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**Salford**  
MANCHESTER

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CONFERENCE 2019:  
Contemporary and Future Directions  
in the Built Environment**

**BOOK OF ABSTRACTS**

**16 – 17 DECEMBER 2019**

 **SCHOOL OF  
SCIENCE, ENGINEERING  
& ENVIRONMENT**

## **FOREWORD**

I am proud to say that this is the 14<sup>th</sup> International Postgraduate Research Conference within the built environment sector that has been held by the University of Salford. We have held this conference in different venues and countries over the years, but we are pleased this time to be holding it once again on our campus.

This Book of Abstracts provides a flavour of the various papers and presentations that have been contributed to the conference by the postgraduate delegates, covering the areas of Business, Economics and Finance; Property and Project Management; ICT, Technology and Engineering; People, Skills and Education; Design and Urban Development, and Sustainability and Environmental Systems. It reflects the rich and varied research conducted in this subject area and I'm confident new insights and further discussions will result from this conference.

Our keynote speakers are Mr Mark Farmer of the real estate and construction consultancy Cast, author of the 2016 Farmer Review which examined the labour model within the UK construction industry, and Professor Jacqui Glass, Professor in Construction Management at the Bartlett School of Construction & Project Management, University College London.

I wish you a pleasurable two days in Salford and hope you will enjoy learning about your colleagues' research, networking with your peers, and potentially developing ideas for future research based on the discussions that will take place. I'm sure the conference will provide you with much to think about and reflect on.



**Professor Sheila Pankhurst**  
**Dean, School of Science, Engineering and Environment**

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## KEYNOTE SPEAKERS

**Professor Jacqueline Glass – University College, London**



**Professor Jacqueline Glass FCIQB FCABE SFHEA**

Jacqui is Chair in Construction Management at The Bartlett School of Construction and Project Management, in University College London and Vice Dean Research for the Bartlett Faculty. She is Principal Investigator of the Transforming Construction Network Plus, funded by UK Research and Innovation (UKRI), an investment supported by the Industrial Strategy Challenge Fund (ISCF). Jacqui has published over 150 papers, managed c. £10m of funding (from research councils and industry) and supervised more than 20 doctoral students to completion. In so doing she has attended to research spanning strategy, procurement, standards, values, and accounting for sustainability. Her specialism is responsible and ethical sourcing, which relates to material and product supply chains, and in 2018 she was named in the Top 100 Corporate Modern Slavery Influencers. You can follow her updates on Twitter: @profjacquiglass

**Mr Mark Farmer – Founding Director and CEO, Cast**



**Mr Mark Farmer**

Mark has 30 years' experience in construction and real estate and is a recognised international commentator on a variety of industry and policy related issues. Mark is a member of the Mayor of London's Construction Skills Advisory Group, a board member for the Construction Scotland Innovation Centre, a co-chair of Constructing Excellence, a vice chair of the ULI UK Residential Council, a trustee of the MOBIE educational charity and is an honorary professor at The University of Salford's School of Science, Engineering and Environment.

Mark authored the Farmer Review, an influential 2016 independent government review of the UK's construction labour model entitled 'Modernise or Die'. He is a member of the Construction Innovation Hub Industry Board, the Construction Leadership Council Advisory Group and chairs the MHCLG joint industry working group tasked with enabling greater use of Modern Methods of Construction in the residential sector.





## **TABLE OF CONTENTS**

Foreword	1
Conference Organisers	2
The Scientific Committee	4
Keynote Speakers	6
Table of Contents	9

## **BUSINESS, ECONOMICS AND FINANCE**

<i>A PHENOMENOLOGICAL STUDY ON DECISION MAKING UNDER UNCERTAINTY IN REAL ESTATE INVESTMENTS IN SUB SAHARAN AFRICA</i>	16
---	----

<i>RE-EVALUATING MEGAPROJECT COST OVERRUNS: PUTTING CHANGES INTO PERSPECTIVE</i>	17
--	----

<i>BARRIERS TO INNOVATION PERSISTENCE DURING ECONOMIC CRISIS: A CASE STUDY OF NIGERIA'S CONSTRUCTION CONTRACTING FIRMS</i>	18
--	----

<i>A REVIEW ON APPROPRIATE TOOL TO PREDICT PROFITABILITY OF BUILDING PROJECTS USING ESTABLISHED SIGNIFICANT CASH FLOW FACTORS</i>	19
---	----

<i>ESTABLISHING THE COST CONTRIBUTION OF SIGNIFICANT CASH FLOW FACTORS IMPACTING ON BUILDING PROJECTS PROFITABILITY</i>	20
---	----

## **PROPERTY AND PROJECT MANAGEMENT**

<i>EXPLORING HOW PERSONALITY TRAITS IMPACT ON COUNTERPRODUCTIVE WORK BEHAVIOUR ON CONSTRUCTION SITES</i>	22
--	----

<i>A LITERATURE REVIEW EXPLORING THE CRITICAL SUCCESS FACTORS FOR THE EFFECTIVE IMPLEMENTATION OF THE ISO 9001 QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION PROJECTS</i>	23
<i>THE ROLE OF VALUATION TASK COMPLEXITY IN COMPULSORY PURCHASE: A CONCEPTUALISATION</i>	24
<i>ASSESSING THE SAFETY PERFORMANCE IN KUWAIT'S OIL AND GAS SECTOR CONSTRUCTION PROJECTS</i>	25
<i>PERFORMANCE MANAGEMENT IN CONSTRUCTION SUPPLY CHAINS: A SYSTEMATIC LITERATURE REVIEW</i>	26
<i>APPRAISALS OF STUDENT PERSPECTIVES ON FIRE SAFETY PRECAUTIONS IN HALL OF RESIDENCE</i>	27
<i>A FRAMEWORK FOR POSITIVE CONSTRUCTION SAFETY CULTURE FOR IMPROVED SME CONTRACTOR PERFORMANCE IN GHANA</i>	28
<i>IDENTIFICATION OF THE CONTRACTOR SELECTION CRITERIA FOR PUBLIC PROJECTS IN TURKEY</i>	29
<i>EMBEDDING SUSTAINABILITY ETHOS ACROSS CONSTRUCTION PROJECT'S LIFECYCLE: A REVIEW OF PROJECT MANAGEMENT COMPETENCIES</i>	30
<i>CONCEPTUALISING A PROJECT MANAGEMENT FRAMEWORK FOR EMERGING CONTRACTORS IN THE FREE STATE</i>	31
<i>FACTORS AFFECTING MATERIALS MANAGEMENT ON LIBYAN CONSTRUCTION SITES</i>	32

## **ICT, TECHNOLOGY AND ENGINEERING**

<i>INVESTIGATION ON COMPARATIVE ROLES OF MAJOR STAKEHOLDERS FOR BIM IMPLEMENTATION IN A TRADITIONAL CONSTRUCTION PROJECT ENVIRONMENT</i>	34
<i>A LEVEL 2 BIM MATURITY-KPI RELATIONSHIP ASSESSMENT</i>	35
<i>IMPROVING THE CONSTRUCTION INDUSTRY IN THE STATE OF KUWAIT</i>	36
<i>EXPLORING BEHAVIOURAL NEGATIVE FACTORS HINDERING THE PERFORMANCE OF STRATEGIC CONSTRUCTION ALLIANCES IN THE UK</i>	37
<i>GIG ECONOMY AS A TOOL FOR SUSTAINABLE LIVELIHOOD STRATEGY FOR CONSTRUCTION WORKERS IN SOUTH AFRICA</i>	38
<i>BIM KNOWLEDGE AMONG NIGERIAN QUANTITY SURVEYORS</i>	39
<i>BARRIERS TO BIM IMPLEMENTATION: CASE STUDY OF NIGERIAN QUANTITY SURVEYORS</i>	40
<i>THE POTENTIAL OF INDUSTRY 4.0 TO ENHANCE CONSTRUCTION HEALTH AND SAFETY (H&amp;S) PERFORMANCE</i>	41
<i>TRAFFIC ACCIDENTS PREVENTION INTERVENTIONS FOR ABU DHABI ROADS</i>	42
<i>CONSULTATIVE APPROACH TO BIM IMPLEMENTATION</i>	43
<i>AN APPROACH TO “NATIONAL ANNEX TO ISO 19650-2”</i>	44
<i>DRIVERS FOR USING OFFSITE CONSTRUCTION IN IRAQ</i>	45

## **PEOPLE, SKILLS AND EDUCATION**

*DEVELOPING PROFESSIONAL CAPACITY IN  
THE CONSTRUCTION INDUSTRY THROUGH  
THE SINO-AFRICAN RELATIONS:  
A LITERATURE REVIEW* 48

*INVESTIGATING REASONS FOR ENGINEERING SKILLS  
DEFICIENCY IN THE SOUTH AFRICAN  
CONSTRUCTION INDUSTRY* 49

*AN INVESTIGATION INTO THE IMPACTS OF THE  
TECHNICIANS' SKILLS GAP ON THE DEVELOPMENT  
OF THE NIGERIAN CONSTRUCTION INDUSTRY* 50

## **DESIGN AND URBAN DEVELOPMENT**

*USING THE FEDUP GROUP SAVINGS SCHEME MODEL  
FOR THE PROVISION OF CONTEMPORARY SUSTAINABLE  
HUMAN SETTLEMENTS* 52

*TACKLING SPATIAL INEQUALITIES THROUGH  
MIXED INCOME HOUSING: A QUALITATIVE  
ANALYSIS OF STAKEHOLDER PERCEPTIONS* 53

*INVESTIGATION OF EMOTIONAL STATES IN DIFFERENT  
URBAN SOUNDSCAPES THROUGH LABORATORY  
REPRODUCTIONS OF 3D AUDIOVISUAL SAMPLES* 54

*THE GHANAIAN CONSTRUCTION INDUSTRY AND  
ROAD INFRASTRUCTURE DEVELOPMENT: A REVIEW* 55

*THE URBAN GOVERNANCE AND INFRASTRUCTURE  
NEXUS: DEVELOPING A CONCEPTUAL FRAMEWORK  
FOR URBAN NIGERIA* 56

## **SUSTAINABILITY AND ENVIRONMENTAL SYSTEMS**

<i>EXPLORING UNCHARTERED TERRITORIES OF BUILDING ACCREDITATION RATINGS IN THE UK</i>	58
<i>CUSTOMISING A RATING SYSTEM FOR ASSESSING SUSTAINABLE HOMES – CASE OF LIBYA</i>	59
<i>ENERGY STORAGE FOR INCREASING SELF-CONSUMPTION OF WIND ENERGY AND MARKET VALUE ON A DISTRIBUTION NETWORK</i>	60
<i>INTEGRATING H&amp;S REGULATIONS INTO GREEN BUILDING RATING TOOLS FOR MORE SUSTAINABLE OUTCOMES: THE CASE OF THE PEARL RATING SYSTEM (ESTIDAMA) ADOPTED IN ABU DHABI, UAE</i>	61
<i>SUSTAINABLE CONSTRUCTION AND SUSTAINABILITY EXPERTISE – UNDERLYING CONCEPTS: GETTING THE BALANCE RIGHT</i>	62
<i>SUSTAINABLE CONSTRUCTION IN WAR ZONES: PALESTINE AS A CASE STUDY</i>	63
<i>NUMERICAL STUDY ON EFFECT OF FIRE ON STRENGTH OF BLAST WAVE AFTER STAND-ALONE HYDROGEN TANK RUPTURE</i>	64
<i>COMPRESSIVE STRENGTH ANALYSIS OF CONCRETE FLOOR USING A NON-DESTRUCTIVE TEST</i>	65
<i>PROPERTIES AND EFFECT OF DORMANT RIVER SAND USED FOR SANDCRETE BLOCK PRODUCTION IN NIGERIA</i>	66
<i>GEO-EXPERIMENTAL INVESTIGATION OF NSUKKA SANDY SAND: AN EVALUATION OF ITS ELECTROCHEMICAL PROPERTIES AND ANGLE OF REPOSE USING THE FIXED FUNNEL METHOD</i>	67

