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

EDITORS:
Asimiyu M. JUNAID
Olatunde F. ADEDAYO
Richard A. JIMOH
Luqman O. OYEWOBI

Conference Proceedings of the School of Environmental Technology International Conference (SETIQ2018

Editors
Asimiyu M. JUNAID, Federal University of Technology, Minna, Nigeria
Olatunde F. ADEDAYO, Federal University of Technology, Minna, Nigeria
Richard A. JIMOH, Federal University of Technology, Minna, Nigeria
Luqman O. OYEWOBI, Federal University of Technology, Minna, Nigeria

Published by:
School of Environmental Technology
Federal University of Technology
Main Campus, Gidan Kwano
Minna, Niger State, Nigeria.

© Copyright. SETIC 2018.

Correspondence:
All correspondence pertaining to the SETIC 2018 should be sent to:
Chairman SETIC 2018 LOC
School of Environmental Technology
Federal University of Technology, Minna
Main Campus,
P.M.B. 65
Minna, Niger State, Nigeria.
setconference@futminna.edu.ng; www.futminna.edu.ng

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

CONTENTS

SECTION 1: KEYNOTES

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

SECTION 2: CONFERENCE ABSTRACTS

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

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

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

• *Amlogu G. Y. & Sulyman A.O*	
Assessment of Housing Standards Compliance and Building Regulations in Minna, Niger State, Nigeria • *Muhammad, A. Y., Junaid, A. M. & Usman, M. I*	191
SMART CITIES DEVELOPMENT	
Prospects And Challenges Of Smart City Development In Nigeria • *Nda, Khadijat Yakubu & Babah, Bishara Musa*	199
Exploring Factors That Contributes To Residential Environment Liveability In Minna, Niger State • *Sule Abass Iyanda, Ojetunde Ismail, Morenikeji Gbenga, & Abdulkareem Sekinat*	506
Analysis Of Livelihood Diversification In Peri-Urban Settlements Of Minna • *Gimba S. L. & Sanusi Y.A*	513
Investigation Of Space Flexibility Principles In The Design Of Student's Social Centres • *Aliyu Usman*	519
Integration Of Recreational Spaces In Abuja Commercial Centres Designs • *ZAKARI Nathaniel Sunday*	526
SOCIAL INTEGRATION IN CITIES	
Social Capital: A Poverty Reduction Mechanism In Minna, Niger State, Nigeria • *Martins V. I., Sanusi Y. A., Akande S. O., Mohammed N. & Adeleye B. M*	538
Appraisal Of The Role Of Informal Economic Enterprises In Minna, Nigeria • *Ibrahim, Bilkisu and Kawu, A.M*	549
Livelihood Opportunities From The Periodic Markets In Eastern Part Of Niger State, Nigeria • *Mbankaan Eric Iormba & Sanusi Yekeen Adeoye*	563
Analysis Of Do It Yourself (Diy) Approach In A Neighbourhood Community Sanitation Project In Sokoto Metropolis • *Ashiru Bello*	572
Assessment Of User's Perception Of Outdoor Eating Area In Abuja Restaurants • *Idris, Ahmad Loko & Mukaila El-Hussain Abdulrahman*	581
Evaluation Of Social Interactive Spaces Of Shopping Centres In Abuja, Nigeria • *Sulyman, O.S. And Akande, O.K*	587
Preference And Compatibility: Ageing In Place Limitations In Nigeria • *Onanuga Omotayo Adebayo*	597
Assessment Of Interactive Spaces In High Rise Residential Building In Lagos City, Nigeria • *Ogunlowo M. O. & Oyetola S.A*	606
Assessment Of The Relationship Between Housing And Livelihood Pattern Of Urban Residents Of Bida, Niger State, Nigeria • *Sulyman A.O. & Dzukogi U.A*	612
The Impacts Of Microfinance On Livelihoods Of Women – A Study Of Lapo Microfinance Women Clients In Minna, Niger State, Nigeria • *AKANBI, Memunat O. and BAMGBADE, Adebisi A.*	621
SUSTAINABLE BUILDING MATERIALS DEVELOPMENT	
Early-Age Properties Of Sorghum Husk Ash And Calcium Carbide Waste Binder In Mortar • *C. I. Egwuda, I. O. Hassan, B. J. Olawuyi, And M. O. Enejiyon*	638
Effect of Revibration on the Flexural Strength of Concrete, Using Locust Bean Pod Epicarp Ash as Partial Replacement for Cement • *Auta, S.M., Anthony, A.I.A. & I. Imadi*	648
Effect Of Superplasticizer On Setting Time And Strength Of Mortar Made Using Rice Husk Ash (Rha) And Calcium Carbide Waste (Cew) As Binder • *M. O. Enejiyon, B. J. Olawuyi, I. O. Hassan, And C. I. Egwuda*	656
Affordable Housing In Nigeria Using Alternative Building Technologies And Materals: A Nbrri Perspective • *Danladi Slim MATAWAL, Nwanade OCEAN, Chukwuma GERALD, and Aliyu KAWU*	665
Performance Evaluation of Egg-Shells and Cow Bone Ashes as Pozzolana in Concrete Production • *Y. Adamu, T. Y. Tsado, & T.W. E. Adejumo.*	673
Effect Of Revibration on the Flexural Strength of Concrete, Using Mahogany Sawdust Ash as Partial Replacement for Cement • *Auta, S.M., Peter, O. & Saidu, M*	679
Effect of Calcium Carbide Waste and Groundnut Shell Ash Blended with Cement in Concrete Production	687

