

## ASSOCIATION OF RESEARCHERS IN CONSTRUCTION MANAGEMENT

# THIRTY-FIRST ANNUAL CONFERENCE **2015** September 7-9

Lincoln

Volume 1

Association of Researchers in Construction Management (ARCOM) Proceedings of the 31<sup>st</sup> Annual Conference

#### Edited by Ani Raidén and Emmanuel Aboagye-Nimo

First published 2015

ISBN: 978-0-9552390-9-0 (2 vols)

Published by
ARCOM, Association of Researchers in Construction Management
c/o School of Construction Management and Engineering
University of Reading
PO Box 219
Reading
RG6 6AW, UK

#### © Association of Researchers in Construction Management

All rights reserved. No part of this publication may be reproduced in any material form (including photocopying or storing in any medium by electronic means whether or not transient or incidentally to some other use of this publication) without the permission of the copyright holder except in accordance with the provisions of the Copyright Designs and Patents Act 1988. Authors of papers in these proceedings are authorised to use their own material freely. Applications for the copyright holder's written permission to reproduce any part of this publication should be addressed to:

Dr Ani Raiden Nottingham Business School Nottingham Trent University Burton Street Nottingham NG1 4BU Email: ani.raiden@ntu.ac.uk

#### **ARCOM Declaration:**

The papers in these proceedings were double-blind refereed by members of the scientific committee in a process that involved, detailed reading of the papers, reporting of comments to authors, modifications of papers by authors and re-evaluation of resubmitted papers to ensure quality of content.

#### **FOREWORD**

Welcome to the 31<sup>st</sup> Annual Association of Researchers in Construction Management (ARCOM) conference. As we settle into the new decade of activities, ARCOM has extended the online provision of materials and embraced international collaboration. For the first time, we have prepared a 'live programme'. This is an interactive version of the conference programme, available via MyARCOM (<a href="https://secure.arcom.ac.uk/view\_prog\_whole.php?id=24">https://secure.arcom.ac.uk/view\_prog\_whole.php?id=24</a>). We will use this tool to provide up-to-date information about the conference and give access to the papers being presented in Lincoln online.

As the world of research becomes increasingly digitised and our conference proceedings are less often read in hard copy form, it felt that the papers weren't perhaps getting the same attention they once were. At the time when a hard copy of the conference proceedings was accessible to all delegates, many browsed and read papers during the sessions to find additional information while others perused the proceedings to seek interesting presentations to attend. Often delegates did a bit of both! I wanted to bring back this easy access to the full papers. The authors whose papers are included in these proceedings have worked very hard, in many cases years, to conduct the research they publish here, and so their work should be available, in full, to all at the conference. ARCOM provides an open access source for the conference proceedings and the abstracts of several leading construction management journals and PhD theses within the CM Abstracts database (http://www.arcom.ac.uk/abstracts.php). We will continue to provide all year round access to relevant publications in the field. We hope that this new tool, the 'live programme', will help you navigate your way through the many parallel and plenary sessions, and smoothly access the full papers via MyARCOM during the conference.

In these proceedings we present the rich variety of contributions to the conference. This year our delegates come from 33 different countries with a diverse range of backgrounds, interests and expertise. Sustainability; planning, productivity and quality; building information modelling; and health, safety and well-being continue to draw a large number of submissions. Procurement and risk management also feature as important themes in the conference, together with house building which is increasingly popular topic. Decision-making modelling emerges as a new area of interest.

We present to you 127 papers that were accepted for publication. This is the result of an intense three-stage double-blind review process through which we have been able to maintain high quality standards. Our initial call led to an astonishing 357 abstracts and 192 full papers being submitted. The Scientific Committee have worked very hard to select the final papers for presentation. If your paper is included in these proceedings then you should feel very proud of your achievement!