<i>APPLICATION OF CONSTRUCTION WASTE MINIMISATION APPROACHES DURING THE CONSTRUCTION STAGE: A RESEARCH REVIEW</i>	68
<i>APPLYING THE RESOURCE-BASED VIEW (RBV) THEORY IN SUSTAINABLE PROCUREMENT PRACTICE IN THE AEC SECTOR</i>	69
<i>PHYSICAL RESILIENCE FACTORS TO ENHANCE COMMUNITY RESILIENCE TO PLUVIAL FLOODS IN THE UAE: THE CASE STUDY OF ABU DHABI CITY</i>	70
<i>A SERVITIZED BUSINESS MODEL FOR IMPROVED CIRCULAR ECONOMY PERFORMANCE IN CONSTRUCTION</i>	71
<i>DISMANTLING BARRIERS TO EFFECTIVE DISASTER MANAGEMENT IN NIGERIA</i>	72
<i>CRITICAL SUCCESS FACTORS THAT ENABLE THE UTILISATION OF AGRICULTURAL WASTE AS BUILDING MATERIAL</i>	73
<i>HOW TRAINING CAN SUPPORT LOW CARBON PRIORITISATION IN FLOOD AND COAST RISK MANAGEMENT CONSTRUCTION</i>	74
<i>A FRAMEWORK TOWARDS THE REDUCTION OF THE ECOLOGICAL AND CARBON FOOTPRINT OF CONSTRUCTION ACTIVITY IN GHANA</i>	75
<i>CONCEPTUAL PERSPECTIVE ON THE SUSTAINABILITY OF COMMUNITY-LED TOTAL SANITATION PROGRAMME IN GHANA</i>	76
<i>DISASTER MANAGEMENT AND THE EFFICIENCY OF HOSPITALS IN NATURAL DISASTER</i>	77
<i>BARRIERS TO LOW CARBON TRANSITIONS AND ENERGY SYSTEM INNOVATIONS</i>	78
<i>OIL AND GAS INDUCED-DISPLACEMENT AND RESETTLEMENTS IN SOUTH-SOUTH NIGERIA</i>	79

# **Business, Economics and Finance**



# **A PHENOMENOLOGICAL STUDY ON DECISION MAKING UNDER UNCERTAINTY IN REAL ESTATE INVESTMENTS IN SUB SAHARAN AFRICA**

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## **Abstract**

From practice, the researchers observed real estate investment decisions being made under uncertainty in sub Saharan Africa due to unreliable and outdated economic and market data. The study was an investigation of the real estate investment decision phenomenon that addressed how real estate investment decisions are made under uncertainty in sub Saharan Africa. The chosen methodology was phenomenological research, i.e., an interpretive qualitative research methodology. The literature was reviewed widely from Von Neumann and Morgenstein to Kahneman and Tversky. The method of data collection was primarily interviews from which co-researchers gave descriptions of their experiences with the phenomenon. The data was analysed as described by Moustakas and other researchers, and with NVIVO analysis. A generic descriptive method of decision making under uncertainty was developed which could be universally applied to similar conditions and circumstances. The findings and conclusions of the analysis of the interviews and case studies confirmed that there was lack of credible economic and market data in practice. From the interviews and case studies analysis, it was evident that the decision-making process was subjective and depended on the experience of the decision maker and his intuition. It was also concluded that biases and heuristics, as described by Kahneman and Tversky, were evident in the descriptions of the experiences of the researcher and co-researchers.

## **Keywords:**

Decisions, investments, real-estate, sub-Saharan Africa, uncertainty.

# RE-EVALUATING MEGAPROJECT COST OVERRUNS: PUTTING CHANGES INTO PERSPECTIVE

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## Abstract

The vast sums of money involved in megaprojects, and the perceived lack of public benefit, create controversy. Flyvberg's *iron law* asserts that megaprojects are *over budget, over time, under benefits, over and over again* (Flyvberg, 2018). More recent research suggests that this focus on cost overruns is based on highly misleading data (Love & Ahiaga-Dagbui, 2017). This research seeks to examine live megaprojects and examine Flyvbergs theories in practice, through an investigation of current megaprojects in the Middle East. The research provides three case studies for two recently completed and one on-going megaproject, to examine these claims further. The research questions whether the right comparisons are made between the initial offerings and final product, through consultation with professionals. Based on the findings, it is suggested that an increase of over 100% of the Contract price, may not constitute an over-budget megaproject. Professional Cost Consultants in the built environment can provide greater insight into the complexity that adds cost in the transitions from initial to final costs for megaprojects, although the validity of this insight may be reduced by a lack of distance from or overview of the megaproject. This paper investigates some of the familiar sources of megaproject cost overrun and considers the findings of Cost Consultants engaged in monitoring megaprojects in the state of Qatar. Time and Cost considerations are just two of the characteristics evident in megaprojects. This research suggests that reporting of time and cost overruns is frequently based on limited, misunderstood or misreported data, and that in order to provide higher fidelity, such 'headline claims' need to be carefully considered in the context of the original project scope. This paper recognises that cost is just one element of a megaproject, and that megaprojects warrant more holistic considerations including acknowledgement of other significant characteristics such as their embodiment of large components of risk, political influences, organisational pressures and management complexities.

## Keywords:

Cost overruns; Megaprojects; megaproject characteristics

# **BARRIERS TO INNOVATION PERSISTENCE DURING ECONOMIC CRISIS: A CASE STUDY OF NIGERIA'S CONSTRUCTION CONTRACTING FIRMS.**

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## **Abstract**

Findings from previous studies confirm that economic crises do constrain firm level innovations. Due to the mono-product nature its economy, Nigeria often finds itself in one manner of economic crisis or the other. The frequent economic crises in Nigeria have been blamed for the lack of appetite and the inability of most firms to sustain the innovation momentum in the local construction industry. Thus, this study seeks to identify the key factors that constrain firm level innovations during economic crisis.

This paper provides an overview of the literature on innovation, economic crisis, and innovation persistence. This is supported by case studies, interviews and questionnaire surveys within construction contracting firms based in Abuja Nigeria.

An unstable funding regime, erosion of good organizational slack, increased apathy to cost by clients, rapid and incessant changes to clients' needs and requirements, dearth of creative ideas and reduced appetite for risks are identified as the specific factors that constrain firm level innovation during economic crisis.

It is argued that having a good understanding of the factors that constrain firm level innovations during economic crisis will provide practitioners and researchers with a useful insight into how economic crises alter the dynamics especially in relation to the validity of existing organizational capabilities, market needs and clients' expectations.

## **Keywords:**

Construction, contractors, crisis, economic, innovation.

# **A REVIEW ON APPROPRIATE TOOL TO PREDICT PROFITABILITY OF BUILDING PROJECTS USING ESTABLISHED SIGNIFICANT CASH FLOW FACTORS**

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## **Abstract**

The construction industry is a competitive environment which influences contractors in using low mark-ups in bidding for jobs to afford great chance of job acquisition. This makes contractors experience challenges of profitability management due to the risk associated with construction activities resulting in construction failures. The risk noted with construction, therefore requires effective management of cash flow and profit with the use of an appropriate tools. The purpose of this paper is to establish an appropriate tool to predict profit and aid in its effective management. Searches of predictive models undertaken unraveled numerous models and reviewed abstracts and conclusion to screen to relevant once. Critical examination of these models established three techniques namely: regression; optimization and hybrid. An evaluation of these techniques identified hybrid and optimization techniques possessing high predictive powers and accuracies. However, hybrid techniques are used to enhance performance of either the regression or optimization techniques. Since a novel model is being proposed with respect to variables and yet to establish the performance, the optimization technique is best suited for the model. Besides support vector regression demonstrated high predictive powers and accuracy than other optimization tools therefore, recognized to be the appropriate tool to predict profit.

## **Keywords:**

Cash flow, construction industry, model, predictive, profitability.

# **ESTABLISHING THE COST CONTRIBUTION OF SIGNIFICANT CASH FLOW FACTORS IMPACTING ON BUILDING PROJECTS PROFITABILITY**

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## **Abstract**

The competitive construction industry is vital to a nation's economy. Low mark-ups are introduced by contractors in job biddings to afford chance of job acquisition. This results in cash flow challenges and profitability that lead to company failing. This paper tries to determine the cost contribution of established significant cash flow factors on building contracts to aid in the effective cash flow and profit management. Purposive and census sampling techniques were employed which resulted in 39 D1 contractors and a response rate of 87.18% was obtained. It was established that wages of labour and staff and replacement of defective work accounts for 26.75% and 3.53% respectively of contract sums. It was therefore established that projects are mostly financed with short-term loans from banks and contractors' own financing due to late payment. Late payment issue motivates contractors to seek for various funding options and it was established that this contributes 20.44% average loss of projected profit and that affect quality delivery. Consequently, this results in defective works which was established to accounts for 3.53% of the contracts sum. The onus therefore rests on management to effectively manage these factors through application of suitable techniques to enhance profit through effective cost minimization.

## **Keywords:**

Cost, profitability, cash flow, construction industry

# **Property and Project Management**

# EXPLORING HOW PERSONALITY TRAITS IMPACT ON COUNTERPRODUCTIVE WORK BEHAVIOUR ON CONSTRUCTION SITES

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## **Abstract**

The causes of construction accidents have been linked to different factors one of which is the human factor, which is a by-product of personalities that determines how people react in a work environment. The reported research explores the effects of Counterproductive Work Behaviour (CWB) of construction workers. The study of personalities in the work environment has been explored among other things to predict future CWB among workers in high risk work environments. An attitudinal scale and CWB checklist was used to categorise workers into personalities as described by the Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism (OCEAN) personality trait model. Non-participant observation was used to identify general CWB on construction sites around Summerstrand, Port Elizabeth, South Africa. The analysed data reveal that workers do not conform to the general definition of CWB in their work environments, although a strong relationship between some personality traits exist. The data further led to the conclusion that CWB in construction sites should be further researched to establish what it means on a project site. This will enable site management to focus on methods that are most beneficial to enable the attainment of set project objectives.

## **Keywords:**

Accidents, construction, human-factor, personality traits, safe-work.

