&A
16:50-17:00	CONFERENCE SUMMARY Dr Roine Leiringer, University of Hong Kong, Hong Kong	
17:00-17:30	CLOSING SESSION Presentation of certificates and prizes	

CONTENTS

SECTION 1: KEYNOTES

A research agenda for the built environment – George Ofori.	- 1 -
Developing an academic career: what should you do, and how should you do it? – George Ofori	- 3 -
Information and communication technology in construction – Koshy Varghese	- 5 -
Some observations on ‘doing’ and ‘writing’ quality research – Roine Leiringer	- 7 -
Design and adoption of innovative procurement systems in infrastructure delivery– Ron Watermeyer	- 11 -

SECTION 2: CONFERENCE PAPERS

A comparison of lightweight and heavyweight construction incorporating phase change materials for office buildings in a composite hot climate - Amina Batagarawa, Neveen Hamza, Steve Dudek and Ruqayyah Tukur	- 15 -
An assessment of the conformity of housing standards in the rising urban development in Kaduna State - Zaki, Y.M., Suleman, N.E. and Teku, Y.	16
An empirical study of the magnitude of construction claims in building projects - Akinradewo O. F., Ogunsemi D. R., Dada M. O. and Aje I. O.	- 17 -
An overview of the road infrastructure development in Ghana - Joseph Ignatius Teye Buertey, and Felix Atsrim, Stephen Kofi Asare	- 18 -
Analysis of budgets for physical infrastructure for public secondary schools - D. O. Mac-Barango and I. Mbamali	- 19 -
Analysis of spatial inequality and urban poverty traps in Akure, Nigeria - Sogbon, Odunwole	- 20 -
Appraisal of health and safety management practices of construction SMEs in Abuja, Nigeria - Abdullateef A. Shittu, Ahmed D. Ibrahim, Yahaya M. Ibrahim & Kulomri J. Adogbo	- 21 -
Architects and interdisciplinary research: reflections from ethnographic and measured fieldwork - Joy Joshua Maina	- 22 -
Assessing the effects of unauthorized buildings in the Sekondi-Takoradi Metropolis of Ghana - Somiah, M. K., Cobbinah, J. F. and Osei-Poku, G.	- 23 -
Attrition of quantity surveying professionals in quantity surveying firms in Ghana - Awene, A. Emmanuel and Nani Gabriel	- 24 -
Bridging the urban-rural gap: key to sustainable development in Akure, Nigeria - Akinrinmade, Oluwayomi and Sogbon, Odunwole	- 25 -
Barriers to implementation of construction innovations and measures of mitigating these barriers - Arthur-Aidoo B. M., Aigbavboa C. O. and Thwala W. D.	- 26 -
Budgetary allocation to the housing sector and the impact on prices of some building materials - D. O. Mac-Barango and A. A. Shittu	- 27 -
Capacity building for Nigerian architectural educators - Abdullahi Abubakar and Nghai Ezekiel Suleman	- 28 -
Combating the impact of collapse of building structures in Lagos Island, Lagos State, Nigeria - Iyanda, Oladimeji	- 29 -
Comparative cost analysis of wall cladding materials - D. O. Mac-Barango	- 30 -
Conceptual cost contingency estimation model: a risk modelling approach - Joseph Ignatius Teye Buertey and Felix Atsrim	- 31 -

Construction professionals' perception on the prospect of adopting E.M.S ISO 14001 in Nigerian construction industry - Abdulkarim Mohammed Iliyasu and Mu'awiya Abubakar	- 32 -
Demographic attributes influence on health and safety practices for small and medium construction enterprises - Justus Ngala Agumba and Theo Conrad Haupt	- 33 -
Designing equator-facing window for direct solar gains optimisation in buildings - Yaktor J. Inusa , Elizabeth Dassah, Pontip S. Nimlyat and Michael O. Ajufoh	- 34 -
Determinants of office rents in Accra, Ghana - Noah Kofi Karley	- 35 -
Due process practice on construction projects in Lagos State, Nigeria - Oluwaseyi Ajayi and Bamidele Mafimidiwo	- 36 -
Ecological self-compacting concrete using gum arabic as a plasticizer - P.W. Zakka, O.F. Job and N.A. Anigbogu	- 37 -
Education at the confluence of effective building information modelling integration to building industry in Malaysia - Badiru, Yunusa Yusuf, Kherun, Nita Ali, Muhammad, Rashid Embi and Abdul'Azeez, Abubakar Darda'u	- 38 -
Effect of African locust bean waste water on soil bricks for masonry walling - Zievie, P., Yalley, P. P., Aseidu, E. and Appiadu-Boakye, K.	- 39 -
Effect of compacting rate on the strength properties of soil blocks - Humphrey Danso	- 40 -
Effect of crushed ceramics waste partially replaced with fine aggregate in hot mix asphalt - Abdulfatai Adinoyi Murana, Lawal Sani and Sani Abdulrahman Tolani	- 41 -
Effects of global financial crises on financial performance of selected indigenous construction firms in Katsina State, Nigeria - Sani Yar'adua Ibrahim and Dikko Kado	- 42 -
Enhancing architecture in Nigeria through research: bridging the gap between academic and practice-led research - Elizabeth Dassah and Zanzan Uji	- 43 -
Enhancing safety: lessons from senior managers in the Nigerian construction industry - T. Zuofa and E.G. Ochieng	- 44 -
Entrepreneurship education in Nigerian polytechnics: case study of the Architectural Technology Programme at Kano State Polytechnic - Abdullahi Abubakar	- 45 -
Estate surveyors and valuers perception of land acquisition problem in Kwara State - Atilola, Moses Idowu , Olaniyan Adenle Akindele and Olowoleru Olaitan Ayodeji	- 46 -
Evaluation of clay roof tiles produced with saw-dust, cassava starch and makuba - Muhammad A.L. and Khalil M. I.	- 47 -
Exploring health and safety practices on some Nigerian construction sites - Baba Shehu Waziri, Mansur Hamma-adama, and Bukar Kada	- 48 -
Facilities management for African urban marketplaces: Attitudes toward waste management - Adeni Abigo, Kassim Gidado and Paul Gilchrist	- 49 -
Factors influencing materials selection for housing projects in the Ghanaian construction industry: stakeholders' perspective - Ansah S.K., Aigbavboa C.O., Thwala W. and Ametepey S.O.	- 50 -
Factors influencing the performance of housing market in Nigeria - Matthew Oluwole Oyewole	- 51 -
Factors responsible for mortgage default in Nigeria: A comparative study of commercial banks and primary mortgage institutions - Atilola, Moses Idowu, Shittu Wasiu Oyewale and Olowoleru Olaitan Ayodeji	- 52 -
Forecasting the duration for small span bridge construction projects using artificial neural network - Isaac Mensah, Theophilus Adjei-Kumi and Gabriel Nani	- 53 -
Framework for assessing the effectiveness of competitive tendering process for works procurement at pre-contract stage in Chad Republic - Douh Sazoulang, Emmanuel Adinyira and Theophilus Adjei-Kumi	- 54 -
FREECAD: Efficacy of arch module for authoring architectural content in a BIM process using open-source software - Onyeibo Oku and Augustine Nwagbara	- 55 -

Gender perceptions of skill sets of female architects in North Central Nigeria - Ebelechukwu Enwerekowe and Erekpitan Ola-Adisa	- 56 -
Highest and best use of residential lands in selected housing estates in Lagos, Nigeria - Adebayo, Michael Adedayo	- 57 -
Impact of residential property development patterns on sustainable environment in Akure, Nigeria – Bamidele M. Ogunleye	- 58 -
Inclusive access to Accra shopping malls - Anthony Kwame Danso and Eric Paul Tudzi-	59 -
Incorporating environmental sustainability into construction procurement at the District Assembly level in Ghana - Harold Adjarko, Joshua Ayarkwa, Kofi Agyekum	- 60 -
Influence of environmental variables on the mechanical properties of rice husk ash blended cement concrete - Mohammed Hassan Nensok	- 61 -
Influence of Fadama activities on women empowerment in Ede North Local Government Area of Osun State, Nigeria - M.B. Gasu and A. A. Ajani	- 62 -
Influence of property market cycle on commercial office property in Victoria Island, Lagos State, Nigeria - Oladapo, R. Adejoke	- 63 -
Management of multi-tenanted properties in Abeokuta - Ibrahim T. Akogun	- 64 -
Management policies for accessible environment in senior high schools - Dwirah Stephen, Opoku Richmond, Obuobi Asabea Loretta, Saafaa Pascal Tagritaa, Agyekum- Boateng Francis and Tudzi Paul Eric	- 65 -
Managing retention in residential building projects in some selected states in Nigeria - Lekan M. Amusan, Joy Nkolika-Peter, Ayo K. Charles, Afolashade Oluwatobi and Ignatius O. Omuh	- 66 -
Measures to improve the performance of construction projects in South Africa - Mandisa Sibiya, Clinton Aigbavboa and Wellington Thwala	- 67 -
Methods to assess the effectiveness of naturally ventilated classrooms in Gauteng, South Africa - E.A. Essah and W. Kwawu	- 68 -
Motivational factors of employee-consultant in Nigerian construction industry - Abdulazeez, A. D., Osuji, E. C., Dahiru, D., and Abdussalam, D.	- 69 -
Pareto analysis on the total quality management status of Nigerian design firms - Dikko Kado and Kabir Bala	- 70 -
Perception of employers on the performance of construction craftsmen trained in Nigeria - Chindo P. G., Ibrahim A.D., Ibrahim Y. M. and Musa-Haddary Y.G.	- 71 -
Perception of estate surveyors and valuers on users' preference for green building in Lagos, Nigeria – Markson Opeyemi Komolafe and Matthew Oluwolwe Oyewole-	72 -
Performance level of accuracy measuring methods in classified remote sensing images as applied to the built environment - Zubayr Alhaji-Taihid Suleyman, Ifeanyi Chukwudi Onuigbo, Joseph Olayemi Odumosu, Oluibukun Gbenga Ajayi and Nanpon Zitta	- 73 -
Performance of private sector participation in solid waste collection: A polycentric planning perspective - Samson Akinola	- 74 -
Perspectives of construction business marketing strategies: exploring the inherent challenges of marketing strategies of SME contracting firms in Ghana - Owusu- Manu, D. , Badu, E. and Darko, A.	- 75 -
Project management competencies of indigenous contractors in Nigeria - Patience F. Tunji-Olayeni, Timothy O. Mosaku, Olabosipo I. Fagbenle and Lekan M. Amusan-	76 -
Project quality management practices in multinational and indigenous construction firms of Nigeria - Mohammed Umar Saad and Dauda Dahiru	- 77 -
Promoting education on inclusive design of the built environment at KNUST - Anthony Kwame Danso and Eric Paul Tudzi	- 78 -
Prudence practice among construction project managers in Nigeria - Wasiu Adeniran Bello and Emmanuel Andenyang	- 79 -

Putting research into practice: exploring the inherent challenges of research uptake in the Built Environment Faculties in Ghana - Owusu-Manu, D., Badu, E., Agyekum, K. and Akom, J.B.	- 80 -
Qualitative adequacy of purpose built hostels in Wa - Elvis Attakora-Amaniampong, Stephen Ameyaw and Wise Akortsu	- 81 -
Remedial approach of securing land-title and development permit: case study of the Ogun State Home-Owner Charter Programme - Bello, Nurudeen Akinsola Jolaoso, Babatunde Adekoyejo and Kilasho, Musiliudeen Omotunde	- 82 -
Role of built environment professionals in achieving sustainable built environment - Dahiru, Dauda, AbdulAzeez, Abubakar Darda'u and Bala, Kabir	- 83 -
Staff perception of relaxation spaces in offices of tertiary institutions of Niger State - Onwuka Bridget Nneoma	- 84 -
Strategies to facilitate Building Information Modelling adoption in the South African construction industry - George Kekana, Clinton Aigbavboa and Wellington Thwala	- 85 -
Thematic analysis of challenges faced by small and medium construction companies in accessing credit in South Africa - Balogun O. A., Agumba J. N. and Ansary N.	- 86 -
Theoretical link between organizational behaviour and cost advice function of quantity surveyors via project teams - Gaius Ishaya, Baba Adama Kolo and Kulomri J. Adogbo	- 87 -
Use of cocoa bean shells ash as a stabilizer in soil bricks production – Fynn, John Kobina, Asiedu, Emmanuel, Yalley, Paa Peter, Zievie Patrick and Appiadu-Boaky, Kennedy	- 88 -
Use of computer tomography scan for non-destructive testing of concrete - Dauda Dahiru-	89 -
Use of crumb rubber as a partial replacement for fine aggregate in asphalt concrete mixes - Abdulfatai Adinoyi Murana, Lawal Sani and Sani Abdulrahman Tolani	- 90 -
Use of knowledge management in the Nigerian construction industry - Abdulrazaq M. , Abdullahi, A. J. and Ibrahim, A. D.	- 91 -
User satisfaction with space flexibility in offices of selected tertiary institutions in Niger State, Nigeria - Adedayo Olatunde Folaranmi, Anunobi Anthony Ikechukwu, Oyetola Stephen Ayodele, Adebayo Oluwatoyin Abiodun and Odine Lynda Catherine	- 92 -
User's preferences in mass housing estate in Niger and Kwara States of Nigeria - Adedayo Olatunde Folaranmi	- 93 -
Virtual reality and the built environment curriculum - Muhammad Zia-ul-haq Muhammad and Mansir Dodo	- 94 -
Wayfinding in multi-level buildings: A study of the Senate Building, Ahmadu Bello University - Joy Joshua Maina and Bello Oben' Umar	- 95 -
INDEX OF AUTHORS	- 97 -
INDEX OF KEYWORDS	- 99 -

SECTION 1: KEYNOTES

A RESEARCH AGENDA FOR THE BUILT ENVIRONMENT

George Ofori¹

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The built environment sector comprises the construction industry and the allied groupings of enterprises in the same value chain which plans for, finances, designs, constructs, owns, sells or rents, operates and manages, and eventually demolishes the physical components of the built environment. This sector plays a key role in the social and economic development of any country as it establishes the physical means for the process of development. The tasks the built environment sector will be required to tackle will continue to be complex. Appropriate materials, technologies, tools and methods, equipment, practices and procedures need to be continuously developed. Further research should be undertaken to provide the industry with the background knowledge, discoveries and the ways and means of successfully delivering on the tasks put to it.

How can researchers know what to research? The aim is to discuss a research agenda for the built environment. It is also the intention to explore new ways of working on research subjects in the built environment sector. In this regard, the main theme is: “going beyond current issues to make connections and make a difference”.

Some fundamental questions on the nature of the built environment are considered in order to establish the objects of research on the sector. First, what and why the sector produces are analysed. Second, the participants in the process, the methods adopted and the environment in which these activities take place are considered. This is followed by a discussion of how the sector's performance is assessed. Third, the nature of the operating environment of the sector is explored. Finally, what the future holds, and what researchers must do are explored.

The research agendas of some countries are discussed, starting with the national strategic development agendas, then considering the national construction industry programmes these strategies give rise to, and then the research agendas for the built environment sector and parts of it. This is followed by consideration of an existing global research agenda for built environment sector.

What should research in the built environment sector aim to achieve? What should it seek to work on? Research agendas for segments of the built environment sector are suggested. These are followed by a discussion of the new approaches to research. Examples of “finding and making connections”; and “looking beyond” are outlined. The outline of the

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proposed research agenda is considered. The agenda should set out the framework for research that should be forward looking and path breaking; it should tackle new topics with new approaches and methods. It should encourage work on topics should deal with real problems to find solutions that will make a difference and improve quality of life.

It is proposed that a national research road map be prepared. This should be context based, with a firm foundation, realistic but aspirational. It should be prepared by the national industry development agency, umbrella industry organizations and academic representatives. There should also be an action plan and monitoring arrangements. National awards and other forms of recognition would be suitable motivators. Finally, a poem sets out the main issues.

Keywords: built environment, research agenda

DEVELOPING A SUCCESSFUL ACADEMIC CAREER: WHAT SHOULD YOU DO, AND HOW SHOULD YOU DO IT?

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The university academic staff member is well qualified and is employed to teach and undertake research. The academic is a teacher and a scholar, and is recognized as being engaged in a profession. Thus, the academic is highly regarded in society. What are the reciprocal responsibilities of the academic? As an academic, what do you intend to achieve in your career? Should you be satisfied with your current level of output and achievement? How can you continue to improve your performance? What is your role? What can you expect from your institution; and what are you entitled to expect? Do you have a responsibility to contribute to the development of knowledge in your field? Do you think you have a responsibility to society?

The aim is to discuss the career development of an academic. Issues covered include motivations for, and benefits of, the continuous development of an academic. A fundamental consideration of the nature of an academic and an analysis of what the academic does is followed by discussion of how the performance of the academic is assessed. The following questions are discussed: Who is an academic? Is the academic a professional? Why is academic development important – to the individual; to the institution; and to society? How is the career development of an academic undertaken? Is it a deliberate process, or does it materialize on its own over time? What should the academic do? How can one measure one's progress in one's development as an academic? What help can one have, in one's institution and elsewhere? Is there an end point (a limit) to the development of an academic?

As “institutions of higher learning”, universities must meet very high expectations and demands from society in terms of the graduates they produce, and the solutions they help to find to the prevailing and future pressing needs of the society. Moreover, the universities are operating in an increasingly more demanding and competitive environment. One of the factors for ranking universities is the perception of peers of the reputation of the particular university. This is invariably derived from the perceived quality of the academic staff members of the university. Further questions arise: does an academic have the responsibility to contribute to the enhancement of the reputation of the university? How can the academic's aspirations be aligned with the institution's policy goals? What should the institution do to guide and support the effort of the academic to improve the academic's performance?

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Some advice is given to the individual, the department and the university. It is suggested that the individual academic should assume the responsibility for the continuous development of the academic's career. The elements of good practice in doing this are discussed. The help that is available for this particular aspect of the academic's life is highlighted. Examples of universities and individual cases are presented. Elements of the career development of one prominent academic are outlined. The implications of the professionalism of the academic are used to frame the discussion of the way forward. The questions considered include: should the service orientation be a watchword of the academic? What about altruism? Should there be a code of ethics that, among others, obliges the academic to continue to improve in performance, and make the maximum contribution to society?

Keywords: academic career, academic development, academic responsibility, successful academic

INFORMATION AND COMMUNICATION TECHNOLOGY IN CONSTRUCTION

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Information and Communication Technology (ICT) advances have disrupted the conventional ways of working in several industries at a global scale. From the 1970's, the impact of computing technologies have steadily been increasing in all activities of Architecture, Engineering and Construction (AEC) Industry. From the initial focus on numerical computing, the technology today has become essential for a wide range of activities such as communication, visualization, planning and field data collection. The construction industry has been slower than most other industries in the adopting, harnessing and deploying of ICT. This has been attributed to the structure of the industry as well as its conservative approach. There is a need to improve the understanding of technology adoption models in the construction industry in order to enable the projects to derive value out of investing in technologies.

This talk will address several aspects of ICT applicability and adoption by the AEC industry through two case studies. The first case study will discuss technology adoption process on a project where a large owner in collaboration with the nominated general contractor adopted building information modeling with the expectation of reducing project duration. The process of evolving the BIM execution strategy and the resulting implementation as well as the outcomes and lessons learned will be presented.

