

# **PROCEEDING 17 – 19**



FEDERAL UNIVERSITY OF TECHNOLOGY  
MINNA, NIGER STATE, NIGERIA



SCHOOL OF ENVIRONMENTAL TECHNOLOGY  
INTERNATIONAL CONFERENCE (SETIC) 2018

# CONFERENCE *Proceedings*

**CONTEMPORARY ISSUES  
AND SUSTAINABLE PRACTICES  
IN THE BUILT ENVIRONMENT**

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Asimiyu M. JUNAID  
Olatunde F. ADEDAYO  
Richard A. JIMOH  
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**School of Environmental  
Technology International  
Conference  
(SETIC) 2018**

**10-12 APRIL 2018**

**Federal University of Technology Minna, Niger  
State, Nigeria**

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**Volume 2**

**Editors**

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# Conference Proceedings of the School of Environmental Technology International Conference (SETIC) 2018

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10th - 12th APRIL 2018  
School of Environmental Technology,  
Federal University of Technology, Minna, Niger State, Nigeria.

## TABLE OF CONTENTS

Table of Contents	iv
Foreword	v
Acknowledgement	vi
Copyright Statement	viii
Declaration of peer review and scientific publishing policy	ix
Review Panel	x
Local Organising Committee	xv
Scientific Committee	xvi
Profile of Keynote Speakers	xviii
Programme for SETIC 2018	xix
List of papers in SETIC 2018 Conference Proceedings	xlii
Keynote Addresses	1
Conference Papers	1

## FOREWORD

The organising committee of the 2<sup>nd</sup> School of Environmental Technology International Conference is pleased to welcome you to Federal University of Technology Minna, Niger State Nigeria.

The conference provides an international forum for researchers and professionals in the built and allied professions to address fundamental problems, challenges and prospects that affect the Built Environment as it relates to Contemporary Issues and Sustainable Practices in the Built Environment. The conference is a platform where recognised best practices, theories and concepts are shared and discussed amongst academics, practitioners and researchers. The scope and papers are quite broad but have been organised around the sub-themes listed below:

- Architectural Education and ICT
- Building Information Modeling
- Construction Ethics
- Energy efficiency and Conservation
- Environmental Conservation
- Facility Management
- Green Construction and Efficiency
- Health and Safety Issues
- Information Technology and Building Maintenance
- Information Technology and Construction
- Information Technology and Design
- Innovative Infrastructure Development
- Resilient Housing Development
- Smart Cities Development
- Social Integration in Cities
- Sustainable Building Materials Development
- Sustainable City Growth
- Sustainable Cost Management
- Sustainable Property Taxation
- Sustainable Architectural Design
- Sustainable Urban Transportation Systems
- Theory and Practices for Cost Effectiveness in Construction Industry
- Urban Ecology Management
- Urban Land Access
- Disasters, Resilient Cities and Business Continuity

We hope you enjoy your time at our conference, and that you have the opportunities to exchange ideas and share knowledge, as well as participate in productive discussions with the like-minded researchers and practitioners in the built environment and academia.

Local Organising Committee  
School of Environmental Technology International Conference (SETIC) 2018  
APRIL 2018



## ACKNOWLEDGEMENTS

We have tried to build on the success of the maiden of SETIC held in 2016 which came with good feedbacks and memories. The success of the 2<sup>nd</sup> School of Environmental Technology International Conference holding at the Main Campus of the Federal University of Technology Minna, Nigeria is predicated on the support and goodwill from Vice-Chancellor of Federal University of Technology, Dean School of Environmental Technology and many other highly motivated people.

I sincerely wish to appreciate you for attending this Second edition of SETIC and to warmly welcome you to the city of Minna the capital of the *POWER STATE*. It is a great honour to have you in the beautiful campus of Federal University of Technology Minna Nigeria. I am aware of the great sacrifices made by many of you to be present in this occasion and I will definitely not overlook the long distances some of you have had to cover to get to the conference venue. We genuinely appreciate all your efforts. It is our singular hope and desire that this 2<sup>nd</sup> edition of the conference (SETIC 2018) meets your expectations and gives you unquantifiable experience and tremendous developmental networking opportunities for a life fulfilling career.

We are grateful for the presence of the Vice Chancellor of the Federal University of Technology Minna Professor Abdullahi Bala whose leadership and distinguished academic career has served as inspiration and encouragement to many academics within and outside Nigeria. His desire to continue on the path of greatness for this Humble University of ours has seen the University become a destination for International conferences, Public lectures, Book Development, Presentations and Seminars that meet International standards. We are happy to have you as the Chief host to declare the conference open and deliver the welcome address.

We are grateful to the former Dean of School of Environmental Technology, Federal University of Technology Prof. A. M. Junaid and the Ag. Dean of School of Environmental Technology Prof. S. N. Zubairu for providing the healthy platform, academic backing, management and guidance for the organisation of the conference. You increased the level of challenge from 2016 and provided the required resources, direction, energy and strategies for achieving its success. It is a great honour of having the opportunity to work closely with you and learning never to give up.

I wish to thank also all the special guests particularly leaders of the Industry, Built Environment and Academia.

A special thanks goes to the Bursar of Federal University of Technology, Mrs. Hajara Kuso for the timely responses to all our requests regarding the financial aspects of access to funds for the conference.

SETIC is beginning at the foundation this year and for this I wish to thank all those who have supported us through various forms of participation. Specifically I wish to thank the delegates and the partners for contributing significantly to the conferences. I wish to thank Prof. S. N. Zubairu, Prof. A. M. Junaid, Prof. O. O. Morenikeji and Prof. Y. A. Samusi, who all genuinely and consistently monitored the progress of the conference preparations. My desire in 2016 was for SETIC to become a constant feature in the calendar of the University and global conference listings, am a happy person today seeing this desire fulfilled with the SETIC 2018 edition.

Delegates to SETIC 2018 are from different academic and research institutions that are spread across different countries. This offers participants a wonderful opportunity for exchange of cultural, social and academic ideas during the conference periods. It is also an opportunity to create awareness about programmes and events at the participants' individual institutions. I encourage you all to make good use of the networking opportunities that are available.

In this 2<sup>nd</sup> edition we received 258 abstract submissions because we had a wide distribution outlet as compared to the 1<sup>st</sup> edition which is an indication of growth. Using a rapid review system we accepted a total of 204 abstracts and the authors were communicated on what issues they were to examine while developing the full papers based on their titles and aim of the paper. Two hundred (200) full papers were received and reviewed. We sent back the reviewed papers and reviewers comments forms to each of the prospective authors to assist

in the preparation of the revised papers. It was after this rigorous and time-consuming process that we were able to accept 172 papers for presentation at the conference. It gives me great joy therefore to congratulate all the authors whose papers made it to the conference. It is my sincere believe that the presentation of the different ideas in your paper would go a long way in improving the knowledge of the participants and also generate meaningful discussions over the tea breaks, lunch and beyond.

I wish to express my utmost gratitude to each of the Seventy-three (73) reviewers for a wonderful job done well and for tolerating our deadlines and Oliver Twist syndrome. It is your dedication and expertise that has ensured that the conference is a success.