# **A LITERATURE REVIEW EXPLORING THE CRITICAL SUCCESS FACTORS FOR THE EFFECTIVE IMPLEMENTATION OF THE ISO 9001 QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION PROJECTS**

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## **Abstract**

Interest in quality began during the Second World War, where companies in various industries incorporated quality systems and established independent rules for their suppliers' compliance. This situation continued for decades, creating barriers to the exchange of goods and services due to inconsistencies in the characteristics and standards of quality. Therefore, it became necessary to introduce common standards to simplify the task of meeting the client's requirements, as achieved by the International Organization for Standardization (ISO) since 1947. The initial ISO 9001 version was launched in 1987 to enhance client satisfaction and increase quality in the manufacturing sector. It has been accepted worldwide and expanded to other domains, including the construction industry. However, research has found that project managers often tend to view quality management systems (QMSs) as being primarily beneficial in terms of marketing, while issues exist regarding their implementation and awareness of the short- and long-term value potential to the project and client. Therefore, this research identifies critical success factors (CSFs) for the ISO 9001 QMS's effective implementation in UK construction projects, to enable the construction industry to develop a strong motivation to improve project performance and ensure quality in delivering construction projects. The research summarises 10 CSFs and 82 factor components that must be effectively carried out for the project to succeed. The analysis of these CSFs provides a strong assessment and factors for strategic planners in the construction field, highlighting vital areas to address in order to ensure that the construction project succeeds.

## **Keywords:**

Critical success factor, construction, ISO 9001, project management, quality management system.



# THE ROLE OF VALUATION TASK COMPLEXITY IN COMPULSORY PURCHASE: A CONCEPTUALISATION

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## **Abstract**

The purpose of this study was to conceptualise a complex task in property valuation for compulsory purchase using the theory of task complexity. Compulsory purchase is the power of government to acquire rights over an estate in land without the owner's consent in return for compensation. At the heart of the compulsory purchase system is the problem of valuation variation. Valuation variation is the difference between acquiring authorities and the property owners' valuations. A wide valuation variation makes negotiated agreement problematic and results in costly appeals at Valuation Tribunals. Valuation task complexity has been recognised as an important contributory factor of valuation variation. However, currently there is no consensus on the definition of task complexity. The methodology involved a review of several studies on task complexity based on structuralist, resource requirement and interaction models. Consistent with theory it is established that variation in valuations is more pronounced in comparatively more complex valuation tasks. These findings have several implications including the inability of valuers to agree market values for compulsory purchase and compensation purposes. Consequently, this results in costly litigations, delay in relocating property owners and limit their ability to purchase replacement properties in the locality.

## **Keywords:**

Compulsory purchase, open market value, task complexity, valuation accuracy, valuation variation.

# ASSESSING THE SAFETY PERFORMANCE IN KUWAIT'S OIL AND GAS SECTOR CONSTRUCTION PROJECTS

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## **Abstract**

The safety outcome has been measured in various ways, and these measures have their pros and cons. In contrast to what one would typically expect, a firm's safety performance cannot be ascertained simply on the basis of its accident rates. This is because accident reporting may not be completely reliable, and because the restriction of variance can render statistical data imprecise. More focus should be on accident self-reporting as a trustworthy method to measure organisation safety outcomes in Kuwait's construction industry. Also, most Kuwaiti construction industries do not have recorded data, and even if they do so, such data are not released due to insurance complications and competition. The researcher used a personally administered, paper-based survey to assess safety outcomes, such as near-misses, days off rate and occupational injury type rate, during the past 12 months at Kuwaiti oil and gas construction projects; 508 responses were received and analysed. The results show that accident statistics among Kuwaiti construction firms are of concern. The most frequent accident type is 'falling from a height', the second accident type is 'transportation means', and the lowest type was 'electric shock'.

## **Keywords:**

Safety outcomes, safety performance, safety climate, safety indicator, oil and gas projects.

# PERFORMANCE MANAGEMENT IN CONSTRUCTION SUPPLY CHAINS: A SYSTEMATIC LITERATURE REVIEW

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## Abstract

Supply chain performance measurement systems are “the central managerial mechanisms for achieving efficient and effective supply chain management” (Hald and Mouritsen, 2018, p. 256), yet only a few studies have been conducted within the construction sector. The purpose of the research presented in this paper was to discover if construction projects could be made to benefit from end-to-end analysis of the kind seen more generally in supply chain management. With this in mind, a methodology of systematic literature review was adopted, aimed at (1) assessing the current state of supply chain performance measurement in construction projects, and (2) identifying areas of inadequacy. The findings of this study reveal construction supply chain performance to be an ideal area for further research. Although the disciplines of supply chain and project management differ, they overlap in terms of how an organisation can manage performance within both upstream and downstream networks. Drawing upon the viewpoints of different disciplines, the study provides original insights for practitioners seeking to improve performance through the reconfiguration of metrics commonly used in project management. Furthermore, it identifies opportunities for academics to research a critical yet underrated aspect of the supply chain.

## Keywords:

Construction, project, supply chain performance.

# APPRAISALS OF STUDENT PERSPECTIVES ON FIRE SAFETY PRECAUTIONS IN HALL OF RESIDENCE

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## **Abstract**

Globally, student enrolment in higher institutions has been increasing in recent times, and it is estimated that the growth will continue to improve. This phenomenon results in a situation where the university administrators are confronted with the challenge of managing the scarce accommodation facility among many students. Fire outbreak is a significant challenge confronting hostel management due to a large population of students occupying a single building. Thus, this study appraised fire safety precautions in student hostels using a University in Nigeria as a case study. The study adopted convenience sampling, in collecting data from student occupying the hostel within the school. A total of 100 questionnaires were distributed out of which 87 questionnaires were returned and used for the analysis. The questionnaire was analysed with SPSS adopting frequencies, mean score, and ANOVA test. The findings from the study show that preventing flammable materials into the hall of residence is the major fire safety precautions. Also, the causes of fire within the hall of residence is due to the reactive maintenance approach adopted by hall managers. The study recommends that fire drills should be conducted for students and the hall managers should adopt a proactive management system.

## **Keywords:**

Fire safety, fire outbreak, hall of residence, safety precautions.

# **A FRAMEWORK FOR POSITIVE CONSTRUCTION SAFETY CULTURE FOR IMPROVED SME CONTRACTOR PERFORMANCE IN GHANA**

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## **Abstract**

Poor safety culture among construction Small and Medium Size Enterprises (SMEs) in Ghana creates an environment for errors and violations, which leads to accidents, injuries and fatalities. Ideal safety culture is the engine that drives the system towards the goal of sustaining the maximum resistance towards its operational hazards. It is therefore essential that a positive safety culture is fostered by SMEs since this promotes safety principles and helps to prevent accidents. There is an urgent need to address the inadequate safety culture practices among SME construction firms in the Ghanaian construction industry. This paper describes the current state of research on safety culture and its related issues among construction SMEs. From the reviews, the components that are needed to develop a framework for positive construction safety culture for improved SME contractor performance in Ghana is unravelled.

## **Keywords:**

Construction, Ghana, safety culture, SMEs

# IDENTIFICATION OF THE CONTRACTOR SELECTION CRITERIA FOR PUBLIC PROJECTS IN TURKEY

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## **Abstract**

Procurement in public projects is regulated by the Public Procurement Law in Turkey, and the bid price is the most effective criterion in contractor selection. This may lead employing unskilled, inexperienced, and financially unstable contractors in public projects. This study aims to identify the several criteria which must be used for the selection of the most suitable contractor candidate along with the bid price, to ensure the optimal use of public resources. Following an extensive literature review, 9 main criteria and 69 sub-criteria were identified. A survey was delivered to technical staff responsible in procurement projects in public institutions, and 53 were fully completed and returned. The relative importance levels of the identified main and sub-criteria were computed using ranking analysis. The internal consistency of the questionnaire was checked with reliability analysis. The findings of this study can be used to reveal the most effective criteria in developing a multi-criteria selection model for the best contractor candidate selection in public projects.

## **Keywords:**

Contractor, public projects, ranking analysis, reliability analysis, selection criteria.

# EMBEDDING SUSTAINABILITY ETHOS ACROSS CONSTRUCTION PROJECT'S LIFECYCLE: A REVIEW OF PROJECT MANAGEMENT COMPETENCIES

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## **Abstract**

Despite the emergence of terminologies like green and sustainable construction, green and sustainable supply chain management, the incidence of certain anthropogenic activities within the industry remains unabated. Although recent studies have sought to investigate the instrumentality of different managerial competencies in tackling this challenge, few studies have explored the relationship between the deployment of the right set of project management competencies and effective incorporation of SD ethos across the construction project lifecycle. Based on these observed gaps, this study embarked on an identification of project management competencies required to achieve optimal incorporation of SD ethos in this context. A phenomenological research design is adopted for data elicitation. Semi-structured interviews are used to gather data from a purposively selected sample of built environment (BE) professionals practicing in the Free State province of South Africa. Qualitative content analysis (QCA) is deployed for data analysis. Findings from the study enable an identification of the right mix of PM competencies required for successful incorporation of SD ethos at different phases of the construction project lifecycle. This study holds salient implications for project managers practising within the BE domain as it provides a platform for further engagement towards the attainment of a sustainable construction process.

## **Keywords:**

Built environment, competencies, construction project lifecycle, project management, sustainability.

# CONCEPTUALISING A PROJECT MANAGEMENT FRAMEWORK FOR EMERGING CONTRACTORS IN THE FREE STATE

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## **Abstract**

This research focuses on developing a project management framework (PMF) for ensuring the economic sustainability of emerging contractors (ECs) in the Free State Province of South Africa. The economic sustainability of ECs is a major concern in the South African construction industry where most of them often exit the business within the first five years of operations. The reported attrition rates of the ECs necessitate the use of project management techniques considered important for project success. The aim of this paper is to present the conceptualisation of a PMF for the success of ECs. The conceptualisation relies on the PMF, which entails project lifecycle, project control cycle, templates and tools. It is herein argued that the adaptation of the PMF to ECs context will enhance their project and business success. This argument is premised on literature that established construction enterprises, which apply the PMF in their operations are associated with significant project and business success.

## **Keywords:**

Construction, emerging contractors, project management framework, economic sustainability.



# FACTORS AFFECTING MATERIALS MANAGEMENT ON LIBYAN CONSTRUCTION SITES

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## **Abstract**

Materials management is crucial in construction projects. It contributes to the achievement of the project on time and, as such, affects the overall economy of any country. Inappropriate materials management results in cost and time overruns that delay the overall project. The purpose of this paper is to identify and analyse the factors affecting materials management on Libyan construction sites. A survey questionnaire was distributed to professionals on construction projects: owners, contractors, site supervisors, consultants, engineers, and suppliers. The questionnaire comprised four sections of pre-defined factors: human, management, technology, and political and civil war issues. The Statistical Package for the Social Sciences (SPSS) was employed, and the factors were analysed. The most significant factors identified affecting materials management were: the contractors' experience and skills, factors related in materials on the site (receiving, storing, handling and tracking), and site supervision. The results of this paper will provide awareness and a better understanding of factors affecting materials management on Libyan construction sites.