• *U. Nuhu, T.Y. Tsado, and M. Abdullahi*	
Sugarcane Straw Waste Ash As A Potential Binder In Concrete Production • *Ahmed, A. and Amah, N.I.*	694
Compressive Strength of Revibrated Concrete Using Sawdust Ash from Selected Wood Species as Partial Replacements for Cement • *Auta, S.M., Agie, V.N. & Alhassan, M.*	699
SUSTAINABLE CITY GROWTH	
Spatial Variation Of Factors Influencing Neighbourhood Change In The Peri-Urban Areas Of Minna, Niger State • *Idowu, O. O., Shaibu, S. I., Bako , A. I. Raheem, W. A. & Martins, V. I.*	709
Assessment Of The Application Of Crime Prevention Through Environmental Design (Cpted) In Residential Estates In Minna • *Idris Attahiru Muhamad, Sarah Kakaiya Goshi & Isa Bala Muhammad*	716
Improving And Sustaining Access To Water And Sanitation In Nigeria: Opportunities And Constraints • *Gognaje, Sunday Barde*	724
Achieving A Sustainable City Growth Through Neighborhood Levels In Bosso Estate, Minna Niger State • *S.I. Shaibu, S.O. Medayese, O.O. Idowu, P.O. Abah And G.S. Owoyele*	733
Appraisal Of Eu Financed Rural Water Supply Project In Selected Communities In Akwa Ibom North Senatorial District, Nigeria • *Edem, E. Essien, Mohammed B. Banki & Obadughu, C. B.*	743
Users Perception In The Planning Of Markets: A Case Study Of Abuja, Nigeria • *Muhammad Abubakar Sadiq*	751
Neighbourhood Crime Vulnerability Mapping In Ilorin, Nigeria • *Lekan Mohammed Sanni*	759
Urban Development Control As A Viable Measure For Achieving Sustainable Development Goals • *Nasiru, S., Kemiki, O.A., Emmanuel, S.G.*	769
Challenges Facing The Development Of Sustainable Petrol Filling Stations In Minna, Niger State- Nigeria • *Aisha Panti ABDULLAHI and Olatunde Folaranmi ADEDAYO*	775
Design Considerations For Crime Prevention Through Environmental Design In Minna Shopping Centres • *Jatto A. Ibrahim & M.E. Abdulrahman*	785
SUSTAINABLE COST MANAGEMENT	
Factors Responsible For Variation In Cost Of Mechanical And Electrical Services In Building Projects In Nigeria • *Ladan, M. & Shittu, A.I.*	796
Impact Of Contractual Claims On The Performance Of Public Building Projects In Nigeria • *Sadiq, J. K. And Oyewobi, L. O.*	803
Effect Of Contractual Risks On Building Contracts In Abuja, Nigeria • *Alhaji, Lawal Haruna & Muhammad, Yakubu Danasabe*	812
Assessment Of The Cost Implication Of Reviving Abandoned Public Projects In Abuja, Nigeria • *Saleeman Yinusa & Anifowose, Opeyemi Maroof*	821
Impact Of Money On Price Direction Of Building Materials In Abuja • *Omoboye, Olayinka Gideon & Anifowose, Opeyemi Maroof*	831
Developing Building Cost Indices Using Federal High Court Projects Of 2007 To 2016 • *Wakili, Abubakar & Ibrahim, Ahmed Doko*	840
Assessment Of Post-Project Review Systems For Construction Projects In Abuja, Nigeria • *John, M. And Oyewobi, L. O.*	848
Design Firm's Perception On Risk Occurrence And Impact On Construction Project Budget Performance • *S.U. Gbate, K.J. Adogbo & H. Musa*	857
Impact Of Wage Differentials On Productivity Of Construction Companies In Abuja • *Abdulmalik, Amina & Y. D. Muhammad*	869
Evaluating The Performance Of Public Private Partnership In The Delivery Of Public Housing Schemes In North Central Nigeria • *Oni Olalere Simeon & Adamu Anita Dzakwe*	873
Strategic Management Initiatives In Small And Medium Scale Construction Companies In Fct Abuja	888

