Reforming HEI to improve skills and knowledge on disaster resilience among construction professionals

Thayaparan, M, Siriwardena, ML, Amaratunga, RDG, Kaklauskas, A and Lill, I


COBRA2010
2nd - 3rd September


RICS
the mark of
property
professionalism
worldwide


DAUPHINE
UNIVERSITÉ PARIS

COBRA 2010

The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors

Held at Dauphine Université, Paris, 2-3 September 2010

ISBN 978-1-84219-619-9

12 Great George Street
London SW1P 3AD
United Kingdom

www.rics.org/cobra

September 2010

The RICS COBRA Conference is held annually. The aim of COBRA is to provide a platform for the dissemination of original research and new developments within the specific disciplines, sub-disciplines or field of study of:

Management of the construction process

- Cost and value management
- Building technology
- Legal aspects of construction and procurement
- Public private partnerships
- Health and safety
- Procurement
- Risk management
- Project management

The built asset

- Property investment theory and practice
- Indirect property investment
- Property market forecasting
- Property pricing and appraisal
- Law of property, housing and land use planning
- Urban development
- Planning and property markets
- Financial analysis of the property market and property assets
- The dynamics of residential property markets
- Global comparative analysis of property markets
- Building occupation
- Sustainability and real estate
- Sustainability and environmental law
- Building performance

The property industry

- Information technology
- Innovation in education and training
- Human and organisational aspects of the industry
- Alternative dispute resolution and conflict management
- Professional education and training

Peer review process

All papers submitted to COBRA were subjected to a double-blind (peer review) refereeing process. Referees were drawn from an expert panel, representing respected academics from the construction and building research community. The conference organisers wish to extend their appreciation to the following members of the panel for their work, which is invaluable to the success of COBRA.

Rifat Akbiyikli	Sakarya University, Turkey
Rafid Al Khaddar	Liverpool John Moores University, UK
Ahmed Al Shamma'a	Liverpool John Moores University, UK
Tony Auchterlounie	University of Bolton, UK
Kwasi Gyau Baffour Awuah	University of Wolverhampton, UK
Kabir Bala	Ahmadu Bello University, Nigeria
Juerg Bernet	Danube University Krems, Austria
John Boon	UNITEC, New Zealand
Douw Boshoff	University of Pretoria, South Africa
Richard Burt	Auburn University, USA
Judith Callanan	RMIT University, Australia
Kate Carter	Heriot-Watt University, UK
Keith Cattell	University of Cape Town, South Africa
Antoinette Charles	Glasgow Caledonian University, UK
Fiona Cheung	Queensland University of Technology, Australia
Sai On Cheung	City University of Hong Kong
Samuel Chikafalimani	University of Pretoria, South Africa
Ifte Choudhury	Texas A and M University, USA
Chris Cloete	University of Pretoria, South Africa
Alan Coday	Anglia Ruskin University, UK
Michael Coffey	Anglia Ruskin University, UK
Nigel Craig	Glasgow Caledonian University, UK
Ayirebi Dansoh	KNUST, Ghana
Peter Davis	Curtin University, Australia
Peter Defoe	Calford Seaden, UK
Grace Ding	University of Technology Sydney, Australia
Hemanta Doloi	University of Melbourne, Australia
John Dye	TPS Consult, UK
Peter Edwards	RMIT, Australia
Charles Egbu	University of Salford, UK
Ola Fagbenle	Covenant University, Nigeria
Ben Farrow	Auburn University, USA
Peter Fenn	University of Manchester, UK
Peter Fewings	University of the West of England, UK

Michael Murray	University of Strathclyde, UK
Saka Najimu	Glasgow Caledonian University, UK
Stanley Njuangang	University of Central Lancashire, UK
Henry Odeyinka	University of Ulster, UK
Ayodejo Ojo	Ministry of National Development, Seychelles
Michael Oladokun	University of Uyo, Nigeria
Alfred Olatunji	Newcastle University, Australia
Austin Otegbulu	
Beliz Ozorhon	Bogazici University, Turkey
Obinna Ozumba	University of the Witwatersrand, South Africa
Robert Pearl	University of KwaZulu, Natal, South Africa
Srinath Perera	Northumbria University, UK
Joanna Poon	Nottingham Trent University, UK
Keith Potts	University of Wolverhampton, UK
Elena de la Poza Plaza	Universidad Politécnica de Valencia, Spain
Matthijs Prins	Delft University of Technology, The Netherlands
Hendrik Prinsloo	University of Pretoria, South Africa
Richard Reed	Deakin University, Australia
Zhaomin Ren	University of Glamorgan, UK
Herbert Robinson	London South Bank University, UK
Kathryn Robson	RMIT, Australia
Simon Robson	University of Northumbria, UK
David Root	University of Cape Town, South Africa
Kathy Roper	Georgia Institute of Technology, USA
Steve Rowlinson	University of Hong Kong, Hong Kong
Paul Royston	Nottingham Trent University, UK
Paul Ryall	University of Glamorgan, UK
Amrit Sagoo	Coventry University, UK
Alfredo Serpell	Pontificia Universidad Católica de Chile, Chile
Winston Shakantu	Nelson Mandela Metropolitan University, South Africa
Yvonne Simpson	University of Greenwich, UK
John Smallwood	Nelson Mandela Metropolitan University, South Africa
Heather Smeaton-Webb	MUJV Ltd. UK
Bruce Smith	Auburn University, USA
Melanie Smith	Leeds Metropolitan University, UK
Hedley Smyth	University College London, UK
John Spillane	Queen's University Belfast, UK
Suresh Subashini	University of Wolverhampton, UK
Kenneth Sullivan	Arizona State University, USA
Joe Tah	Oxford Brookes University, UK
Derek Thomson	Heriot-Watt University, UK
Matthew Tucker	Liverpool John Moores University, UK
Chika Udeaja	Northumbria University, UK
Basie Verster	University of the Free State, South Africa
Francois Viruly	University of the Witwatersrand, South Africa
John Wall	Waterford Institute of Technology, Ireland
Sara Wilkinson	Deakin University, Australia
Trefor Williams	University of Glamorgan, UK