## **Keywords:**

Materials management, construction site, contractors and technology

# **ICT, Technology and Engineering**

# INVESTIGATION ON COMPARATIVE ROLES OF MAJOR STAKEHOLDERS FOR BIM IMPLEMENTATION IN A TRADITIONAL CONSTRUCTION PROJECT ENVIRONMENT

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## **Abstract**

The revolutionary effect of Building Information Modelling (BIM) towards the conventional Architecture Engineering and Construction (AEC) industry has been appraised by many specialists as a constructive force to change AEC's conformist technologies and management principles. Even though BIM has been appraised as an integrator of technology and construction project management, it also has been misguidedly identified in the eyes of many professionals to consider BIM as a '3D model' which is in genuinely, a 'process' to achieve an exceptional alliance in between each construction project stakeholder. However, the complexities in a traditional construction supply chain have far more accelerated with the intervention of BIM where project stakeholders are at an edge of ambiguity to ascertain their supply chain roles and duties in a BIM environment. Therefore, this paper aims to study on roles and duties of BIM project stakeholders concerning the construction supply chain as in BIM Standards and how those standard roles have been embraced in real-life setups. To achieve the aim, comprehensive literature was conducted which is largely based on BIM standards to identify the theoretically established roles and duties of BIM project stakeholders. However, the theoretical aspects may not be the same in real-life scenarios where the project stakeholders may have to alter themselves following the BIM project context. Therefore, BIM expert interviews were directed to extract the opinions of professionals who are virtually involved in the BIM environment to identify how the theoretical aspects had differed. Consequently, this paper acknowledged unsung stakeholders in a theoretical context that are inevitable to consider in actual implementation. Moreover, the experiences of respondents brought up the added duties and responsibilities of stakeholders than identified in BIM standards. Finally, the collected data were illustrated through the cognitive mapping technique which would help the traditional construction project stakeholders to identify and adopt their extended or modified roles to achieve a successful BIM implementation.

## **Keywords:**

Building Information Modelling (BIM), BIM standards, supply chain management, Construction Supply Chain (CSC), construction project stakeholders.

# A LEVEL 2 BIM MATURITY-KPI RELATIONSHIP ASSESSMENT

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## **Abstract**

Building Information Modelling (BIM) maturity was addressed as a measurement process on capabilities and performance in relation to BIM implementation. Key Performance Indicators (KPIs) presents a set of targets that aims to deliver overall improvements within construction industries. This study proposes an assessment that aims to bring concepts of BIM maturity and KPI assessments together, whereby BIM maturity provides a measure of the organisational/project BIM capability level (i.e. 'input') and KPIs measures impact of the BIM capabilities on organisation/project performance (i.e. 'output') to the UK client sector. A mixed method approach was attempted with an in-depth single case study (a UK Main Contractor-Procurement Platform) through focus group workshops to propose a BIM maturity assessment to the Client sector. The study established a set of BIM maturity metrics aligned with the UK Level 2 BIM requirements. Therefore, based on the data collection, the metrics were assessed at 3 organisational levels targeted to industry stakeholders involved in the Level 2 BIM adoption. Having developed the BIM maturity assessment and determined the linkage between BIM maturity and KPIs, this study aims to then examine strength of relationships between the proposed BIM maturity and KPIs to assess Level 2 BIM adoption in line with the UK construction strategy.

## **Keywords:**

BIM, KPI, maturity assessment, project performance, UK client sector

# IMPROVING THE CONSTRUCTION INDUSTRY IN THE STATE OF KUWAIT

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## **Abstract**

After the Government of Kuwait launched the 2035 vision of Kuwait, the development of a sustainable built environment industry become one of the country's priority topics. Yet, the construction industry is confronting numerous challenges including time and cost overruns, waste, and low industry performance. Globally, delays in projects is the most common problem in this industry and specifically in Kuwait. However, several studies revealed that using advanced project management approaches such as Lean Construction and Building Information Modelling can improve the performance of the construction industry, therefore, overcoming these challenges. This paper aims to investigate the challenges facing construction projects in Kuwait, the implementation of Lean Construction and BIM approaches in this industry; in an attempt to find a suitable solution to address these issues. Thus, this study delivers a comprehensive awareness into the causes of delays in construction projects in Kuwait from reviewing the relevant literature and by examining the findings of the distributed online questionnaire. This questionnaire targeted 114 specialists in the construction industry who are involved in public-sector construction projects in Kuwait including clients, contractors, and consultants. The findings of the questionnaire revealed that delays in projects and a lack of collaboration and communication between stakeholders are the main challenges facing this industry.

## **Keywords:**

Construction industry, Kuwait, Lean Construction, Building Information Modelling, construction challenges, time overrun, cost overrun, Information Management, sustainability.

# EXPLORING BEHAVIOURAL NEGATIVE FACTORS HINDERING THE PERFORMANCE OF STRATEGIC CONSTRUCTION ALLIANCES IN THE UK

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## Abstract

The importance of strategic alliances as a collaboration strategy in the global markets in general and the UK markets, in particular, are obvious which can yield long-term survival and achieve success for companies working within a competitive environment. Many authors have emphasised the role of the alliances for adding value through knowledge development, improving skills and enhancing learning processes of firms aligned together. Over the past decades, many opportunities have been provided by the collaboration of firms for achieving targeted goals. Eventually, using strategic alliances strategy is one of fundamental mechanism able to develop skills of the participants of the construction industry and dealing with risks facing project delivering. The aim of this paper is to identify behavioural negative factors which affect the performance of strategic construction alliances in the UK. The methodology adopted to achieve the aim of this study is the qualitative exploratory technique for collecting data from the alliances in the UK construction industry. Interviews were conducted with project managers to identify the behavioural negative factors leading the performance of the UK construction alliances to failure. The main findings emerged as five behavioural barriers through semi-structured interviews are namely: distrust, opportunistic behaviour, coercive power, conflict and lack of commitment. The contribution of this paper is to help researchers to step forward in considering behavioural barriers and challenges in various typologies of alliances. Awareness of the presence of these barriers is another contribution that helps UK construction's practitioners to make sure regarding the effectivity of decisions are selected for alliance future and what its consequences.

## Keywords:

Strategic alliances, behavioural negative factors, the UK construction industry.

# GIG ECONOMY AS A TOOL FOR SUSTAINABLE LIVELIHOOD STRATEGY FOR CONSTRUCTION WORKERS IN SOUTH AFRICA

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## **Abstract**

The economic meltdown and recession experienced in the country have affected the construction industry negatively in numerous ways. Among them is the shortage of construction work that affects the livelihood of construction workers. Towards improving the livelihood of construction workers this study proposes the adoption of the gig economy as a tool for enhancing their sustainable livelihood strategy. The study's aim was achieved through administering a questionnaire to construction workers in Gauteng province in South Africa. Random sampling was adopted administering the questionnaire and a total of 60 was retrieved from the construction workers and used for the analysis. The data extracted from the questionnaire was analysed using SPSS V 24, adopting, mean score and frequencies. The study discovered that the workers have low awareness about the adoption of the gig economy as a tool for sustainable livelihood strategy. The adoption is hindered by the corrupt practices within the construction industry and poor collaboration among construction workers. The study contributes to practice through the provision of an effective means for improving the livelihood of workers. The study recommends that collaborative practices should be encouraged and awareness regarding the gig economy should be created in the industry.

## **Keywords:**

Construction workers, gig economy, independent contractor, sustainable livelihood.

# BIM KNOWLEDGE AMONG NIGERIAN QUANTITY SURVEYORS

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## Abstract

Building Information Modeling (BIM) has become the new international benchmark for the efficiency of design, construction, and maintenance of buildings. It is the platform that brings about the collaboration between project stakeholders and improvement of project outcomes. BIM with all its potential, the impact of BIM technologies has not really been felt in Nigeria construction industry. The aim of this project is to investigate the BIM awareness level of Nigerian Quantity surveyors. The research was exploratory in nature. A field survey was constructed with the use of a structured questionnaire, self-administered to quantity surveying firms within Lagos state. The survey revealed that professionals are moderately aware but far from implementation. Professional bodies such as the Nigerian Institute of Quantity Surveyors (NIQS) and Quantity Surveyors Registration Board of Nigeria (QSRBN) should organize rigorous awareness campaign (workshops, seminars, training, etc.), to increase BIM awareness among Nigerian Quantity surveyors and the general public. This will prepare Nigerian Quantity surveyors for a technological revolution in the construction industry as witnessed in other construction industries.

## Keywords:

BIM, BIM awareness, BIM implementation, BIM knowledge, global south.



# BARRIERS TO BIM IMPLEMENTATION: CASE STUDY OF NIGERIAN QUANTITY SURVEYORS

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## Abstract

Building Information Modeling (BIM) is an embodiment platform for collaboration to deliver value and efficiency in the construction industry. Its application is not limited to efficiency of design for new construction, but it affects facilities management, maintenance, and renovation of buildings among other applications. Despite the inherent benefits, implementation has been lopsided in the construction industry and among professionals. The aim of this study is to investigate the barriers to implementing BIM by the Nigerian Quantity surveyor; the impact of BIM technologies has not really been felt in the Nigeria construction industry. The research was exploratory in nature. A field survey was constructed with the use of a structured questionnaire, self-administered to quantity surveying firms within Lagos state. The questionnaire sought the perception of the respondents on barriers to BIM implementation of Quantity surveying firms. Cost and client's failure to demand the use of BIM is rated as the biggest barriers to the implementation of BIM among Quantity surveyors in Nigeria. The study concludes that for BIM to be fully implemented among Quantity surveyors in Nigeria, clients will be a major driver and subsidy by the government will also play a large role.

## Keywords:

Barrier to BIM implementation, BIM implementation, Building Information Modelling, global south, quantity surveyor.

# THE POTENTIAL OF INDUSTRY 4.0 TO ENHANCE CONSTRUCTION HEALTH AND SAFETY (H&S) PERFORMANCE

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## **Abstract**

Construction health and safety (H&S) challenges have persisted despite a range of interventions over decades and include adequate hazard identification and risk assessments (HIRAs), real time monitoring of construction-related activities, workers handling heavy materials, plant, and equipment, and ultimately, the experience of injuries. Given the abovementioned, and the advent of Industry 4.0, a quantitative study, which entailed the completion of a self-administered questionnaire online, was conducted among registered professional (Pr) and candidate (Can) Construction H&S Agents, to determine the potential of Industry 4.0 to contribute to resolving the challenges cited. The findings indicate that Industry 4.0 technologies such as augmented reality (AR), drone technology, virtual reality (VR), VR based H&S training, and wearable technology / sensors have the potential to resolve the cited H&S challenges as experienced in construction. Conclusions include that Industry 4.0 technologies can finally address the persistent H&S challenges experienced in construction. Recommendations include: employer associations, professional associations, and statutory councils should raise the level of awareness relative to the potential implementation of Industry 4.0 relative to H&S in construction; case studies should be documented and shared; tertiary construction management education programmes should integrate Industry 4.0 into all possible modules, especially H&S-related modules, and continuing professional development (CPD) H&S should address Industry 4.0.