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

Assessment Of Passive Security Measures In Hotel Design In Osun State, Nigeria • *Jimoh Olawale Uthman & Sarah Kakanya Goshi*	1104
Assessment Of The Level Of Integration Of Organic Architecture In Hotel Buildings In Makurdi, Benue State • *Icha, Lazarus O. and Arc. Eze, Chukwudum J.*	1112
Integrating Cultural Identity To Broadcasting Station Design In North Central Nigeria Perception Of Broadcast Station Workers • *BAMIDELE, I. and AKANDE, O.K.*	1119
Evaluation Of Crimes, And User's Perception On Preventive Measures In Commercial Buildings In Nigeria • *SALAWU Abdulkareem Muda and Isah Abubakar Danlami*	1126
Crowd Control In Public Building Designs: Current Trend And Strategies For Ecclesiastical Buildings In Abuja, Nigeria • *Ikibe J. H. and Akande, O.K.*	1133
Intergration Of Green Design Principles In Circulation Spaces Of Shopping Centers, Ilorin, Nigeria • *Oyebode Abdulhafeez Olabode & Isah Abubakar Danladi*	1142
Assessment Of Display Techniques Design Consideration For Car Sales And Service Station Abuja • *Aliyu, Musa Chiji and Olagunju, R. E.*	1149
Assessment Of Passive Crowd Design Control Considerations In Jumuat Masjids (Mosques), Minna, Niger State • *ALIYU Muhammad Baba & EZE J. C.*	1155
Assessment Of Passive Security Measures In Senate Buildings Of Federal Universities In North Central Nigeria • *Egwuma Macaulay*	1161
SUSTAINABLE URBAN TRANSPORTATION SYSTEMS	
Commuters' Assessment Of Intra- City Bus Service In Kaduna Metropolis, Nigeria • *Oluwole Matthew Sunday & Tolufashe Stephen Ifedayo*	1170
Users Circulation Satisfaction In Nnamdi Azikiwe International Airport (Naia) Terminal Building Abuja, Nigeria • *Yabagi M. & Isah A. D.*	1179
Assessment Of Circulation Safety Design Features In Tram Terminal Buildings In Nigeria • *Adeboh, David And Olagunju, R. E.*	1188
Assessment Of The Extent Of Traffic Congestion In Selected Traffic Appian In Minna, Nigeria • *Medayese S. O, Abd'razack, N.T.A & Ajumobi O.*	1196
Spatial Analysis Of On-Street Parking In Kpakungu Area Of Minna, Nigeria • *Medayese, S. O., Musa-Daud F.A & Martins, V.I.*	1207
Road Passengers' Perception On The Quality Of Bus Terminal Facilities In Nigeria • *Edikan B. & A.D. Isah*	1219
Spatial Analysis And Modelling Of Campus Shuttle Stops In Federal University Of Technology, Akure, Nigeria • Nzelibe I. U., Idowu T. O. & Ajayi G. F.	1239
Users' Satisfaction Of Tricycle As Urban Commercial Transportation In Minna, Nigeria • *Owuri Aishat Ize & Aliyu Kawu*	1248
THEORY AND PRACTICES FOR COST EFFECTIVENESS IN CONSTRUCTION INDUSTRY	
Assessing The Performance Trend Of Quantity Surveying Students In Core Quantity Surveying Courses In Selected Tertiary Institutions In Niger State • *Kure B.A. & Mohammed Y. D.*	1259
Factors Influencing Rework Occurrence In Some Selected Ongoing Building Project – Abuja • *Okwara O. G. & Mohammed Y. D.*	1267
Analysis Of Costs Of Rework On Time And Cost Performance Of Building Construction Projects In Nigeria • *Eze, E. C. & Idiake, J. E.*	1273
Assessment Of Leadership Capability In The Nigerian Construction Industry For Effective Project Delivery • *Akinsanya, A.Y., Olanrewaju O. D., Ikegwu E. M. & Oke, E.*	1285

Effect Of Motivation Strategies On Labour Output Of Small And Medium Construction Contractors In Nigeria • *Uzoma, C. N., Shittu, A. A & Oke, A. A*	1292
Evaluating The Current Teaching Techniques To The Nigerian Undergraduate Quantity Surveying Students • *Saidu I., Nkollo O.W., Danjuma M. & Shakantu W*	1298
Assessment Of Labour Productivity And Construction Workers Wages On Active Sites In Minna • *O. A. Obanibi, And D. A. Muazu*	1307
Cost Implications Of Rework Due To Design Errors In Institutional Building Projects In Abuja • *C. Salihu & A.D. Adamu*	1315
Evaluation Of The Nigeria Construction Industry Preparedness To Adopt Supply Chain Management Practices • *Abah, E. & Adamu A. D*	1322
Evaluation Of Factors Affecting Labour Productivity In Selected Building Construction Sites In Abuja Metropolis, Nigeria • *M. O. Peter and D. A Muazu*	1332
Restructuring The Construction Industry And The Built Environment In Africa: A Polycentric Environmental Planning Strategy • *Samson R. AKINOLA*	1340
Perception Of Drug Abuse On Productivity Of Construction Site Workers In Minna, Niger State • *BAMGBADE Adebisi Abosede, AMOS Kelechi Goodluck, OKOSI N Blessing, AKANBI Memunat Oyiza*	1355
URBAN ECOLOGY MANAGEMENT	
Assessment Of Recreational Spaces In Public Secondary Schools, Minna, Niger State • *Hassan, B. Y. & Yelwa, M. U. K*	1365
Livelihood Opportunities In Solid Waste Recycling In Kaduna Metropolis, Nigeria • *Shaibu, S. L; Nwamuo A. G. And Medayese, S. O*	1372
Exploring The Tourism Potentials Of Cultural Landscape Of Nupe Communities In Central Nigeria • *Isyaku Mahmud & Isa Bala Muhammad*	1383
Spatial Inequality In Environmental Amenities Distribution In Bida, Niger State, Nigeria • *Mohammed N., Samusi Y. A., Akande S. O., Adeleye B. M., Ohadugha C. B., Mohammed M.*	1393
User Satisfaction With Organic Architecture Design Considerations In Hospital, Abuja • *Ajiboye Oluwaseun Charles , and M.U.K Yelwa*	1403
URBAN LAND ACCESS	
Effectiveness Of Compulsory Land Acquisition Process In Durumi District, Abuja Nigeria • *Kuma, S. S., Fabunmi, F. O., Adamu, S. And Kemiki, O. I*	1413
Developing An Efficient Urban Land Market In Warri, Nigeria: The Challenges And A Road Map • *Bernard Adjekophoni*	1422
Access To Residential Land In Minna, Nigeria: Methods And Constraints • *Chukwuma C. Nwuba & David Adogu*	1431
A Comparison Of The Performance Of Manual And Digital Land Information System In Kwara State, Nigeria • *ADEKOYA Adeola Adesanya, ADEWUSI Amos O.*	1443
Impact Of Peri Urban Growth On Agricultural Land In Minna Suburb • *Morenikeji, G., Popoola, N. I., Alfa, M., and Adeleye, B.M*	1453
DISASTERS, RESILIENT CITIES AND BUSINESS CONTINUITY	
Post-Resettlement Changes And Adjustment: A Case Study Of Sabon Wuse In Niger State, Nigeria • *Sulyman, A.O And Kudu, S.F.*	1464
Institutional And Community Awareness On The Environmental Impact Of Municipal Solid Waste Management In Bida Metropolis, Nigeria • *Yahaya, U.; Abd'razack, N.T.A. & Mohammed, M*	1475