Special thanks to all our keynote speakers, Arc. Umaru Aliyu, (fciArb, Inia, ppmaj) (President, Architects Registration Council of Nigeria (ARCON)), Prof. Stella N. Zubairu (Former Dean Postgraduate School, Federal University of Technology Minna), Dr. Julius A. Fapohunda, (Editor-in-Chief, International Journal of Sustainable Energy Development & Leader: Sustainable Building and Urban Growth Research Unit, Cape Peninsula University of Technology).

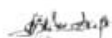
It is important to appreciate the roles and efforts of the following people for their selfless and very significant contributions made towards the successful organization of the conference: Oyetola Stephen, Alonge Olubunmi, Lynda Odine, Adedokun John, Idowu Oqua, Bamidele Eunice and Muhina Lumi (for being available to run around at very short notice),

The organisation of this conference would not have been this easy without dedicated individuals offering to serve. My heartfelt gratitude goes to Dr. Taihat Lawanson, Dr. R. A. Jimoh, Dr. L.O. Oyewobi, Dr. N.I. Popoola, Dr. Lekan Sanni, Dr. I. B. Muhammad, Dr. A. A. Shittu and Dr. A. Saka for their unflinching support all through the process.

It is our sincere hope that this conference will serve as a forum for the advancement of research in the urban sphere towards achieving a sustainable environment. It is our sincere believe that academics and professionals in practices will continually participate in this forum.

Worthy thanks goes to the members of the Local Organising Committee for the tireless effort. The success of the conference goes to these wonderful people. You have made SETIC 2018 to ROCK.

Once again I wish to thank you all for creating time out of your busy schedule to attend this conference. Please do enjoy your stay at Federal University of Technology Minna, and the city as a whole. Ensure that you make use of the different fora created throughout the conference to build new relationships for the future and strengthen existing relationships. I look forward to seeing you all in future.



Olatunde Folaranmi ADEDAYO  
SETIC 2018 LOC Chairperson  
APRIL 2018



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## **DECLARATION**

### **PEER REVIEW AND SCIENTIFIC PUBLISHING POLICY STATEMENT**

10th APRIL 2018

#### **TO WHOM IT APPLS CONCERN**

I wish to state that all the papers published in SETIC 2018 Conference Proceedings have passed through the peer review process which involved an initial review of abstracts, blind review of full papers by minimum of two referees, forwarding of reviewers' comments to authors, submission of revised papers by authors and subsequent evaluation of submitted papers by the Scientific Committee to determine content quality.

It is the policy of the School of Environmental Technology International Conference (SETIC) that for papers to be accepted for inclusion in the conference proceedings it must have undergone the blind review process and passed the academic integrity test. All papers are only published based on the recommendation of the reviewers and the Scientific Committee of SETIC

Names and individual affiliation of members of Review and Scientific Committee for SETIC Conference 2018 are published in the SETIC 2018 Conference Proceedings and made available on [www.futminna.edu.ng](http://www.futminna.edu.ng)

Olarunde Folaranmi ADEDAYO  
Chairman SETIC 2018  
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## REVIEW PANEL

We wish to express our deepest and sincere gratitude to the following people in no particular order who provided comprehensive scientific reviews and made commendable suggestions towards improving the over 258 abstracts and 182 full papers submitted to SFTIC 2014. They provided constructive comments to authors regarding their papers, it is necessary to state that there was no reported case of conflict of interest by any of the reviewers or the authors.

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## CONTENTS

### SECTION 1: KEYNOTES

Overview of Challenges of Sustainability - Arc. Umaru Aliyu,	ii
Intelligent Buildings and Green Buildings – Which Way For Nigeria? - Prof. Stella N. Zubairu	iii

### SECTION 2: CONFERENCE ABSTRACTS

<b>ARCHITECTURAL EDUCATION AND ICT</b>	
Creative Art And Transformative Development In Architecture Nexus: A Case Of Federal University Of Technology Minna • <i>A. S. Alfa</i>	2
Users' Perception Of Informal Interaction Spaces In Research Institutes In The Federal Capital Territory, Nigeria • <i>Olu Muhammed Adeiza &amp; Isa Bala Muhammad</i>	13
Trends, Problems And Prospects Of Computer & Ict In Architectural Education And Practice In Nigeria • <i>Abdulwahab Engworo Etudaiye, Precious Ugochikwu &amp; Abubakar Adamu Girei</i>	21
Proposed Architectural Curriculum Framework For Sustainable Development • <i>Mudashir Gafar And Abubakar Abdullah</i>	28
<b>BUILDING INFORMATION MODELING</b>	
Building Information Modelling: A Tool For Diffusion Of Information In Nigeria • <i>Hanna-Adama, M., Galadima, Y. K. &amp; Kouider, T.</i>	35
An Overview Of The Km Tools And Techniques Essential For The Development Of A BIM Knowledge Framework • <i>Ganiyu Skiru Abiodun &amp; Egbu Charles</i>	44
Appraisal Of The Extent Of Bim Integration In Facility Management Practices In Abuja, Nigeria • <i>M.H. Yunusa, M. Abubakar And M. Abdullahi</i>	52
Evaluation Of Building Information Modelling (BIM) Software Capabilities That Support Quantity Surveying Practices In Nigeria • <i>ABDULLAHI Abdulrasheed Madugu, ABDULLAHI Muhammad, GUDE Daniel Monday</i>	59
Building Information Modelling (BIM) As It Relates To The Construction Industry: A Review • <i>SHUAIB Ikunah &amp; SALIHU Suleiman</i>	67
<b>ENERGY EFFICIENCY AND CONSERVATION</b>	
Energy Consumption Pattern Among Households In Minna Metropolis, Niger State, Nigeria • <i>Akanmu, W. P., Jinoh, I. A. And Bajere, P. A.</i>	76
Determinants Of Households Domestic Cooking Energy Choice And Technology In Minna, Niger State Nigeria • <i>Ohadugha, C. B., Sanusi, Y. A., Morenikeji, O. O., Zubairu, M. &amp; Olaide, A.</i>	84
Passive Techniques For Energy Conservation In Hotel Buildings In Minna, Nigeria • <i>Zhira, G. H. &amp; Akande, O. K.</i>	95
Analysis Of Energy Poverty In Rafi Local Government Area Of Niger State, Nigeria • <i>Akande S. O., Sanusi Y. A., Mohammed N., &amp; Ohadugha C. B.</i>	105
User's Satisfaction Level With Passive Cooling Design Techniques In Public Secondary Schools Minna, Nigeria • <i>Isijola Deborah Boluwatife, Adedokun John &amp; Gashi Sarah Kakajiya</i>	122
Integrating Natural Lighting Design Approach To Library Of Public Universities In North Central Nigeria • <i>Mukaila Ethuseein Abdulrahman &amp; Ibrahim Charles Adejoh</i>	129
Evaluation Of Thermal Comfort In School Of Environmental Technology Complexes In Selected Government Owned Universities In South East Nigeria • <i>Eze, Chukwudim Jasper &amp; Okoro Emmanuel Ifoma</i>	136