## **Keywords:**

Construction, health and safety, industry 4.0, performance, South Africa.

# TRAFFIC ACCIDENTS PREVENTION INTERVENTIONS FOR ABU DHABI ROADS

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## **Abstract**

Abu Dhabi faces the challenge of increased traffic congestion and traffic accidents. This study identified interventions and solutions for mitigating road accidents in Abu Dhabi. The study was guided by researcher questions that focused on the causes of accidents and road accident prevention strategies. The study was based on observational descriptive methodology where quantitative data were collected using a detailed survey questionnaire that assessed various aspects relating to the driver's behaviour. The survey data was collected from 400 respondents, which included 200 drivers, 100 police officers and 100 staff in the traffic department. The study findings showed that the common traffic problems on Abu Dhabi's roads include the driver-related factors, vehicular factors, and the road condition-related factors. Risky overtaking, violation of the need to keep a safe distance and violation of speed limits were noted as the major violations that are associated with the traffic problems on Abu Dhabi's roads. According to this study, the effective approach towards the management of road accidents in Abu Dhabi includes the enforcement of regulation regarding the close following, strict speed limits on 80 KM roads, and the introduction of random breath testing of drivers.

## **Keywords:**

Traffic accidents, causes, prevention strategies, Abu Dhabi.

# CONSULTATIVE APPROACH TO BIM IMPLEMENTATION

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## Abstract

Building Information Modeling is transforming AECO industry, it introduces new approaches and new technology as well as collaborative working environment amongst different stakeholders. BIM requires new method of management adapted to the new concept. As a result, a managerial gap within construction industry is created. New skills, expertise and standards have been developed to fulfil the gap. One of the reasons of the shortage of professionals adapted to the new era is the lack of investment in R&D in organizations. One option to bridge the gap in organizations is to involve an external BIM consultancy firm. The role of external BIM consultancy in bridging the gap in Architectural firms is the subject of the research. The objective is to identify the challenges faced by architecture firms in lack of internal R&D and how an external BIM consultancy can bridge the gap. An overview of the literature is discussed, interviews with industry experts verify the concept. The findings approve that lack of R&D in organizations results in lack of skilled professionals which is one of the key reasons of the gap. Other factors such as resistance to change was mentioned as well through the interviews. Recommendations on how to approach the managerial gap are discussed. As well future research related to the subject is proposed.

## Keywords:

Building Information Management (BIM) implementation, research & development (R&D), external BIM consultancy, resistance to change.

# AN APPROACH TO “NATIONAL ANNEX TO ISO 19650-2”

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## Abstract

In the UK the objective of BIM mandate in 2011 was to develop a strategy for introducing and implementing BIM Level 2. PAS 1192-2:2013 was published by BSI and came into effect from February 2013, focused specifically on project delivery and provided specifications for the information management requirements and digital transformation of the built environment. The ISO 19650-1 and ISO 19650-2 were published in January 2019 based on BS 1192 + A2 2016 and PAS 1192-2:2013, providing the international standards and supporting information management process. For certain requirements detailed in ISO 19650-2, each region/country can define and add its own recommendations in the form of National Annex. The aim of the research is to explore the ISO national mirror committee’s interpretation of the “National Annex to ISO 19650-2” content. An overview of the literature is discussed and a survey was conducted to verify the concept. The results of the survey are analysed and recommendation is given. Future researches need to be conducted to approach this concern.

## Keywords:

BIM, ISO 19650-2, ISO 19650 series, PAS 1192 series.

# DRIVERS FOR USING OFFSITE CONSTRUCTION IN IRAQ

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## **Abstract**

The advancement in design and technology, and increasing demand for housing, infrastructure and other facilities in the construction sector to address technical, social, economic and sustainability issues have proven the role of offsite construction (OSC), which can offer a more viable solution than traditional construction. Although most developed countries have already adopted OSC and are benefitting from its advantages, the uptake of this method is low in the Iraqi context. A literature review was conducted to study the adoption of this technology in Iraq, and the drivers for using OSC were identified. A questionnaire survey was subsequently carried out amongst construction companies to examine the relative drivers for using OSC in Iraq. The findings show that drivers like the speed of construction, low costs, high quality, increased productivity, improvements to environmental issues, revision-legislation, labour reduction and improved working conditions were strongly agreed by participants as drivers for using OSC in Iraq. Also, the research investigated the relationships between the identified drivers by using the Spearman rho test. The highest correlation was found between the time and quality factor, while the lowest correlation was found between environmental issues and the legislation factor. Further research will involve the conduct of an interview method with stakeholders from the construction industry in Iraq in order to further develop knowledge about the identified drivers and their relationships. Consequently, a strategy will be created to enhance the use of OSC in Iraq and to assist construction companies to achieve the best application of OSC.

## **Keywords:**

Offsite construction, Iraq.



# **People, Skills and Education**



# DEVELOPING PROFESSIONAL CAPACITY IN THE CONSTRUCTION INDUSTRY THROUGH THE SINO-AFRICAN RELATIONS: A LITERATURE REVIEW

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## **Abstract**

Over the years, China has taken a decisive lead in partnering with Africa. This partnership is fuelled by China's need for energy and Africa's need for infrastructural development. The partnership is perceived as a definitive means to fund numerous projects and access more advanced technology in the African construction industry. Numerous infrastructural projects have been executed since the advent of the Sino-African relations which has drastically decreased the cost of construction for African governments. Chinese firms have made this possible through the importation of capital, skills, equipment, and technologies. Based on this, the current study is aimed at understudying China's efforts towards skills development in Africa with specific emphasis on the construction industry. The study reviewed archived literature on Chinese presence in Africa and how it has influenced the transfer of modern technology and skills. Findings from this study revealed that strategies have been taken within the framework of the Sino African relations to enhance capacity building in the construction industry. However, there are still voids to be filled as the partnership have not distinctively contributed to skills development and technology transfer in the construction industries in Africa. Decisive actions must be taken to ensure that while projects are being executed within the continent, peculiar skills are transferred to the indigenous construction professionals. This will improve the professional capacity within construction industries in Africa.

## **Keywords:**

Sino-African relations, China-African relations, construction industry, skills transfer, technology transfer, capacity development.

# INVESTIGATING REASONS FOR ENGINEERING SKILLS DEFICIENCY IN THE SOUTH AFRICAN CONSTRUCTION INDUSTRY

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## **Abstract**

Over the years, engineering skills shortages have been a serious issue in the construction industry of most developing countries including South Africa. Despite numerous education reform schemes, the country is still facing considerable shortages in the construction industry. This study is therefore aimed at identifying the factors responsible for the deficiency in engineering skills within the South African construction industry. Primary data for the study was sourced from construction professionals within Gauteng Province of South Africa while secondary data was sourced through archived literature. Results from the study identified the major causes of engineering skills shortages in South Africa as; retirement of veteran engineers; low success rate in Science, Technology, Engineering, and Mathematics (STEM) subjects; bad career counselling; and inadequate practical training. It was concluded that organizing efficient career guidance and mentorship programs will boost the availability of engineering skills within the country. Similarly, adequately addressing the issues identified in this study will not only improve the productivity of the construction industry but will also enhance the national economy.

## **Keywords:**

Engineering skills, engineering skills' shortage, construction skills, construction industry, South Africa.

# AN INVESTIGATION INTO THE IMPACTS OF THE TECHNICIANS' SKILLS GAP ON THE DEVELOPMENT OF THE NIGERIAN CONSTRUCTION INDUSTRY

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## **Abstract**

This study investigates the effect of the technicians' skills gaps and its impact on the building construction industry development in Nigeria. The technicians' skills gaps are considered critical in terms of the industry performances particularly in the workforce efficiency. This has led to poor performances of the industry in its competences and productivity, which affected the nation's economy. The paper critically assessed the technicians' skills gaps and most appropriate training on the output of the industry performances. Hence, identify the factors that negate growth in technicians' skills within the industry. The research method for this study is quantitative enquiry, through empirical literature and questionnaire survey. The questionnaire survey received 73% participants' response rate. These Participants are Project Managers, Technicians and Trainers within the Nigerian construction industry in Abuja Metropolis. Collected data was analysed using content means and frequency analysis, descriptive analysis. The findings of this study indicate that there are great demands for skilled workforce within the industry. More so, behavioural issues may exist between the employers and employees, which negate proper construction practices. This suggests that technicians' skills training and development is necessary for the industry to achieve effective output for its future growth.

## **Keywords:**

Construction industry, skill gaps, Nigeria, training.

# **Design and Urban Development**

# USING THE FEDUP GROUP SAVINGS SCHEME MODEL FOR THE PROVISION OF CONTEMPORARY SUSTAINABLE HUMAN SETTLEMENTS

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## **Abstract**

The study aims to understand the Federation of the Urban Poor (FEDUP) group savings scheme model for self-help housing and how it can be used for the promotion of sustainable human settlements. This study, therefore, aims to evaluate this model, whether or not it could be replicated in the central region of South Africa as well as to devise a policy framework in order for the model to be used for housing consolidation in South Africa. The study will use the qualitative research approach for data collection, analysis and presentation. The data collection techniques include semi-structured interviews, structured observations, and focus groups. The preliminary results exemplified how the FEDUP group savings scheme model can enhance the current unsustainable public housing delivery mechanisms. The literature findings also show how this model can be an alternative to the current delivery mechanism for housing in South Africa. This study will, therefore, have a positive social impact by demonstrating how self-help housing can assist in enhancing the current unsustainable government system of low-cost housing provision, through community participation in the housing development process and production of an arguably better housing product. It also has the potential to make contemporary contributions to the public housing policy framework in South Africa.

## **Keywords:**

Community participation, group savings scheme, self-help housing.

# TACKLING SPATIAL INEQUALITIES THROUGH MIXED INCOME HOUSING: A QUALITATIVE ANALYSIS OF STAKEHOLDER PERCEPTIONS

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## **Abstract**

Although several studies have sort to establish the influence of mixed income housing (MIH) on eradicating urban poverty, few of such studies have appraised the utility of MIH initiatives in combating spatial inequalities in a manner that tackles the incidence of urban poverty, particularly in South African cities. This is the gap which this study seeks to contribute to bridging. Adopting a case study research design, this study elicits the perceptions of a cross-section of stakeholders on the development of a new MIH scheme as it pertains to the usefulness or otherwise of proposed scheme in combating urban poverty through spatial restructuring. Semi-structured interviews and a focus group discussion exercise was conducted with purposively selected interviewees and discussants. The emergent data was analysed thematically. Preliminary findings highlight a consensus among relevant stakeholders on the MIH's potential to curb urban poverty through the facilitation of spatial restructuring. However, they observe that the MIH under the present delivery arrangements was only inclined to the geographical aspects of resolving spatial inequalities and not the social relations aspect. This inadequate consideration of the social relation facets signals the potential of the approach to underperform with regards to resolving spatial inequalities, and by extension, urban poverty. This study holds salient implications for stakeholders involved with the planning of MIH developments.