Development Control: A Strategy For Flood Vulnerability Assessment In Suleja • *Adeleye, B.M[1], Zitta, N[2], Popoola, A.A. and Ayanghile, O. A*	1489
Towards resilient In Design and Construction Of Housing In Coastal Area Of Lokoja, Nigeria • *Abdulmutalib Ohimoyi Ibrahim & Ochepa Yahaya Sadiq*	1497
Preference And Compatibility: Ageing In Place Limitations In Nigeria • *Onanuga Omotayo Adebayo And Oviasogie Collins O*	
SUSTAINABLE GEOMATIC TOOLS AND TECHNIQUES	
A Method For Assessment Of Optimal Choice Of Parametric Model In Least Squares Collocation • *Odumosu, J.O., Onuigbo, I.C., Nwadialor, I.J. And Kemiki, O.A*	1520
Investigation Of The Robustness Of Different Contour Interpolation Models For The Generation Of Contour Map And Digital Evelation Models • *Kuta A. A., Ajayi O. G., Osunde T. J., Ibrahim P. O., Dada D.O. & Awwal A. A*	1527
Geospatial Information Systems Solutions To The Consequences Of Modernization And Technological Advanvements On The Built Environment • *Onuigbo, Ifeanyi Chukwuebi*	1537
Evaluation of Rainfall Trend in North – Central Region of Nigeria • *G. H. Ntat, S. Ojoye, Y. M Suleiman, A. A Adenle &S. D. Francis*	1548
A Review of Geographic Information Systems Applications to Election Mapping in Nigeria • *Okolie, C.J., Adesina, E.A., Irivboghe, H.E., and Umar, A.A*	1557
Assessment of the Tourism Potentials of Gurara Waterfalls, Niger State, Nigeria • *Musa, U.G., Mohammad, A.M., Abubakar, S., & Abdulrahman, B.I.*	1566
Performance Evaluation of Outsourced Facility Management Services at Baze University Abuja • *Bajere, P. A. & Akor, V. O*	1575
Structural Integrity of Hollow Sandcrete Block Walls in Federal University of Technology, Minna using Rebound Hammer Test • *Sule, Bandagi Ahmed, Abdullahi Mohammed., Alhassan Mohammed*	1584

APPRAISAL OF THE EXTENT OF BIM INTEGRATION IN FACILITY MANAGEMENT PRACTICES IN ABUJA, NIGERIA

M.H. Yunusa, M. Abubakar and M. Abdullahi
Department of Building. Ahmadu Bello University, Z.ana. Kaduna Slate. Nigeria
Department of Quantity Survey. Ahmadu Belo University, Zaria. Kaduna Slate, Nigeria

The success of organizations in current business environment era depends to a large extent on their information technology power base which they incorporate in their daily processes Recent studies indicated that facility operations data are maintained separately from design and construction data BIM, is a concept which creates a physical representation of physical and functional characteristics of a building in an electronic model BIM plays a very important role in the I'M practices such as space planning, asset management etc as it is becoming a better known established collaboration process in the construction industry. As affirmed by researchers, the ideal situation for the facility management industry to fully adopt the BIM. thus, this research investigates the extent of integration of BIM in I'M services and procedures Data for the studs were gathered through review of related literature for secondary data and questionnaire administration as primary data, to assess the extent of integration of BIM in Abuja FM practice Research findings indicated that most respondent a staff have "fair" knowledge of BIM Recommendations include, calling for the effective utilization of BIM technology in FM services and procedures while funis should also imbibe the culture of training staffs to acquire the capacity to match these technology The researchers recommend the correlation of facility management BIM application arears with sources ol data and file formats so as lo boost interoperability factors