The second case-study will present the adoption of a wide range of digital technologies being utilized for metro rail construction. Some of the largest construction projects in the world today are metro rail projects. These include the Cross-Rail project in London, several projects in the Middle East and over fifty on-going metro rail projects in India and China. Successful metro rail planning and construction requires collaboration of a wide range of disciplines- from Archeologists to Urban Planners. In addition to sophisticated engineering technologies for under and over ground construction, the utilization of digital technologies to model and integrate the information needs of various disciplines has had a major impact on several of the metro rail projects. The talk will discuss the technologies, adoption mechanisms, success and challenges faced in developing an integrated digital technology platform for one of the largest projects in India.

Keywords: BIM, information technology, ICT applicability, computing technology, technology adoption, visualization

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SOME OBSERVATIONS ON ‘DOING’ AND ‘WRITING’ QUALITY RESEARCH

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This presentation is based on observations made acting as a reviewer and theme leader for five consecutive WABER conferences. The presentation will strive to go from the generic to the specific in dealing with a variety of issues that are important both in doing research and in writing for publication. Due to the nature of the exercise the treatment of the issues is by no means exhaustive. Indeed, each topic is worthy of a presentation/paper of its own. Furthermore, it is important to note that ‘research quality’ is a very subjective concept. Views vary depending on the philosophical underpinnings and research methods applied. However, commonly it is assessed on the basis of all aspects of study design; and is a judgment regarding the match between the methods and questions, selection of subjects, measurement of outcomes, and protection against bias. Thus, the objective here is not to draw strict conclusions regarding what is right and what is wrong as this is simply not possible; and even if it was it would not be desirable. Instead, focus is on highlighting the need to actively strive for research quality and how this then can be transferred into publications.

To start, the ever growing importance of publishing will be briefly discussed. The point will be made that, on the international arena, academic reputational credibility is increasingly dependent on journal rankings and citation indicators. For universities, in general, citations and journal rankings are now used as an index of institutional quality and as a means to establish prestige. The ‘value’ and ‘quality’ of a publication is measured against the perceived quality of the journal it is published in, the number of citations it gets, and a variety of time related indexes. It follows that, publications in high ranking outlets and citations accrued by academic units are significantly related to rankings of their academic quality. The main drivers for this – in my opinion rather sad scenario – including university rankings, promotions, competition for funding, national research assessment exercises etc. will be briefly touched upon. While it is clear that not all these drivers have a direct influence on academics in the African context, I will argue that they have an indirect impact as they influence the international journals in which African-based researchers strive to publish. Following on from this the argument is then progressed to look at how to find an appropriate journal to publish in, and how the type and quality of the research undertaken dictates this choice.

The presentation then takes a brief detour to outline the very different ways of doing and thinking about research, i.e. paradigms. This is necessary as the methods and techniques mobilised in research bring with them certain assumptions about how the world works, and about what knowledge you can produce to describe it. I will argue that understanding

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this is essential. While not something that has to be made explicit in writing, a good understanding of ontology, epistemology and methodology significantly increases the chances of producing rigorous research, and in turn, well-argued papers. Some terms that will be discussed are: Ontology – basic assumptions about the nature of reality. Any way of understanding the world, or some part of it, makes assumptions about what kinds of things do or can exist in that domain, and what might be their conditions of existence and relations of dependency (for example persons, institutions, relations, norms, practices, structures, roles, and so on). Such an inventory of kinds of being and their relations is an ‘ontology’. Epistemology – basic assumptions about what we can know about reality, and about the relationship between knowledge and reality. Put slightly differently, it deals with the problem of knowledge: what knowledge consists of, how we know what we think we know, and what grounds we have for thinking that it is possible to have knowledge of anything. Methodology - specifies how the researcher may go about practically studying whatever he / she believes can be known. Methodology is focused on the specific ways -- the methods -- that we can use to try to understand the world better. Paradigm - overarching perspective concerning appropriate research practice, based on ontological and epistemological assumptions.

Our ontological and epistemological leanings have fundamental implications on how we use theory and our choice of research method(s). In very simple terms, theory can be seen as a way of looking at a field that is intended to have explanatory and/or predictive implications. Generally speaking there are three different ways of viewing theory in the social sciences: (i) Theory as generalisations about, and classifications of, the social world. The scope of generalisation varies from theorising about a particular range of phenomena to more abstract and general theories about society as a whole; (ii) Theory as a set of statements that should be translated into empirical, measurable, or observable propositions, and systematically tested; (iii) Theory as explaining phenomena, identifying causal mechanisms and processes which, although they cannot be observed directly, can be seen in their effects. All three are perfectly acceptable and the view taken quite clearly relates to ontological and epistemological considerations. I will argue that it is these considerations that dictate which theories could be used together and which that cannot. This is known as theoretical proximity and theoretical compatibility. Crudely put, theories are based on a series of assumptions and claims of how things are connected and they cannot, therefore, be combined indiscriminately. Examples will be shown to illustrate this point. Of great importance here is the explication of the theoretical constructs. These are conceptual abstractions of phenomena that cannot be directly observed, such as ‘trust’ and ‘capability’. Achieving construct clarity is, therefore, a necessity for the successful collection and analysis of data. This is where many research endeavours fall short.

Similarly related to ontological and epistemological considerations is the choice and explication of the research methodology. The presentation will deal with two key issues in regards to methodology. The first is the misuse of the term and the tendency to use ‘methodology’ as a pretentious substitute for method. This misuse of the term obscures an important conceptual distinction between the tools of scientific investigation (properly ‘methods’) and the principles that determine how such tools are deployed and interpreted. The second issue, which is of greater substantial

importance, is that of methodological slurring. This is sometimes made explicit in the papers; e.g. when an author claims to be adopting an interpretivist approach, but goes on to use positivist methods (the misuse of the Yin case study method is a very common example of this). Other times it is not made explicit, but it is nonetheless clear that there is little congruence between the research question (i.e., the researcher's assumptions about the nature of reality and how one might know reality) and the methods used to address the question. Methodological slurring leads to poor research and resultant papers will not get accepted in any of the better journals. Note that this does not mean that it is wrong to combine quantitative and qualitative methods. On the contrary, such research can be very powerful if done properly.

From these broad observations, attention will then turn to more specific observations on paper writing and issues that keep appearing in most papers. The first of these has to do with the introduction and framing of the paper. In general this relates to the problematisation of the research and the literature review. This is a very important part of the paper that seemingly is not given the amount of attention it deserves. What is commonly missed is that the introduction needs to effectively introduce the paper. When writing an introduction the following sequence is useful: a short introductory statement of the contextual grounding (i.e. what does this paper deal with? - this could be a brief background statement etc.); what is the issue or problem within this context that the paper will address, and why is this interesting and worthy of research; what does the paper set out to do (i.e. what is the purpose of the paper and what might the reader gain from reading it); how is the paper structured (i.e. what specific issues, approaches, theories etc. are going to be introduced). Specific attention will be given to the question of how to explicate what is usually called 'the knowledge gap'. It is my firm belief that this should not take the form of showing/arguing that no one has done this particular kind of research before. There could be very good reasons for why it has not been done...! Rather it is necessary to show how the research actually adds to the current knowledge base. So, instead of arguing that no one has applied this particular method/theory to this particular problem before, the author should present a justification for why it is useful to do so. This is a slightly different, but substantially stronger, argument.

The second observation has to do with the analysis and discussion. This is the most challenging part of the paper and requires critical thinking skills. Too often this section is reduced to presenting numerical data and the results of statistical tests, or a series of excerpts from interviews. Sometimes this is justified, but more often than not what is lacking is engagement with theory and the literature. This is the section in which 'value' should be added, and it should form the basis for new knowledge claims. Hence, rather than just presenting the data, authors should try and think about the following: Respond to the research question / problem you set out in the introduction; what have you found out; what arguments are you making – are they obvious; what is the logic behind the argument – how does the data get you there; relate both to the data and back to the literature positioning/theory. A good front-end makes the analysis and discussion much easier to write.

A third, more specific, observation concerns the use of factor analysis and Structural Equation Modelling (SEM). There is nothing wrong with using

these techniques, if done properly. However, far too often this is not the case. My main argument here is that this particular research method is not well suited for exploratory studies. Indeed, it was developed to test theory rather than develop it. Somehow over time the method has been adapted from its original purpose of testing the relationships between theoretical constructs/factors in specific settings to instead explore the relative importance of factors elicited from the literature in said settings. The latter approach has a number of inherent weaknesses. First is the process of 'extracting' factors from existing literature. This requires a rigorous and systematic literature review (the question is always going to be if you have missed any factors...). It also requires a solid understanding of the issues discussed above (e.g. theoretical compatibility and construct clarity). In short, the factors cannot be adopted indiscriminately regardless of whether they are commonly found in the literature or not! Much of the construction related 'success factor' literature is largely reductionist and unreflective – you do not want to add to this. Second, even sophisticated statistical manipulation does not counter a relatively simplistic data set (e.g. ranking of perceived importance by a select few respondents). Here much more care needs to be taken to sampling and the common tendency for authors to conflate perceptions and actions. Asking respondents what they think about specific issues is fine, but this is not the same thing as observing / measuring what they do. Too many papers make claims about actual practices when all that the authors have done is asked people's opinions. For example, a ranking of the most important processes in house building in a certain country says nothing about how and when these processes play out.

The final observation relates to the country (or regional) context. This goes beyond the question of whether or not to add this information to the title. There are two key concerns here. The first is if the particular context is important or not. This varies depending on how the research is justified and the kind of knowledge claims that are made. Simply applying research developed elsewhere to the case of your own country does not extend our collective knowledge. There needs to be some basis on which to conclude that your country is a special case to which existing knowledge cannot be applied! Second, if the context is important it needs to be treated as such. This means giving it appropriate space in the first half of the paper (i.e. giving it due attention in the literature review) and also weaving it into the analysis and discussion.

Keywords: paper writing, research quality, theory

DESIGN AND ADOPTION OF INNOVATIVE PROCUREMENT SYSTEMS IN INFRASTRUCTURE DELIVERY

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Procurement systems need to be designed around a set of objectives. An objective that is common to both the public and private sector is value for money. Whenever procurement outcomes fail to deliver value for money, or are perceived to have failed to do so, those responsible for the procurement are held to account.

Value for money may generally be regarded as the optimal use of resources to achieve intended outcomes. It needs to be assessed during the planning, implementation and close out phases with a focus on economy, efficiency and effectiveness, respectively. Objectives and expected outcomes framed during the planning phase frame the value for money proposition that needs to be implemented. During the close out of a project the projected outcomes are compared against the actual outcomes. This confirms the “effectiveness” of the project in delivering value for money. Any deficit between what was planned and what was achieved puts value for money for a project at risk.

It is well understood that optimism bias and strategic misrepresentation may compromise the projected project outcomes and be the root cause for failing to obtain value for money on projects. A key question is what proactive action can be taken during implementation (efficiency) to minimise any gaps between achieved and projected outcomes irrespective?

This paper examines the fundamental differences between the general goods, general services and delivery of infrastructure. It thereafter reviews the approaches to the soliciting of tenders and the awarding of contracts and the conditions of contract which are most likely to enable value for money to be delivered during implementation. It also examines the question of procurement strategy and tactics and issues of governance and project management, all of which can improve efficiencies during implementation and as such contribute to the achievement of the value for money proposition established during the planning phase of projects. It also describes the culture change that is necessary to deliver value for money during implementation.

Keywords: value for money, procurement, delivery management, infrastructure.

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SECTION 2: CONFERENCE PAPERS

A COMPARISON OF LIGHTWEIGHT AND HEAVYWEIGHT CONSTRUCTION INCORPORATING PHASE CHANGE MATERIALS FOR OFFICE BUILDINGS IN A COMPOSITE HOT CLIMATE

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A comparison of lightweight and heavyweight construction types incorporating Phase Change Materials (PCM) in office building fabric is conducted. The aim is to compare between the energy conservation and cooling capabilities of the two construction types in office buildings in the composite hot humid/hot dry climate found in a large part of Nigeria. PCMs are incorporated into the building fabric of a hypothetical building in a composite hot humid/hot dry climate in order to conserve electricity. A building energy calculation software called EnergyPlus is used to model and simulate the performance of the lightweight and heavyweight partitioned buildings. The predicted electricity consumption and thermal comfort performance between the two construction types are compared by keeping all variables in the models constant except the construction type. Previous analyses of PCM incorporated in the building fabric of heavyweight type of construction made of sandcrete block partitions indicate that the combination of large heat capacity of the heavyweight building to store heat during the day and high night time temperatures cause thermal discomfort in the building. In this study, a lightweight construction made of Gypsum board for partitions is considered. The context of power outage in developing countries is also considered in the analyses through the use of a novel cooling strategy termed Cyclic cooling. Cyclic cooling is the cooling of the interiors long enough to maintain comfort for a maximum duration within the working hours. Results predicted by EnergyPlus show an almost 2-fold improvement in electricity consumption in the lightweight partitioned building when compared to the heavyweight partitioned building. This is due to the added thermal mass in heavyweight construction that traps unwanted heat within the building.

Keywords: electricity conservation, EnergyPlus, hot climate, phase change material, thermal comfort

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AN ASSESSMENT OF THE CONFORMITY OF HOUSING STANDARDS IN THE RISING URBAN DEVELOPMENT IN KADUNA STATE

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The growing rate of urbanization in Nigeria is drawing global attention. New settlements are fast emerging in many cities. A quick look from a distance calls for concern raising questions needing answers on policies relating to urban development process; do they exist in our nation? How much of it is being conformed to? This study seeks to find out the environmental conditions of the new settlements in conjunction with town planning standards vis-a-viz its effects on the community. The study assessed the conformity of housing standards at plot level and the level of provision of community facilities. The study collected data through structured questionnaire and interviews with the stakeholders of these settlements. Two sets of questionnaires (totalling 225 copies) were distributed to sort for information from developers, government agencies and occupants of Gonin gora Sabon Tasha, Mararaban Rido, Graceland and Kabama. The data collected were analyzed using SPSS tools such as averages, ratios and percentages. The results show that at plot level some of the settlements are not planned, standards are forsaking and setback are not observed, The communities involved suffer untold hardship due to lack of community facilities. The reason for this as revealed by the study is because the sale of land is control by individuals or families instead of government. The buyers now build to their financial capability, which in most cases do not adhere to standards criteria thereby making the areas mere modern slums. The study recommended that to achieve sustainable development, government should buy off land from individuals, plan and provide infrastructure, amenities and needed facilities in a layout (if they cannot build for the citizens), before selling plots of land to individuals to develop.

Keywords: community, facilities, housing standard, settlements

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AN EMPIRICAL STUDY OF THE MAGNITUDE OF CONSTRUCTION CLAIMS IN BUILDING PROJECTS

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Claims are unavoidable task in implementing construction projects nowadays due to advanced technologies, new standards and consultants/client-desired additions and changes. The study adopted six different types of construction claims, assessed their magnitudes and evaluated the relationship between them and the initial contract sum. Archival data were collected from 53 projects that had been completed in which claims were involved. Data collected were analysed using percentile and Pearson correlation. The study revealed that the most frequent type of claim was different site conditions claims while none of the projects experienced delay claims. The analysis also showed that projects with contract ambiguity had the highest amount of claims averaged 22% of the initial contract sum while the overall claims were averaged 60% of the initial contract sum. The study further revealed that there was significant relationship between initial contract sum and different type of claims (change claims, acceleration claims, different site conditions claims, contract ambiguity claims and extra works claims). The study recommended that 'purposeful tender' should be considered in the award of contract and the provision of the conditions of contract regarding variations should be amended to include 'limit of changes' that could be made to contract based on the magnitude of the project.

Keywords: construction claims, contract sums, magnitude of claims, Nigeria, types of claims.

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AN OVERVIEW OF THE ROAD INFRASTRUCTURE DEVELOPMENT IN GHANA

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Road sector development requires huge capital investment. The government of Ghana however, is constrained with limited financial, technological, and other requisite resources. These have over the years hampered its effort to provide adequate infrastructure to ensure comfort and economic growth. The paper discusses the trend in the development of the road network in Ghana for the past decade, identifying and ranking the key factors that affect the delivery of infrastructure projects in Ghana. The paper adopts a mixed approach with the distribution of 105 questionnaires to construction clients, professionals and experts in the built environment receiving a response rate of 91%. Secondary information was sourced from articles, journals, reports, and historical documents from the agencies relevant to the study. Findings from field studies indicate that funding is a dominant challenge hindering the delivery of road infrastructure in Ghana. Currently, the approximate ratio of tarred to un-tarred road network is 18.7 to 81.2. At the current rate of 7.13% per annum, all things being equal, it would take country close to 2 decades to meet its road needs. It was revealed that the key factors that affect road infrastructure delivery are adequate funding, procurement system, political interest, contractor characteristics, project team performance and Technical supervision. To close the gap in the road sector, road financing in Ghana would require a joint effort from both the public and private sector to take advantage of the private sectors adequate resources in terms of finance, technology and expertise.

Keywords: feeder road, road development, road financing, private sector, public sector, trunk road, urban road

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ANALYSIS OF BUDGETS FOR PHYSICAL INFRASTRUCTURE FOR PUBLIC SECONDARY SCHOOLS

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Budgetary allocations to the educational subsector have fallen short of UNESCO standard which stipulates that 26 percent of the budget be set aside for the sector. This research analyses the capital budgets for secondary schools physical infrastructure with a view to revealing existing relationships between total and capital budgetary allocations to the (educational subsector and secondary schools). The research obtains data from the ministry of economic planning (budget department) for the period (2000-2007). Using simple and multiple methods of statistical of tool regression carried out at 5 percent level of significance, it evaluates the existing relationships between total and capital budgetary allocations. Research findings established that (i) there were no significant relationships between the tested budgetary parameters (ii) the values of the R-square, P, Fcal and Ftab of all the observed relationships were between (0.70-28.4%), 0.233-0.84%, (0.144-0.993) and (5.79-5.99), respectively (iii) the transpositions of the linear relationships to their exponential and polynomial formats, were not significantly different from the earlier linear ones. The research concludes that budgetary allocations to capital funding had no significant influence on secondary schools physical infrastructure development. The research recommends further studies exploring the possible adoption of innovative budgeting technique which inputs demographics and anthropometrics as basis for the establishment of appropriate empirical parameters for the allocation of capital budgets for secondary schools physical infrastructure development.

Keywords: budget, education, physical infrastructure, secondary school

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ANALYSIS OF SPATIAL INEQUALITY AND URBAN POVERTY TRAPS IN AKURE, NIGERIA

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The incidence of spatial inequality and poverty traps are evident in the developing countries of the world including Nigeria. This scenario is stemmed out of the disparity in differential investment activities and economic prosperities. The paper appraises poverty traps and spatial inequality in Akure- the capital city of Ondo State. The study covers five out of the nine existing political wards of Akure metropolis. These five political wards were purposively selected for the study on the basis of their peculiar nature. The sampled wards are: ward 4, ward 7, ward 9, ward 10 and ward 11 respectively. The study adopted direct observation and oral interview. Development pattern and interaction were used in identifying gaps of socio-economic inequality and poverty traps in the study area. For better understanding, the city was clustered alongside with political wards where study was carried out. However, general overview of the city was also examined in line with facility and infrastructural distribution and the level of its accessibility by residents. The study identified limited access to insurance, credit facilities and unstable equilibrium among urban competitors as some of the factors responsible for spatial inequality and poverty traps. In view of the foregoing, the paper posited that cities should be studied and analysed on sectoral basis, cities appraisal should be carried out on the peculiarity of neighbourhood units, provision of urban basic services as well as massive reinvestment towards bridging the gaps, achieving city livability and urban sustainability in Africa.