In addition to the research papers we welcome to the conference our keynote speakers and debate panellists: Professors John Connaughton, University of Reading; Alan Penn, The Bartlett, University College London; Martin Loosemore, The University of New South Wales, Australia; and Deborah Pullen, Building Research Establishment. The debate will address: 'This house believes that the widespread insistence on justifying investment in research with reference to the 'business case' inevitably perpetuates current modes of working and hence hinders innovation.'

The Langford Lecture this year will be presented by Jemma Bridgeman from Construction Youth Trust, Cymru. And, as a follow on from the debate on method in

Portsmouth last year during the 30<sup>th</sup> Annual ARCOM Conference, we are most pleased to introduce a new Spotlight session on Comparative Studies. Professors Henrik Linderoth, Jönköping University, Sweden, and Chris Harty, University of Reading, will chair this discussion of comparisons by country, industry, stakeholder, competences, task, and process.

Putting together the academic programme for the conference is a collective effort, and I thank the ARCOM committee and wider Scientific Committee for their voluntary contribution to making the conference such a success year after year. David Boyd, Paul Chan, Scott Fernie, Chris Harty and Simon Smith in particular have been instrumental in supporting the planning and managing of the conference over the past eight months.

I wish you an enjoyable and inspiring three days in Lincoln; enjoy the diversity of research presented at the conference and proceedings and make the most of the many networking events.

Ani Raidén, ARCOM 2015 Conference Chair, Nottingham Trent University, UK On behalf of the ARCOM Committee

#### **ARCOM COMMITTEE 2014/15**

Dr Ani Raidén, Nottingham Trent University (Chair)

Dr. Simon Smith, University of Edinburgh (Immediate Past Chair)

Dr. Paul Chan, University of Manchester (Vice-chair)

Dr. Chris Harty, University of Reading (Treasurer)

Dr. Fred Sherratt, Anglia Ruskin University (Secretary)

Dr. Shu-Ling Lu, University of Reading (Membership Secretary)

Dr. Robby Soetanto, Loughborough University (Publications Officer)

Dr. Chika Udeaja, Northumbria University (Workshops Convenor)

Dr. Colin Booth, University of West of England

Professor David Boyd, Birmingham City University

Professor Andrew Dainty, Loughborough University

Mr. Steve Donohoe, University of Plymouth

Professor Charles Egbu, London South Bank University

Dr. Scott Fernie, Loughborough University

Dr. Rod Gameson, University of Salford

Professor Chris Gorse, Leeds Beckett University (ARCOM-CIOB Liaison Officer)