Keywords: Built Environment. Building Information Modelling. Facility Management. Informal ion Technology, Operation & Maintenance

INTRODUCTION

International Facility Management Association (IFMA) defines Facility Management as a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, processes and technology. The multi-disciplinary nature of facility management firms confines the scope of cooperation between work contractors and property owners. Facility management firms habitually drown in waves of documents which are regularly paper based and not often presented in electronic formats FM include various functions such as strategic planning and asset management, to planning and design, construction management, operations, maintenance and general administrative services (Ellethorpe, 2000).

Building Information Modelling (BIM) is the use of computer generated models to simulate planning, design and construction of projects. BIM as categorised by Associated General Contractors of America (2005) is a data-rich, object-oriented, intelligent and parametric digital representation of a building from which views and data needs can be extracted and analysed to generate information that can be used in decision making and improve service delivery process.

hayatu.yunusa10@gmail.com

Yunusa, et al., (2018). **APPRAISAL OF THE EXTENT OF BIM INTEGRATION IN FACILITY MANAGEMENT PRACTICES IN ABUJA, NIGERIA.** Contemporary Issues and Sustainable Practices in the Built Environment. School of Environmental Technology Conference. SETIC, 2018

Building Information Modelling was considered to remedy the problem of defragmentation and error by creating a system to manage building related information. Furthermore, as opposed to traditional data representation formats, Building Information Modelling provides one model for storing all building information and hence enables integrated views which has the prospective to support visualisation and spatial analysis of various maintenance activities occurring in any building (Lee, An & Yu, 2012). Building Information Modelling is one of the most promising recent development in the construction industry and representing a new paradigm in Facility Management practice (Azhar, 2011). The researcher further acknowledged that Building Information Modelling technology enables an accurate virtual model which can be used for planning, design, construction and operation of a facility.

Building Information Modelling is increasingly getting the attention of organisations involved in architecture, engineering and construction as well as the owners and operators of buildings (facility managers and real estate managers inclusive). In a nutshell, it is defined as a digital model representing physical, technical and functional characteristics of a building.

The revolution in building Operation and Maintenance (O&M) is being fuelled by a parallel revolution in Information Technology. These, new technologies have been identified to bring opportunities for optimising facility performance. According to Arayici, Coates, Koskela, Usher & O'Reily (2012) Building Information Modelling is not just a tool but it is a process and software which implements a new way of thinking. Complex building systems and controls increasingly offer opportunities as well as challenges for the profession (Ghosh, Chasey & Mergenschroer, 2015). Thus, the skill of a Facility Management team has to expand to include knowledge about complex system, technology and organisational impacts of BIM. Previous studies have stated the adoption of BIM technologies in many developed nations of the world such as USA, UK, Australia, Singapore, Denmark, Hong Kong (Yan & Damian, 2010; Sebastian & Berlo, 2011) with impressive outcomes, regardless of some challenges. In Nigeria, researchers such as, Olatunji, Gu & Ogunsemi (2010) stressed the need for the full adoption of BIM technologies across all disciplines and geographical boundaries. As affirmed by Sebastian & Berlo (2011), the ideal situation for the facility management industry to fully adopt the BIM process along with sufficient supply of BIM practitioners with various knowledge and skill levels to service the entire industry. Thus, this research seeks to assess the extent of BIM integration in facility management practices in Abuja. The objectives of this study is limited to identifying current BIM application areas in FM and to determine the level of BIM expertise within FM firms.

LITERATURE REVIEW

As BIM becomes widely adopted by the construction industry, it bears undeveloped possibilities for supporting Facility Management (Liu & Issa, 2013). Moreover, they further declared that the Architecture, Engineering, Construction (AEC) industry has raised a good deal of interest surrounding the use of BIM for Facility Management. Although, Akamete, Akinci & Garrett (2010) stated that the opportunities of leveraging BIM for facility operations are compelling but its utilisation in Facility Management is lagging behind if compared to BIM implementation in both design and construction phases.

All facility owners as ascertained by Ghosh et al. (2015) share a common theme in their organisational goals which is ensuring the end users effectively receive the services for which the facility has been designed. Thus, the key role of the Facility Management team is to maintain the facility, optimise operational cost and efficiently manage all systems while assessing its impact on people, and processes within the facility.

According to Yan & Damian (2010) digitalisation of building management information is accompanied with the hope that it is more accessible, accurate and easily communicated. Most of the documented and qualified benefits of BIM are related to design and production of buildings and there is relatively little hard evidence of Building Information Modelling in Operations and Maintenance (O&M) activities. Ghosh et al. (2015) identified BIM as a medium which supports open access to information when and where required across the Facility Management organisation. Furthermore, it allows the Facility Managers access to information about the facility within minutes, when previously it could take hours of research to obtain same information.