Keywords: Akure, Nigeria, poverty trap, spatial inequality, urban competitor

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APPRAISAL OF HEALTH AND SAFETY MANAGEMENT PRACTICES OF CONSTRUCTION SMES IN ABUJA, NIGERIA

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The construction industry is a major contributor to the economic growth of developed and developing nations. Surprisingly, it is also a major contributor to the occupational accidents and ill-health record. This research was undertaken to evaluate the health and safety (H&S) management practices of Small and Medium Sized Enterprises (SMEs) operating in the construction sector of the Federal Capital Territory of Nigeria. The data for the study was collected using questionnaires. The research population comprised construction SMEs operating in Abuja and registered with the Federation of Construction Industry (FOCI). The data were analysed using relative importance index (RII). Out of the fifty-eight (58) H&S management practices identified from literature, this study revealed that forty-six (46) were important. The 46 H&S management practices were categorized under five core practices: company commitment, worker consultation and participation, communication, health and safety planning, and education and training. Dominant H & S practices include provision of first aid facilities on site, provision of personal protective equipment and keeping of safety record and follow-ups. It was concluded that all the core H&S practices are capable of improving the health and safety performance of construction SMEs.

Keywords: accident, SME, hazard, health and safety management, Nigeria, risk.

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ARCHITECTS AND INTERDISCIPLINARY RESEARCH: REFLECTIONS FROM ETHNOGRAPHIC AND MEASURED FIELDWORK

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Contemporary problems observed in the built environment often necessitate architects and other construction professionals to employ interdisciplinary approaches from allied disciplines in order to adequately address them. However, few experiences by architects conducting fieldwork in this regard have been reported. This paper presents some practical considerations, problems and prospects of conducting interdisciplinary research by an architect to address housing related problems in Tangale land, northeast Nigeria. These relate to the predisposition towards naïve realism; characteristics of the field and study area; gender, language and communication; nature of data required and modalities for analysis; appropriate style of reporting ethnographic research in architecture; ethical considerations as well as issues related to extensive time frame for interdisciplinary fieldwork and funding. Experiences accruing from the fieldwork reveal employing interdisciplinary methods from anthropology, sociology, behavioral studies and architecture proffer good prospects in addressing issues regarding housing and the built environment. Recommendations for future planning of similar studies implore researchers to carefully consider the scope and methodology for the research; conduct a thorough SWOT analysis; evaluate ethical and funding considerations and make adequate allowances for the time required in processing research applications.

Keywords: architect, ethnography, fieldwork, interdisciplinary research

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ASSESSING THE EFFECTS OF UNAUTHORIZED BUILDINGS IN THE SEKONDI-TAKORADI METROPOLIS OF GHANA

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The proliferation of unauthorized buildings has resulted in many socio-economic, environmental and health related problems in some Municipal and Metropolitan Assemblies across the globe. The rising effects of unauthorized buildings show that, past interventions by local authorities, to address the problems, have not yielded the desired results. As a result, this research identifies the problems induced by unauthorized buildings in Asakae, a suburb of the Sekondi-Takoradi metropolis, and suggests measures to curb them. In view of this, a sample size of 182 House-owners was chosen for the study using Fisher *et al.* formula and questionnaire survey approach was adopted for the study. More so, data generated from the survey was further analyzed, by mean scores. The findings of the survey indicated that, the variables identified as problems induced by unauthorized buildings, through the qualitative survey, reflect the consensus of the respondents. Furthermore, the mean score rankings, indicating the extent of severity of the problems, ranked *lack of adequate accessibility and services* and *deforestation* as first and tenth respectively. It is recommended that, services should be extended to all zoned land to facilitate even distribution of developments. More so, the Assembly should adopt automatic building detection systems for quick detection of unauthorized buildings so that appropriate measures could be taken even before they are completed. In addition, the Sekondi-Takoradi metropolitan assembly can widen their revenue net by regularizing structurally sound unauthorized buildings so that owners will be eligible to pay property rate to the Assembly.

Keywords: questionnaire, Sekondi-Takoradi metropolis, unauthorized building

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ATTRITION OF QUANTITY SURVEYING PROFESSIONALS IN QUANTITY SURVEYING FIRMS IN GHANA

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Despite a number of reforms undertaken by the Quantity Surveying-Division of Ghana Institution of Surveyors (GhIS) to raise the standards of professionalism and global competitiveness, Quantity Surveying Firms (QSFs) feared attrition of professionals that could lead to their extinction. Several practicing professionals and graduates yearly end up in other industries. Though employees leave for many reasons, this study aim to explore and identify factors that lead to attrition of Quantity Surveying Professionals (QSPs). This is to establish the rate, type and factors that account for attrition of QSPs in the country and attempt to propose measures to reduce professional turnover of QSPs in order to sustain QSFs. An in-depth field interviews/survey was conducted on ten QSFs in Ghana. The findings revealed the existence of voluntary and involuntary attrition of QSPs in QSFs at rate of two (2) QSPs within a firm per year and the extinction of some QSFs. QSFs in Ghana are classified as small (10 employees) per the number of employees. The tattered growth of QSFs which affects infrastructural delivery in Ghana. Rebranding QSPs/QSFs was recommended as a measure to reduce high rate of professional attrition, attractive compensative packages to QSPs, strict usage of Public Procurement Act (PPA 663) in award of contract rather than political influence and a possible review of course content for student professionals so as to add on innovative and entrepreneurial training with new technologies in work delivery. Finally, the legal framework (surveyors' bill) and its implementation must create an enabling environment for the rapid development of QSFs.

Keywords: attrition, Ghana, quantity surveying firm, quantity surveying professional

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BRIDGING THE URBAN-RURAL GAP: KEY TO SUSTAINABLE DEVELOPMENT IN AKURE, NIGERIA

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Rural communities in Nigeria remain the major producer of food for the sustenance of the urban populace. There has been a significant and incessant rural-urban drift over the decades. This has given rise to rural depopulation and consequently, urban congestion. The study centres on unveiling developmental disparities between the urban settlements and the complementary rural communities. The study observed the intensity of the problems and unveiled the opportunities for bridging the urban-rural gap through viable sustainable development approaches. Qualitative research method was adopted, involving questionnaire administration, direct observation and oral interview. Akure metropolis and four other rural settlements were purposively selected for the study. The communities are Oda, Iwoye, Aponmu and Igbatoro. The sample frame for the study was the combined population of the rural communities which was 4,874 and 2.5% or 122 of this was sampled. For the Akure urban, 0.25% of its 375,424 population was sampled, which was 939. The study identified neglect of rural economy, inadequate provision of rural infrastructure, lack of poor storage system, poor funding of rural development programmes, imbalanced sector investment-programme and gender imbalance as major determinants of Akure-urban-rural regional development disparity. Declining access to some of the basic infrastructure was observed in 2015 compared to 2014. The paper posited that rural mapping and village regrouping should be carried out, provision of comprehensive rural infrastructure should be embarked upon, adequate funding of rural development programmes, and revitalization of farm-gate processing and storage system should be vigorously pursued.

Keywords: Urban-Rural Gap, Region, Sustainable Development, Poverty

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BARRIERS TO IMPLEMENTATION OF CONSTRUCTION INNOVATION AND MEASURES OF MITIGATING THESE BARRIERS

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Emphasis on the importance of innovation within the construction industry to a larger extent has received an increased call. The need for the construction industry to facilitate technological innovations in order to maintain a competitive edge in the market lower Construction cost, improve quality, maximize productivity and meet the infrastructure need of the economy has been further emphasized. Realization of this increased importance of innovation will be nullified if the barriers to implementation of innovation are not understudied with provisions of stringent measures to mitigate the barriers to innovation. This exploratory paper analyses the barriers to implementation of construction innovation in the construction industry and likewise proposes measures of reducing the barriers to construction innovation. The research methodology includes extensive literature review supported with and random interviews. In all thirty (30) contractors, clients and construction association professionals were contacted via structured interviews to ascertain the existence and severity of the barriers. Findings from the study revealed that some of the barriers to construction innovation include: industry barriers, organizational barriers, legislative and regulatory barriers amongst others. It is recommended that effective collaboration within the construction sector and its stakeholders should be fostered in order to facilitate construction innovation as evidenced from other industries. Moreover, the formulation and cooperation of governmental and institutional policies which does not suppress construction companies must be established.

Keywords: barriers to innovation, construction innovation, structured interview, literature review

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BUDGETARY ALLOCATION TO THE HOUSING SECTOR AND THE IMPACT ON PRICES OF SOME BUILDING MATERIALS

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This research evaluates budgetary allocations to the housing sector and the impact on prices of some building materials. Using data obtained from Lokoja metropolis in (Kogi State) of Nigeria as well as the statistical technique of regression, set at 95% confidence level, it establishes as follows: significant relationships exist between the prices of (blocks, sand and cement) and the budget for housing sector, recording R-square values that were between (64.25-55.31)%. Further linear regression equations between the parameters of (% change in prices of block, sand and cement) and (the % changes in budgets for housing) were not however significant, recording R-square values that were between (0.37-3.27)%. Exponential transpositions of the linear equations were not significantly different from the initial ones. The research concludes that % increases in budgetary allocations to the housing sector do not account for the % increases in the prices of the materials. Other economic factors outside the tested parameters are likely to account for the changes in prices. The research recommends further studies which explore the influence of macro-economic variables on the prices of building materials and budgetary allocations.

Keywords: budgetary allocation, building material, housing sector, price determinants

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CAPACITY BUILDING FOR NIGERIAN ARCHITECTURAL EDUCATORS

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The quality, quantity and effectiveness of architectural educators are some of the major determinants of the successful implementation of architectural curriculum. By implication these affect the attainment of architectural educational goals in both the universities and polytechnics - the institutions that run programmes leading to the award of degrees/diplomas, particularly in Nigeria. However, a review of some studies shows that the quality, quantity and effectiveness of the educators in Nigerian schools of architecture are inadequate/ not meeting the challenges of contemporary development, especially in the area of Information and Communication Technology, number of Ph.D. holders and Pedagogy. This paper, based on a review of existing researches, is advocating for capacity building for the educators as a panacea for the problems of training of architects in Nigeria to meet up with the challenges of the 21st century. In order to achieve this purpose, the paper reviews concepts of capacity building and some studies carried out in Nigeria on quality, quantity and effectiveness of architectural educators. The paper concludes by emphasizing on the need for capacity building for the upgrading of the educators so as to facilitate the attainment of the educational goals for both internal and external validation in order to meet the challenges.

Keywords: architectural educator, capacity building, contemporary development, curriculum, school of architecture

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COMBATING THE IMPACT OF COLLAPSE OF BUILDING STRUCTURES IN LAGOS ISLAND, LAGOS STATE, NIGERIA

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This study appraised the incessant building collapse in Lagos Island over the years; by determining, its nature, trend, causes and impact on the environment, lives and properties of the study area, possible reduction and preventive recommendations are being proffered to combat the impact. The specific objectives to achieve this included examining the trend of urbanisation and building construction in Lagos Island; Identifying and examining the various causes of building collapse in Lagos Island; Identifying and examining the impact of building collapse on the environment, lives and properties; Proffering and developing appropriate framework, action plans with recommendations towards the reduction and prevention of building collapse impact on the environment, lives and properties of the people of in Lagos Island. The data for this research were obtained from both primary and secondary sources obtained from the study area through observation and questionnaire administration, literatures and interview and focus discussion group sessions with staff of the building construction regulatory agencies. Through systematic random sampling, both descriptive and inferential statistics were used for the data analysis and presentation. The study showed that most of the building sampled were designed by draughtsman and not registered Architects hence and constructed by “quacks” without adequate building construction knowledge and qualification; there was no adequate site visit before, during and after construction of building and its certification for occupation by qualified stakeholders and government officials. Most of the buildings were built hurriedly without quality construction materials to meet the profit schedule of the 20 – 30 years of the development and management agreement. These unwholesome trends degenerate into urban crises, chaos, housing shortage and incessant building collapse causing loss of several lives and properties, loss of jobs and empowering economic activities . This paper discusses combating the impact of building collapse, hence an efficient and effective integration between government and private stakeholders to plan and prepare against reoccurrence of building collapse and reducing and managing its impact in Lagos Island.

Keywords: building collapse, building construction, building demand, building supply, migration, urbanisation

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COMPARATIVE COST ANALYSIS OF WALL CLADDING MATERIALS

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Wall is a principal component in building construction. Cost data statistics for pretender planning/investment appraisal analysis as it relates to alternative choice of cladding materials (sandcrete blocks, concrete blocks or timber) are seldom readily available. This research examines the cost relationships between sandcrete blocks and timber as alternative wall cladding materials. Using rates from synthesized bills of quantities, and the statistical tool of percentile, it establishes and compares cost profiles of the elemental components of buildings constructed in both materials. Research findings establish as follows: (i) Buildings constructed of timber are about 6% more expensive than those constructed in sandcrete blocks. Electrical component installation reveals a percentage cost of 6.8% and 5.9% respectively for block and timber claddings respectively. It is recommended that improvement be made to cost data compilation, on periodic basis for the both types of claddings.

Keywords: cladding material, cost analysis, sandcrete block, timber panel

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CONCEPTUAL COST CONTINGENCY ESTIMATION MODEL: A RISK MODELLING APPROACH

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The application of knowledge and application of risk in project management is limited in some domains. To this end, the estimation of cost contingency for developmental projects is challenging because, it is mainly based on historical data which to a great extent is full of subjectivity, dwelling greatly on experience and organizational process asset. To date however, the built environment lacks standardized methods to be adopted in the estimation of cost contingency, further hampered by the lack of understanding and application of risk methods. In response to the above challenge, a systematic risk methodology for the estimating of cost contingency based on empirical judgment has been the driving force behind this research. The failure mode effect analysis (FMEA) and the theory of evidence are presented as qualitative and quantitative risk tools respectively. The research adopted quantitative methods with data gathered through structured questionnaires distributed to built-environment professionals based on the theoretical framework. Analysis of data gathered revealed that, the most significant factors that affect cost contingency are incomplete scope definition, scope changes which results in scope creep, delayed payment problems, differing site conditions and economic instability. Based on the work sections, the substructure, essential building services and finishes identified as work sections with high severity classes and propensity to scope changes. To this end, a four stage conceptual model was developed which translated into a 3-phase implemented model. The process selects high priority risk and work sections based on the data sources and hypotheses to generate the mass, belief and plausibility based on the Dempster's combination hypotheses. The model was tested and evaluated using an action exercise which found values to be realistic in comparison to the actual closing account figures of completed projects.

Keywords: cost risk, hypertext pre-processor, mass, project specific risk, plausibility, systemic risk

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CONSTRUCTION PROFESSIONALS' PERCEPTION ON THE PROSPECT OF ADOPTING E.M.S ISO 14001 IN NIGERIAN CONSTRUCTION INDUSTRY

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The construction industry is one sector that contributes to the Development and Economic growth of any Nation, however, it is also one that has been characterized as having a tremendous Environmental impact. ISO 14001 Environmental management system is a globally recognized Management standard and is published by ISO to serve as a framework to limit such Environmental impact and also ensure regulatory compliance. This paper assesses the construction professionals' perception on the prospect of ISO 14001 Environmental management systems in Nigerian Construction Industry. The paper employs both primary and secondary means to source for data. The primary data was collected through a well-structured questionnaire which was distributed to construction professionals, which includes: Architects, Builders, Estate surveyors, Engineers, Land surveyors, Quantity surveyors, and Town Planners. The secondary data was collected by reviewing relevant related literatures on the subject. Findings reveal that ISO 14001 is currently not practiced by most construction companies in Nigeria, but professionals are however optimistic that there is prospect and the practice will reduce the impact construction practices have on the environment. Further, implementing environmental law is the most prominent factor hindering the adoption of ISO 14001 environmental management system, followed by awareness on EMS by Construction firms, and also lack of proper motivation among practitioners in the industry, these barriers have also been directly responsible for low level of certification among construction firms. Recommendations include, stakeholders in the construction industry should work together to increase the level of awareness among practitioners and other stakeholders as well, the government should make it mandatory through the use of appropriate policies and other legislations for contractors and other practitioners in the industry to be ISO 14001 EMS certified.

Keywords: construction professional, environmental management system, ISO 14001

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DEMOGRAPHIC ATTRIBUTES INFLUENCE ON HEALTH AND SAFETY PRACTICES FOR SMALL AND MEDIUM CONSTRUCTION ENTERPRISES

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There is paucity of research on demographic attributes on health and safety (H&S) practices. Hence, the purpose of this study was to investigate the influence of demographic attributes on the H&S practices within small and medium construction enterprises (SMEs) in South Africa. A mixed method approach was used i.e. Delphi and questionnaire survey. A structured questionnaire consisted of 31 H&S practices/measures. They were categorized in five major H&S practices. The questionnaire was developed from extensive review and the participation of 20 purposively sampled H&S experts, in four iterative rounds of Delphi survey. The questionnaires were distributed to a total of 1,450 conveniently sampled SMEs. 228 questionnaires were returned of which 216 responses were usable. The findings imply that upper management commitment and involvement in H&S, employee involvement and empowerment in H&S, project supervision, project H&S planning and communication in H&S and H&S resources and training were retained as reliable and valid H&S practices. However, multiple linear regression analysis established demographic attributes i.e. experience in the construction industry, education level and the number of employees in the organization was not good predictors of the H&S practices.

Keywords: demographic attributes, health and safety practice, small and medium construction enterprise

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DESIGNING EQUATOR-FACING WINDOW FOR DIRECT SOLAR GAINS OPTIMISATION IN BUILDINGS

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As solar gains play a vital role in influencing thermal environment in buildings, direct solar gains is the most influential of the three modes of transmission. So, optimising direct solar penetration through equator-facing window would aid in improving thermal performance of buildings during winter. This study seeks to investigate the effects of varying equator-facing window height on horizontal shading device size and the rate of change of radiation beam height (RBH). This study adopted the apparent sun-paths model described in Szokolay (2007) for this analysis. In varying the window height, calculated solar altitude was used to determine the shading device size and corresponding RBH while examining its rate of change. Results show that increase in window height increases the shading device size as well as corresponding RBH. However, the rate of increase of RBH diminishes with increase in window height indicating that optimising direct solar gains does not rely on largest window height. This study focuses on vertical aspect of the equator-facing window which requires only horizontal shading device for optimisation. However, it provides a basis for further research in modelling direct solar gains in buildings, and a useful means for architects to design equator-facing windows.

Keywords: direct solar gain, equator-facing window, façade, radiation beam, shading device.