## **Keywords:**

Mixed income housing, qualitative analysis, urban poverty, South Africa.

# INVESTIGATION OF EMOTIONAL STATES IN DIFFERENT URBAN SOUNDSCAPES THROUGH LABORATORY REPRODUCTIONS OF 3D AUDIOVISUAL SAMPLES

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## Abstract

Sounds in urban areas have traditionally been treated as an annoyance for which noise control solutions aim mostly at reducing sound levels. However, recent studies demonstrate that soundscapes could also enhance the quality of life and become a resource for urban planning. This work aims to investigate how human presence in urban settings can modulate human emotional states and change how humans describe soundscapes through audio-visual laboratory reproductions using virtual reality. Several places with representative soundscape categories--exciting, calm, chaotic, and monotonous--in the Manchester (UK) region were identified through structured interviews with local people. Audio-visual recordings using a soundfield microphone and a 360° camera were made at the identified locations. These recordings in different human density (empty, medium, and busy) were subjectively evaluated (self-report) by the participants, regarding the emotional states and soundscape descriptions through an audio-visual reproduction using headphones and a head-mounted device. Pilot results suggest that crowd density may significantly affect soundscape perception. By understanding the emotional responses in different soundscape scenarios, the knowledge of the acoustic environment approaches towards the management of urban sound as a resource for design in practice.

## Keywords:

Human presence; emotional states; soundscape; urban design; virtual reality.

# THE GHANAIAN CONSTRUCTION INDUSTRY AND ROAD INFRASTRUCTURE DEVELOPMENT: A REVIEW

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## **Abstract**

The construction industry contributes largely to the economy of a nation. This makes the industry one of the major backbones of a thriving economy. Employment is created by the industry while infrastructure to facilitate business transactions are also provided by the industry. The Ghanaian construction industry is not an exception to this phenomenon as it helps in shaping the country's economy although there are challenges facing the industry. These challenges have limited the impacts of the construction industry which is patterned after the UK Built environment. Road infrastructure in the Ghanaian construction industry can be traced back to 1850 which started with pathways before they were widened and hammock was used for the road surfacing. Over the years, road network in Ghana has improved and developed to boast of 72,381km road networks in which 75% of the paved road networks are in good condition and 74% of unpaved road networks are in good condition in 2017. Findings from reviewed literature revealed that the Ghanaian construction industry is gaining more grounds and with the recent improvement in the activities of the industry, it is obvious that there are various opportunities emerging from the initiatives that are being put in place in the industry. These improvements among others include the effect of globalisation; Public-Private Partnerships; growth of information and communication technology (ICT). The study concluded that even though the industry is faced with numerous challenges, there are opportunities and innovation to be explored by the construction industry stakeholders.

## **Keywords:**

Construction industry, Ghana, infrastructure, road.



# **THE URBAN GOVERNANCE AND INFRASTRUCTURE NEXUS: DEVELOPING A CONCEPTUAL FRAMEWORK FOR URBAN NIGERIA**

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## **Abstract**

It is widely acknowledged that urban governance is vital to the functioning of cities. Accordingly, scholars and experts continue to suggest that effective and efficient urban governance could help redress the dire infrastructure conditions in African cities, a situation that is being compounded by rapid unsustainable urbanisation. However, the link between urban governance and infrastructure provision has been rarely explored by detailed empirical studies. This work is a precursor to a study that seeks to evaluate urban governance in Nigeria in the context of its potential to facilitate infrastructure and services' delivery. The aim is to provide a conceptual understanding of how urban governance can influence the provision of infrastructure and services based on an extensive review of the extant literature. Based on the literature reviewed, a conceptual framework will be developed. This framework, following refinement, will guide the use of relevant concepts and theories to explain the complexities of governance structure for the provision of infrastructure. It will guide the identification of variables to be measured as indicators for linking good urban governance and infrastructure provision.

## **Keywords:**

Infrastructure, participation, urban governance, system theory.

# **Sustainability and Environmental Systems**

# EXPLORING UNCHARTERED TERRITORIES OF BUILDING ACCREDITATION RATINGS IN THE UK

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## Abstract

There are several factors used to determine the energy performance of buildings. These factors range from the size, location, building fabric and other associated components. There seems to be a streamlined approach in determining the energy performance of buildings. This study intends to broaden the assessment of the evaluation process, explore the key attributes associated with building accreditation and the nature of buildings. The energy performance of buildings and certifications are based on several factors, which culminate into the category of energy ratings for a building. The correlations and significance of building parameters, which are not usually explored in energy performance, were taken into consideration. These factors were taken from 117 samples from the Building Cost Information Service (BCIS) repository for the UK. Based on hypothesis aimed at testing the relationship between procurement, gross internal floor area, type of house, building frame and the number of floors with the energy ratings. The analysis revealed that there is a significant relationship between the type of house, the number of floors in a building and the building energy ratings. The descriptive analysis indicated that the code for sustainable homes; code 3, forms a larger percentage of 49.6% of building energy ratings in the UK. Consequently, the findings in this study related the codes for sustainable homes with the type of house and number of floors. In conclusion, other outliers outside the regular scope of factors have no effect on building accreditations.

## Keywords:

Accreditation, building, ratings, UK.

# CUSTOMISING A RATING SYSTEM FOR ASSESSING SUSTAINABLE HOMES – CASE OF LIBYA

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## **Abstract**

The attention on sustainable homes is driven by the desire to use more environmentally friendly products, that are aligned with the improvement of the health and wellbeing of the occupants, whilst attributing to the reduction of life cycle costs. It is argued that sustainable homes should satisfy the overarching principles of sustainability, fitting in with the local influences of the regional specialities they are built in. The aim of this study is to develop a sustainability-based index of multi-criterion to assist Libyan public home projects in addressing sustainability issues in their activities and strategies. A variety of research methods within a triangulated approach have been adopted in this research, including: a focus group interview; a wide questionnaire survey; and the Analytical Hierarchy Process method (AHP). A set of 43 criteria, grouped into seven broad categories (i.e. Management & Process; Materials Efficiency; Energy Efficiency; Water Efficiency; Waste & Pollution; Health & Wellbeing; Location Quality) has been developed through this research. Water efficiency ranked at the top with 32 credits, reflecting Libyan crisis due to water scarcity. Whilst Libya has alternative and abundant natural energy resources (i.e. so-lar energy, wend, etc.). This has made energy efficiency issues at the second highest priority (24 credits), which can encourage the adoption of more sustainable, renewable energy resources. The sustainability-based index provides a clear vision of what needs to be addressed and what would enable the achievement of sustainable homes in Libya. The Libyan housing industry could benefit greatly from such a rigorous index that aid to design, evaluate and monitor the desired development.

## **Keywords:**

Sustainable homes, sustainability index, rating system, AHP, Libya.

# ENERGY STORAGE FOR INCREASING SELF-CONSUMPTION OF WIND ENERGY AND MARKET VALUE ON A DISTRIBUTION NETWORK

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## **Abstract**

It is desirable to maximize the utilization of renewable energy resources. Wind energy, being a renewable resource, could be generated and stored within the customer premises while using the captured energy to provide various services. To demonstrate the benefits of adding an energy storage at a distribution network having a typical peak load of 1,000 kW and two wind turbines, a 2MW/4MWh storage is installed. All storage options that meet the performance characteristics required are selected for economic and technical analysis. The technical analysis is done through power flow techniques using the NEPLAN 360 modelling tool while an existing market pricing scheme is used in analysing the feasibility of project. To avoid the errors inherent in price quotes, hypothesised price ranges are used in estimating storage costs and a likely payback period of project. New integration possibilities and potential benefits of storage suggest how changes in market conditions could impact the profitability of the project. Self-consumption of wind energy increased by about 10% after introducing the storage. Using the storage to provide stacked market services makes the project more profitable. Policies that encourage the integration of storage in delivering more benefits across the electricity supply chain make storage project profitable.

## **Keywords:**

Energy storage, storage economics, storage services, wind energy, wind self-consumption.

# INTEGRATING H&S REGULATIONS INTO GREEN BUILDING RATING TOOLS FOR MORE SUSTAINABLE OUTCOMES: THE CASE OF THE PEARL RATING SYSTEM (ESTIDAMA) ADOPTED IN ABU DHABI, UAE

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## **Abstract**

Safety needs to be a visceral element of construction processes in order for them to succeed. In that context, the United Arab Emirates (UAE) makes use of Estidama as a tool for building design so as to measure practices relating to sustainable building via its Pearl Rating System. To that end, in essence, it shares some similarities with UK BREEAM measures. Against this backdrop, the current research will evaluate the potential for using Estidama as a tool for implementing systems with a view to track construction workers' health and safety (H&S). It has been pointed out that there needs to be greater appraisal when it comes to these systems within GCC nations and, on a larger level, draw linkages between cultural, socioeconomic, institutional, environments, political, and safety-related elements across construction sites owing to poor levels of understanding. Notably, meaningful comparisons of H&S statistical data could help drive enhanced performance; however, greater degrees of transparency must be ensured and the ability to secure valid information. A systematic literature forms the cornerstone of this research, and exploratory interviews are then undertaken with UAE-based construction professional staff. According to the findings, a lot of work needs to be done in order to enhance H&S performance. Governments need to demonstrate greater commitment towards enforcement, whereas the perception of legislation leaves a lot to be desired. Put simply, the prospect of implementing tools such as Estidama is not impervious to challenge. In a similar vein, questions must be asked about implementing H&S regulations with building green buildings under the same guidelines, methods and structures of green building rating tools systems.

## **Keywords:**

Construction, Estidama programme, environments, sustainability, worker H&S.

# **SUSTAINABLE CONSTRUCTION AND SUSTAINABILITY EXPERTISE – UNDERLYING CONCEPTS: GETTING THE BALANCE RIGHT**

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## **Abstract**

There is a huge discussion on sustainability in literature and in practice but a disparity has been found between construction professionals' understanding of sustainability and how their perceptions of it are translated into practice. Having the requisite sustainability expertise/competencies have been posited to be a way to help bridge this gap. Using a literature review, this paper presents a discussion around what true sustainability is and how sustainability expertise can help achieve more sustainable outcomes in the Built Environment (BE). Sustainable development calls for people skilled at understanding and employing sustainability principles and concepts and thus, efforts to achieve more sustainable outcomes require an examination of the competencies of these technical personnel. This paper examines the very concepts of sustainability and what it is for the case of the BE. Some findings emerging from this research include achieving the right balance among the concepts of sustainability which governs three main pillars; environment, social and economy. True sustainability is not the attainment of any of these concepts in isolation but one that addresses all of these three fundamental pillars of sustainability at the same time.

## **Keywords:**

Built environment, concepts, sustainability, sustainable construction, sustainability expertise.

# SUSTAINABLE CONSTRUCTION IN WAR ZONES: PALESTINE AS A CASE STUDY

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## **Abstract**

Palestinian construction sector suffers from prolonged conflict and numerous restrictions imposed by Israeli occupation; international funds have been focusing on sustainability, but it is not achieved yet. The aim of this paper is to appraise reconstruction in war zones, taking Palestine as a case study, it will discuss the political situation and its impact on construction sector in Palestine, it also attempts to prioritise procedures and tasks involved in reconstruction, trying to set a suitable framework for sustainable construction and trigger sustainability out of war rubble.