Assessment On The Extent Of Passive Cooling Strategies Integration In Public Centers Ado-Ekiti, Ekiti State, Nigeria	• <i>SANTHUS Ericson Beshel</i>	145
Using Waste Heat Recovered From Household Refrigerator To Heat Water For Domestic Use	• <i>MUSA Nicholas Akhaze, AKINBODE Folorunsho Olayiwola &amp; NJOKU, Benedicta Chidinma</i>	154
A Review Of Literatures On Energy Performance In Low Income Housing Using Retrofitting Techniques In View Of Optimizing Energy Efficiency	• <i>Mbohok, O. E. and Akanmu, W. P.</i>	161
Integration Of Biomimicry Principles As A Means To Energy Efficiency In Office Design, Abuja, Nigeria	• <i>Abubakar Usman Karfi &amp; Eze J. C.</i>	171
Application Of Courtyard Concept As A Passive Cooling System Case Of Artisan Training Institute In North Central Nigeria	• <i>Abdul Hakeem Eneze</i>	178
Evaluation Of Natural Lighting As A Solution Towards Achieving Sustainability In The Design Of Shopping Malls In F.C.T Abuja Municipal Area	• <i>Obinna C. Q. and Akande, O. K.</i>	187
Assessment Of Passive Design Strategies For Energy Efficiency In Office Buildings Of Federal Capital Territory Abuja	• <i>Olah, C. A. &amp; Olaniyon, O. A. A.</i>	195
Sustainability, Resource Consumption and Ecological Footprint of Bida, Nigeria	• <i>Oluwafemi Joshua OJO &amp; N.T.A. Abd'Razack</i>	201
<b>ENVIRONMENTAL CONSERVATION</b>		
Evaluation Of Waste Management Practices In Garment Factories, Kaduna, Nigeria	• <i>Demide AR and Isah A. D.</i>	212
Socio-Economic Impact Of Fadama Iii Programme In Tunga-Kawo Irrigation Scheme, Wushishi Niger State, Nigeria	• <i>Olaseni G. O. and Musa Dalil</i>	219
<b>FACILITY MANAGEMENT</b>		
The Contributory Effect Of Externalities To The Void Periods For Residential Buildings In Minna, Nigeria	• <i>Ogunbajo, R. A, Adewusi, A. O, Usman, B. S. &amp; Ayoola, A. B.</i>	226
The Prospects Of Facility Management In Real Estate Sector In Nigeria	• <i>Emmanuel C. Osuji, Joshua Daniel Aua, Patricia Ehi Ehoche</i>	233
Assessment Of User Satisfaction With Facilities In Rest-Stops Along Kano-Abuja Highway	• <i>Abubakar Aisha Sadiq &amp; Shitta Abdumajeed Olaremi</i>	243
Evaluation Of Health Implication Of Off-Campus Residence As A Sustainable Alternative In Tertiary Institutions	• <i>Ibok U. Okon, Udomiaye Emmanuel And Okaudu Ugbede Sunday</i>	253
User Satisfaction With Informal Space Efficiency In Selected Office Buildings In Lokoja Kogi State Nigeria	• <i>Audu Muhammad Onoriaza &amp; Eze Chukwudum J.</i>	260
Post-Occupancy Evaluation Of Students Hostel Facilities In Federal Universities In North Central Nigeria	• <i>Abdul Christopher Ileanwa &amp; Ayuba Philip</i>	267
Open Spaces Maintenance Practices In Shopping Centres In Kaduna Metropolis Kaduna State	• <i>Muhina Lami Ibrahim</i>	275
The Role Of Architecture In Wayfinding Performance In Hospital Buildings In Nigeria	• <i>S. Ahmed, R.E. Olagunju, S.N. Zubairu and O.K. Akande</i>	282
Assessment of Facilities Condition and Users' Satisfaction in Public Housing Estates in Minna, Nigeria	• <i>Hassan Shuaibu Liman</i>	290
Integration of BIM Technology into Facilities Space Planning and Management at A Tertiary Educational Institution in Nigeria	• <i>Bajero, P. A., Akanmu, W. P. And Jimah, J. A.</i>	297
Assessment Of Space Provision And Adequacy In Paediatric Hospital Design: A Case Study Of Offa, Kwara State	• <i>Lawal Aminat Abiola</i>	309



<b>GREEN CONSTRUCTION AND EFFICIENCY</b>		
Promotion Of Green Infrastructures In Nigerian Urban Settlements For Sustainable Development: An Advocacy	• <i>Olufemi, J. E. &amp; Nuhu, A. A.</i>	319
Perceived Benefits And Potential Challenges Of Implementing Green Building Practices In Lagos, Nigeria	• <i>Ola, Olumide Samson</i>	325
Strategies For Material Wastage Minimization On Building Construction Sites In Kaduna State – Nigeria	• <i>Okosun B.O., Oyewobi, L.O., And Odine, L.C.</i>	334
Evaluation Of An Eco-Friendly Approach For The Physically Challenged People In Nigeria	• <i>Dauda C. G. &amp; Akande O. K.</i>	346
Evaluating The Barriers In Developing Green Building In Nigerian Construction Industry	• <i>Idowu Faruq Ayobami, Salawu Abdulfatal Oyeboade &amp; Peter Gangas</i>	355
Evaluation Of Design Features For Adoption Of Bright Green Concept In Hotels In Minna, Nigeria	• <i>Ijege, A. A.</i>	362
Urban Green Infrastructure Planning In Europe And The United States: Lessons For Nigerian Cities	• <i>Alabi, A.M. and O.M. Olaniyan</i>	370
<b>HEALTH AND SAFETY ISSUES</b>		
Effect Of Health And Safety Management Practices On Safety Performance Of Construction Contractors	• <i>David B.R., Idake J.E. &amp; Shittu A.A.</i>	384
Assessment Of Pattern Of Accident Occurrence On Building Construction Sites In Abuja, Nigeria	• <i>Adeniyi, K. E. &amp; Mohammed Y. D.</i>	392
Impact Of Safety Managers' Leadership Styles On Workers Safety Behavior On Construction Site In Abuja	• <i>Ajala J. O. &amp; Mohammed Y. D.</i>	401
Assessment Of Health And Safety Measures In Selected Basic Schools In Abuja	• <i>UGBAN, Nguseer Cynthia &amp; OLASENI, Gbenga Olaolu</i>	407
<b>INFORMATION TECHNOLOGY AND BUILDING MAINTENANCE</b>		
Facility Maintenance Management Plan – A Case Study Of Kashim Ibrahim Library, Ahmadu Bello University, Zaria	• <i>Musa Sylvanus Hassan</i>	414
<b>INFORMATION TECHNOLOGY AND CONSTRUCTION</b>		
Impact Of Information And Communication Technology (Ict) Facilities Deployment On Quantity Surveying Practice In Abuja	• <i>Alabi, T. T. &amp; Anifowase, O. M.</i>	425
<b>INFORMATION TECHNOLOGY AND DESIGN</b>		
Design And Implementation Of A Computerised Battery Analyser	• <i>E.N. Onwuka, E.I. Nwankwo, P. Oluwatoyi, A. Nurudeen &amp; S.O. Aliyu</i>	439
<b>INNOVATIVE INFRASTRUCTURE DEVELOPMENT</b>		
Effects Of Infrastructure Provision On Residents Of Selected Private And Public Housing Estates In Lokoja Metropolis, Nigeria	• <i>Okpanachi, M. &amp; Zubairu, M.</i>	445
<b>RESILIENT HOUSING DEVELOPMENT</b>		
Study Of Residents' Satisfaction With Housing Conditions In Urban Centres Of Southwest Nigeria	• <i>Mukaiya El-Hussain Abdulrahman</i>	453
Micro-Housing Development As Feature Of Class Stratification In The Jos Metropolis Of Plateau State, Nigeria	• <i>Sulyman A.O And Kudu, S.E.</i>	464
Assessment Of User Satisfaction As A Basis For Sustainable Housing Provision In Nigeria	• <i>OCHEPA Yahayo Sadiq</i>	475
Integrated Approach: A Sustainable Strategy to Adequate Housing Provision by The Urban Poor in Lokoja, Nigeria		482