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DETERMINANTS OF OFFICE RENTS IN ACCRA, GHANA

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This paper examines determinants of office rent in Accra, the capital city of Ghana. Rent determinants are a well-researched topic by a wide range of specialist disciplines. Although existing studies have identified a number of factors that explain determinants of office rents, some factors are unique to certain cases. In Ghana, economic restructuring from the mid-1980s and globalisation have contributed to growing interest in the country as an attractive location for international businesses, firms and organisations. This has led to rising demand for office space and caused rents to increase, especially in Accra. To accommodate growing demand in the short term, property owners often convert residential buildings into other uses. In the medium term, office space development activities increased. Yet, office rents in the city are still high. This paper attempts to ascertain the factors that influence office rent rate in Accra, and what the consequence are in the long term. Following an introduction to the paper, the second section presents a brief discussion of the approach to the paper before a review of studies on determinants of rental rates is undertaken in the third section. In the fourth section the relationship between economic development and demand for office space in Accra is examined. This is then followed by a presentation on demand and supply data on Accra office market, consisting of data collected from office space providers and managers, and interviews with office users, developers and investors. Relevant variables are analysed to establish trends and rent determinants in the office market. The study shows that although there are supply constraints and increasing demand issues, these alone do not sufficiently explain the high office rents in Accra. There might be issues relating to speculation inhibiting factors requiring policy interventions to stabilise the office market in Accra.

Keywords: Accra, office rent, real estate, rent determinants

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DUE PROCESS PRACTICE ON CONSTRUCTION PROJECTS IN LAGOS STATE, NIGERIA

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Procurement process for construction projects in Nigeria is facing a lot of challenges. These challenges often result in abandonment, cost and time overruns substandard work and insolvency. These problems emanate as a result of improper procedure for selecting the appropriate contractor for the project. Hence this study aim at assessing the implementation of Due Process Practice (DPP) which is a process developed through the Procurement Act (2007). Cross - sectional research survey was used for this study and the populations are construction professionals such as Architects, Quantity Surveyors, Engineers, Builders, Pubic clients' organisation and contracting organisation involved in government projects. The sampling procedure adopted for this study is stratified sampling technique. Eighty (80) questionnaires were distributed and sixty-five (65) was retrieved. Statistical packages for social sciences (SPSS) 17th version were used for analysing the data collected using descriptive and inferential statistics. The study shows that the major factor affecting due process implementation on construction projects in Lagos State is political interference by influential political figures and the misuse of power by top level official and as such if adequate measures are not taken to curb this amongst the top officials handling public procurement the purpose of due process is forfeited. Therefore, the need on how to abate to the minimum level all manners of unethical practice and promote the ethos of transparency, objectivity and accountability for the achievement of projects delivery to time, cost and quality brought about the emergence of Due process policy.

Keywords: construction project, contractor selection, due process practice, procurement, public client

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ECOLOGICAL SELF-COMPACTING CONCRETE USING GUM ARABIC AS A PLASTICIZER

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The general trend towards green construction and sustainability leads to the demand for environmentally friendly construction additives from renewable sources. Gum Arabic is a natural gum made of hardened sap taken from two species of the acacia tree. Gum Arabic has a low reactivity, an excellent emulsifying, and foam stabilizing adhesive properties and does not interfere with blended products. In this study, the suitability of Gum Arabic with respect to its ability to act as a plasticizer in concrete is tested with the aim of producing self-compacting concrete. The self-compacting properties of the fresh concrete were tested as well as the compressive strength of the concrete produced. The research found out that Gum Arabic is a good plasticizer as well as a good viscosity modifying agent for use in cheap self-compacting concrete.

Keywords: ecological, self-compacting concrete, gum arabic, plasticizer, Nigeria

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EDUCATION AT THE CONFLUENCE OF EFFECTIVE BUILDING INFORMATION MODELLING INTEGRATION TO BUILDING INDUSTRY IN MALAYSIA

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It is an open fact that building information modelling (BIM) have been and is still expanding its usefulness across professional specialization in the built environment. Building Information Modelling (BIM) as a new way of doing things in the building industry and it is a system that is rapidly revolutionizing entire process therein. It is also apparent that most professionals in the building industry are aware and willing to embed the BIM culture but with absolute little to no knowledge about it workability. Thus, the craving to be BIM compliance both in academics and practices it is very imperative that a serious study of the education system needs should immediately be ensured. It is on this note that this paper is an attempt to confirm the important role of education in the BIM adoption in the building industry globally, then establish the gap that exist in BIM adoption in Malaysia building industry as a result of inadequacy of BIM education among the industry . The objective to this aim is to determine the current state of BIM and the trends of BIM education and training so as to come with a statement that BIM-education is a factor that needs consideration in the adoption of BIM in the building industry.

Keywords: building information modelling, built environment, construction industry, education

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EFFECT OF AFRICAN LOCUST BEAN WASTE WATER ON SOIL BRICKS FOR MASONRY WALLING

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A newly proposed concept of soil bricks as masonry units for low-cost environmentally friendly construction is proposed using agro-based waste water obtained from the processing of the African locust bean into local food condiments. Laboratory test system was designed to perform strength and durability test on four types of soil brick mixed with African locust bean waste water (ALBWW) as replacement of portable water and also as soil stabiliser for bricks production. Tests were conducted on strength and durability properties of the specimens. There was an increase of 66% over unstabilised specimens when the soil was fully mixed with ALBWW. The density of the bricks increased from 2120kg/m³ for the soil bricks without ALBWW to 2167kg/m³ when the soil was mixed with ALBWW. The resistance to wear for bricks increased steadily from 6.45cm²/g for bricks without ALBWW as stabilisation to 9.45cm²/g for bricks with ALBWW. The presence of ALBWW reduced the amount of water absorbed by the bricks. The study concluded that ALBWW which is an environmental nuisance can be used to replace portable water and also as stabiliser for masonry units in construction. This then implies that effective utilization of ALBWW as soil stabiliser would reduce the cost of relative durable houses for the rural and peri-urban areas in Northern part of Ghana where locust beans are prevalent.

Keywords: abrasion resistance, compressive strength, locust bean, water absorption

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EFFECT OF COMPACTING RATE ON THE STRENGTH PROPERTIES OF SOIL BLOCKS

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Compaction of soil blocks contributes significantly to the strength properties of the blocks. This paper investigates the strength properties of soil blocks produced with different compaction rates. Experiments were conducted to determine the density, compressive strength, splitting tensile strength and erosion properties of soil blocks produced with different rates of compaction speed. The study concludes that although the low rate of compaction achieved better performance characteristics, there is no statistically significant difference between the soil blocks produced with low compaction rate and high compaction rate. However, the study suggests the use of low compaction rate due to its better performance characteristics. The paper contributes to the general body of knowledge in the area of built environment particularly in construction and building materials.

Keywords: compaction rate, compressive strength, density, erosion, soil blocks, tensile strength

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EFFECT OF CRUSHED CERAMICS WASTE PARTIALLY REPLACED WITH FINE AGGREGATE IN HOT MIX ASPHALT

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This research studies the effect of Crushed Ceramic Waste (CCW) partially replaced with fine aggregate in Hot Mix Asphalt (HMA). The ceramics used was obtained from laundry sink which was cleaned and crushed. Marshall Method was used to determine the Optimum Binder Content (OBC) and to evaluate the properties of the asphalt mix. In total, twenty-seven (27) samples were prepared, of which all have been used to determine the OBC, and the effects of adding different percentages of CCW to the asphalt mixture. Marshall Samples showed that the OBC was 5.5% of the total weight of the HMA. Also, the Marshall Samples containing different percentages of ceramic showed that the optimal replacement ratio of CCW was 12.5% of the weight of the aggregate which was against the optimal replacement ratio of 10% by Wu, *et al.*, (2003).

Keywords: bitumen, ceramic, fine aggregate, hot mix asphalt, Marshall Method

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EFFECTS OF GLOBAL FINANCIAL CRISES ON FINANCIAL PERFORMANCE OF SELECTED INDIGENOUS CONSTRUCTION FIRMS IN KATSINA STATE, NIGERIA

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A period during which a country's economy is performing badly or a business cycle contraction or general slowdown in economic activity in a country over a sustainable period of time is known as financial crisis. The financial crisis that started in August, 2007 in the United States due to difficulties in making higher payment on adjustable mortgages and which resulted into sub-prime mortgage crisis was experienced all over the world. This research examined the financial performance of indigenous construction firms in Katsina state before and during the period of financial crisis with an aim to establish how the crisis affected their performance. Questionnaire survey was adopted for the study. Financial records of the firms were evaluated using three Profitability and Efficiency Financial Ratios as the financial indicators of the firms' performance. Results obtained indicated that Global Financial crisis has impacted negatively on the performance of the indigenous construction firms in the state. In 2007 there was a sharp drop in firms' averages in 'Return on Capital Employed' to -15.38%. In 2008 average 'Return on Equity' and Net Profit Margin' dropped to -10.61% and -0.038%, respectively. Other impacts disclosed by the study included; projects cancellation, default on repayment of loans and loss of bonds, high rate of job loss and wages cut. It was recommended, among other things that construction firms should diversify their operations and should also exploit the benefits of joint venture and/ or partnership in order to cushion effects such as that of the global financial crisis.

Keywords: financial crisis, financial ratio, indigenous firm, performance, period.

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ENHANCING ARCHITECTURE IN NIGERIA THROUGH RESEARCH: BRIDGING THE GAP BETWEEN ACADEMIC AND PRACTICE-LED RESEARCH

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The architecture reflected within a society cannot go beyond the knowledge base it develops, which relates directly to the quality of research activity being conducted within it. Architectural research is commonly accepted as having two components - the academic and the practice-led component. It is not new, however there have been recent attempts to re-establish it as a research discipline. The current state of architectural research in Nigeria indicates that most research conducted is academic-led; although practice-led research occurs this is often in an ad hoc manner. By discussing two predominant orientations to architectural research as a thematic background to the discussions that follow this paper addresses two questions: where is architectural research as practiced in Nigeria situated in relation to contemporary thinking and current global practices? How may architecture in Nigeria be enhanced through research? The first question is addressed through the analysis of recent research work in Nigeria where issues of the researchers' involvement in research is explored and paradigmatic frameworks most commonly adopted are examined. The second question leads to the suggestion that from a perspective of global happenings, architectural research by bridging the gap between academic and practice-led research can potentially enhance architectural quality in Nigeria.

Keywords: academic research, architecture, architectural research, PhD dissertation, practice-led research

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ENHANCING SAFETY: LESSONS FROM SENIOR MANAGERS IN THE NIGERIAN CONSTRUCTION INDUSTRY

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The construction industry plays a major role in the global economy. However, studies indicate that the industry is one of the most hazardous with frequent accidents and safety related problems. This study utilised semi-structured interviews among ten senior managers to examine safety practices within the Nigerian construction industry. It highlights the diversity associated with the implementation and management of safety in the Nigerian construction industry. The emerging key issues showed that the lack of knowledge and skills, as well as the absence of relevant safety policies and procedures were among the major challenges and barriers for safety in the Nigerian construction industry. Based on the analysis, it was proposed that the Nigerian government needs to introduce more appropriate safety policies and legislations. The paper proposed the adoption of lean strategies for enhancing safety and suggested that organisations within the Nigerian construction industry should also adopt informal trainings which provide further learning options for safety awareness among construction workers.

Keywords: construction safety, Nigeria, safety, semi-structured interview, senior manager

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ENTREPRENEURSHIP EDUCATION IN NIGERIAN POLYTECHNICS: CASE STUDY OF THE ARCHITECTURAL TECHNOLOGY PROGRAMME AT KANO STATE POLYTECHNIC

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In order to address the current high rate of graduate unemployment in Nigeria, the Federal Government directed all tertiary institutions through their various regulatory agencies to incorporate Entrepreneurship Education (EE) into the curricula of their programmes. The aim of this study is to appraise the state of implementation of entrepreneurship education in the Architectural Technology Programme of Kano State Polytechnic. Case study was employed in carrying out the research; the Director of Entrepreneurship Study Centre, Head of the Department of Architectural Technology and three (3) lecturers of the five (5) teaching the theoretical aspects of the entrepreneurship education formed the respondents of this study; structured interview and direct observation were the instruments used in collecting data for the study; two experts from the Department of Business Administration, Bayero University, Kano validate both the interview schedule and observation checklist; content analysis was used for analysis of the data collected. Findings reveal that the Kano State Polytechnic has introduced the Entrepreneurship Education into the Architectural Technology programme along all its other programmes. This shows compliance with the directives of the Federal Government of Nigeria. Furthermore, having appraised the implementation of the policy in the Architectural Technology programmes, the study unfolds that the implementation pattern is similar in all programmes of the Polytechnic. Hence, the architectural technology programme pattern of implementation is not different from other programmes. Thus, the findings of this study could be applicable to all other programmes offered in the Polytechnic. Some of the recommendations from the study are that the Polytechnic should employ the services of EE curriculum expert to introduce some variations in the structure of the curriculum to cater for the peculiarities/needs of the programmes and, the Kano state government should provide adequate funding to enable the polytechnic procure current teaching aids and provide all the necessary facilities at the Entrepreneurship Study Centre (ESC).

Keywords: architectural technology, curriculum, entrepreneurship education

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ESTATE SURVEYORS AND VALUERS PERCEPTION OF LAND ACQUISITION PROBLEM IN KWARA STATE

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The significance of land that is free from litigation in the construction Industry cannot be over emphasised, either for housing or infrastructural facilities provision. The study evaluates the problems of land acquisition in Nigeria with reference to Kwara State. The opinions of the 26 Estate Surveying and Valuation firms were sought through questionnaire with a response rate of 84.6% (that is 22 out of 26). The data was analyzed with descriptive statistics. Findings from the study reveal that description of the land to be acquired in acquisition notice; basis of valuation used for the assessment of compensation payable and delay in the payment of compensation are major problem of land acquisition in Kwara State. The study among other things recommended that the acquisition notice should be explicit enough to provide the required information to the general public and the Land Use Act should be expunged from Nigeria Constitution as to facilitate its amendment.

Keywords: compensation, kwara state, land acquisition/revocation

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EVALUATION OF CLAY ROOF TILES PRODUCED WITH SAW-DUST, CASSAVA STARCH AND MAKUBA

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Nigeria has for many years been over dependent on conventional and imported building materials which are rather costly and beyond the affordability of the common man. The prices of building materials are increasing by leaps and bounds daily, and consequently these affect the cost of producing housing units. A look inward reveals that Nigeria has a good number of agro-allied wastes, Industrial wastes and mineral deposits such as clay, saw-dust, Makuba and Cassava starch, to mention but a few. The aim of this study is to evaluate the properties of clay roof tiles produced using laterite, saw-dust, Makuba and cassava starch. Clay was the primary material; Laterite was added to reduce shrinkage; saw-dust serves as filler and in order to reduce the density of the roof tile. Makuba and Cassava Starch were compared as the main binders in the mix matrix. Absolute volume method of mix proportioning was adopted in the design of the mix. The water/binder ratio of 0.7 was used in the production of all the tiles. Equal quantities of clay roof tiles were produced using clay/binder replacement level of 0%, 2.5%, 5%, and 10% of Makuba, Cassava Starch and the mixture of Makuba and Cassava Starch. Finding indicates that clay roof tiles produced using 2.5% Makuba as a binder gives the optimum result in terms of abrasion resistance, water absorption, and flexural strength. The study therefore concluded that the performance of Makuba is better as compared to cassava starch in clay roof tile production. To improve the water absorption and binding property, Makuba (*parkia biglobosa*) should be blended with cement or combined with other pozzolanas in clay roof tile production.

Key Words: cassava starch, clay roof tile, makuba, sawdust

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Muhammad A.L. and Khalil M. I. (2015) Evaluation of clay roof tiles produced with saw-dust, cassava starch and makuba *In: Laryea, S. and Leiringer R. (Eds) Procs 6th West Africa Built Environment Research (WABER) Conference, 10-12 August 2015, Accra, Ghana, 481-490.*

EXPLORING HEALTH AND SAFETY PRACTICES ON SOME NIGERIAN CONSTRUCTION SITES

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Globally, construction industry has poor safety records indicating that, construction workers are three times more likely to be killed and twice as likely to be injured as workers in other occupations. The costs of these accidents which usually amount to considerable share of the contract price are usually borne by the sponsors of the projects. Many of such accidents in the Nigerian construction industry could be attributed to poor safety measures resulting from weak regulations and low level of compliances. This study attempts to investigate the implementation of accident preventive actions on some selected construction sites based on requirements compiled by the European Agency for Safety and Health at work. Data for analysis were obtained through field observations and direct interviews of operatives and personnel from the selected sites in the six geographical zones of Nigeria via purposive sampling technique. Descriptive statistics was used with the aid of Origin 5.0 software for windows for analysis. Results of the study indicate an average compliance of 45% to the preventive actions by the sites investigated. Two construction sites had the highest percentage of compliance of 71% while the lowest compliance of 17.9% was recorded on one construction site. These poor results could be attributed to the low level of awareness among stakeholders, non existence and/or weak regulations, poor compliance and poor health and safety plans and programmes. It is recommended that effective health and safety standards and guidelines be enforced to reduce accidents on construction sites with the view to ensuring safe working conditions.

Keywords: accident, construction site, health and safety, Nigeria.

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FACILITIES MANAGEMENT FOR AFRICAN URBAN MARKETPLACES: ATTITUDES TOWARD WASTE MANAGEMENT

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Facilities Management (FM) entails enhancing the performance of users in a set environment by optimising organisational targets. It involves managing user behaviour, provision of pleasant user experience and an aim to improve facilities performance by the operators. This paper focuses on the African urban marketplace environment (MPE) as a facility, chosen due to its cultural significance within the African setting and its effect on the behaviour of the society in which it exists. The environmental management theme is a reoccurring issue in this facility, with solid waste management of concern. There is evidence to suggest that the performance of the facility hinges on attitudinal actions of the stakeholders towards waste. This paper therefore aims to provide an understanding of the dynamics of marketplaces in order to identify key underlying issues that affect attitudes of direct users of the marketplace. The study adopted the use of literature searches, observation and semi-structured interviews. As furtherance to this study, the findings will be used to develop a model for facilities managers to enhance the quality of the facility in order to improve their performance. As an added benefit, it is anticipated that the change in attitudes of the users of MPE could have a significant effect on their general attitude towards waste beyond the African marketplace environment.

Keywords: African marketplace, attitude, facilities management, solid waste management, stakeholders

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FACTORS INFLUENCING MATERIALS SELECTION FOR HOUSING PROJECTS IN THE GHANAIAN CONSTRUCTION INDUSTRY: STAKEHOLDERS' PERSPECTIVE

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Selection of suitable building material options are being influenced by various stakeholders in the construction industry. The process of selecting these material options can be very complex, being influenced and determined by numerous preconditions, decisions, and considerations. It should however, be noted that stakeholders are legally responsible for the project and their importance can be reflected by the various ways they influence the adoption of innovation strategy. Therefore, this research attempts to identify the possible factors that influence the selection of building materials for housing projects from the perspective of stakeholders in the Ghanaian construction industry. 47 possible factors influencing the selection of building materials for housing projects were identified through literature review. Interviews were carried out prior to the questionnaire survey to examine the relevance of the identified factors in the Ghanaian context. The interviews were conducted amongst eight purposively selected top architectural and structural engineering firms operating in Ghana. Questionnaires were also distributed to a sample of 150 stakeholders in the Ghanaian construction industry, out of which a total of 138 were returned and then analysed using Statistical Package for Social Sciences (SPSS). Relative Importance Index was used to rank the selected factors according to their order of importance. The ten most important building materials selection factors identified in this study are: strength, durability, initial cost, appearance (aesthetic value), water resistance, owner's/user's choice, availability of materials, resistance to decay, heat resistance, and fire resistance. The research concluded that stakeholders in the construction industry should consider all the important factors identified in this study when selecting building materials for housing project in Ghana.