Collecting information about sustainable construction in conflict zones is challenging, since valid data is difficult to find. The main data collection instruments are a literature review and a group discussion, with ten construction professionals in Palestine. The debate structure was founded on issues in the literature; data reliability was also supported by interviewing five Palestinian experts in construction and an authoritative figure on green building in Palestine. Participants agreed that issues described in literature are applicable in the context of Palestine. Accordingly, a list of consequences of how war affected the construction industry in Palestine was agreed on, and how they hindered the development of sustainable construction. Methods both on private and public levels were discussed, which aim to create buildings to last, by designing structures that could stand against strikes; thus, using destruction to reconstruct in the right way. Sustainable construction in Palestine should be focusing on high resilience buildings and providing affordable homes. Socio-economic development and planning are needed as post-conflict countries suffer from destruction, poverty and lack of access to basic needs. It is recommended to build stronger institutions and municipal systems for cities to be able to anticipate, endure and rebound from crisis situations.

## **Keywords:**

Conflict zones, construction, Palestine, Palestinian construction, sustainable construction.



# NUMERICAL STUDY ON EFFECT OF FIRE ON STRENGTH OF BLAST WAVE AFTER STAND-ALONE HYDROGEN TANK RUPTURE

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## **Abstract**

Using hydrogen as fuel to power vehicles requires it being stored under high pressures, up to 70 MPa. Such storage conditions present detrimental consequences following a tank rupture due to fire, such as blast wave and fireball. Prior to rupture, a high-pressure hydrogen tank rupture surrounded by fire will experience less chemical reaction due to the limited amount of oxidizer available. This reduces the initial combustion of hydrogen, and less chemical energy contribution to the generated blast wave. The purpose of this study is to numerically simulate a high-pressure hydrogen tank rupture and observe the effect of fire, of areas 2 m<sup>2</sup> and 21 m<sup>2</sup>, on the blast wave. Compared to when rupture occurs without fire present, the starting shock wave pressure in the near field is found to be reduced by half, the effect diminishing outside the fire zone area. The relationship between blast wave pressure, concentrations of hydrogen and oxygen and combustion mechanisms are analysed. These results will aid in creating more accurate consequence analysis and harmful criteria within hydrogen safety, taking into regards the effect of fire prior to rupture.

## **Keywords:**

Blast wave, combustion, fire, hydrogen, rupture.

# COMPRESSIVE STRENGTH ANALYSIS OF CONCRETE FLOOR USING A NON-DESTRUCTIVE TEST

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## **Abstract**

A non-destructive test (NDT) using a Schmidt rebound hammer is used in testing an existing structure because of its ability to access and test strength of concrete components in any part of a building with less labour stress or causes damage to the building structure. This study analyzed the rebound value (R) of an existing concrete floor with 150mm<sup>2</sup> thickness. The rebound values (R) were taken at three (3) different points of the concrete floor of an existing building to determine the relatively compressive strength of the concrete floor area. The standard experimental procedure for the non-destructive test (NDT) using the impact method was followed and the analysis of the result was presented through figures and tables. The result shows that the Rebound value (R) of the concrete floor taken at different points was 24.21N/mm<sup>2</sup> (CF1), 27.51 N/mm<sup>2</sup> (CF2) and 26.18N/mm<sup>2</sup> (CF3). The result further indicates that the average rebound value (R) of the concrete floor area sampled in relation to the compressive strength (MPa) of in-situ concrete is 25.97N/mm<sup>2</sup>. The result shows that the strength of the concrete floor is within the stipulated minimum compressive strength of between 21N/mm<sup>2</sup>- 25N/mm<sup>2</sup> for load-bearing concrete floor in accordance to BS EN 197-1, and this shows that the concrete floor tested is suitable for habitation and can perform its required functions. The study concluded that NDT using Schmidt hammer with its relative simplicity and economy is a suitable test that can be used to determine the strength of existing building structures and its components, where its performance and quality will not be compromised.

## **Keywords:**

Compressive strength test, non-destructive test; rebound value; Schmidt rebound hammer.

# PROPERTIES AND EFFECT OF DORMANT RIVER SAND USED FOR SANDCRETE BLOCK PRODUCTION IN NIGERIA

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## Abstract

River sand used as an aggregate for sandcrete block production is cheap and readily available aggregate materials that are sometimes abandoned on production sites and make dormant for prolonged periods of time before utilization. This study investigates the effect of Dormant river sand (DRS) used as an aggregate material for sandcrete block production in order to determine its suitability in the production of quality and affordable sandcrete block. Data for the study were collected from two different sandcrete block production locations in Ota, Ogun State Nigeria. Silt content, water absorption, specific gravity, sieve analysis, and the compressive strength test was conducted on the DRS to determine its efficiency, quality, suitability, and strength on sandcrete block produced through it. The analysis of the performed experiment on the dormant aggregates was presented through tables and figures. The analysis result of the study revealed that DRS used for block moulding in Nigeria is of quality and is suitable for block production and it meets the specified requirement as stipulated by NIS 2007 for sandcrete block quality and strength parameters. The study concluded that the DRS used as aggregate materials for block production is suitable and has no effect on its quality and strength.

## Keywords:

Bulk density, compressive strength, dormant river sand, sandcrete block, sieve analysis.

# **GEO-EXPERIMENTAL INVESTIGATION OF NSUKKA SANDY SAND: AN EVALUATION OF ITS ELECTROCHEMICAL PROPERTIES AND ANGLE OF REPOSE USING THE FIXED FUNNEL METHOD**

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## **Abstract**

Sand remains an integral part of engineering construction for both building foundation work, road construction work and other engineering construction works. To ensure the safety and durability of engineering construction, it is important to always carry out relevant tests on the materials to be used for the construction. The aim of this study is to determine the electrochemical properties of Nsukka sandy sand and evaluate its angle of repose using the fixed funnel method. The investigation ascertained that Nsukka sand has low salt content and electrical conductivity which ranges from 1090 – 1950  $\mu\text{S}/\text{cm}$ . The pH values fluctuate between 6.6 and 7.1 which signifies that the sand is slightly acidic or basic in nature while the chloride content of the sands was 98.5ppm which satisfies FHWA (2009) specifications, however, two samples out of the eight samples investigated were found to have chloride content slightly above 100. The angles of repose of the samples were measured using the fixed funnel method, the results obtained established that the angle of repose of Nsukka sands varies from  $24.9^{\circ}$  –  $32.2^{\circ}$ , meanwhile there was a slight variation on its specific gravity which ranged from 2.55 – 2.72, these values represent the typical values for sands. From the results obtained from the analysis, it can be said that Nsukka sandy sand is a good material for engineering construction which can involve concreting, backfilling, etc. It is recommended also that this study be repeated with larger sample points from various locations in South East, Nigeria to enable construction Engineers to make better decisions in material selections during construction. Further studies with larger sample points from various locations will also help in performing a good comparative study.

## **Keywords:**

Angle-of-repose, electrochemical-properties, geotechnical-engineering, highway-construction, sandy-soil, cohesionless-soil.

# APPLICATION OF CONSTRUCTION WASTE MINIMISATION APPROACHES DURING THE CONSTRUCTION STAGE: A RESEARCH REVIEW

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## **Abstract**

With the growth of construction waste (CW) generation worldwide, and the resulting environmental and economic impact, construction waste minimisation (CWM) is increasingly becoming more critical. The construction stage and on-site activities contribute to the largest proportion of waste generation in the sector through various causes. A number of waste minimisation approaches have been utilised during the construction process, targeted to solve this problem and towards attaining sustainable construction. This paper contributes towards a review of related literature published in leading journals through Science Direct and Scopus databases, to investigate the CWM implementation levels and barriers during the construction stage, in order to identify research gaps for future studies. The results show that recycling, reusing and legislations are the most adopted approaches for CWM, while behavioural approaches are the least implemented methods by construction's stakeholders. Accordingly, this study suggests that that education and training programmes can be a viable strategy to increase the awareness of the construction stakeholders regarding the effective adoption of recycling and reusing of wasted materials. Moreover, strengthening governmental policies and governmental supervision is very important to minimise and control waste materials in construction projects. Finally, more attention should be paid to the implementation of behavioural approaches, especially financial incentives such as reward mechanisms.

## **Keywords:**

Construction stage, construction waste, construction waste minimisation, review.

# APPLYING THE RESOURCE-BASED VIEW (RBV) THEORY IN SUSTAINABLE PROCUREMENT PRACTICE IN THE AEC SECTOR

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## **Abstract**

In driving the objectives of sustainable development, construction firms have been observed to place ‘sustainability policy’ as a critical issue in their organisational policies. These policies are mostly implemented through their procurement processes. However, studies have shown that construction firms sustainability policies are rarely reflected in their procurement practices. Some of the reasons argued in relation to this are the complexity of the sector (where it is made up of different actors and supply chains) and a lack of clearly defined benefits to be derived in fully implementing sustainable procurement practices. Also, it can be argued that most firms adopt sustainability practices only to gain legitimacy and competitive advantage rather than complying to government laws or directives. Underpinning this research on the Resource-Based View (RBV) theoretical lens, the study through a literature review proposes a conceptual framework that illustrates how firms resources could be effectively utilised to gain a sustained competitive advantage. The firm’s resources are the physical capital resources (digital tools), human capital resources (workers of the firm), and organisational capital resources (supply chains). The firms’ capability in effectively utilising these resources enhances the chances of gaining a sustained competitive advantage.

## **Keywords:**

Organisation resources, resources based view (rbv), sustainability, sustainable procurement.

# PHYSICAL RESILIENCE FACTORS TO ENHANCE COMMUNITY RESILIENCE TO PLUVIAL FLOODS IN THE UAE: THE CASE STUDY OF ABU DHABI CITY

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## **Abstract**

In recent years, the United Arab Emirates (UAE) has become vulnerable to several natural hazards including floods. Flood hazards have become a global concern as they considered a serious threat to lives and livelihoods. Consequently, enhancing community capacity to overcome these hazards has been recognised as an important approach in disaster management. The aim of this paper is to identify the key factors within physical resilience dimension to enhance community resilience to pluvial floods in the UAE. The methodological choice of this study is qualitative exploratory design to understand comprehensively the main factors that influence community flood resilience in the UAE. The case study research strategy is used in this study which was performed in Abu Dhabi city. To collect data, semi-structured interview technique has been conducted with top level management level from different local authorities. The results presented a number of critical factors such as infrastructure capacity, building condition, building design and location of built environment. These key factors benefit communities in the UAE through appropriate preparedness to prevent and mitigate pluvial floods impacts and build more flood resilient communities.

## **Keywords:**

Pluvial flood, vulnerability, resilience, community resilience, Abu Dhabi, UAE.