Dr. Poorang Piroozfar, University of Brighton

Dr. Niraj Thurairajah, Birmingham City University

Dr. Craig Thomson, Glasgow Caledonian University

Dr. Apollo Tutesigensi, University of Leeds

### SCIENTIFIC COMMITTEE

Adebayo Oladapo University of Central Lancashire

Alex Copping University of Bath

Andre Doree Universiteit Twente

Brian Sloan Edinburgh Napier University

Christian Koch Chalmers University of Technology

Christine Räisänen Chalmers University of Technology

David Blackwood University of Abertay Dundee

David Greenwood Northumbria University

David Johnston Leeds Metropolitan University

David Thorpe University of Southern Queensland

Derek Thurnell United Institute of Technology

Dominic Ahiaga-Dagbui Robert Gordon University

Doug Forbes Dundee University Incubator

Dylan Tutt University of Reading

Emmanuel Aboagye-Nimo University of Brighton

Hannah Wood University of Brighton

John Smallwood Nelson Mandela Metropolitan University

Kjell Tryggestad Copenhagen Business School

Leentje Volker Delft University of Technology

Martin Crapper University of Edinburgh

Martin Loosemore University of New South Wales

Martine Buser Chalmers University of Technology

Monjur Mourshed Cardiff University

Motiar Rahman University of Dundee

Nicholas Chileshe University of South Australia

Patrick Manu University of West of England

Paul Bowen University of Cape Town

Paul Stephenson Sheffield Hallam University

Peter Demian Loughborough University

Richard Fellows Loughborough University

## SCIENTIFIC COMMITTEE CONTINUED

Stefan Christoffer Gottlieb Danish Building Research Institute

Steve Goodhew University of Plymouth

Subashini Suresh University of Wolverhampton

Valerie Caven Nottingham Trent University

Wei Pan The University of Hong Kong

Will Hughes University of Reading

# TABLE OF CONTENTS

## **VOLUME ONE**

DECISION-MAKING MODELLING
A mathematical model for allocating project managers to projects - Lone Seboni and Apollo Tutesigensi
Time-cost-quality trade-off model for subcontractor selection using discrete particle swarm optimization algorithm - Befrin Neval Bingol and Gul Polat
Validation of a model for assessing alliance team integration - Khairil Izam Ibrahim, Seosamh B.  Costello and Suzanne Wilkinson
Pareto oriented optimization of discrete time-cost trade-off problem using particle swarm optimization Saman Aminbakhsh and Rifat Sonmez
LAW AND CONTRACTS41
Soft landings or a bumpy touch down? - Steve Donohoe and Jeremy K Coggins43
Pre-contract assumptions in practice - Hatice Cigdem Demirel, Wim Leendertse and Marcel Hertogh 53
Ownership of materials - Ian Trushell and Siobhan Morrison
Resolving infrastructure-related construction disputes in developing countries - Joseph Mante73
Investigating the factors influencing the quality of adjudication of complex payment disputes in Australia - Samer Skaik, Jeremy Coggins and Anthony Mills
A proposed roadmap to optimise the adjudication of complex payment disputes in Australia - Samer Skaik, Jeremy Coggins and Anthony Mills
RISK MANAGEMENT103
What is risk? Construction activity near hazardous infrastructure - Jan Hayes, Vanessa McDermott and Helen Lingard
Modelling economic risks in megaproject construction - Prince Boateng, Dominic Ahiaga-Dagbui, Zhen Chen and Stephen Ogunlana
Green retrofit projects - Xianbo Zhao, Bon-Gang Hwang and Yi Lin See
The influence of critical infrastructure interdependencies on post-disaster reconstruction - Erica Mulowayi, Vaughan Coffey, Jonathan Bunker and Bambang Trigunarsiah
Integrating value, risk and environmental management at the strategic definition stage - Mohammed Alaqad, Kassim Gidado and Poorang Piroozfar14:
Minimisation of risk exposure at the pre-production stage through the use of contractor-led design management - Seoung Wook Whang and Roger Flanagan
Conceptual framework for risk propensity, risk perception, and risk behaviour of construction project managers - Wenqian Wang, Junqi Zhao, Wenjing Zhang and Yu Wang165
Training provisions for risk management in smes in the UK construction industry - Ali Rostami, Atousa Khodadadyan, James Sommerville and IngLiang Wong175
SUSTAINABILITY IN THE BUILT ENVIRONMENT185
Making sense of corporate social responsibility strategies in construction organisations in the UK - Ankit Singh, John Connaughton and Richard Davies
Making sense of CSR in construction - Greg Watts, Andrew Dainty and Scott Fernie19
Putting a value on young people's journey into construction - Jemma Bridgeman, Alex Murdock, Peter Maple, Christine Townley and John Graham20
The impact of nativist exclusion on the migrant labourers in the South African construction industry - Nthatisi Khatleli
Use of advanced and green construction materials by small and medium-sized enterprises - David Thorpe and Christopher Wright