Assessment of Housing Standards Compliance and Building Regulations in Minna, Niger State, Nigeria	• Amigbo G. T. & Suleman A.O. • Muhammad A. T., Usaid A. M. & Usman M. J.	491
<b>SMART CITIES DEVELOPMENT</b>		
Prospects And Challenges Of Smart City Development In Nigeria	• Nda, Khadija; Yakubu & Babah, Bukuru Musa	499
Exploring Factors That Contributes To Residential Environment Liveability In Minna, Niger State	• Sule Abass Iyanda, Ojetunde Ismail, Morenikaji Gbenga & Abdulkarim Selama	506
Analysis Of Livelihood Diversification In Peri-Urban Settlements Of Minna	• Gimba S. L. & Samur T.A	513
Investigation Of Space Flexibility Principles In The Design Of Student's Social Centres	• Aina Usman	519
Integration Of Recreational Spaces In Abuja Commercial Centres Designs	• ZAKARI Nathaniel Sunday	526
<b>SOCIAL INTEGRATION IN CITIES</b>		
Social Capital, A Poverty Reduction Mechanism In Minna, Niger State, Nigeria	• Martins F. J., Sarasi Y. A., Akank S. O., Mohammed N. & Adedoye B. M.	538
Appraisal Of The Role Of Informal Economic Enterprises In Minna, Nigeria	• Ibrahim Bilatu and Kawa, A.M	546
Livelihood Opportunities From The Periodic Markets In Eastern Part Of Niger State, Nigeria	• Mbaulan Eric Ioroba & Samua Yekzen Adeero	564
Analysis Of Do It Yourself(Diy) Approach In A Neighbourhood Community Sanitation Project In Sokoto Metropolis	• Animi Bello	572
Assessment Of User's Perception Of Outdoor Eating Area In Abuja Restaurants	• Idris Ahmad Loko & Mukaila E-Hussain Abdurrahman	581
Evaluation Of Social Interactive Spaces Of Shopping Centres In Abuja, Nigeria	• Suliman O.S. and Atanda, O.K.	587
Preference And Compatibility: Ageing In Place Limitations In Nigeria	• Omotayo Omakwe Adedero	597
Assessment Of Interactive Spaces In High Rise Residential Building In Lagos City, Nigeria	• Ogunlowo M. O. & Orenio S.A	606
Assessment Of The Relationship Between Housing And Livelihood Pattern Of Urban Residents Of Bida, Niger State, Nigeria	• Suliman A.O. & Dabirge L.A.	612
The Impacts Of Microfinance On Livelihoods Of Women – A Study Of Lapo Micro-finance Women Clients In Minna, Niger State, Nigeria	• AKAYI Memurat O. and BAYOBADE, Adedun A.	621
<b>SUSTAINABLE BUILDING MATERIALS DEVELOPMENT</b>		
Early-Age Properties Of Sorghum Husk Ash And Calcium Carbide Waste Binder In Mortar	• C. I. Egwuadi, J. O. Hassan, B. J. Olowu, and M. O. Enyisim	638
Effect of Rehydration on the Flexural Strength of Concrete, Using Locust Bean Pod Epicarp Ash as Partial Replacement for Cement	• Ansa S.M., Anthony A.J. & A.A. Amadi	648
Effect Of Superplasticizer On Setting Time And Strength Of Mortar Made Using Rice Husk Ash (Rha) And Calcium Carbide Waste (Ccw) As Binder	• M. O. Enyisim, B. J. Olowu, J. O. Hassan, and C. I. Egwuadi	656
Affordable Housing In Nigeria Using Alternative Building Technologies And Materials: A Nbrri Perspective	• Danladi Slim MATAWAL, Nwanak OCEAN Chidwama (GERALD) and Aina K.APEL	665
Performance Evaluation of Egg-Shell and Cow Bone Ashes as Pozzolana in Concrete Production	• Y. Adams, T. J. Tsutsi & T. W. E. Adigunmi	673
Effect Of Rehydration on the Flexural Strength of Concrete, Using Mahogany Sawdust Ash as Partial Replacement for Cement	• Ansa S.M., Peter U. & Saidu M.	679
Effect of Calcium Carbide Waste and Groundnut Shell Ash Blended with Cement in Concrete Production		687