Keywords: building material, Ghana, housing project, selection factor, stakeholder

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FACTORS INFLUENCING THE PERFORMANCE OF HOUSING MARKET IN NIGERIA

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The purpose of this paper is to investigate the forces that influence the performance of housing market in Nigeria with a view to giving insight to investors, developers and other stakeholders on the effects of various factors on residential property performance. Relevant data for the study were gathered through questionnaires administered on registered estate surveying and valuation firms in Lagos, the economic capital and Abuja, the political capital of Nigeria. The data were analyzed using descriptive statistics, multi attribute utility approach and relative influence index. The results showed that location with relative influence index of 0.27 was the most influential factor affecting the performance of housing market in Nigeria. Others were economic (0.259), building attributes (0.237), and market conditions (0.234). The relative influence of underlying subcomponents under each broad category of factors is presented. The knowledge of the property performance influencing factors is expected to benefit the investors and other stakeholders in real property market and stimulate a healthy national economy.

Keywords: housing market, investors, Nigeria, property performance

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Oyewole, M.O. (2015) Factors influencing the performance of housing market in Nigeria In: Laryea, S. and Leiringer R. (Eds) *Procs 6th West Africa Built Environment Research (WABER) Conference*, 10-12 August 2015, Accra, Ghana, 533-544.

FACTORS RESPONSIBLE FOR MORTGAGE DEFAULT IN NIGERIA: A COMPARATIVE STUDY OF COMMERCIAL BANKS AND PRIMARY MORTGAGE INSTITUTIONS

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This study is aimed at examining reasons for mortgage default in Nigeria. Primary data was used for the study which was collected from 14 Commercial Banks and 21 Primary Mortgage Institutions (PMIs). Data was analyzed with descriptive statistics. The findings from the study reveal that most commercial banks declare their borrowers defaulters after missing 2 repayment, while the PMIs make such declaration after missing 3 repayment. Also the findings reveal that net-income to repayment, credit history, interest rates and mortgage charges are the most prominent factors responsible for default for the commercial banks; while mortgage charges, net-income to repayment, loan duration and credit history were the prominent factors for default for the Primary Mortgage Institutions. The study however recommends among other things the enactment of an Act for the establishment of Credit History Bureau in Nigeria and long term loan duration in the country.

Keywords: commercial bank, default factor, mortgage Nigeria, PMI

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FORECASTING THE DURATION FOR SMALL SPAN BRIDGE CONSTRUCTION PROJECTS USING ARTIFICIAL NEURAL NETWORK

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Forecasting the duration for bridge construction projects represents a problem for construction professionals in Ghana. The purpose of this paper is to develop an artificial neural network model for forecasting the duration of small span bridge projects. Data for 18 completed bridge projects from the Department of Feeder Roads were collected and analyzed using the artificial neural network (ANN) and multiple regression. The data collected were quantities of work items executed in the BOQ namely site clearance, earthworks, in –situ concrete, reinforcement, formwork, approach gravelling and actual duration. The coefficient of correlation (R) as well as the mean absolute percentage error (MAPE) obtained show that construction professionals can use the developed ANN model or the multiple regression model for forecasting duration. The study shows that ANN model produces a better result (MAPE of 7.88%) than the multiple regression model (MAPE of 12.58%). The outcome of this study is to help construction professionals to fix realistic contract duration for bridge construction projects before signing of a contract. Such realistic contract duration would help reduce time overruns as well as the payment of liquidated and ascertained damages by contractors for late completion.

Keywords: artificial neural networks, artificial neural network model, bridge projects, project duration, multiple regression

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FRAMEWORK FOR ASSESSING THE EFFECTIVENESS OF COMPETITIVE TENDERING PROCESS FOR WORKS PROCUREMENT AT PRE-CONTRACT STAGE IN CHAD REPUBLIC

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The paper presents a developed framework for assessing the overall effectiveness of Competitive Tendering Process in the award of public works contract in Chad. The adopted method is quantitative strategy using questionnaire. Respondents were asked to pair-wise compare phases, criteria and indicators established by previous studies using a simplified Analytic Hierarchy Process scale of 5 points. Then, relative and composite weights of all identified variables were computed. Based on these findings, a framework is developed following an adapted AHP methodology involving nine steps including a scoring system. The assessment process begins with the assessment of elementary effectiveness at each phase level and end at the overall effectiveness assessment of the whole competitive tendering process. After its validation by an expert group, the developed framework is an appropriate management tool that helps public contracting authorities to assess the effectiveness of every project at pre-contract phase. Its implementation will generate a substantial improvement of the performance of Competitive Tendering Process elsewhere. In addition, the study demonstrated the practical application of AHP in the evaluation of the overall performance in public works procurement. Authors believed that this framework will be adopted by the construction projects managers and recommend its computerization for easy usage.

Keywords: Analytical Hierarchy Process, Chad, competitive tendering process, effectiveness assessment framework, works procurement

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FREECAD: EFFICACY OF ARCH MODULE FOR AUTHORIZING ARCHITECTURAL CONTENT IN A BIM PROCESS USING OPEN-SOURCE SOFTWARE

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Young firms in the Architecture, Engineering and Construction (AEC) business have had to contend with stringent licensing policies and challenging financial commitments when acquiring software tools. Architects in emerging economies may be able to circumvent these restrictions by using open-source alternatives that implement open industry standards. In recent years, increasing numbers of architects prefer design tools that can integrate seamlessly into a Building Information Modelling (BIM) process to traditional CAD applications. The Arch Module in FreeCAD aims to be a plausible BIM tool for architects. It is free (gratis), and its source is available under the GNU Lesser General Public License (LGPL). This study sought to forecast the quality of this promise given the current direction of its development. The study employed normative case study methodology, in qualitative research design, to deduce qualities of BIM software that are deemed to be desirable. Deductions were made from the comparative analysis of a conservative number of selected proprietary like-products – *the combination of exemplars* – from which hypotheses were developed towards the resolution of the research aim. The resultant postulations should inspire further studies and refinements for improving the case product (Arch Module).

Keywords: BIM, open-source, FreeCAD, Arch Module

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GENDER PERCEPTIONS OF SKILL SETS OF FEMALE ARCHITECTS IN NORTH CENTRAL NIGERIA

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Employability (or lack of) of graduates has become a widely discussed concern recently due largely to the fact that overall graduate employability is at an all-time low. The link between a nation's economic progress and graduate employability challenges all stakeholders to make a concerted effort to tackle their respective roles in addressing the phenomenon. There are deficiencies in technical and discipline competencies, as well as other lacking employability skills/attributes such as team-working, communication, leadership skills, critical thinking and problem-solving. However the challenges experienced in developing nations runs a bit deeper. This study examines the roles and ideologies of employers, graduate students and Higher Educational Institutions (HEI's) of architecture in North Central Nigeria and suggests key areas of improvement in the supply and demand of employment opportunities for architects in general and female architects in particular.

Key words: employability, employer ideology, female architect, Nigeria, skills development

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HIGHEST AND BEST USE OF RESIDENTIAL LANDS IN SELECTED HOUSING ESTATES IN LAGOS, NIGERIA

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The study focuses on the ideology of highest and best use to achieve economic efficiency of residential land in Lagos metropolis of Nigeria. Data on variables determining the highest and best use of residential lands in Lagos were obtained through structured questionnaire fully and well completed by 542 private and corporate house owners and developers. Pearson Correlation analysis and the Multiple Regression analysis were employed to analyse the data. The study found that the significant variables determining HBU of residential lands in Lagos are accommodation units, land cost, plot size and the level of demand for the type of house on the land. Developers are advised to consider these variables when making decisions on the use of residential lands in Lagos metropolis.

Keywords: economic efficiency, highest and best use, housing estate, residential land,

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IMPACT OF RESIDENTIAL PROPERTY DEVELOPMENT PATTERNS ON SUSTAINABLE ENVIRONMENT IN AKURE, NIGERIA

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Real property is important in physical and economic developments of towns and cities all over the world. It plays a critical role in a country's welfare than is always recognised as it directly affects not only the well – being of the citizenry but also the performance of other sectors of the economy. This study examines the dynamics of residential property in Akure - a medium sized city in south western Nigeria and its implication on sustainable environment. The choice of this location was based on the fact that Akure is experiencing high pace of urbanization. Data were collected by grouping Akure into three neighbourhoods namely the inner traditional core, the transition zone and the peripheral district upon which multi stage sampling technique was used to select residential properties and their occupants for questionnaire administration. Simple descriptive statistical models were used in the analysis and interpretation of data. The study revealed that rooming house was dominant in the core area and transition zone and they lacked in essential infrastructure and services with its attendant effect on sustainable environment while the situation differs as when moving towards the peripheral district. The study further revealed different environmental consequences in each of the zones and based on this, deliberate and innovative policy strategies were proffered for the sustainability of our environment.

Keywords: Akure, environmental degradation, neighbourhood, residential property, spatial, sustainable environment

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Ogunleye, B.M. (2015) Impact of residential property development patterns on sustainable environment in Akure, Nigeria *In: Laryea, S. and Leiringer R. (Eds) Procs 6th West Africa Built Environment Research (WABER) Conference, 10-12 August 2015, Accra, Ghana, 635-652.*

INCLUSIVE ACCESS TO ACCRA SHOPPING MALLS

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On daily basis, People with Disabilities (PWDs) are faced with barriers, which effectively exclude them from participating in society as equal citizens. Many of these barriers relate to the accessibility of the built environment. In recent years, a number of shopping malls have sprung up in Accra, the capital of Ghana. They depict grandeur and class and the question is whether all and sundry have equal access to these facilities. This study was conducted on six shopping malls in Accra to assess the various provisions made by their designers to give equal access to all users. Using purposive sampling, fifty five (55) questionnaires were distributed to PWDs who belong to the Ghana Federation of the Disabled in Accra. Also, a checklist designed from international standards (BS 8300, 2010 and Solidere, 2004) were employed to audit the malls. Interviews were also conducted with major stakeholders of the built environment including governmental institutions. The data was analysed using descriptive statistics. The outcome of the study revealed that the buildings studied did not meet most of the requirements of standards on accessibility for the PWDs.

Keywords: accessibility, built environment, equal access, people with disabilities, shopping mall

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INCORPORATING ENVIRONMENTAL SUSTAINABILITY INTO CONSTRUCTION PROCUREMENT AT THE DISTRICT ASSEMBLY LEVEL IN GHANA

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Construction projects account for high carbon emissions, high water consumption, high amount of landfill waste and high usage of raw materials. By incorporating environmental sustainability into construction procurement in the public sector it would be possible to reduce the corresponding effects on the environment. The study aimed at exploring the driving factors of environmental sustainability into construction procurement at the district assembly level in the western region of Ghana. Census sampling technique was combined with purposive sampling to identify the four categories of respondents from the twenty-two (22) district assemblies used for the study. Related literature on construction procurement and factors driving environmental sustainability issues were reviewed, questionnaires was used as the data collection instrument for the study. Four major factors namely: leadership influence, environmental culture, public influence and personal skills were identified as driving environmental sustainability into construction procurement at the district assembly level in Ghana. The study concluded that environmental officers are to be made part of the construction procurement team as they have the expertise knowledge in environmental laws and environmental impacts such as forest degradation, water pollution, farm land destruction, and air pollution at the various districts. The study highlighted issues, requirements and responsibilities necessary to promote more responsive environmental outcomes from construction projects.

Keywords: district assembly, environmental sustainability, Ghana, procurement

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INFLUENCE OF ENVIRONMENTAL VARIABLES ON THE MECHANICAL PROPERTIES OF RICE HUSK ASH BLENDED CEMENT CONCRETE

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This study focuses on the influence of environmental variables (ambient temperature, relative humidity and wind speed) on the strength property of RHA blended cement concrete. Three dissimilar environments in Nigeria were studied. Jos, humid-cold; Makurdi, hot-humid; and Birnin Kebbi, dry-hot- in rainy season. Concrete cubes at various replacement levels of Ordinary Portland Cement (OPC) with RHA were cast. Makurdi, which has the moderate values of the conditions when cured in water, has the highest compressive strength at 28 days and 10% RHA replacement of 27.3N/mm² followed by Jos 25.4N/mm² and lastly Birnin Kebbi 22.7N/mm². Similar trend of differences of flexural strength was also confirmed. This implies that higher values of temperature and wind speed as experienced in Birnin Kebbi and Jos respectively is detrimental to concrete. It is therefore recommended that shading of concrete products at high temperature and the use of wind barriers at high wind speed should be adopted. Further studies should be undertaken in Nigeria during harmattan and dry season to ascertain their effects on RHA concrete in different environmental conditions. It is also recommended that 20% RHA replacement is the optimum under all environmental conditions for both water and field curing especially in mass concrete construction.

Keywords: ambient temperature, mechanical properties, Nigeria, relative humidity, rice husk ash, wind speed

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Nensok, M.H. (2015) Influence of environmental variables on the mechanical properties of rice husk ash blended cement concrete *In: Laryea, S. and Leiringer R. (Eds) Procs 6th West Africa Built Environment Research (WABER) Conference, 10-12 August 2015, Accra, Ghana, 691-704.*

INFLUENCE OF FADAMA ACTIVITIES ON WOMEN EMPOWERMENT IN EDE NORTH LOCAL GOVERNMENT AREA OF OSUN STATE, NIGERIA

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The study was conducted to assess the influence of Fadama activities on women empowerment in Ede North Local Government Area of Osun State, Nigeria. The specific objectives examined the rate at which women participated in Fadama and the differences in income before and during Fadama in the area. Data were obtained from primary and secondary sources. Primary data was obtained purposively with the use of 240 structured questionnaires in a survey of 24 Fadama Users Groups (FUGs) whose representatives constitutes 6 Fadama Communities Associations (FCAs) in the study area. Secondary data was obtained from published and unpublished sources. Primary data was analyzed with the aid of statistical package for social science (SPSS) to obtain both descriptive and inferential statistics. Findings show with regards to the Fadama activities undertaken, majority 58.8% were into agro processing, 25.4% into farming, 12.5% - into poultry while 2.9% were into fish farming. Similarly, 74.6% earned N18,000-28,000, 21.2% of Fadama farmers received an average annual income of below N18,000, and 3.8% earned N29,000-39,000 per annum before joining Fadama and after 45.4% of the respondents received income of N29, 000-N39, 000, 42.9% earned N40, 000 and above while 10.0% received N18, 000-N28, 000. The Result of the factor analysis reveals that the total variance explained by each component extracted made up to 69.61% of total variance with variable 1 gender explaining 31.34%, the second 17.65%, third 11.22% and fourth variable 9.40%. Based on the findings of the study, it is evident that the Fadama program in Ede North Local Government increased the participation of - rural women farmers in agricultural production which has helped to reduce the problems of gender discrimination which if explored could create jobs with value chain addition, reduce poverty, food security and advance the MDGs.

Keywords: Fadama, food security, women empowerment, poverty reduction

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INFLUENCE OF PROPERTY MARKET CYCLE ON COMMERCIAL OFFICE PROPERTY IN VICTORIA ISLAND, LAGOS STATE, NIGERIA

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The paper seeks to explain the influence of market cycle on the quality of office property investment decisions advice given by property managers in Victoria Island Lagos, Nigeria. It identifies the nature of market cycle on office property in that location between 1995 and 2014, examines the factors influencing the property market cycles and subsequently determines their implications on the office property investment. The study was a survey research in which data were collected through well-structured close-ended questionnaire administered to both the office property managers / investors and office tenants with variables capturing factors on market cycle on a 5 point liker scale and weighted mean scores was employed to identified important factors. The findings identified four property market phases that were cyclical in nature within the period understudy. The property market depression period had started since late 1980s lasted till 1994, while there was recession between 1995 and 1997, recovery period was between 1998 and 2001, an upturn in rents to expansion began in 2002 and got to the peak in 2007, and slump/contraction began by 2008 to 2010, no evidence of deep depression, but rather a recovery leading to an upturn in rents since 2011 till 2014 the period of this study due to national policy of privately led growth in Nigeria economy coupled with general unemployment in the public service sector. This findings implied that market cycles dictates defensible and rational investment decisions of when to let, purchase or sell, start a new development or convert existing- use, or wait for ripe period . Hence, property managers or analysts must be well acquainted with the periods within the market and this must be well captured in their appraisal works and during counselling their clients in achieving their investment objectives.

Keywords: commercial office property, investment decision, Lagos, property market cycle

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Adejoke, O.R. (2015) Influence of property market cycle on commercial office property in Victoria Island, Lagos State, Nigeria *In: Laryea, S. and Leiringer R. (Eds) Procs 6th West Africa Built Environment Research (WABER) Conference, 10-12 August 2015, Accra, Ghana, 725-735.*

MANAGEMENT OF MULTI-TENANTED PROPERTIES IN ABEOKUTA

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Due to the fact that the occupiers of multi-tenanted properties are usually from different backgrounds, dissimilar aspirations and dispositions, lots of problems were encountered by the landlord, tenants and managers usually with gruesome effects that cannot be easily forgotten by the stakeholders. This study examines the associated problems with a view to proffering pragmatic recommendations. The secondary data was derived from archival sources and content analysis of different research findings in relation to property management around the world. For primary data, 52 property managers in Abeokuta were surveyed by personally administered questionnaire; 45 were returned and found useful for this study, giving a response rate of 86.54%. Data gathered were analysed by frequency distribution, percentage and relative importance indices. Findings of the study revealed the inherent problems to include rent default, tenant selection, irregular payment of rates and occupation taxes, overcrowding, tenants and landlords' frustrating attitude and facilities deterioration. Multi-tenanted property management requires special skills of estate management profession as the task is fraught with a number of problems which should be addressed carefully by the manager in order to secure a guaranteed optimum returns to landlords, quite enjoyment to tenants and long life to the property facilities and services.

Keywords: Abeokuta, estate agent, estate surveyor, multi-tenanted property, property management.