Facility Managers involvement at the design phase of building projects cannot be over emphasized. Furthermore, Liu & Issa (2013) ascertained that in reality, the Facility Management team may not have been set up during the design stage. The integration of BIM to the Facility Management stage of buildings lifecycle cannot be downplayed as it portends a significant boost to maintenance and operations procedures (Torreno, Anumba & Dubber, 2016).

According to Trivedi (2014), BIM experts ease Facility Management by:

i. Identifying the parameters that are needed to keep a track of the lifecycle of a building and its elements.

ii. Create a new parameter and add them to the Building Information Modelling model elements such as different fixtures, rooms, equipment etc.

iii. Now, formulas are built to calculate, keep a track and report the identified Facility Management matric.

iv. Schedules for reporting and easy entry of parameter values for model elements created.

v. When the aforementioned steps are implemented (successfully), the model is now ready and it displays the facility management plan.

Application of BIM in FM

Utilizing BIM for Facility Management, users can successfully explore, record and resourcefully manage the information regarding a facility. The adoption of BIM has been limited to both design and construction phases, Edirisinghe, Kalutara & London (2016) noted less emphasis on its integration with FM services and procedures which is as a result of associated challenges outweighing external and internal motivators. Furthermore, they highlighted most organisations are in the value realisation phase of BIM-based FM practices. Facility Managers cannot only track the space or facility related data and evolving requirement, but also manage the inventory and lifecycle data, identify safety loophole and henceforth enforce occupant safety measures, perform analyses of evolving needs versus the related cost (Trivedi, 2014). BIM application areas in Facility Management are not limited to the following:

i. Access design performance in relation to spatial requirements

Using BIM, Facility Managers can analyse the existing spaces and compare them with complex spatial standards and regulations. Furthermore, grave decisions regarding the spatial improvements and other design related improvements that upset the operations and management of the facility can be brought to notice and repeated after significant analysis and approval by all responsible stakeholders (Trivedi, 2014).

ii. Creating as-built physical conditions and assets of a facility

BIM is also used to record the structural, architectural and MEP details of a built facility to serve as a comprehensive documentation of these disciplines of an existing building. An as-built model for Facility Management is also created from the design, construction, 4D coordination models and subcontractor fabrication models (Torreno, Anumba & Dubber, 2016). This according to Trivedi (2014) makes BIM a treasured means which provides complete facility information that can be linked to operations, maintenance and asset data of a facility to enable better management of the facility. As the facility experiences repairs and renovation for changes are made to fulfil spatial requirements, these changes have to be updated in the BIM model to ensure that it contains accurate information about the maintenance history of the facility (Trivedi, 2014).

iii. Preventive maintenance

BIM facilitates tracking and maintenance of all information in relation to buildings structure, architecture and equipment (Torreno et al. 2016). Thus, BIM enables cost effective, timely and efficient maintenance program management.

iv. Analysis of energy utilization

The use of model permits Facility Managers to predict the performance of equipment and systems. It also facilitates the prediction of energy performance of a building while they can further compare such predictions with actual performance (Trivedi, 2014). If it is found that

the performance is not in tally with the prediction. BIM models supports the planning, repairs, modification in operations and proposing systems and material changes to ensure that system and energy performance of the building are at optimum levels (Lorrene et al. 2016).

v. Asset management

BIM models can be linked to the building assets database and utilized to support decision-making and planning concerning facility management issues. The implications of upgrading or changing the building assets can be grouped accurately using BIM (Trivedi, 2014). Furthermore, quantity takeoffs of the assets can be produced for financial reports and cost estimation.

vi. Managing spatial requirements

BIM models can be used to efficiently manage existing and evolving spatial requirements of a building. Allocation and management of resources and space within a facility based on the requirements is a process enabled by BIM (Trivedi, 2014). This is due to its capabilities to furnish a Facility Management work detailed space information for both new and retrofit buildings.

vii. Disaster planning and management

Emergency responders such as fire fighters, technical rescue, police and emergency medical service (just to mention a few) can get access to critical information about a building using BIM models. These models can be utilized to enable informed decisions and hence deliver better response to situations and also reduce safety risk to occupants of a building (Lorrene et al. 2016). BIM models can also be used to effectively locate emergency areas within a building and to gauge other surrounding dangers, thus it enables planning the best way to counter and contain disaster.

METHODOLOGY

The research is a quantitative study due to its aim, objectives and nature of data acquisition. A quantitative research is a type of research method that requires a quantifiable data involving numerical and statistical explanation. A well-structured questionnaire was used to collect data from respondents regarding the study area of interest. The population selected were facility management firms within Abuja. Non-random purposive sampling technique was adopted for this study due to the adequate knowledge of the samples in terms of FM services. Purposive sampling which is known as non-probability sampling was adopted for this research. This involves the deliberate selection of Thirty-three (33) facility management firms within Abuja, Nigeria, to constitute the sample size for this research work. Adding 10% of 30 for non-responsiveness = 3

30 + 3 = 33

The analysis of data collected from the questionnaire was done using Statistical Product and Service Solution (SPSS) tool. Descriptive statistical method of analysis i.e frequency distribution pie chart, bar chart and percentage were extensively used in the analysis of the questionnaire. Aroha (2006), conferred that the employment of descriptive data analysis is useful in discerning patterns which are not apparent in the raw data.