within the UK co	which waste management legislation affects waste management practices nstruction industry - Solomon Adjei, Nii Ankrah, Issaka Ndekugri and David23
*	nmental emissions in construction phase of buildings in the Australian contex nayake, Guomin Zhang and Sujeeva Setunge
	ouse gas emissions for evaluating actual road construction operations - n and Vacharapoom Benjaoran25
	n stage embodied carbon prediction model - Michele Victoria, Srinath Perera
	opment mechanism concept to building projects - Nathan Kibwami and si
	nergy management initiatives on energy use during the construction phase of illding project in Ireland - Jan Gottsche and Mark Kelly
	ne cost and energy relationship of zero carbon buildings from the life cycle Wang and Wei Pan29
	mance gap in zero carbon homes - Colin Hobart, Derek Thomson, Andrew nie and Douglas Drewniak30
House building in Scotlan	d - Gary Tierney and Stuart Tennant
1 0 1	accounting for embodied carbon emissions in building projects in Uganda - and Apollo Tutesigensi
	erformance gap - Christopher Gorse, David Glew, Dominic Miles-Shenton r
	the UK community energy ownership models - Ayi Iboh and Ibrahim Motaw
	ole retirement villages in Australia - Xin Hu, Bo Xia, Martin Skitmore and
Green campus initiatives a	as projects - Pantaleo M. D. Rwelamila and Neha Purushottam 36
	assessment in sustainability management for urban redevelopment - Daniel Blackwood, Ruth Falconer, John Isaacs and Edward Simpson
e e	arough public sector construction procurement - Christopher Burke and
Sitting between two chairs	s - Christian Koch and Martine Buser
Barriers to social enterpris	se in the UK construction industry - Martin Loosemore
	tion professionals sustainability literacy in North West England - Anthony g Thomson41
	ns of architectural designers to engage with sustainable construction - Niamh oberts and Richard Hind42
	hrough decision processes - Richard Kulczak, Poorang Piroozfar, Marie
Furthering sustainable bui	ilding or not? - Sofia Lidelöw and Susanne Engström
	ty assessment tool to aid organisational learning in construction SMEs - James Jacqui Glass, Andrew Dainty and Ian Nicholson
HEALTH, SAFE	TY AND WELL-BEING46
	ips between mindfulness and stress for construction professionals - Qi Liang ung
stress, among Sou	e importance of job control and support factors, as moderators of workplace ath African construction professionals - Paul Bowen, Peter Edwards and Keit
	nd engagement of construction workers - Nick Bell, Colin Powell and Peter
	and resource typologies within a systems framework - Michelle Turner and

Managing the unknown - Wendy Jones, Alistair Gibb, Chris Goodier and Phil Bust509
Exploring the potential for using video to communicate safety information to construction workers - Ruwini Edirisinghe, Helen Lingard and David Broadhurst
'You couldn't finish the job without breaking the rules' - David Oswald, Emmanuel Aboagye-Nimo, Simon Smith, Ani Raidén and Fred Sherratt
Factors that affect construction safety equilibrium: Nakhon Ratchasima construction crews perspective - Nart Sooksil and Vacharapoom Benjaoran
Is the concept of zero harm an achievable goal? - Brianna Chesworth
Health and safety issues and mitigation measures relating to adaptive-retrofits projects - Frederick Danso, Edward Badu, Divine Ahadzie and Patrick Manu
Evaluating the effectiveness of fall prevention plan - Yang Miang Goh and Wei Min Goh569
Institutional environment and institutional logics in construction safety management - Yunyan Andrea Jia, Steve Rowlinson, Mengnan Xu and Baizhan Li
Doing the 'funky chicken' to communicate on multinational projects - David Oswald, Simon Smith and Fred Sherratt
BUILDING INFORMATION MODELLING599
Moving from static to dynamic measures of BIM success - Ruth Dowsett and Chris Harty601
BIM roadmap strategic implementation plan - Nor Asma Hafizah Hadzaman, Roshana Takim and Abdul Hadi Nawawi
The impact of employee experience in uptake of company collaborative tool - Tamara Longwe, Wayne Lord and Patricia Carrillo
BIM adoption in integrated supply chains - Eleni Papadonikolaki, Ruben Vrijhoef and Hans Wamelink
Investigating the diffusion of 4D BIM innovation - Barry Gledson
Incorporation of expert reasoning into the BIM-based cost estimating process - Shen Xu, Kecheng Liu and Llewellyn Tang
The potential of Building Information Modelling (BIM) for improving productivity in Singapore construction - Evelyn Ai Lin Teo, George Ofori, Imelda Krisiani Tjandra and Hanjoon Kim661
Building Information Modelling energy performance assessment on domestic dwellings - John Spillane, David Stundon, James Lim, Paul Tansey and Marc Tracey
Major project team learning - Edward Simpson, Daniel Gilmour, David Blackwood, Ruth Falconer and John Isaacs
Building information modelling (BIM) within the Australian construction related small and medium sized enterprises - Callum Rodgers, M. Reza Hosseini, Nicholas Chileshe and Raufdeen Rameezdeen
A case study of fostering multidisciplinary in built environment using BIM - Chika Udeaja and Zeeshan Aziz
Building Information Modelling (BIM) software interoperability - Shervin Yousefzadeh, John P.Spillane, Laura Lamont, John McFadden, James P. B. Lim711
Semiotic approach to building information modelling based service model - Bohan Tian and Kecheng Liu
VOLUME TWO
PLANNING, PRODUCTIVITY AND QUALITY731
Client's presence during design - Janni Tjell and Petra Bosch-Sijtsema
Tracing client interests in the course of the project - Megumi Kurokawa, Libby Schweber and Will Hughes
Prioritizing quality over profit - Marina Bos-de Vos, Leentje Volker and Hans Wamelink753
Relative contributions of project quality to customer satisfaction in Nigerian road construction projects - Chimene Obunwo, Ezekiel Chinyio and Subashini Suresh