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Akogun, I.T. (2015) Management of multi-tenanted properties in Abeokuta *In: Laryea, S. and Leiringer R. (Eds) Procs 6th West Africa Built Environment Research (WABER) Conference, 10-12 August 2015, Accra, Ghana, 737-748.*

MANAGEMENT POLICIES FOR ACCESSIBLE ENVIRONMENT IN SENIOR HIGH SCHOOLS

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In Ghana, governments and stakeholders of education over the years have been interested in drafting policies that are geared towards increasing Senior High School (SHS) student enrolment and infrastructural development without regard to how these facilities provided are accessed by Persons with Disability (PWD). Inspired by the initiative to incorporate PWD into mainstream education, the study sought to identify and examine the management policies employed in managing facilities in selected second cycle institutions to make them accessible to PWD, specifically mobility impaired persons. The knowledge of PWD in the schools and stakeholders of education about the existence of the Persons with Disability Act, 2006, Act 715 was also assessed. The research focused on three schools in the Kumasi metropolis. Data collection was done through interviews as well as the administration of questionnaires. The simple random sampling technique was used for questionnaire administration in this research. Purposive sampling was used for the interviews. Furthermore, personal observations were employed in the study. Data was also collected from secondary sources. The study revealed that there were no management policies pertaining to PWD in the schools; there was poor coordination amongst stakeholders in addressing management issues; disability unfriendly facilities were still predominant in all the schools; and majority of the respondents were ignorant about the existence of the PWD Act, 2006, Act 715. The advocacy for a barrier free environment has now taken a new dimension through the ultimatum given by the drafters of the Persons with Disability (PWD) Act, 2006, Act 715 to ensure that public buildings in Ghana are disability friendly. Based on the findings, it is recommended that there must be advocacy for the strict enforcement of the provisions of the PWD Act, 2006, Act 715. Trained facilities managers should be allocated to Senior High Schools (SHS) schools in predetermined zones.

Keywords: facilities management, inclusive education, Kumasi, mobility impairment, persons with disability, Persons with Disability Act, 2006, Act 715, senior high schools

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MANAGING RETENTION IN RESIDENTIAL BUILDING PROJECTS IN SELECTED STATES IN NIGERIA

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Residential building projects consist of complex interrelated subsystems of cost centers which often require huge financial commitment. The huge financial commitment therefore makes monitoring the disbursement and flow of financial resources a worthwhile task. Therefore in order to maximize fund on various cost centers, client and project actors often exhibits restraint in fund disbursement in order to ensure value for fund already released. However, it is the proper management of the process of fund release and retention of some funds that determines the value for money expected on the projects. It is against this background that this study was centered on managing project retention fee in residential building projects in Lagos state, Ogun state, Abuja (F.C.T.) and Port Harcourt in Nigeria. A random sampling technique was used in the study, a population size of 250 residential building projects was used for the study from which sample size of 120 was chosen. Moreover, a structured questionnaire in Likert scale 1-5 was used for the work. Mean Item Score was used to generate the agreement index for the parameters influencing the retention fee management process. It was discovered that most deducted retention percentage is 5% of the project cost. Also, the type of intervention system often used as alternative intervention system was studied, the most advocated intervention system is paying interest on retention when delayed, followed by release of retention on line item basis. There should be adequate compensation for the fund tied down. However the following intervention system could be used: release of retention fee on line item basis, introduction of letter of credit, application of bond as alternative of retention fee, application of performance bond, financial security package, the use of escrow account for retention fee, use of payment bond and performance bond among others. The combination of two or three or all of them should guarantee adequate management of the fund. However, there are challenges often encountered in the fund administration these includes; delay in the release of fund, reduction in contractors fee and retention fee reduces contractors profit if all the retained fund is used to remedy bad work among others. Factor Analysis in Regression Analysis of SPSS software was used to generate factors for a suitable fee management model by reducing the factors to their Coefficients and Eigen Values. The model would assist clients and project actors in management of project elements retention fee on residential building sites.

Keywords: factor analysis, project management, residential building project, retention

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MEASURES TO IMPROVE THE PERFORMANCE OF CONSTRUCTION PROJECTS IN SOUTH AFRICA

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Construction projects are complex, risky and time-consuming undertakings that are usually commissioned by governments and delivered by national and international participants with a variety of cultural differences, backgrounds, political systems, and languages. The South African construction industry operates in a uniquely project-specific and complex environment, combining different investors, clients, contractual arrangements and consulting professions. It impacts directly on communities and the South African public at large, and its improved efficiency and effectiveness will enhance quality, productivity, health, safety, environmental outcomes and value for money. Therefore, this paper will investigate measure that can be used to improve the performance of construction projects in the South Africa construction industry. Data for this paper were obtained from a structured questionnaire was distributed to construction professionals both from contracting companies, consultant offices and public owners sectors. Findings from the questionnaire surveys revealed that the measures to be taken for the improvement of the performance of construction projects in Gauteng, South Africa, include: proper project planning and scheduling, use of effective project management techniques, clear information and communication channels, adherence to construction drawings and specifications, proper material procurement, adequate planning, effective strategic planning, proper project implementation and management, frequent coordination between the construction team, use of appropriate construction methods, site management and supervision amongst others. The study contributes to the body of knowledge on the subject of measures to improve the performance of construction projects in the South Africa construction industry.

Keywords: construction project, project performance, South Africa

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METHODS TO ASSESS THE EFFECTIVENESS OF NATURALLY VENTILATED CLASSROOMS IN GAUTENG, SOUTH AFRICA

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There is a tendency to reduce ventilation rates and natural or hybrid ventilation systems to ensure the conservation of energy in school buildings. However, high indoor pollutant concentration, due to natural or hybrid ventilation systems may have a significant adverse impact on the health and academic performance of pupils and students. Reviewed evidence shows that this can be detrimental to health and wellbeing in schools because of the learner density within a small area, eventually indicating that CO₂ concentrations can rise to very high levels (about 4000 ppm) in classrooms during occupancy periods. In South Africa's naturally ventilated classrooms, it is not clear whether the environmental conditions are conducive for learning. In addition, natural ventilation will be minimized given the fact that in cold, wet or windy weather, doors and windows will commonly remain closed. Evidence from literature based studies indicates that the significance of ventilation techniques is not understood satisfactorily and additional information concerning naturally ventilated schools has to be provided for better design and policy formulation. To develop a thorough understanding of the environments in classrooms, many other parameters have to be considered as well, such as outdoor air quality, CO₂ concentrations, temperature and relative humidity and safety issues that may be important drawbacks for naturally ventilated schools. The aim of this paper is to develop a conceptual understanding of methods that can be implemented to assess the effectiveness of naturally ventilated classrooms in Gauteng, South Africa. A theoretical concept with an embedded practical methodology have been proposed for the research programme to investigate the relationship between ventilation rates and learning in schools in Gauteng, a province in South Africa. It is important that existing and future school buildings must include adequate outdoor ventilation, control of moisture, and avoidance of indoor exposures to microbiologic and chemical substances considered likely to have adverse effects in South Africa. Adequate ventilation in classrooms is necessary to reduce and/or eradicate the transmission of indoor pollutants.

Keywords: carbon dioxide (CO₂), classroom, Gauteng, natural ventilation

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MOTIVATIONAL FACTORS OF EMPLOYEE-CONSULTANT IN NIGERIAN CONSTRUCTION INDUSTRY

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This research seeks to assess Motivational factors of Employee-consultant in Nigerian Construction Industry with a view to enhance best practices of motivation, towards the growth and sustenance of the construction industry. The research work focused on employee-consultants as the key players in the construction industry. It therefore reviewed literatures on motivational theories and factors, providing a platform for the design of questionnaires, and a sample size of 108 construction/consultancy firms, and 150 employee-consultants were randomly selected to answer the two set of questionnaires within Kaduna and Abuja metropolis which are areas of dense construction activities in the country. The results were analysed using statistical tools including the relative important index (RII). From the research findings, the ranking of motivational factors reveals the first six factors as outlined in order of their significance from the research: Job security (0.9), salary (0.89), working condition (0.87), reward (0.84), Training and development (0.83) and Leadership respectively (0.82). The generality of the research findings was affected by at least two factors. First, the research involved only consultancy and construction firms based in Kaduna and Abuja; therefore not all the country was covered. Secondly, the response rate is relatively low, even though it is adequate for analysis. The implementation of the key motivational factors identified in the research will greatly improve the efficiency of the industry.

Keywords: employee-consultant, motivational factors, Nigerian construction industry, management.

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PARETO ANALYSIS ON THE TOTAL QUALITY MANAGEMENT STATUS OF NIGERIAN DESIGN FIRMS

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Total Quality System (TQS) is an agreed companywide operating work structure, documented in effective technical and managerial procedures, for guiding coordinated actions of workforce, machine and information of a company in the best and most practical ways to ensure customer satisfaction and economical cost of quality. Total Quality Management (TQM), a subsidiary of TQS is based on the philosophy of continuously improving goods and services. In 1993, European construction Institute (ECI) developed a measurement matrix based on 12 quality factors used to measure the degree at which a company is operating under TQM. This study was aimed at identifying the vital factors that have greater effects on the ECI status of Nigerian Design Firms based on principles of Pareto Analysis. The results of the analysis identified 20% of the quality factors responsible for the status recorded by the Nigerian Design Firms with their average scores as; 'Training, awareness, education and skill (3.3)'; 'Natural use of TQ tools and techniques (3.4)'; and Objective measurement and feedback (3.4)'. For the Nigerian Design Firms to make progress towards attaining the requirements of TQM, it is recommended that proper attention need to be paid on these three factors as outlined in the ECI matrix.

Keywords: design firm, measurement matrix, pareto analysis, quality factors, total quality management

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PERCEPTION OF EMPLOYERS ON THE PERFORMANCE OF CONSTRUCTION CRAFTSMEN TRAINED IN NIGERIA

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Studies on construction craft skills have identified a number of problems including ineffective training as responsible for shortages of craftsmen in construction industry. This study assessed the performance of construction craftsmen trained in Nigeria. Qualitative approach was used in conducting the research. Detail literature review on training of craftsmen led to the development of a semi-structure interview guide which was used in conducting interviews with management staff in construction organisations. Nine (9) large construction firms were selected using purposive sampling and interviews were done with a management staff in each firm. Data obtained from the interviews were subjected to conceptual content analysis. The results showed that organisations are generally not satisfied with the performance of craftsmen trained in Nigeria. Craftsmen are found relatively satisfactory in general education but lack trade focused theory as such, organisations had to train them on-the-job to acquire basic operation skills. The poor performance of the craftsmen was generally attributed to generic training adopted by the institutions against industry focused training. The study also found that training is institution-based with very weak arrangement for industrial training which lack direct collaboration with the construction industry. It is therefore concluded that the performance of craftsmen trained in Nigeria is unsatisfactory in terms of practical (hands-on) skills. It is recommended that training should be done on industry basis and collaboratively with emphasis on acquisition of hands-on skills.

Keywords: construction, craft skills, craftsmen, Nigeria, training, performance

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PERCEPTION OF ESTATE SURVEYORS AND VALUERS ON USERS' PREFERENCE FOR GREEN BUILDING IN LAGOS, NIGERIA

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The purpose of this paper is to investigate users' preference for green building features as perceived by real estate practitioners managing office properties in Lagos. This is with a view to determining the willingness of users to demand for property with green features and maturity of the property market for sustainable green building. Questionnaire were administered on 88 estate surveyors and valuers managing office properties selected through a purposive sampling technique. Data were analysed with the use of frequency distribution, percentage and relative preference index (RPI). The results showed that users preferred most of green building features above conventional building features. The index of preference on all features is above average (2.50). It was also discovered that features relating to direct occupant use and comfort were most preferred. The paper concludes that with high level of preference for green features in the study area, conscious efforts should be made by relevant agencies to encourage green building practice.

Keywords: energy efficiency, green building, Nigeria, office property, sustainability

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PERFORMANCE LEVEL OF ACCURACY MEASURING METHODS IN CLASSIFIED REMOTE SENSING IMAGES AS APPLIED TO THE BUILT ENVIRONMENT

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Assessing the accuracy of a classified image is an essential task that gives the user apriori information of the overall reliability of subsequent analysis performed with such classification methods. This research seeks to carry out an assessment of the accuracy measure for evaluating the integrity of the result of image classification using the overall accuracy and the Confusion Matrix. The effect of the size of the defined training site on the accuracy of the resulting classified image has also been examined. LandSAT image of part of South Western Nigeria was used in this study with three different classification methods (Maximum Likelihood, Mahalanobis distance and minimum distance Classifiers). The results obtained shows that the use of the confusion matrix gives a better analysis of the level of reliability of the classification than the use of chance adjusted indices or overall accuracy.

Keywords: accuracy measure, confusion matrix, image classification, spectral class, training site

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PERFORMANCE OF PRIVATE SECTOR PARTICIPATION IN SOLID WASTE COLLECTION: A POLYCENTRIC PLANNING PERSPECTIVE

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The inability of public authorities in charge of waste management to effectively perform their responsibility in waste collection has led to the adoption of Private Sector Participation (PSP) initiatives. A study was conducted to ascertain the performance of PSP in waste collection taking into cognizance the aspirations, expectations and perspectives of the citizens and the role of the government. Data were collected from 159 households sampled across three areas in Osogbo – core, intermediate and newly developing areas. Results show that the majority of the respondents (80.5%) subscribed to the private waste collectors, while others still employ crude and environmentally degrading methods such as: dumping on roadsides and water channels (3.2%) and burning (13.1%). Most of the respondents (47.4%) rated the PSP efficient, while another 20.1% rated it very efficient. Further findings show that 79.2% of the respondents confirmed the consistency and reliability of the PSP in waste collection. In spite of the laudable achievement of the PSP, political factor discouraged private collectors that had been in the business for about 8 years before governmental intervention. They were economically disempowered and government action is viewed to be paradoxical to its objective of using PSP to create jobs for citizens. The study suggests policy template that can enable government to facilitate rather than strangle the private sector initiatives in waste collection in the city and the entire Osun State. Using African Polycentric Information Networking (APIN) and African Polycentric Public-Private Solid Waste Management Model (APPPSWM), this paper designs institutional mechanisms for involving the stakeholders/grassroots in waste collection through public enlightenment, necessary to bring the people to the level of public officials so that a common-thought between the three groups can be established.

Keywords: Nigeria, performance, polycentric planning, private sector, waste collection

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PERSPECTIVES OF CONSTRUCTION BUSINESS MARKETING STRATEGIES: EXPLORING THE INHERENT CHALLENGES OF MARKETING STRATEGIES OF SME CONTRACTING FIRMS IN GHANA

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Facing keen competition for survival and sustenance is evident in every sector of the economy; and the construction industry is not an exception. Marketing is acknowledged to influence organizational performance and survival of small medium enterprises (SMEs). However, professional alignment of marketing in SME contracting firms is struggling to gain acceptance in the construction industry. Research into construction business marketing (CBM) is also sparse and many contributing factors account for these paucities. The resolution of such challenges will inevitably facilitate the alignment of appropriate marketing strategies in the construction industry. This current paper focuses on exploring the inherent challenges of professional alignment of marketing in SME contracting firms in Ghana. Cast in a quantitative research mode, the study utilized a structured questionnaire survey to gather data. The response data was subjected to rigorous analysis. Lack of in-house marketing expertise; lack of partner level acceptance of marketing as a legitimate business function; the misconception about marketing as selling game; personalized management style; resource constraint and professional limitation were found to be critical challenges of professional alignment of marketing among SME contracting firms in Ghana. The research findings will be useful to construction professionals who are exploring strategic approaches of improving their business prospects. Further research is recommended to consider marketing strategies of these SME contracting firms.

Keywords: business, contracting firm, marketing, professional, SME, strategy

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PROJECT MANAGEMENT COMPETENCIES OF INDIGENOUS CONTRACTORS IN NIGERIA

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All over the world, governments are talking about reducing spending of capital and recurrent expenditures. Capital expenditures cover cost for major projects such as infrastructure. Moreover, the wealth and worth of a nation is a function of the availability and quality of its infrastructure. It has been noted that indigenous construction firms do not represent a strong source of competition. Consequently, most construction markets in Africa are dominated by expatriates. Governments of most African countries pay huge amount of money to expatriates because of deficiencies in indigenous capacity. The study therefore, aimed at identifying and assessing critical project management competencies required by indigenous construction firms. A quantitative research method was adopted for the study and 72 copies of the questionnaire were distributed to indigenous construction firms in Lagos and Abuja, Nigeria. The study revealed cost management, site management, time management and quality management as the most critical project management competencies required by indigenous construction firms. The study suggested that indigenous construction firms should sagaciously allocate more resources for development of the critical project management competencies identified in the study so as to audaciously become major players in the Nigerian construction market.

Keywords: construction firm, construction market, project management competency, Nigeria

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PROJECT QUALITY MANAGEMENT PRACTICES IN MULTINATIONAL AND INDIGENOUS CONSTRUCTION FIRMS OF NIGERIA

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As it is currently found in the Nigerian construction industry that multinational construction firms dominates major projects, a dolorous situation that calls for deep and sober reflection. The circumstances warranting that has, conversely, been incubated by deficiencies, failures, poor quality, etc. of the indigenous construction capacity coupled with mounting demand of construction clients for better project quality, more satisfactory production cost thereby eliminating or minimizing the twin consequences of defects and rework that has come a long way to explain why multinationals are far ahead of the indigenous in terms of client patronage. The research looks at the efforts made by both multinational & indigenous construction firms in achieving project quality. Three parameters of Human Resource (HR), Process, and Technology were identified, studied and then compared. A field survey was used to conduct the research using a structured questionnaire and oral interview. A total of one hundred (100) questionnaires were administered, forty-five (45) were returned and analyzed. Descriptive statistics, percentages, tables, bar charts, frequency and mean were used. Results of the study revealed that both multinational & indigenous construction firms strive to achieve quality during construction as specified in the production information and contract documents. The multinational construction firms have an uncompromising attitude towards quality unlike their counterparts...the indigenous. Moreover, it was observed that certain factors such as technical capability, training of human resources, quality of material resources, etc. needs to be revisited by the indigenous construction firms if at all they are to compete with the multinationals. As such, a number of recommendations were made at the end such as bridging the wide communication gap for improved professional integration, project timely delivery to design and specification, unswerving supply management to checkmate defective building materials & components should be put in place; and finally that Project Quality Management Plan (PQMP) shall be adhered to strictly during construction.

Keywords: construction firm, Nigeria, project, quality management practice, total quality management

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PROMOTING EDUCATION ON INCLUSIVE DESIGN OF THE BUILT ENVIRONMENT AT KNUST

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Persons with Disabilities (PWDs) represent the most marginalized, neglected and excluded persons in society hence the rise in the activities of various advocacy groups to ensure the inclusion of PWDs in society. One of the most sensitive areas of discrimination against persons with disabilities (PWDs) is barriers in the built environment. This study is aimed at promoting and improving inclusive design education and disability equality in Ghana. It therefore assessed the training of the graduates at Kwame Nkrumah University of Science and Technology (KNUST) who later become professionals of the built environment in Ghana. To achieve the objective of the study, the Course Contents of various departments that taught courses relating to the built environment were evaluated through a survey of 259 respondents made up of 23 lecturers, 127 students, 52 design professionals of the built environment and 57 Persons with Disabilities (PWDs). The findings revealed that the curricula of most of the Departments that taught built environment courses at KNUST were deficient in the principles of inclusive design. The PWDs on the other hand blamed the government and design professionals for the inaccessible built environment. The study recommends that the present curricula of all relevant Departments should be revised to incorporate elements of inclusive design and design professionals who are already practicing in the field should be given refresher courses by their respective professional bodies to make them more responsive to the changing trends of universal design.