# A SERVITIZED BUSINESS MODEL FOR IMPROVED CIRCULAR ECONOMY PERFORMANCE IN CONSTRUCTION

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## **Abstract**

The construction industry has continued to deploy traditional business models for project delivery instead of adopting servitized business models or service-led construction assets. This fixation has been blamed for the increasing rates of client/customer dissatisfaction. Clients are being continuously offered products that are not aligned to their business needs thereby impeding maximum functionality. Worse hit by the continued use of traditional project delivery business models in the industry is the increasing quest for improved circular economy performance by clients. Based on the foregoing, this conceptual study seeks to propose a framework for improved Circular Economy Performance using a Servitized Business Model approach within the South African construction industry. Adopting a qualitative case study research design, this study will conduct semi-structured interviews with a purposively selected sample consisting of construction clients and construction company owners. Expectedly, preliminary findings from this study provide an insight into the utility of the servitized business model in achieving the previously mentioned objectives or otherwise, albeit from the perspective of select stakeholders. This conceptual paper forms part of the PhD study which is still in its nascent stages.

## **Keywords:**

Business model, circular economy, construction industry, servitization.



# DISMANTLING BARRIERS TO EFFECTIVE DISASTER MANAGEMENT IN NIGERIA.

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## **Abstract**

Barriers to managing the disaster cycle remains challenging in the built environments' effort to delivering a wholesome contribution to planned and emergency responses. Planning for and responding to the effects of displacement and damage to lives and the built environment resulting from these disaster events require effective forecast, adequate planning and swift responses to recover and reconstruct. The resulting consequences of these disasters have been the foci for disaster planning and management. Current disaster management protocols in Nigeria are bureaucratically centred around policy formulation without adequate inclusion of expertise from the built environment. This paper is focused on examination and assessment of prevailing disaster management efforts. Teasing out project management principles and how applicable these principles could be to improving trust, comprehensive planning and rapid response from stakeholders in the disaster management cycle. Bringing required expertise and knowledge into the built environment curriculum at various levels could be another key step towards improved engagement with core disaster management practices. An effective, inclusive and statute engagement framework initiative that harnesses the vast knowledge and expertise inherent in the construction industry will be invaluable to disaster management processes and efforts in Nigeria in coming years.

## **Keywords:**

Policy, resilience, disaster management, construction industry, inclusion.

# CRITICAL SUCCESS FACTORS THAT ENABLE THE UTILISATION OF AGRICULTURAL WASTE AS BUILDING MATERIAL

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## **Abstract**

A substantial amount of literature suggests that innovation is a process of adding value to a product for sustainable competitive advantage in any organisation. However, the development of agricultural innovation management has resulted in an extensive and disjointed body of literature. In Nigeria, rare literature exists that addresses agricultural waste management, whether in form of a framework or guideline. There is indeed abundant evidence on the utilisation of agricultural waste material for construction purposes to address housing deficits and promote sustainable development. This paper sets out to identify the critical success factors that enable the utilisation of agricultural waste as building materials. However, before attempting to identifying the CSFs, this paper firstly explores the literature that affect the innovation management of agricultural waste as building materials via innovation system, agricultural and construction innovation. This study explores cases from participating stakeholders in selected organisations in Nigeria through semi-structured interviews, which aim to investigate the validity of the critical success factors as identified from literature and to identify new ones. The study finds some critical success factors that enable the use of agricultural waste as building materials in Nigeria. These are: good governance; people/actors; cooperation and coordination; research and development; knowledge transfer and funds and finance. This paper discusses the five most important success factors to present a holistic view of innovation management. From this it is concluded that a few dominant relationships exist among the factors within the innovation system, agricultural innovation and construction innovation.

## **Keywords:**

Actors, agricultural waste, innovation, management, strategy.

# HOW TRAINING CAN SUPPORT LOW CARBON PRIORITISATION IN FLOOD AND COAST RISK MANAGEMENT CONSTRUCTION

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## **Abstract**

This paper presents research work and major findings from both a survey and action research, where a leading government agency and its supply chain was selected as the population for the survey and action research activities. The survey covers participants from the whole value chain within the project lifecycle, since many authoritative sources call for integration, and for change to be implemented in partner organisations; two main actions: implementation of a whole life carbon planning tool (WLCPT) and promotion of low carbon within the public domain by the author have been taken forward. The survey and action research activity results show that training improves low carbon prioritisation, but the type and approach to training also has an influence. This suggests that there is still further work to be undertaken in sharing knowledge and best practice examples across industry, and how the provision of such valuable data and information needs to become integral to project deliverables, to facilitate the change required to fully embed low carbon into flood and coast risk management (FCRM) construction and wider industry. This research supports industry knowledge specifically for evidencing that training supports low carbon prioritisation and that low carbon solutions lead to reduced cost and improved efficiency, specifically in FCRM construction. Evidencing this supports a need for wider changes to organisational culture to fully embed low carbon solutions in public sector construction. This will in turn have an impact on the amount of carbon being used, which can positively affect climate change as a whole. Through the literature review it is evidenced that carbon has an impact on climate change; organisational culture and training can facilitate the successful implementation of new initiatives such as low carbon solutions to support the climate change challenge. However, attempts to embed low carbon into infrastructure construction practice have had limited success to date; the research study demonstrates that training can have a positive influence in embedding low carbon solutions.

## **Keywords:**

Training, low carbon, organisational culture, flood and coast risk management (FCRM).

# A FRAMEWORK TOWARDS THE REDUCTION OF THE ECOLOGICAL AND CARBON FOOTPRINT OF CONSTRUCTION ACTIVITY IN GHANA

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## Abstract

The lack of an empirical framework for the reduction of construction activity carbon and ecological footprint hinders the realisation of sustainability in the built environment in Ghana. In essence, the study sought responses from experts to know how construction companies focus on sustainability to reduce the carbon and ecological footprint of their activities in Ghana. A review of relevant literature was carried out in order to develop a model to reduce carbon emissions levels and ecological footprint of construction activities. A pilot study has been conducted with the goals of testing and adjusting the Delphi questionnaire for the main study. The experts rank the level of integration of sustainability measures in Ghanaian construction industry low and recommended that a sustainable construction framework would help Ghana to achieve sustainability. Therefore, the model to be developed will aid the drive towards a low level of carbon emissions in construction and help in identifying any inefficiency in the use of construction designs and programmes and weaknesses in adhering to specifications. It would also reduce the ecological footprint for an improved built environment in Ghana to influence the realisation of three sustainable development goals (SDG 9, SDG 12 and SDG 13).

## Keywords:

Built environment, carbon and ecological footprint, construction activity, empirical framework, sustainability.

# CONCEPTUAL PERSPECTIVE ON THE SUSTAINABILITY OF COMMUNITY-LED TOTAL SANITATION PROGRAMME IN GHANA

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## **Abstract**

The sustainability of sanitation interventions is a significant challenge. Community-led total sanitation (CLTS) is a sanitation intervention that uses a participatory approach to address open defecation by triggering the emotions of the community members to generate a collective demand for a behavioural change in sanitation. This study seeks to evaluate the performance and sustainability of the CLTS programme by critically examining the activities of institutions and organisations implementing it. A sequential mixed-methods approach is planned for the main study, but the initial findings from desktop research constitute the source of the data shared in this paper. Results from this study will reveal activities that are yielding sustainable outcomes as well as organisations and institutions contributing to the SDG section six; 'provision of sustainable sanitation for all'. A sustainable activity framework designed at the end of the study will serve as a harmonised framework, which can aid in monitoring and evaluation of sanitation interventions by policymakers as well as practitioners and managers implementing CLTS.

## **Keywords:**

Community, health, programme, sanitation, sustainability, Ghana

# DISASTER MANAGEMENT AND THE EFFICIENCY OF HOSPITALS IN NATURAL DISASTERS

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## Abstract

The frequent occurrence of natural disasters is resulting in significant threats to many countries around the world. Adverse impacts and damages can be caused by disasters such as damaging communities and infrastructures. Unexpected disasters also affect service providers, such as hospitals and health centres. As the frequencies and impacts of disasters cannot be controlled easily, there is a need for an effective strategy so that the necessary services can take the required measures to withstand the aftermath of these disaster events. Given the growing importance of hospitals in disaster, the safety and security of hospitals in disaster events have become very challenging. Frankly, the lack of appropriate preparedness and mitigation strategies affect the provision of an appropriate health service for injured people. The purpose of this research is to study and explore the importance of hospitals in natural disaster events and to evaluate the preparedness of hospitals against potential disasters in Iran. A cross-sectional study was carried out to establish the challenges that hospitals face during disaster events and what can be done to prepare hospitals to mitigate against the impacts of disaster events. The qualitative data was used in this research study. The research population concentrated upon disaster managers and hospital employees that have been involved in recent disaster events.

## Keywords:

Disaster events, disaster management, hospitals, preparedness, Iran.

# **BARRIERS TO LOW CARBON TRANSITIONS AND ENERGY SYSTEM INNOVATIONS**

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## **Abstract**

Addressing climate change is a transformative agenda which requires shifts to clean energy technologies that provide sustainable, secure, adequate, reliable and affordable delivery of energy services with high levels of efficiency and environmental performance. While the transition to low carbon technologies has been identified to be effective in mitigating climate, existing systems establish stable technological trajectories which act as barriers to energy transitions and system innovations. Consequently, energy transitions require disruptions in the established order and a whole system reconfiguration with transformational changes not only in technologies but also in consumer behaviours, policies, infrastructure, production networks, business models and market culture referred to as socio-technical transitions. The aim of this paper is to provide an in-depth analysis of the barriers to energy transitions and system innovations as a step towards the development of effective solutions that will trigger the required transformational change to 100% clean energy mix. This paper adopts a socio-technical approach using technology as an entry point to analyse the dynamics of urban energy transitions through an extensive literature review. The findings in this paper reveal that there are technical, social, infrastructural, geographical, organisational and legal barriers to low carbon transitions in the energy system.

## **Keywords:**

Clean energy technologies, climate change, transformational change, socio-technical systems, low carbon transitions.

# OIL AND GAS INDUCED-DISPLACEMENT AND RESETTLEMENTS IN SOUTH-SOUTH NIGERIA

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## **Abstract**

The extraction of oil and gas has been identified by many authors as a mixed blessing for oil producing countries. The impact of oil spills, gas flares and air pollution on the environment and the relationship with existing policies has remained a contentious issue in the handling of involuntary resettlements in the South-South region of Nigeria. International recognition that development-induced displacement has many of the same effects upon the displaced as groups forcibly displaced due to oil and gas activities is growing. The argument is that the disastrous ecological consequences caused by oil and gas have the potential of increasing internal migration. The challenge here is that regulatory agencies have failed to protect communities against the impacts of environmental degradation and the consequences of oil and gas exploration from the multinational corporations and the government. Also, rehabilitation policies designed to mitigate the impact of resettlement have been unsuccessful mostly due to failure of policies and non-participation as in the case of the involuntary resettlement of Finima community, located in the Island of Bonny. This study will adopt the mixed methods combining both semi-structured interviews and questionnaires which will provide a framework whereby guidelines in existing regulatory policies for oil and gas-induced resettlements can be improved.

## **Keywords:**

Displacement, environment, Finima, oil & gas, resettlement.



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