<ul style="list-style-type: none"> <li>• <i>U. Nuhu, T.Y. Tsado, and M. Abdullahi</i></li> </ul>	
Sugarcane Straw Waste Ash As A Potential Binder In Concrete Production	
<ul style="list-style-type: none"> <li>• <i>Ahmed, A. and Amali, N.U</i></li> </ul>	694
Compressive Strength of Revbreated Concrete Using Sawdust Ash from Selected Wood Species as Partial Replacements for Cement	
<ul style="list-style-type: none"> <li>• <i>Auta, S.M., Agie, V.N. &amp; Alhassan, M</i></li> </ul>	699
<b>SUSTAINABLE CITY GROWTH</b>	
Spatial Variation Of Factors Influencing Neighbourhood Change In The Peri-Urban Areas Of Minna, Niger State	
<ul style="list-style-type: none"> <li>• <i>Idowu, O. O., Shabu, S.J., Bako, A. I. Raheem, W. A. &amp; Martins, V. I.</i></li> </ul>	709
Assessment Of The Application Of Crime Prevention Through Environmental Design (Cpted) In Residential Estates In Minna	
<ul style="list-style-type: none"> <li>• <i>Idris Attahiru Muhamad, Sarah Kakajiya Gosh &amp; Isa Bala Muhammad</i></li> </ul>	716
Improving And Sustaining Access To Water And Sanitation In Nigeria: Opportunities And Constraints	
<ul style="list-style-type: none"> <li>• <i>Gognaje, Sunday Barde</i></li> </ul>	724
Achieving A Sustainable City Growth Through Neighborhood Levels In Bosso Estate, Minna Niger State	
<ul style="list-style-type: none"> <li>• <i>S.I. Shabu, S.O. Medayese, O.O. Idowu, P.O. Abah And G.S. Owoyele</i></li> </ul>	733
Appraisal Of Eu Financed Rural Water Supply Project In Selected Communities In Akwa Ibom North Senatorial District, Nigeria	
<ul style="list-style-type: none"> <li>• <i>Edem, E. Essien, Mohammed B. Banki &amp; Ohadugha, C. B</i></li> </ul>	743
Users Perception In The Planning Of Markets: A Case Study Of Abuja, Nigeria	
<ul style="list-style-type: none"> <li>• <i>Muhammad Abubakar Sadiq</i></li> </ul>	751
Neighbourhood Crime Vulnerability Mapping In Ilorin, Nigeria	
<ul style="list-style-type: none"> <li>• <i>Lekan Mohammed Sanna</i></li> </ul>	759
Urban Development Control As A Viable Measure For Achieving Sustainable Development Goals	
<ul style="list-style-type: none"> <li>• <i>Nasiru, S., Kemiki, O.A., Emmanuel, S.G.</i></li> </ul>	769
Challenges Facing The Development Of Sustainable Petrol Filling Stations In Minna, Niger State- Nigeria	
<ul style="list-style-type: none"> <li>• <i>Aisha Panti ABDULLAHI and Olatunde Folaranmi ADEDAYO</i></li> </ul>	775
Design Considerations For Crime Prevention Through Environmental Design In Minna Shopping Centres	
<ul style="list-style-type: none"> <li>• <i>Jatto A. Ibrahim &amp; M.E. Abdulrahman</i></li> </ul>	785
<b>SUSTAINABLE COST MANAGEMENT</b>	
Factors Responsible For Variation In Cost Of Mechanical And Electrical Services In Building Projects In Nigeria	
<ul style="list-style-type: none"> <li>• <i>Ladan, M. &amp; Shitta A.A</i></li> </ul>	796
Impact Of Contractual Claims On The Performance Of Public Building Projects In Nigeria	
<ul style="list-style-type: none"> <li>• <i>Saidu, J. K. And Oyewobi, L.O</i></li> </ul>	803
Effect Of Contractual Risks On Building Contracts In Abuja, Nigeria	
<ul style="list-style-type: none"> <li>• <i>Alhaji, Lawal Haruna &amp; Muhammad, Yakubu Danisabe</i></li> </ul>	812
Assessment Of The Cost Implication Of Reviving Abandoned Public Projects In Abuja, Nigeria	
<ul style="list-style-type: none"> <li>• <i>Saleem Yimusa &amp; Anifowese, Opeyemi Maroof</i></li> </ul>	821
Impact Of Money On Price Direction Of Building Materials In Abuja	
<ul style="list-style-type: none"> <li>• <i>Omoboye, Olayinka Gideon &amp; Anifowese, Opeyemi Maroof</i></li> </ul>	831
Developing Building Cost Indices Using Federal High Court Projects Of 2007 To 2016	
<ul style="list-style-type: none"> <li>• <i>Wakili, Abubakar &amp; Ibrahim, Ahmed Doko</i></li> </ul>	840
Assessment Of Post-Project Review Systems For Construction Projects In Abuja, Nigeria	
<ul style="list-style-type: none"> <li>• <i>John, M. And Oyewobi, L. O.</i></li> </ul>	848
Design Firm's Perception On Risk Occurrence And Impact On Construction Project Budget Performance	
<ul style="list-style-type: none"> <li>• <i>S.U. Gbure, K.J. Adogbo &amp; H. Musa</i></li> </ul>	857
Impact Of Wage Differentials On Productivity Of Construction Companies In Abuja	
<ul style="list-style-type: none"> <li>• <i>Abdulmalik, Amina &amp; Y. D. Muhammad</i></li> </ul>	869
Evaluating The Performance Of Public Private Partnership In The Delivery Of Public Housing Schemes In North Central Nigeria	
<ul style="list-style-type: none"> <li>• <i>Oni Olalere Sunoan &amp; Adamu Anita Dzikwe</i></li> </ul>	873
Strategic Management Initiatives In Small And Medium Scale Construction Companies In Fct Abuja	
	888

	<i>Olubaja O. O. &amp; Olawuyi, B. J.</i>	
Stakeholders' Perception Of The Causes And Effects Of Variation Orders In Public Construction Projects In South-Eastern Region Of Nigeria	• <i>Emmanuel Tayo Adu &amp; A. Opawole</i>	896
Assessment Of Contractors' Perception On The Effect Of Cash Flow On Construction Project Delivery	• <i>Ali A. A., Idowu Faruq Ayobami &amp; Musa Abulrasheed Alhassan</i>	907
Im Pact Of Public Procurement Reform On Construction Project Delivery In Kaduna State	• <i>ADOGA, Angela Omoyemen and Abdulateef SHITTU</i>	915
<b>SUSTAINABLE PROPERTY TAXATION</b>		
Estate Surveyors' Perspectives On Residential Property Tenancy Determination In Ilorin Metropolis	• <i>Ibrahim Tajudeen Akogun, Olatoye Ojo, Agava, Yusuf Halim, Adeogun Sunday Adekunle</i>	925
Residential Property Investment Returns: Inequalities In Ilorin	<i>A.S. Adeogun, M.B. Nuhu, N.B. Udoekarem, N.I. Popoola, M.B. Wahab, and W.O. Shittu</i>	936
<b>SUSTAINABLE ARCHITECTURAL DESIGN</b>		
Effectiveness Of Passive Design Features In Active Security Installation In Large Shopping Centres In Abuja, Nigeria	• <i>Bamidele Oluwatosin Eunice, Adedayo O.F.</i>	946
Assesment Of Student Satisfaction With Provision Of Recreational Spaces In Faculty Buildings In Public Universities In North Central Nigeria	• <i>Nasirdeen M. Y. &amp; Adedayo, O.F.</i>	956
Assessing User Perception On The Efficiency Of Passive Security Control Measures In Modern Public Secondary Schools In Minna, Niger State	• <i>Omeje, S.C. &amp; Olaniyin, O.A.</i>	967
Elements Of Architectural Design And Interpretation Of Buildings And Monuments In Kaduna State	• <i>Isa Sani Mohammed, Anas Muhammad &amp; Aisha Wali Aminu-Umar</i>	978
Assessment Of User Centered Design Approach In Schools Of Architecture, Nigeria	• <i>David Odinya Emmanuel &amp; Oluwafemi Kehinde Akande</i>	986
Assessment Of Design Features For Circulation In General Hospitals In Kogi State, Nigeria	• <i>Ocheje, Enejo Abdulmunin And Olagunju, R. E.</i>	994
Adaptation Of Interior Design As A Therapeutic Tool In Paediatric Hospitals In Federal Capital Territory, Nigeria	• <i>Ummi Hamidu Mai</i>	1002
Assessment Of Design Features For Crowd Control In Sport Centres In Nigerian Universities	• <i>Grace Okushola Jaiveola, Isa Bala Muhammad &amp; Olagunju R.E</i>	1012
Integration Of Crowd Control Mechanisms In Civic Centre Design In Kaduna State, Nigeria	• <i>Izigah Sunday Anthony &amp; Abubakar Dantadi Isah</i>	1022
Impacts Of Therapeutic Environments On The Recovery Process Of Patients In Healthcare Facilities In Nigeria	• <i>Uzah Oghor Jewel</i>	1031
Assessment Of Courtyard Functions And Its Design Considerations In Hospitals In Niger State	• <i>Mamud, M.I. And Yelwa, M.U.K.</i>	1041
Design Considerations For Pedestrian Circulation Control In General Hospitals, Abuja	• <i>Okonkwo Emmanuel Obinri And Isa Bala Muhammad</i>	1049
Adaptive Reuse Design Consideration In Campaign Office Buildings In Minna, Niger State	• <i>Jimoh, Rukayat Olajumoke, Abdurrahman, M. E.</i>	1057
Evaluation Of Integration Of Users Needs In Paediatric Ward Designs In General Hospitals In Niger State	• <i>Adedokun A. J., Adedayo O. F., Isijola D. B. &amp; Omwuka B. N.</i>	1065
Integration Of Open Spaces In Maternity Hospital Design For Therapeutic Functions In Kaduna, Kaduna State	• <i>Mordi, C.Y &amp; Ayuba, P</i>	1073
Adoption Of User's Perception Of Landscaping Elements For Passive Security In Public Recreational Parks In Nigeria	• <i>Ogbonna C. O. &amp; Isah D. A</i>	1083
Assessing Flexible Features In The Design Of Event Centres In Minna, Niger State Nigeria	• <i>Agah, F. A. &amp; Ayuba P</i>	1093