Keywords: built environment, course content, education, inclusive design, persons with disabilities, universal design

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PRUDENCE PRACTICE AMONG CONSTRUCTION PROJECT MANAGERS IN NIGERIA

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Measurement of prudence practice of construction professionals is an innovation long overdue in the construction industry that is constantly in need of new strategies to deal with construction challenges. The performance of project manager's principal responsibilities in delivering the project end-item is dependent on the prudence of a project manager in dealing with uncertainties of the construction industry. Professionals used as project managers on construction projects performed differently in managing the planned and actual resources required for a project with disputable variance in project outcomes thus, the need to analyse and compare their prudence practice on projects. Twenty-seven (27) prudent practice criteria used to test the prudence of fiduciaries were adapted to assess the prudence practice of construction project managers. A total of one hundred and twenty two (122) questionnaires were successfully retrieved using stratified random sampling. Data analysis process was carried out using statistical tools such as frequency, mean and analysis of variance (ANOVA). Project managers in the Nigerian construction industry that were surveyed performed better in the awareness of their duties and responsibilities including seven other criteria; While the Civil Engineers and Quantity Surveyors match on to high performance in prudence practice, the Architects performance is typical prudence practice. The respondents ranked Quantity Surveyors as project managers that displayed high prudence practice among the professionals although; no professional achieved excellent prudence practice.

Keywords: architect, civil engineer, professionals, prudence practice, quantity surveyors

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PUTTING RESEARCH INTO PRACTICE: EXPLORING THE INHERENT CHALLENGES OF RESEARCH UPTAKE IN THE BUILT ENVIRONMENT FACULTIES IN GHANA

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Existing literature on Research Uptake (RU) have focused on exploring communication gaps between researchers and the audience. Unfortunately, the review of literature points to the dearth of research studies on Research Uptake within the Built Environment (BE). Recent studies have concentrated on improving uptake strategies neglecting the challenges of RU. The resolution of such challenges will inevitably facilitate the uptake of research. This paper aims to explore the inherent challenges of research uptake in the Built Environment faculties. A structured questionnaire survey was used to elicit perceptions of Researchers on the challenges identified from literature and the preliminary survey. The data were analysed using descriptive statistics (mean score ranking) to examine the severity of the challenges. The findings of the study revealed that *lack of resources, policymakers' perception about research and lack of collaborative research* are the main challenges to research uptake in the Built Environment faculties in Ghana. Subsequently, the Kruskal-Wallis Test was used to compare the scores on the main challenges across the various department. It revealed that there is a difference in the challenge pertaining to *policymakers' perception about research*. However, the difference in the other main challenges proved to be statistically insignificant. The challenges presented indicate that research in the Built Environment needs intense management and resources intervention to facilitate its uptake with demonstrated outcome benefits. This study provides rich insights of the challenges to the uptake of research in the Built Environment. Little study in the literature has provided such insights that link the challenges to the uptake of research in the Built Environment. The findings from the research would be of significance to both researchers, policymakers, advocates and potential policy beneficiaries, among others. Further research is recommended to examine the challenges from the perspective of policymakers.

Keywords: built environment, challenge, faculty, research, strategy, uptake

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QUALITATIVE ADEQUACY OF PURPOSE BUILT HOSTELS IN WA

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This study sought to assess the level of adequacy of some hastily constructed purpose-built hostels around the Wa campus of the UDS to meet the growing students' population in the Wa township. It sought to find out the qualitative adequacy levels of the accommodation provided by these private hostels and how the accommodation provided by the private sector adequately supports the educational needs and requirements of students. It also sought to identify the key housing attributes and services (facilities) whose improvement will enhance the level of satisfaction derived from these hostels. It was a post-occupancy evaluation based on survey questionnaires of 31 housing attributes. A five-point Likert scale was used in measuring the level of qualitative adequacy of five purpose-built hostels. The data was analysed with descriptive statistical techniques. Respondents found the hostels fairly *adequate* for academic purposes. No hostel was either *very inadequate* or *very adequate*. The building component attributes rated were mainly found to be *adequate* while the ancillary services needed by students were mostly found fairly adequate. Fire safety and internet services were found to be *inadequate* and contributed least to the overall adequacy of the hostels. The results suggest the need for regulation in the planning, design and construction of hostels in Wa since about one-half of the attributes used were generally rated fair and none found very adequate. Fire safety is critical in students housing due to the multitenant nature of hostels. This was however found *inadequate*; necessitating urgent attention to avert any future disaster.

Keywords: adequacy index, facilities, Ghana, student housing, Wa

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REMEDIAL APPROACH OF SECURING LAND-TITLE AND DEVELOPMENT PERMIT: CASE STUDY OF THE OGUN STATE HOME-OWNER CHARTER PROGRAMME

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Common knowledge assumes that most occupied residential property developed in Nigeria urban centres are faced with lack of or improper land-title and physical development documentation. This can also be said to have come with the problem of authenticity and acceptability of population census data. Consequent upon these and in the realization of likely loss of significant revenue accruable therefrom and perhaps because of the emerging sporadic yearning and aspiration of most property owners to have their respective properties properly and statutorily documented for one reason or the other, such as, for record purpose or for financial obligations or both, the government of Ogun State, Nigeria came up with a programme tagged " Home-Owner Charter (HOC) 2013 ". The programme provides window of opportunity for home-owners or property developers in respect of residential buildings for securing statutory land-title and development permit, with concession/waiver on some usual pre-requisites and financial obligations. The HOC is to stimulate voluntary compliance with the physical development requirements by homeowners for generating appropriate population data and improving upon the internally generated revenue base for developmental project planning and implementation. This paper therefore evaluated the level of achievement of the Government in this pursuit. Pertinent data were obtained through case study approach and field survey on randomly selected 304 respondents in Ogun state and data therefrom were subjected to descriptive statistical analysis. Findings reveals that Ogun State Government gave priority to revenue generation above other objectives set for the programme; and that the programme is generally not meeting up with the scheduled time for the exercise.

Keywords: compliance, development permits, home-owner charter, land-title, population data, remedial

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ROLE OF BUILT ENVIRONMENT PROFESSIONALS IN ACHIEVING SUSTAINABLE BUILT ENVIRONMENT

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Construction industry across the globe is making concerted effort to mitigate the negative side effects of its activities. This paper examines the role of Built Environment, BE, professionals in the attainment of sustainable built environment in the West African sub-region. Through wide review of literature such as publications, research works, on line materials, etc. The concepts of sustainability and sustainable development were discussed. This was followed by an exposition on sustainable construction and challenges faced by the BE, professionals due to the influence of technological development. The role of BE, professionals in achieving sustainability in design, construction and operation of building were examined. In addition, their function towards the creation of an enabling environment for the sustainable construction practice was discussed. Also, close study of the effort made by the BE professionals in West Africa, reveal that very little effort was made towards achieving sustainability. This is particularly true, when such effort is compared with that of the developed nations. It was concluded that the BE, professionals can only avoid putting themselves in disadvantaged position if they make concerted effort to put themselves and the industry at par with their counterparts across the globe – in terms of training, skills, exposure, etc. taking responsibility for the negative side effects of their activities on the environment as well as the creation of sustainable built environment. Part of the recommendation made are: BE, Professionals should make sincere effort to improve themselves, Government policy that will assist construction firms to be at same level with their counterparts across the globe should be put in place and close collaboration among the BE professionals in the West African sub-region should be encouraged.

Keywords: built environment, built environment professional, sustainability, sustainable construction, West Africa

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STAFF PERCEPTION OF RELAXATION SPACES IN OFFICES OF TERTIARY INSTITUTIONS OF NIGER STATE

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As humans engage in daily activities in order to make ends meet, they go through the hustling of working environment of their work places. This in the long run builds up stress in their system. Stress which is unavoidable is in most cases accumulated most times and definitely leads to ill physical conditions, mental illnesses or poor/reduced staff output. Relaxation, is the most recommended cure by medical practioners for treating stress related cases. Since stress builds up over time, it is then necessary to regulate its build up in one's system. In the academic system, staff of tertiary institutions undergo much more pressure than staff in primary and secondary institutions. The faculty offices in tertiary institutions, such as any work place, are a bee hive of activities. There is therefore a die need to address how to control the stress levels in staff by providing relaxation spaces in faculty offices. This paper examined the availability and functionality of relaxation spaces provided in faculty offices of tertiary institutions from the view of direct users. This study was carried out on faculty offices of tertiary institutions in Niger state. Data is generated by the use of questionnaire and data collated and analyzed using SPSS 17 and graphic illustrations generated using Microsoft excel. The paper shows that the relaxation spaces so provided in faculty offices in tertiary institutions are inadequate hence there would be need for the remodeling of the office facilities and new facilities designed would need to take into cognizance relaxation spaces.

Keywords: faculty offices, space, stress, relaxation space

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STRATEGIES TO FACILITATE BUILDING INFORMATION MODELLING ADOPTION IN THE SOUTH AFRICAN CONSTRUCTION INDUSTRY

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Building Information Modelling (BIM) is a concept that has been defined as a technology that digitally constructs an accurate virtual model of a building. BIM can be defined as an IT enabled approach that involves the application and maintenance of a fundamental digital representation of a building and all its information throughout the different stages of the project. This study assesses the ways to overcome the barriers hindering the adoption and implementation of BIM in the South African construction industry. The data used in this paper were derived from primary and secondary sources. The primary data tool (questionnaires), was designed based on the related literature that was reviewed. The questionnaire was distributed to construction professionals in the South Africa construction industry, facility managers, and academics who have been, or are scholars (researchers) on BIM in the South African construction industry. The questionnaires were analysed using descriptive statistical procedures. The findings revealed that a lack of skills, education, and knowledge of BIM are the biggest barriers to the adaptation and implementation of BIM in South Africa. Furthermore, the results also show that educational and skill development initiatives are widely considered to be the answer to the existing barriers to BIM adoption. Lastly, the study makes some recommendation on feasible ways of moving away from the common practice of construction process and to the adoption of BIM on construction projects in South Africa.

Keywords: building information modelling, construction industry, South Africa

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THEMATIC ANALYSIS OF CHALLENGES FACED BY SMALL AND MEDIUM CONSTRUCTION COMPANIES IN ACCESSING CREDIT IN SOUTH AFRICA

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Small- and-medium-sized enterprises (SMEs) are considered the engines of growth in developing countries. In developed countries, SMEs have historically played a vital role in creating jobs, spurring innovations, and creating new products, and thus contributed to economic vitality and growth. However, it has been indicated that SMEs faces challenges in accessing credit. The purpose of the study was to provide an overview of the challenges small and medium contractors in South Africa construction industry are facing in accessing credit facilities. The method of the research is based on literature review. A thematic analysis was used to analyse both quantitative and qualitative research projects between 1995 and 2015. The literature revealed that lack of business management skills leads to challenges including difficulty in accessing credit and lack of collateral. The findings were based on literature review of relevant articles between 1995 and 2015, hence might be biased. The paper suggests that small and medium sized contractors in South Africa are subject to challenges in accessing credit making their growth and being innovative almost impossible. Conclusion: The study sought to explore the challenges and barriers in accessing credit by Construction SMEs in South Africa.

Keywords: small and medium construction company, South Africa, thematic analysis

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THEORETICAL LINK BETWEEN ORGANIZATIONAL BEHAVIOUR AND COST ADVICE FUNCTION OF QUANTITY SURVEYORS VIA PROJECT TEAMS

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Over the past decades, researches on the accuracy of cost advice have emphasized the technical aspects of early cost advice while focusing on factors that affect the accuracy of the cost advice. However, the softer issues for example, behaviours, which plays significant role in all aspect of human endeavour receives less attention. Organizational behaviour research has established that in today's competitive and demanding workplace, managers cannot succeed on their technical skills alone. They also need to have good people skill. This paper takes a cue from the fact that the outcome of any endeavour is dependent on the behaviour inherent in an organization. This point to the fact that the outcome of quantity surveyors cost advice is dependent on project team's effectiveness, rather than on the direct influences of factors that affect accuracy. This work is based on the review of literature and is aimed at establishing a theoretical link to the effectiveness of project teams within client organizations and the cost advice function of Quantity Surveying firms.

Keywords: cost advice, effectiveness, organizational behaviour, quantity surveyor, team behaviour

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USE OF COCOA BEAN SHELLS ASH AS A STABILIZER IN SOIL BRICKS PRODUCTION

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Over the years, soil bricks have been stabilized to improve its properties for masonry purposes. Most of these stabilization methods have been regarded as unsustainable as the stabilizers are uneconomical. A study was conducted to determine the suitability of using Cocoa bean shells ash (CBSA) as a stabilizer in soil bricks production. Seven levels of stabilization were adopted which ranged from 0% to 30% at intervals of 5%. A total of 126 bricks were produced with dimensions; 210mm × 105mm × 75mm. Soil bricks were tested for their compressive strength, abrasion resistance and water absorption property alongside density after 28 days curing age. Data from the study showed that the cocoa bean shell ash had a significant effect on the properties of the bricks. The compressive strength of the soil bricks ranged between 4.084N/mm² and 6.506N/mm² above the BSI 1985 minimum requirement for masonry units of 2.8N/mm² with the optimum strength obtained with 20% CBSA. The ability of the bricks to absorb water (water exclusion coefficient) and wear (abrasion coefficient) both showed significant improvements as the quantity of Cocoa beans shell ash increased. Although Soil bricks stabilized with CBSA were recommended for use as interior partition units where it is protected from moisture, bricks performed satisfactorily as masonry units especially when stabilization quantity does not exceed 20% by weight.

Keywords: cocoa bean shell ash, soil bricks, stabiliser, water absorption

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USE OF COMPUTER TOMOGRAPHY SCAN FOR NON-DESTRUCTIVE TESTING OF CONCRETE

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Growing age and high exposure of concrete structures to aggressive environment has led to the increasing need for reliable tools that will give useful information on internal structure of concrete. The paper examines the use of computer tomography scan in the study of internal structure of concrete. It is an experimental research that entails the following steps: First, a preliminary investigation of the various properties of the materials used for the production of concrete samples was carried out. Concrete samples were, then prepared, cured and subjected to computer tomography scan test at the end of the following curing days: 1, 3, 7, 14, 21, 28 and 56 days. Also, two 150mm x 300mm cylinders were used to produce reinforced concrete. Result showed that when concrete sample was subjected to CT scan the internal structure and the concealed steel reinforcements were clearly shown. Visual inspection was used to analyse the results. Part of the conclusion drawn from the analysis, is that CT scan can be used to monitor the internal structure of concrete. Hence it was recommended CT scan should be used to examine the concrete at micro level especially with a means of magnifying the processed CT scan image.

Keywords: compliance, compressive strength, computer tomography scan, concrete, non-destructive testing

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USE OF CRUMB RUBBER AS A PARTIAL REPLACEMENT FOR FINE AGGREGATE IN ASPHALT CONCRETE MIXES

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This work focus on the investigation of the improvement on the properties of asphalt concrete with crumb rubber use as partial replacement for fine aggregate in the proportion of 1.0%, 1.25%, 1.5%, 1.75%, 2.0%, 2.25%, 2.5%, 2.75% and 3.0% respectively by weight. Twenty-seven (27) specimens compacted with each percentages of crumb rubber were produce for the experiment. Marshall Stability method of asphalt mix design was chosen to test the performance of the material in terms of its known engineering properties. The Marshall stability result obtained shows that sample prepared with 2.0% crumb rubber and bitumen content of 5.5% are within the standard specification for Asphalt Concrete mix design specified by Asphalt Institute.

Keywords: bitumen, crumb rubber, fine aggregate, hot mix asphalt, Marshall Method

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USE OF KNOWLEDGE MANAGEMENT IN THE NIGERIAN CONSTRUCTION INDUSTRY

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Researches have shown that there is a growing recognition in the business community about the importance of knowledge as a critical resource for organizations. This has encouraged attention and support for the field of Knowledge Management (KM) by different organisations. Effective Knowledge Management Systems in organisations are supported by the use of techniques (process-based methods of gathering lessons learned from concluded projects) and technologies (documentation-based methods to learn from project experiences by focusing on aspects of the content-wise representation of the experiences and the storage of contents within the organisation). This research was carried out to investigate the use of Knowledge Management techniques and technologies in the Nigerian construction industry. Eighteen techniques and thirteen technologies were identified through literature review. The identified techniques and technologies were used to conduct a pilot survey in order to test the awareness of the techniques and technologies by respondents in the Nigerian Construction Industry (NCI). The result of the pilot survey revealed that the respondents are aware of fourteen techniques and two technologies. The fourteen techniques and two technologies were used to draw up interview questions for the respondents. Data was collected from a total number of 23 respondents. 16 of the interviewees are staff of Facility, Security and Safety Management Department (FSSMD) of the Federal Inland Revenue Service (FIRS), 5 of them are contractors on new works for FIRS while the remaining 2 are contractors on maintenance works. The interviews were taped and later transcribed. The transcription revealed that all the respondents use "Post Project Review", "Documentation of Knowledge" techniques, among others. "Intranet/extranet" technologies are used at different levels of needs by the respondents. "Content System Management" is not used by all the categories of respondents. Major recommendations are that more awareness and orientation need to be carried out in the Nigeria Construction Industry on the role and importance of the use of Knowledge Management techniques. The Nigeria Construction Industry needs to be enlightened on the relevance of the use of knowledge management technologies for easy and proper storage of useful knowledge/lessons learnt in projects.

Keywords: knowledge, management, technique, technology

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USER SATISFACTION WITH SPACE FLEXIBILITY IN OFFICES OF SELECTED TERTIARY INSTITUTIONS IN NIGER STATE, NIGERIA

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The design of office buildings and other buildings in tertiary institutions have mainly been determined by the management of the institutions with little or no input from the end users. It is expected of any building design that the building suits the needs of the users and not the users adapting to the building. The nature of work and facilities being used by the staff has also changed with the adoption of ICT facilities. The most significant change that has affected the office design is the increase in staff population in many tertiary institutions, which has increased the number of shared offices and an increase in number of staff per office. It can be observed that despite these changes in office use and capacities, there has not been any change in the design of newer offices. The problem therefore is that users of offices are finding it increasingly difficult to perform their duties conveniently due to the degree of adaptation they could adjust to within the building. The aim of this research is to examine the user satisfaction with the flexibility of offices spaces. The research method adopted is mixed method with the use of structured questionnaire and observation schedule. The data would be analysed using SPSS software and the results transferred to Microsoft Excel. The results will show that the users of offices in tertiary institutions are not satisfied with the office spaces. It will also reveal that space flexibility will improve user satisfaction with office. The paper will conclude that to achieve space flexibility in offices there is need to group functions properly.

Keywords: flexibility, office space, satisfaction

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USER'S PREFERENCES IN MASS HOUSING ESTATE IN NIGER AND KWARA STATES OF NIGERIA

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An examination of selected low income mass housing schemes built by government and private developers in Nigeria reveal a similarity amongst them, which is lack of involvement of house owners. The design process adopted for these houses showed that mass housing schemes designs have been based on the assumptions of user needs. The degree of importance users placed on the various aspects of the houses was never considered. In the 100 years of Nigeria's development between 1914 and 2014 there has been significant changes in many sectors, however the nature of the houses being built in mass housing schemes across the country remain the same. The problem with the assumption method of housing provision is that the target peoples' needs and desires are never achieved even with the change in government policy towards housing provision. The aim of this paper is to determine the level of importance placed on different aspects of housing by the house owners. The research made use of mixed research method by using questionnaire and observation method in gathering the data from field surveys in Niger State and Kwara State. The perception of the house owners was collated and SPSS was used to analyze the data. The results showed that house owners placed high importance on some aspects of the houses measured. The research concludes that there is need for a drastic change from the design process in mass housing provision in Nigeria as Nigeria marks its 100 years. The change should be towards designing for user focused housing designs.