Causes of delay on infrastructure projects in Qatar - Hassan Emam, Peter Farrell and Madelaal	
Provincial roads capex programme in South Africa - Fidelis Emuze, W S Norgbey and	
An empowered collaborative planning method in a Swedish construction company - Natligren, Mattias Roupé and Mikael Johansson	Mikael Viklund
A framework of total constraint management for improving work flow in liquefied nat construction - Jun Wang, Wenchi Shou and Xiangyu Wang	
An application of value stream mapping for turnaround maintenance in oil and gas ind Wenchi, Jun Wang, Xiangyu Wang and Heap-Yih Chong	
Are contractors' cost accounting practices up to the job of establishing improvement is - Abigail Robson, David Boyd and Niraj Thurairajah	
Construction project change - Stephen Charles, Nadeeshani Wanigarathna and Fred Sl	herratt 83
Developing an artificial neural network model for life cycle costing in buildings - Olu Michael Okoroh and Angela Dean	
Non-parametric bill-of-quantities estimation of concrete road bridges' superstructure - Marinelli, Loukas Dimitriou, Nikolaos Fragkakis and Sergios Lambropoulos.	Marina 85
Spotlight on construction cost overrun research - Dominic Ahiaga-Dagbui, Simon D S  Love and Fran Ackermann	
DESIGN	873
Visualisations and calculations of spaces - Chris Harty, Kjell Tryggestad and Peter Ho	olm Jacobsen . 87
Integration of lean construction considerations into design process of construction pro Md Yusof, Min An and Mahsa H. Barghi	
Pareto analysis on the quality sections/factors prevalence of Nigerian design firms - D Kabir Bala	
Factors in building design that improve building maintainability in Malaysia - Neza Is Mohamad Ibrahim Mohamad	
STRATEGIC ISSUES FOR THE INDUSTRY	91
The significance of diverse economic logics for innovation in the construction industry.  Bygballe, Malena Ingemansson Havenvid, Will Hughes, Finn Orstavik and T	
Strategic alignment within a TMO - Amos Haniff and Stephen Ogunlana	
Understanding competitiveness in complex and dynamic environments - Dilek Ulutaş Stuart Green	
An exploratory study of a CSV concept for achieving firm competitiveness in Hong K firms - Raman Awale and Steve Rowlinson	
CONSTRUCTION EDUCATION	95′
The employability skills provision within a Construction Project Management Degree Yakubu Olawale	
Inclusion of HIV/AIDS awareness in core curricula for Construction Economics and M students - Jane English and Sianne Abrahams	Management
Towards an understanding of building energy management education - Sonja Oliveira O'Flynn	and Patrick
Assessment feedback to enhance student development as effective construction indust Barbara Vohmann, Peter Crabtree, Julian Priddle and Fred Sherratt	ry practitioners -
NEGOTIATION AND CONFLICT MANAGEMENT	99
Formal education and the practise of negotiation - Ian Trushell and Oghenekaro Egwa	re 100
The interaction of trust and contractual governance on dispute negotiation strategy in a subcontractor relationships - Yafan Fu and Shuibo Zhang	contractor-
- secondario remaining remain a wife plianed fining	