# **PROCEEDING 17**



# FACTORS RESPONSIBLE FOR VARIATION IN COST OF MECHANICAL AND ELECTRICAL SERVICES IN BUILDING PROJECTS IN NIGERIA

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Cost is the primary factor that determines the success and failure of a construction project and must be considered as the paramount and driving tool in order to have a successful project. Cost variation is a very frequent term associated with Mechanical and Electrical (M & E) service in construction projects. Maintenance cost projection for M & E services had been an issue of serious concern to both Client and Project contractors. In view of this, The aim of the research is to determine factors responsible for variation in cost of M & E services in building project in Nigeria with the following objectives: to identify the factors responsible for variation in cost of M & E services and to proffers possible recommendation. To achieve these objectives, the study designed a structured questionnaire containing 52 cost variation factors which were distributed among the construction firms registered with Federation of Construction Industry (FOCI). Data were analyzed using mean item score (MIS) and simple percentages. It was analytically discovered that factors such as inadequate planning; fraudulent practices, kick back and corruption; incessant variation order; change in Project design are the most important (Critical) factors responsible for variation in cost of M & E services. It was recommended that adequate planning should be made at both design and construction stage; variation must be reduced to barest minimal; design should be finalized before construction can commence and ensuring that proper methods of cost estimations were used.

**Key words:** *Electrical services; Mechanical services; Nigeria; Variation; Building Projects*

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## INTRODUCTION

Building services are very vital in Construction Industries and accounts to 40% of construction cost. Regrettably, developers in this sector have not given enough attention to the way cost is managed and most of these developers do not also pay attention to the process of procuring Mechanical and Electrical services. The reason has been tied to the fact that the lump sum has been used when preparing the bill of quantity (BOQ). Yusuf and Mohamad (2012) noted that this has resulted in a condition where it becomes difficult to determine a dependable cost information from earlier projects. Building services in Nigeria is very complex to understand, calculate, schedule, coordinate and design. As selection, design, installation and coordination of mechanical and electrical system are poor, this will result in significant problems for Designers, Engineers, Contractors and Clients during and after execution. Trained project managers in high capacity are important for the successful execution of mechanical and electrical projects. Mechanical and Electrical Engineering Services Systems in Buildings comprises all engineering systems associated with building other than civil and structural engineering works. It is therefore imperative to have an accurate estimate for the cost of M & E service at the early stage of project.

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Accuracy will give both the clients, contractors and even consultants an insight on how to include the issue of variation in the percentage allocation of building services from initial stage in order to eliminate the problem of future project abandonment, dispute among the members of construction team and loss of client confidence in consultants among the other benefits. It is on this background that, the purpose of this research work is to determine factors responsible for variation in cost of M & E services in building projects in Nigeria.

## LITERATURE REVIEW

### Cost overrun

Cost has been described as important prime factor for project success. Some of the importance factors that affect cost are qualitative in nature (Elchaig, Boussabina and Ballal, 2005). Cost overrun can be defined as when the initial estimate of the project is exceeded (Avots, 1982). Variation in construction work cannot be avoided and it has effect on labour productivity. A complete project may not be regarded as successful project until and unless it is finished within the cost limit (Rizwan and Azhar, 2008). It is believed that the construction project experience an increase in cost of about 33% on average (Hartley and Okamoto, 1997). According to Flyvbjerg, Holm and Buhl, (2002) for every 10 project executed 9 of them had overrun, over 50-60% were common and overrun had been constant for period of 70 years for which data were available. In developing countries Nigeria in particular, cost overrun is severe which sometime goes above 100% of the total construction cost. Wakjira (2011) opined that Building owner discovered five reasons for project cost overruns. These reasons were (1) incomplete drawings; (2) poor pre-planning process; (3) escalating of materials; (4) lack of timely decisions; (5) excessive variation orders.

### Importance of Cost Overrun

Serag, Oloufa, Malone, Radwan (2010) stated that variation orders are very common in almost every construction project nowadays which resulting to increases of 5 – 10% in the contract price and that encountered an increase in the price from 1% to 15%. Eleven variables were analyzed to test their impact on the cost of variation orders. The study concluded that most significant variables that impact the value of variation order, which are: (1) Timing of variation order and (2) when the reason for issuing variation order is unforeseen conditions. The need to make variation on a construction project may necessitate variations due to various factors. The variations can be minimized when problem is studied collectively as early as possible, since the problems can be beneficial, variation can be made. Project management teams must have the ability to recognised potential effect of variations in order to minimize their adverse impacts to the project. Hanna and Swanson, (2007) suggested some strategies that both the client and the contractor can undertake whenever there are variation which have cumulative impact on the project to reduce disputes.

### Effect of Cost Overrun

Osman, Omran, and Foo, (2009) pointed out most frequent effect of variations were (1) Increase in project cost, (2) Rework and demolition; (3) Completion schedule delay; (4) Increase in over head expenses; (5) Additional payment for contractor. Anan and Low, (2005) the occurrence of variation orders has indirect cost implications. Direct cost constitutes the additional cost incurred to perform the activities of the current variation orders. The direct cost associated with variation orders include the following (1) cost of resources that were used to carry out the aborted or substituted work; (2) Resources used including Labour, Material and Plant to carry out the actual variation order; (3) increase in over heads related charges and professional fees; (4) Demolition cost of aborted works; (5) cost for resources lying idle before the ordered task restarts; (6) Loss of productivity due to interruption of works where the gang has to familiarize with new working conditions tools and materials; (7) plant hire and paid time for labour loitering around while waiting for instruction; (8) cost for redesign and administration of variation order.