Keywords: design assumption, design process, mass housing, perception

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VIRTUAL REALITY AND THE BUILT ENVIRONMENT CURRICULUM

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Virtual reality (VR) is an advanced visualisation tool used for the simulation of 3D interactive environments with visual, audio and tactile effects. Its applications in the construction industry include construction integration, computer aided design and drafting (CADD), construction scheduling, construction process/modelling, productivity management and safety management. Its rapid adoption in the construction industry has been deterred mainly by its excessive cost, hence only large companies could readily invest in the technology. Efforts have been made by some UK universities in introducing VR to their built environment curriculum as a move to increase in the long run, the awareness of VR in the industry, and also to expose students to advanced visualisation tools. This paper examined what UK universities are doing about integrating VR to their built environment curriculum. Data were obtained from a web-based survey distributed to 46 respondents in 36 universities offering six selected built environment courses. Results indicate that a significant percentage of UK universities have introduced VR in their built environment curriculum with a majority in Architecture courses. This further confirms the predominance of visualisation tools in Architecture programmes than in other construction disciplines. Also, methodologies for delivery varied from institution to institution. It was recommended that VR instructors exploit innovative practical sessions like online VR resources and simulation games that help stimulate the learning process.

Keywords: built environment curriculum, industrial application, United Kingdom, virtual reality, visualisation

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WAYFINDING IN MULTI-LEVEL BUILDINGS: A STUDY OF THE SENATE BUILDING, AHMADU BELLO UNIVERSITY

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Large numbers of multi-level buildings have been developed over the years in a disorganized manner producing complex environments where navigation poses great difficulties and frustration to users. Such difficulties become pronounced during emergencies where panic induces crowd stampedes often resulting in fatalities. Wayfinding research for multi-level buildings has become even more pertinent in Nigeria following the spate of insecurity recorded in recent years. A pilot survey involving 50 students, staff and visitors was carried-out to find effective ways of managing information for improving wayfinding performance in emergency situations as well as Visibility Graph Analysis (VGA) from Space Syntax. This was to explore the relationship between physical features and coded information in the Senate Building of Ahmadu Bello University, Zaria-Nigeria. Results from the survey support findings from literature as respondents agree more with elements of physical features as their navigation guides within the Senate Building followed by coded information, then social practices. VGA run on the floor plans of the Senate Building however reveal that while a number of physical features are located in the most visually integrated areas, coded information were often located in less visible areas. This finding reveals why users may find it tasking to find their way out of the Senate Building during a fire or security emergency by relying on coded information as wayfinding guides. This paper recommends the management of Ahmadu Bello University Zaria provide properly designed signage and graphics placed at areas of high visual integration as well as employ security personnel with training in emergency management. Architects and other design professionals also need to pay closer attention to the design and location of physical features as wayfinding systems for multi-level buildings in future.

Keywords: Ahmadu Bello University, emergency, Senate Building, multi-level buildings, wayfinding

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INDEX OF AUTHORS

A

Abdul'Azeez, A D, - 38 -
 AbdulAzeez, A D, - 83 -
 Abdulfatai, A M, - 41 -
Abdullahi, A., - 45 -
 Abdullahi, A. J., - 91 -
 Abdulrazaq M, - 91 -
 Abigo, A, - 49 -
 Abubakar, **A.**, - 28 -
 Abubakar, M, - 32 -
 Adebayo, M A, - 57 -
 Adebayo, O A, - 92 -
 Adedayo, O F, - 92 -, - 93 -
 Adinyira, E, - 54 -
 Adjarko, H, - 60 -
 Adjei-Kumi, **T**, - 53 -, - 54 -
 Adogbo, K J, - 21 -, - 87 -
 Agyekum, K, - 60 -, - 80 -
 Agyekum-Boateng, F, - 65 -
 Aigbavboa, C, - 67 -, - 85 -
 Aigbavboa, **C O**, - 26 -, - 50 -
 Ajani, A A, - 62 -
 Ajayi, **O**, - 36 -
 Ajayi, O G, - 73 -
 Aje, I O, - 17 -
 Ajufoh, M O, - 34 -
 Akinola, **S**, - 74 -
 Akinradewo, O F, - 17 -
 Akinrinmade, O, - 25 -
 Akogun, **I T**, - 64 -
 Akom, J B, - 80 -
 Ametepey, S O, - 50 -
 Amusan, L M, - 66 -, - 76 -
 Andenyang, E, - 79 -
 Ansah, S K, - 50 -
 Anthony Kwame Danso, - 78 -
 Anunobi, A I, - 92 -
 Appiadu-Boakye, K, - 39 -, - 88 -
 Arthur-Aidoo, B M, - 26 -
 Asare, S K, - 18 -
 Aseidu, E, - 39 -
 Asiedu, E, - 88 -
 Atilola, M I, - 46 -, - 52 -
 Atsrim, F, - 18 -, - 31 -
 Awene, A E, - 24 -
 Ayarkwa, J, - 60 -
B
 Badiru, Y Y, - 38 -
 Badu, E, - 75 -, - 80 -
 Bala, K, - 70 -, - 83 -
 Batagarawa, A, - 15 -
 Bello, N A, - 82 -
 Bello, W A, - 79 -
 Buertey, J I T, - 18 -, - 31 -

C

Charles, A K, - 66 -
Chindo P G, - 71 -
 Cobbinah, J F, - 23 -
D
 Dada, M O, - 17 -
 Dahiru, D, - 77 -, - 83 -, - 89 -
 Danso, A K, - 59 -
 Danso, H, - 40 -
 Darko, A, - 75 -
 Dassah, E, - 34 -, - 43 -
 Dodo, M, - 94 -
 Douh, S, - 54 -
 Dudek, S, - 15 -
 Dwirah, **S**, - 65 -
E
 Ebelechukwu, E, - 56 -
 Erekpitan, O A, - 56 -
 Eric Paul Tudzi, - 78 -
 Essah, E A, - 68 -
F
 Fagbenle, **O I**, - 76 -
 Fynn, J K, - 88 -
G
 Gasu, M B, - 62 -
 Gidado, K, - 49 -
 Gilchrist, P, - 49 -
H
 Hamma-adama, M, - 48 -
 Hamza, N, - 15 -
I
Ibrahim A D, - 71 -
Ibrahim Y M, - 71 -
 Ibrahim, A D, - 21 -
 Ibrahim, A. D., - 91 -
 Ibrahim, S Y, - 42 -
 Ibrahim, Y M, - 21 -
 Iliyasu, A M, - 32 -
 Inusa, Y J, - 34 -
 Ishaya, **G**, - 87 -
Iyanda, O, - 29 -
J
 Jolaoso, B A, - 82 -
K
 Kadai, B, - 48 -
 Kado, D, - 42 -, - 70 -
 Karley, K. K., - 35 -
 Kekana, G, - 85 -
 Khalil M I, - 47 -
 Kherun, N A, - 38 -
 Kilasho, M O, - 82 -
 Kolo, **B A**, - 87 -
 Komolafe, M O, - 72 -
 Kwawu, W, - 68 -

L

Lawal, S, - 41 -

Leiringer, R., - 7 -

M

Mac-Barango, D O, - 19 -, - 27 -, - 30 -

Mafimidiwo, **B**, - 36 -

Maina, **J J**, - 22 -, - 95 -

Mbamali, I, - 19 -

Mensah, **I**, - 53 -

Mosaku, **T O**, - 76 -

Muhammad A L, - 47 -

Muhammad, M Z, - 94 -

Muhammad, R E, - 38 -

multi-tenant property, - 64 -

Murana, A A, - 90 -

Musa-Haddary Y G, - 71 -

N

Nani, G, - 24 -, - 53 -

Nensok, M H, - 61 -

Nimlyat, P S, - 34 -

Nkolika-Peter J, - 66 -

Nwagbara, A., - 55 -

O

Obuobi, **L A**, - 65 -

Ochieng, E G, - 44 -

Odine, L C, - 92 -

Odumosu, J O, - 73 -

Ofori, G., - 1 -, - 3 -

Ogunleye, B M, - 58 -

Ogunsemi, D R, - 17 -

Oku, O., - 55 -

Oladapo, R A, - 63 -

Olaniyan, A A, - 46 -

Olowoleru, O A, - 46 -, - 52 -

Oluwatobi, A, - 66 -

Omuh, I O, - 66 -

Onuigbo, I C, - 73 -

Opoku, **R**, - 65 -

Osei-Poku, G, - 23 -

Owusu-Manu, D, - 75 -, - 80 -

Oyetola, S A, - 92 -

Oyewole M. O., - 51 -

Oyewole, M O, - 72 -

S

Saad, M U, - 77 -

Saafaa, P T, - 65 -

Sani, A T, - 41 -

Sani, L, - 90 -

Shittu, A A, - 21 -, - 27 -

Shittu, W O, - 52 -

Sibiya, M, - 67 -

Sogbon, **O**, - 20 -

Somiah, M K, - 23 -

Suleman, N E, - 16 -

Suleman, N. E, - 28 -

Suleyman, Z A, - 73 -

T

Teku, Y, - 16 -

Thwala, W, - 50 -, - 67 -, - 85 -

Thwala, **W D**, - 26 -

Tolani, S A, - 90 -

Tudzi, **E P**, - 59 -

Tudzi, P **E**, - 65 -

Tukur, R, - 15 -

Tunji-Olayeni, **P F**, - 76 -

U

Uji, Z, - 43 -

Umar B O, - 95 -

V

Varghese, K., - 5 -

W

Watermeyer, R, - 11 -

Waziri, B S, - 48 -

Y

Yalley, P P, - 39 -, - 88 -

Z

Zaki, Y M, - 16 -

Zievie, P, - 39 -, - 88 -

Zitta, N, - 73 -

INDEX OF KEYWORDS

A

Abeokuta, - 64 -
 abrasion resistance, - 39 -
 academic career, - 4 -
 academic development, - 4 -
 academic research, - 43 -
 academic responsibility, - 4 -
 accessibility, - 59 -
 accident, - 21 -, - 48 -
 Accra, - 35 -
 accuracy measure, - 73 -
 African marketplace, - 49 -
 Ahmadu Bello University, - 95 -
 Akure, - 20 -, - 58 -
 ambient temperature, - 61 -
 Analytical Hierarchy Process, - 54 -
 Arch Module, - 55 -
 architect, - 22 -, - 79 -
 architectural educator, - 28 -
 architectural research, - 43 -
 architectural technology, - 45 -
 architecture, - 43 -
 attitude, - 49 -
 attrition, - 24 -
B
 barriers to innovation, - 26 -
 BIM, - 5 -, - 55 -
 bitumen, - 41 -, - 90 -
 budget, - 19 -
 building collapse, - 29 -
 building construction, - 29 -
 building demand, - 29 -
 building information modelling, - 38 -, - 85 -
 building material, - 50 -
 building supply, - 29 -
 built environment, - 2 -, - 38 -, - 59 -, - 78 -, - 80 -, - 83 -, - 94 -
 built environment professional, - 83 -
 business, - 75 -
C
 capacity building, - 28 -
 carbon dioxide, - 68 -
 cassava starch, - 47 -
 ceramic, - 41 -
 Chad, - 54 -
 challenge, - 80 -
 civil engineer, - 79 -
 cladding material, - 30 -
 classroom, - 68 -
 clay roof tile, - 47 -
 cocoa bean shell ash, - 88 -
 commercial bank, - 52 -
 commercial office property, - 63 -
 community, - 16 -
 compaction rate, - 40 -
 compensation, - 46 -

competitive tendering process, - 54 -
 compliance, - 82 -, - 89 -
 compressive strength, - 39 -, - 89 -
 computer tomography scan, - 89 -
 computing, - 5 -
 concrete, - 89 -
 confusion matrix, - 73 -
 construction, - 71 -
 construction claims, - 17 -
 construction firm, - 76 -, - 77 -
 construction industry, - 38 -, - 85 -
 construction innovation, - 26 -
 construction market, - 76 -
 construction professional, - 32 -
 construction project, - 36 -, - 67 -
 construction safety, - 44 -
 construction site, - 48 -
 contemporary development, - 28 -
 contract sums, - 17 -
 contracting firm, - 75 -
 contractor selection, - 36 -
 cost advice, - 87 -
 cost analysis, - 30 -
 cost risk, - 31 -
 course content, - 78 -
 craft skills, - 71 -
 craftsmen, - 71 -
 crumb rubber, - 90 -
 curriculum, - 28 -, - 45 -, - 94 -
D
 default factor, - 52 -
 demographic attributes, - 33 -
 density, - 40 -
 design assumption, - 93 -
 design firm, - 70 -
 design process, - 93 -
 development permits, - 82 -
 direct solar gain, - 34 -
 district assembly, - 60 -
 due process practice, - 36 -
E
 economic efficiency, - 57 -
 education, - 19 -, - 38 -, - 78 -
 effectiveness, - 87 -
 effectiveness assessment framework, - 54 -
 electricity conservation, - 15 -
 emergency, - 95 -
 employability, - 56 -
 employer ideology, - 56 -
 energy efficiency, - 72 -
 EnergyPlus, - 15 -
 entrepreneurship education, - 45 -
 environmental degradation, - 58 -
 environmental management system, - 32 -
 environmental sustainability, - 60 -
 equal access, - 59 -

equator-facing window, - 34 -
erosion, - 40 -
estate agent, - 64 -
estate surveyor, - 64 -
ethnography, - 22 -

F

façade, - 34 -
facilities, - 16 -
facilities management, - 49 -
faculty, - 80 -
Fadama, - 62 -
feeder road, - 18 -
female architect, - 56 -
fieldwork, - 22 -
financial crisis, - 42 -
financial ratio, - 42 -
fine aggregate, - 41 -, - 90 -
flexibility, - 92 -
food security, - 62 -
FreeCAD, - 55 -

G

Gauteng, - 68 -
Ghana, - 24 -, - 50 -, - 60 -
green building, - 72 -

H

hazard, - 21 -
health and safety, - 48 -
health and safety management, - 21 -
health and safety practice, - 33 -
highest and best use, - 57 -
home-owner charter, - 82 -
hot climate, - 15 -
hot mix asphalt, - 41 -, - 90 -
housing, - 51 -
housing estate, - 57 -
housing project, - 50 -
housing standard, - 16 -
hypertext pre-processor, - 31 -

I

ICT applicability, - 5 -
image classification, - 73 -
inclusive design, - 78 -
indigenous firm, - 42 -
industrial application, - 94 -
information technology, - 5 -
infrastructure, - 11 -
interdisciplinary research, - 22 -
investment decision, - 63 -
investors, - 51 -
ISO 14001, - 32 -

K

knowledge, - 91 -
kwara state, - 46 -

L

Lagos, - 63 -
land acquisition/revocation, - 46 -
land-title, - 82 -
literature review, - 26 -
locust bean, - 39 -

M

magnitude of claims, - 17 -
makuba, - 47 -
management, - 91 -
market, - 51 -
marketing, - 75 -
Marshall Method, - 41 -, - 90 -
mass, - 31 -
mass housing, - 93 -
measurement matrix, - 70 -
mechanical properties, - 61 -
migration, - 29 -
mortgage, - 52 -
multi-level buildings, - 95 -

N

natural ventilation, - 68 -
neighbourhood, - 58 -
Nigeria, - 17 -, - 20 -, - 21 -, - 44 -, - 48 -, - 51 -
, - 52 -, - 56 -, - 61 -, - 71 -, - 72 -, - 74 -, -
76 -, - 77 -

non-destructive testing, - 89 -

O

office property, - 72 -
office rent, - 35 -
office space, - 92 -
open-source, - 55 -
organizational behaviour, - 87 -

P

pareto analysis, - 70 -
people with disabilities, - 59 -
perception, - 93 -
performance, - 42 -, - 71 -, - 74 -
period, - 42 -
persons with disabilities, - 78 -
phase change material, - 15 -
PhD dissertation, - 43 -
physical infrastructure, - 19 -
plausibility, - 31 -
PMI, - 52 -
polycentric planning, - 74 -
population data, - 82 -
poverty reduction, - 62 -
poverty trap, - 20 -
practice-led research, - 43 -
private sector, - 18 -, - 74 -
procurement, - 36 -, - 60 -
professional, - 75 -
professionals, - 79 -
project, - 77 -
project management competency, - 76 -
project performance, - 67 -
project specific risk, - 31 -
property management, - 64 -
property market cycle, - 63 -
property performance, - 51 -
prudence practice, - 79 -
public client, - 36 -
public sector, - 18 -

Q

quality factors, - 70 -

quality management practice, - 77 -
 quantity surveying firm, - 24 -
 quantity surveyor, - 87 -
 quantity surveyors, - 79 -
 questionnaire, - 23 -
R
 radiation beam, - 34 -
 real estate, - 35 -
 relative humidity, - 61 -
 remedial, - 82 -
 rent determinants, - 35 -
 research agenda, - 2 -
 residential land, - 57 -
 residential property, - 58 -
 rice husk ash, - 61 -
 road development, - 18 -
 road financing, - 18 -
S
 safety, - 44 -
 sandcrete block, - 30 -
 satisfaction, - 92 -
 sawdust, - 47 -
 school of architecture, - 28 -
 secondary school, - 19 -
 Sekondi-Takoradi metropolis, - 23 -
 selection factor, - 50 -
 semi-structured interview, - 44 -
 Senate Building, - 95 -
 senior manager, - 44 -
 settlements, - 16 -
 shading device, - 34 -
 shopping mall, - 59 -
 skills development, - 56 -
 small and medium construction enterprise, - 33 -
-
 SME, - 21 -, - 75 -
 soil blocks, - 40 -
 soil bricks, - 88 -
 solid waste management, - 49 -
 South Africa, - 67 -, - 85 -
 spatial, - 58 -
 spatial inequality, - 20 -
 spectral class, - 73 -
 stabiliser, - 88 -
 stakeholder, - 50 -
 stakeholders, - 49 -
 strategy, - 75 -, - 80 -
 structured interview, - 26 -
 successful academic, - 4 -
 sustainability, - 72 -, - 83 -
 sustainable construction, - 83 -
 sustainable environment, - 58 -
 systemic risk, - 31 -
T
 team behaviour, - 87 -
 technique, - 91 -
 technology, - 5 -, - 91 -
 technology adoption, - 5 -
 tensile strength, - 40 -
 thermal comfort, - 15 -
 timber panel, - 30 -
 total quality management, - 70 -, - 77 -
 training, - 71 -
 training site, - 73 -
 trunk road, - 18 -
 types of claims, - 17 -
U
 unauthorized building, - 23 -
 United Kingdom, - 94 -
 universal design, - 78 -
 uptake, - 80 -
 urban competitor, - 20 -
 urban road, - 18 -
 urbanisation, - 29 -
V
 virtual reality, - 94 -
 visualisation, - 94 -
 visualization, - 5 -
W
 waste collection, - 74 -
 water absorption, - 39 -, - 88 -
 wayfinding, - 95 -
 West Africa, - 83 -
 wind speed, - 61 -
 women empowerment, - 62 -
 works procurement, - 54 -

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9 780620 662499 >