RESULTS AND DISCUSSION

4a. Staff Level of BIM Knowledge

Staff level of BIM knowledge was measured against a scale of: 1-None, 2-Some knowledge, 3-Fair and 4-Competent. Results revealed that 30.8% of staffs from respondents firm poses a "Fair" knowledge of Building Information Modelling while 23.1% indicated "Competent" knowledge of Building Information Modelling. 26.9% and 19.2% indicated "Some knowledge" and "None" respectively. Results are as depicted in Table 1. This table reveals the average BIM knowledge levels of respondents firm.

Table 1: Level of staff BIM knowledge

Knowledge Level	Frequency	Percent	Cumulative Percent
None	5	19.2	19.2
Some Knowledge	7	26.9	46.2
Fair	8	30.8	76.9
Component	6	23.1	100.0
Total	**26**	**100.0**	

Source: Researcher's Field survey (2016)

4b. Number of Years of Firm's BIM Usage

As depicted by the Figure 1 above, 12 respondents indicated that they have been using Building Information Modelling within the past "0-5years". Eight (8) respondents ascertained to its usage within the past "11-15years". Four (4) and Two (2) indicated "6-10years" and "Above 15years" respectively. Akamete et al. (2010) stated that the opportunities of leveraging Building Information Modelling for facility operations are compelling but its utilisation in Facility Management is lagging behind if compared to Building Information Modelling implementation in both design and construction phases. This result clearly indicates that Building Information Modelling is an infant concept in terms of adoption and integration in Facility Management operations in Nigeria

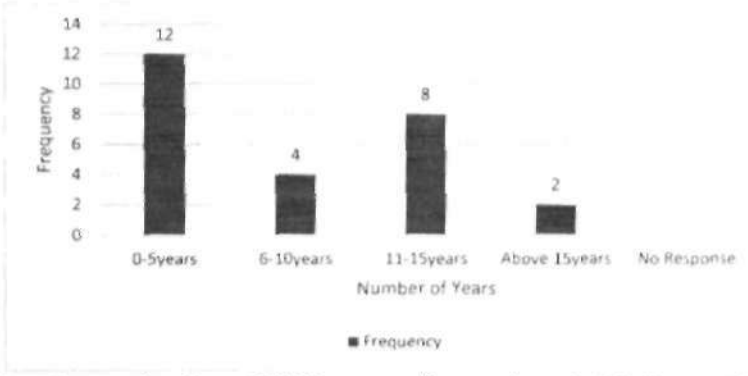


Figure 1: respondents Years of BIM Usage **Source:** Researcher's Field survey (2016)

4c. Facility Management Application Areas Integrated with BIM

The focus of Building Information Modelling is to create and reuse consistent digital information by stakeholders through the building's lifecycle. Although, researchers such as Akamete et al. (2010) argued that the utilisation of Building Information Modelling in facility management is lagging behind, one cannot downplay its integration in facility management as it means a noteworthy boost to both maintenance and operations procedures of buildings (as ascertained by Torreno et al., 2016,).

This research reveals that 42.3% of facility management firms utilises BIM to "Locate building components". 34.6% of respondents uses BIM in "Space management/planning" while 30.8% and 26.9% indicated its integration with "Asset management" and "Property management", respectively.

Table 2: Facility Management services integrated with BIM

Facility Management Application Area	Frequency	Percent
Locating building components	11	42.3
Checking maintainability	6	23
Emergency management	1	3.8
Space management/planning	9	34.6
Creating digital assets	3	11
Preventive maintenance	1	3.8
Property management	7	26.9
Support services	4	15
Asset management	8	30.8
Managing spatial requirements	2	7.7
Construction sequencing	2	7.7
Cost estimates	3	11
Project schedule	4	15

Forensic analysis	1	3.8
Material inventories	5	19
Geographic information	3	11

Source: Researcher's Field survey (2016).

4d. Building Information Modelling Proficiency Level

Building Information Modelling is not just a tool but it is a process and software which implements a new way of thinking. Complex building systems and controls increasingly offer opportunities as well as challenges for the profession (Ghosh et al. 2015). Thus, the skill of a Facility Management team has to expand to include knowledge about complex system, technology and organisational impacts of Building Information Modelling. Building Information Modelling proficiency training should be designed to meet the firms required skill levels. In addition, firms should adequately match their identified training programs with their staff(s) job description. Fifteen (15) respondents indicated "professional level" of training to be most suitable for their staff. While Eight (8) indicated "Intermediate level" and just a single respondent indicated "Learner level" and "Beginner level" respectively.