### Impact of M/E Systems on Construction Cost

Richard and William (2005) asserted that the impact of M/E system on construction cost varies greatly depending on the type of building standard of living of the country, Architectural design and M/E systems selected. The range of M/E system cost in the United States for fully air-conditioned and high-quality buildings is given in Table 2.1. These values may serve as a general reference for modifying and refining the cost throughout the design process.

**TABLE 1.1: Range of M/E Systems Cost of Building Cost**

Type of Occupancy	Percent of total Building cost		
	Low	Medium	High
Cumputer centres	30	45	60
Department stores	20	25	30
Hospitals (Research)	30	40	50
Hospital (Clinical)	25	30	35
Hotels (Residence)	20	30	35
Hotel (Convention)	25	35	40
Office (General)	20	25	35
Office (high-tech)	25	35	45
Research laboratories	30	40	50
Residential, Single-occupancy	10	15	20
Residential high-rise	15	20	25
Retail (multi dual stores)	10	20	25
Retail (Department)	20	25	30
Schools, elementary	15	20	30
Schools, secondary	15	25	35
Universities and colleges	20	30	40

Source: Richard and William (2005)

Hall and Greeno (2003) have noted that engineering services in a building provide an environmental health and comfortability which allow people to carry on their activities without physiological stress or constituting nuisance. Hall and Greeno (2003) Generalized services as provision of mechanical and electrical services in a building. The goodness of engineering services has increased as the standard for internal building environment are varied and also as more measures are taken. According to Morenikeji (2006) a house should not be regarded as a home if it does not guarantee the minimum require privacy, protection and essential facilities. Housing goals and objectives can be perceived as the extent to which the quality and quantity of existing services are required for each house hold.

### Factors Responsible for Cost Variation in Services

Research as showed that construction projects encountered an average of 33% increase in cost (Hartley and Okamoto, 1997). Angelo and Reina (2002), pointed out that it is important to know problems of cost overrun and learn more how to improve on these problems in future. They also pointed out that cost overruns are major challenges in both developed and developing countries. The trend causes more problems in developing countries where this overrun goes beyond 100% of the anticipated cost of the project. Substandard materials lead to increase in construction cost than the expected because of the loss of material during the implementation phase. This resulted from lack of standards for materials and management systems (Aram and Iwu, 2004). Inability to control construction costs, lead many construction companies not to succeed (Scriprasert, 2000). According to User's Guide (2005), the following are the factors that change the cost of the construction projects through time: (1) Poor project management; (2) Design changes; (3) Unexpected ground conditions; (4) Inflation; (5) Shortages of materials; (6) Change in exchange rates; (7) Inappropriate contractors; (8) Funding problems; and (9) Force majeure. Elinwa and Buba (1993), stated that cost of materials, fraudulent practices and kickbacks, and fluctuation of prices of materials are three of the most important factors, among other factors, leading to high construction costs in Nigeria. Analyses of results leading to high construction costs show excellent agreement between the responses of the professionals (architects, engineers, and quantity surveyors) and the results of past researchers Flyvbjerg *et al.* (2002) and Molenaar (2005), in developing countries, the lack of proper phasing of construction projects and lack of proper planning can contribute to the discrepancy of supply and demand. This leads to shortage of construction materials as the demand will exceed the supply, which in turn leads to an increase in the cost of construction materials; this inevitably gives rise to project cost overruns. Alnuaimi *et al.* (2010), discovered that for every seven out of eight of building contractors surveyed in the late 1960s in Australia, were completed after scheduled completion, while according to Oman delay affect 70% of the project and executed above initial cost. Ogunsemi and Jagboro (2006) stated that the overrun can be cause by wrong cost estimation method adopted at the early stage of building projects. Remon (2012), discovered that factors such as lowest bidding procurement method, additional work, bureaucracy in bidding/tendering method, wrong method of cost estimation, and funding problems were critical factors responsible for causing cost variation for constructing waste water project, while Inaccurate cost estimation, mode of financing and payment for completed work, unexpected ground conditions, inflation and fluctuation in prices of raw materials are also responsible.

However these research works does not determined factors responsible for variation in cost for M & E services in building projects in Nigeria, hence this study filled the gap by determining factors responsible for variation in cost for M & E services in building projects in Nigeria with the following set objectives: to identify the factors responsible for variation in cost of M & E services and to proffers possible recommendations.

## METHODOLOGY

This study short-listed 52 factors responsible for variation in cost for M & E services in building projects in Nigeria. The research work involved the use of qualitative approach. This study employed primary source of data collection. The primary data are obtained from administration of structured questionnaire. Out of 50 questionnaires administered, 35 were returned and 5 were not filled properly, basically 30 were found useful for this research work. The study employed the use of descriptive statistic (MIS and percentage) to analyze the data collected.

The population of this study constitutes the number of construction firms in Abuja registered with Federation of Construction Industry in Nigeria (FOCI) from where sample were drawn. FOCI have 84 registered construction firms in Nigeria, out of which 50 operate in Abuja.

These are methods of organizing, summarizing and presenting data where no tests conducted. The use of tables and bar charts were employed to present collected data. The data collected from the questionnaires were analyzed through the use of mean item score in order to rank the factors responsible for variation in cost of M & E services in building projects in order of importance.

Mean item score thereafter was used to rank the degree of important of these factors responsible for variation in cost of M & E Services based on a 5- point Liker's scale. The decision rule used for the 5- point ranking is summarized in Table 1.

Table 1: Decision Rule for Mean Ranking

Rank	Cut-off Point	Decision
5	4.50 - 5.00	Most Important
4	3.50 - 4.49	Very Important
3	2.50 - 3.49	Fairly Important
2	1.50 - 2.49	Less Important
1	1.00 - 1.49	Not Important

Source: Morenikeji (2006)

## RESULTS AND DISCUSSION

### Demographic Information of Respondents

Table 2 shows that respondents that are males accounts for the higher percentages of 80% with a count of responses from respondents as 24 whilst the respondents that are females accounts for the smallest amount of responses counts of 6, accounting for 20%. This implies that majority of respondents are male.

Table 2: Gender of Respondents

Gender of the Respondent	Frequency	Percent
Male	24	80
Female	6	20
Total	30	100.0

Source: Author's Field study, (2018)

Table 3 shows that respondents that are 25-35 years of age accounts for the higher percentages of 50% with a count of responses from respondents as 15 followed by 36-45 years which account for 33.3% with a count of responses from respondents as 10 and finally, the respondents that are 46-55 years accounts for the smallest amount of responses a count of 5, accounting for 16.7% while the remaining two categories, Less than 25 years and above 55 years had no respondents. This implies that majority of respondents are 25-35 years of age.

**Table 3: Age of Respondents**

Age of the Respondent	Frequency	Percent
Less than 25 years	0	0
25 – 35 years	15	50
36 – 45 years	10	33.3
46 – 55 years	5	16.7
Above 55 years	0	0
<b>Total</b>	<b>30</b>	<b>100.0</b>

Source: Author's Field study, (2016)

Table 4 shows that respondents that are contractors and consultants possess equal percentages of 50% each, possessing a count of responses of 15 whilst those that are clients possess Zero percent with a response count of 0. This implies that both Contractors and Consultants possess the most percentages.