HOUSE BUILDING10	31
Developing temporary manufacturing facilities for residential building - Bert Young, Chris Harty, Sh Ling Lu and Richard Davies10	
Discrete-event simulation model for offsite manufacturing in Australia - Sherif Mostafa and Nicholas Chileshe	
Exploring Swedish local planning authorities' perceptions of standardized housing construction - Anders Viking and Lars Stehn10	053
Factors in building design that improve building maintainability in Malaysia - Anthony Iweka and Anthony Adebayo10	063
Detecting defects in the UK new-build housing sector - Tony Hopkin, Shu-Ling Lu, Phil Rogers and Martin Sexton10	
Renewing renovation - Martine Buser and Veronica Carlsson	)83
An approach to sustainable refurbishment of existing building - Saiful Islam Bhuiyan, Keith Jones ar Nadeeshani Wanigarathna	
COMPARATIVE STUDIES11	03
New ways of organising construction due to user demands - Malena Ingemansson Havenvid, Kajsa Hulthén, Åse Linné and Viktoria Sundquist1	105
Comparing safety intelligence in air traffic management and construction - Eleanor Harvey, Patrick Waterson and Andrew Dainty	115
Comparative study of user-centred design approaches - Min Hi Chun, Chris Harty and Libby Schweb	
BIM in Europe - Richard Davies, Florence Crespin-Mazet, Åse Linné, Catherine Pardo, Malena Ingemansson Havenvid, Chris Harty, Chris Ivory and Robert Salle	
When big visions meet the pragmatic practice - Henrik C. J. Linderoth	145
INNOVATION11	55
How do technological niches emerge? - William Robinson, Paul Chan and Thomas Lau	157
Digital innovation in construction - Amna Shibeika and Chris Harty	
Managing the complexity of information flow for construction small and medium-sized enterprises (CSMEs) using system dynamics and collaborative technologies - Khurram I. A. Khan, Rog Flanagan and Shu-Ling Lu	ger
PROCUREMENT11	87
Exploration of factors which affect trust within the context of construction partnering - Jason Challender, Peter Farrell and Fred Sherratt	189
The value of trust in construction supply chains - Jing Xu and Hedley Smyth1	199
Partnering in construction - Jelle Koolwijk, C. van Oel, R. Vrijhoef, J.W.F. Wamelink	209
The impact of the recent economic recession on the NEC contract in Northern Ireland - Tara Brooks and John Spillane	219
A sustainable infrastructure delivery model - Oluwumi Arowosafe, Boris Ceranic and Angela M. De	
Critical success factors in obtaining project financing for private finance initiative projects in Malays - Yati Md Lasa, Norizan Ahmad and Roshana Takim	
Renegotiation of public private partnership road contracts - Ajibola Fatokun, Akintola Akintoye and Champika Liyanage	249
Relational approach of value creation for construction project delivery - Boris Heredia-Rojas, Li Liu and Louis Taborda	
RESEARCH METHODOLOGY AND METHODS12	
Rapid ethnography in construction gender research - Martin Loosemore, Abigail Powell, Megan Blaxland, Natalie Galea, Andrew Dainty and Louise Chappell	271

Trust and construction projects - Henning Grosse  Methodological approach of construction businesses failure projects  Oyedele, Olalekan Toriola-Coker, Hakeem Owolabi	prediction studies - Hafiz Alaka, Lukumo
and Saheed Ajayi	
INDEX OF AUTHORS	130
INDEX OF KEYWORDS	130