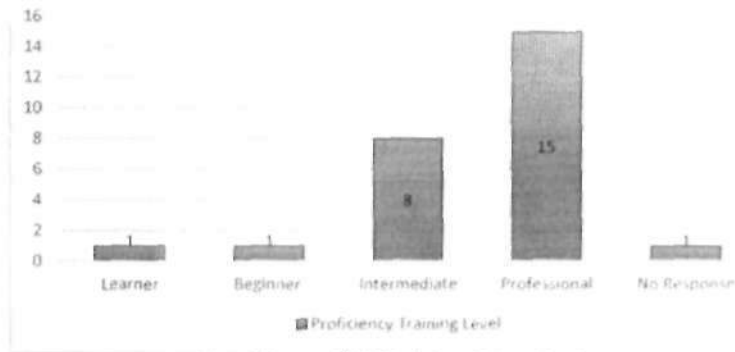


Figure 2 Suggested BIM Proficiency Training Levels
Source: Researcher's Field survey (2016)

CONCLUSION

Previous researches conducted by numerous researchers indicated the effectiveness of BIM technology in the design and construction phases of buildings. However the need to expand BIM utilization beyond these phases and integrate it with FM operations and procedures can not be over emphasized as BIM model is a real building information model which is data rich for different stakeholders and can be utilized at different phases of a facility's lifecycle. Based on the findings of this study, the researchers conclude that FM firms should constantly imbibe the culture of catching-up with technological trends in the industry. Research findings indicate a poor level of BIM integration in FM practices and lack of sufficient proficiency skill level. This research highlights that much work and effort still need to be put in place by industry practitioners for utmost utilization and benefits of BIM based FM practice as research findings indicated that most firms poses a fair level of BIM expertise. This can be achieved via matching appropriate FM application areas with software tools as well as train their respective staffs to acquire skills and expertise thus improving quality of services rendered and data management.

REFERENCES

Alufohai, J. Agele.. (2012). *Adoption of Building Information Modelling and Nigeria's Quest for Project Cost Management*, FIG Working Week 2012, Rome, Italy. 6-10 May.

Akcamate, A., Akinci, B., and Garrett, J.H., Jr. (2010). "*Potential Utilisation of Building Information Models for Planning Maintenance Activities*". Proceeding of the International Conference on Computing in Building and Civil Engineering. Tizumi, W. (Ed.). Nottingham University Press, University of Nottingham, UK.

Associated General Contractors of America. (2005). The Contractor's Guide to BIM. First Edition. AGC Research Foundation, Las Vegas, NV.

Atkin, B., and Brooks, A. (2009). Total Facilities Management (3rd ed.)West Sussex, United Kingdom, Wiley-Blackwell.

Arayici, Y., Coates, P., Koskela, L., Kagidlon, M., Usher, C. and O'Reilly, K. (2011). "Technology adoption in the BIM implementation for loan architectural practice". Autom. Constr., 20(2). 189-195.

Aroha, M. (2006). Research Methodology. Retrieved from http://www.ranghau.co.nz/methodology

Ayoku, Y. A. (2000). The use of ICT in management of Hamdala Hotel, Kaduna. Masters of Facility Management.

Azhar, S. (2011) "Building Information Modelling (BIM): Trends, Benefits, Risks and Challenges for the AEC Industry, ASCE Journal of Leadership and Management in Engineering, 11(3), 241-252.

Becerik-Gerber, B., Jazizadeh, F., Li, N., and Calis, G. (2012) "Application areas and data requirements for BIM-enabled facilities management" Journal of Construction Engineering and Management, 138, 431-442.

Ellerthorpe, R. (2000). "Facility Management" Excerpt from The Architect's Handbook of Professional Practice, 13th edition.

Ghosh, A., Chasey, A.D., and Mergenschroer, M. (2015). Building Information Modelling for Facilities Management. Current practices and future prospects. Retrieved from http://ascelibrary.org

IFMA. (2013). "What is Facility Management?" IFMA International Facility Management Association. Retrieved from http://ifma.org/about/about-ifma

Lee, S. K, An, H. K, & Yu, J. H, (2012). "An Extension of the Technology Acceptance Model for BIM-based FM". In Construction Research Congress. 2012 @ construction challenges in a FlatWorld (pp. 602-611).

Liu, R., and Issa, R.R.A. (2013). Issues in BIM for Facility Management from Industry Practioners Perspectives. Retrieved from http://ascelibrary.org

Olatunji, O.A. Sher, W.D. Gu, N. Ogunsemi, D.R (2010) *Building Information Modelling Processes: Benefits for Construction Industry.* Proceedings of the 18th CIB World Building Congress 2010, 10-13 May 2010 The Lowry, Salford Quays, United Kingdom

Sebastian, R., and van Berlo, L., (2011). "Tool for benchmarking BIM performance of design, engineering and construction firms in the Netherlands". Archit Eng Des Manage , 6(4), 254-263.

Seul-ki Lee, Hyo-kyung An and Jung-Ho Yu. (2012). An Extension of the Technology Acceptance Model for BIM-based Facility Management. Retrieved from http://ascelibrary.org

Torreno, S., Anumba, C.J. and Dubber, C. (2016). BIM-Based Management of Building Operations. Retrieved from http://ascelibrary.org

Trivedi, G. (2014). 7 Applications of BIM for Facility Management. Retrieved from http://architecturelinked.com/m/blogpost?id=4741207%3ABlogPost%3A205304

Yan, H and Damian, P (2010) Benefits and Barriers of Building Information Modelling. 12th international conference on computing in civil and building engineering. Beijin, China.

UK Government (2011). "UK government construction strategy from UK government". Retrieved from http://www.gov.uk/government/uploads/system/uploads/attachement-filedata/file/61152Government-construction-strategy_0.pdf