**Table 4: Type of Organization of the Respondents**

Type of organization	Frequency	Percent
Contractor	15	50
Consultant	15	50
Client	0	0
<b>Total</b>	<b>30</b>	<b>100.0</b>

Source: Author's Field study, (2016)

Table 5 summarizes the Designations in the Construction Industry. The table indicates that the respondents that are in Quantity Surveying possess the most highest percent of 36.7% possessing a count of responses of 11 accompanied by respondents that are in Building and Architecture possessing a count of responses of 7 giving 23.3% each. The respondent which are engaged in Engineering have a response count of 5 with 16.7% each. However, the respondents that are others have response count of zero (0). This implies that Quantity Surveyors are the major respondents for the study followed by Architects and Builders and finally, those that are Engineers.

**Table 5: Designation of Respondents**

Designation of the Respondent	Frequency	Percent
Architects	7	23.3
Builders	7	23.3
Engineers	5	16.7
Quantity Surveyors	11	36.7
Others	0	0
<b>Total</b>	<b>30</b>	<b>100.0</b>

Source: Author's Field study, (2016)

Table 6 contains fifty-two factors that are ranked using mean item score in order to establish the most important factors causing variation in the cost of M & E services in Nigeria.

**Table 6: Mean Item Scores**

S/NO	FACTORS	MEAN SCORE	RANK	REMARK
1	In adequate planning	4.40	1 <sup>st</sup>	Most Important
2	Fraudulent practices, kickbacks and corruption	4.17	2 <sup>nd</sup>	Most Important
3	Incessant variation order	4.17	2 <sup>nd</sup>	Most Important
4	Change in project design	4.13	4 <sup>th</sup>	Most Important
5	In accurate cost estimation	3.83	5 <sup>th</sup>	Very Important
6	Inadequate site investigations	3.83	5 <sup>th</sup>	Very Important
7	Wrong method of cost estimation	3.80	7 <sup>th</sup>	Very Important
8	Project complexity	3.77	8 <sup>th</sup>	Very Important
9	Stealing and waste of material on site	3.77	8 <sup>th</sup>	Very Important
10	Additional works	3.73	10 <sup>th</sup>	Very Important
11	Scope changes arising from redesign and extensive variations occasioned by change in brief	3.73	10 <sup>th</sup>	Very Important
12	Fluctuation in prices of raw materials	3.70	12 <sup>th</sup>	Very Important
13	In appropriate preconstruction study	3.63	13 <sup>th</sup>	Very Important
14	Inflation	3.60	14 <sup>th</sup>	Very Important
15	Dispute on site	3.53	15 <sup>th</sup>	Very Important
16	Scope changes occasioned by inadequate pre-contract study	3.53	15 <sup>th</sup>	Very Important



17	In appropriate contractors	3.53	15 <sup>th</sup>	Very Important
18	Work suspension owing to conflict	3.47	18 <sup>th</sup>	Fairly Important
19	Unexpected ground condition	3.47	18 <sup>th</sup>	Fairly Important
20	High cost of machineries	3.43	20 <sup>th</sup>	Fairly Important
21	Poor contract management	3.43	20 <sup>th</sup>	Fairly Important
22	Bureaucracy in bidding/tendering method	3.43	20 <sup>th</sup>	Fairly Important
23	Litigation	3.43	20 <sup>th</sup>	Fairly Important
24	In appropriate contractor's policies	3.43	20 <sup>th</sup>	Fairly Important
25	High interest rates charged by bankers on loans received by contractors	3.40	25 <sup>th</sup>	Fairly Important
26	Poor financial control on site	3.40	25 <sup>th</sup>	Fairly Important
27	Inadequate quality/ambiguity of contract documents	3.40	25 <sup>th</sup>	Fairly Important
28	Poor project (site) management/poor cost control	3.40	25 <sup>th</sup>	Fairly Important
29	Force majeure	3.40	25 <sup>th</sup>	Fairly Important
30	Lack of coordination between design team and general Contractors	3.30	30 <sup>th</sup>	Fairly Important
31	Lowest bidding procurement method	3.27	31 <sup>st</sup>	Fairly Important
32	High machines maintenance cost	3.23	32 <sup>nd</sup>	Fairly Important
33	In adequate labour skill availability	3.23	32 <sup>nd</sup>	Fairly Important
34	Shortage of materials and plants	3.23	32 <sup>nd</sup>	Fairly Important
35	Unstable cost of manufacture materials	3.20	35 <sup>th</sup>	Fairly Important
36	Inadequate production of raw material in the country	3.20	35 <sup>th</sup>	Fairly Important
37	Adverse effect of weather	3.20	35 <sup>th</sup>	Fairly Important
38	High transportation cost	3.17	38 <sup>th</sup>	Fairly Important
39	Funding problems	3.17	38 <sup>th</sup>	Fairly Important
40	In appropriate government policies	3.13	40 <sup>th</sup>	Fairly Important
41	In appropriate contractual procedure	3.10	41 <sup>st</sup>	Fairly Important
42	Absence of construction cost data	3.03	42 <sup>nd</sup>	Fairly Important
43	Poor relationship between manager and Labour	3.00	43 <sup>rd</sup>	Fairly Important
44	Shortening in project period	2.97	44 <sup>th</sup>	Fairly Important
45	Domination of construction industry by foreign firms and subs	2.97	44 <sup>th</sup>	Fairly Important
46	Lack of coordination between general contractors and Subcontractors	2.90	46 <sup>th</sup>	Fairly Important
47	Mode of financing and payment for completed work	2.87	47 <sup>th</sup>	Fairly Important
48	High cost of skilled labourers	2.87	47 <sup>th</sup>	Fairly Important
49	Long period between design and time of bidding/tendering	2.83	49 <sup>th</sup>	Fairly Important
50	Conflict between design consultants and implementation consultants	2.83	49 <sup>th</sup>	Fairly Important
51	Simultaneous construction activities going on at the same time	2.57	51 <sup>st</sup>	Fairly Important
52	Land acquisition cost	2.57	51 <sup>st</sup>	Fairly Important

Source: Author's Field study (2016)

## CONCLUSION AND RECOMMENDATION

### Conclusion

The study concluded that inadequate planning, Fraudulent Practices, Kick back and Corruption, Inconstant Variation order and change in project design are most important factors responsible for variation in cost of M & F services in building projects in Nigeria.

### Recommendation

In view of research findings and conclusions of the study the following recommending are made

1. Adequate planning should be made by breaking the project planning into short term, medium and long term planning at both design and construction stage, adequate supervision
2. Variation must be reduced to the barest minimal, designs should be finalized before construction can commence, the cost estimator should be aware of problems and must use all data and time available to produce the best possible estimate, adequate site investigation, materials should be purchase in bulk



- 3) Establishing a system that will check fraudulent of individual accountability to discourage stealing and other criminal activities, keeping in view trends of inflation and depreciation factors.

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