Bimbo Windapo	University of Cape Town, South Africa
Francis Wong	Hong Kong Polytechnic University
Ing Liang Wong	Glasgow Caledonian University, UK
Andrew Wright	De Montfort University, UK
Peter Wyatt	University of Reading, UK
Junli Yang	University of Westminster, UK
Wan Zahari Wan Yusoff	Universiti Tun Hussein Onn Malaysia, Malaysia
George Zillante	University of South Australia
Benita Zulch	University of the Free State, South Africa
Sam Zulu	Leeds Metropolitan University, UK

In addition to this, the following specialist panel of peer-review experts assessed papers for the COBRA session arranged by CIB W113

John Adriaanse	London South Bank University, UK
Julie Adshead	University of Salford, UK
Alison Ahearn	Imperial College London, UK
Rachelle Alterman	Technion, Israel
Deniz Artan Ilter	Istanbul Technical University, Turkey
Jane Ball	University of Sheffield, UK
Luke Bennett	Sheffield Hallam University, UK
Michael Brand	University of New South Wales, Australia
Penny Brooker	University of Wolverhampton, UK
Alice Christudason	National University of Singapore
Paul Chynoweth	University of Salford, UK
Sai On Cheung	City University of Hong Kong
Julie Cross	University of Salford, UK
Melissa Daigneault	Texas A&M University, USA
Steve Donohoe	University of Plymouth, UK
Ari Ekroos	University of Helsinki, Finland
Tilak Ginige	Bournemouth University, UK
Martin Green	Leeds Metropolitan University, UK
David Greenwood	Northumbria University, UK
Asanga Gunawansa	National University of Singapore
Jan-Bertram Hillig	University of Reading, UK
Rob Home	Anglia Ruskin University, UK
Peter Kennedy	Glasgow Caledonian University, UK
Anthony Lavers	Keating Chambers, UK
Wayne Lord	Loughborough University, UK
Sarah Lupton	Cardiff University
Tim McLernon	University of Ulster, UK
Frits Meijer	TU Delft, The Netherlands
Jim Mason	University of the West of England, UK
Brodie McAdam	University of Salford, UK
Tinus Maritz	University of Pretoria, South Africa

Reforming HEI to improve skills and knowledge on disaster resilience among construction professionals

Menaha Thayaparan
University of Salford, UK
Email address: m.thayaparan@salford.ac.uk

Mohan Siriwardena
University of Salford, UK
Email address: m.l.siriwardena@salford.ac.uk

Chamindi Malalgoda
University of Salford, UK
Email address: c.i.malalgoda@pgr.salford.ac.uk

Dilanthi Amaratunga
University of Salford, UK
Email address: r.d.g.amaratunga@salford.ac.uk

Arturas Kaklauskas
Vilnius Gediminas Technical University, Lithuania
Email address: arturas.kaklauskas@st.vgtu.lt

Irene Lill
Tallinn University of Technology, Estonia
Email address: irene.lill@ttu.ee

Abstract

The built environment is significantly affected by disasters. Firstly, built facilities are expected to withstand such situations. Secondly, the construction industry is expected to play a pivotal role in reconstruction of damaged property & infrastructure. Such responses also call for technological and managerial innovation. Therefore it is important that construction professionals receive continuous skill development to respond to disaster situations and to a disaster resilient built environment. BELLCURVE research project aims to promote the concept of 'lifelong university' in modernising

Higher Education Institutes (HEI) to be more responsive to labour market skills needs. BELLCURVE focuses on the role HEIs play in continuous improvement of the skills and knowledge on disaster resilience among the construction professionals. In this paper an overview of the role of built environment professionals in the context of disaster is presented, and the related demand and supply side issues are discussed. The need to improve responsiveness of HEIs through modernisation of higher education to improve the quality and efficiency of education and training is further explained. Initial conceptual framework of the research is presented. Literature reviewed identified peculiarities of post-disaster reconstruction, justifying the need to provide sector and context specific skills and knowledge to the construction professional. The review also cover issues associated with education and training from HEIs to the construction professional, and also focus on integrating the construction labour market skills needs to the modernisation agenda of the HEIs. In this regard, modernisation of HEI through governance reform is highlighted. Disaster resilience is considered as a test case. The initial conceptual model with the methodology adopted to develop, refine and test the model is also briefed. This paper is expected to stimulate debate as well as be a supportive resource to towards improving skills and knowledge on disaster resilience among construction professionals.

Keywords: Construction professionals, Disaster resilience, Higher Education, Reform, Skills & knowledge.

1. Introduction

The rapid human population growth and its increased settlement concentration in often hazardous environments (such as flood plains, earth quake zones etc), has escalated the frequency and severity of disasters. Disasters are significantly related with human induced development, leading to vulnerabilities to natural and manmade hazards. Disasters lead to human, financial and environmental losses.

EU labour force survey 2008 reported that the mismatch between graduate skills and labour market requirements has been identified as one of the main factors behind graduate unemployment and employer dissatisfaction, particularly in the Built Environment (BE) sector. Some advances have been made in recent years to incorporate the roles of construction professionals into topics such as climate change and sustainability. However, the integration of construction professions with processes associated with Disaster Risk Management (DRM) has largely been ignored (Spence and Kelman 2004). Therefore, it is imperative that HEIs focus on providing continuous support to the construction professionals to build their skills and knowledge thereby be more responsive to specific contexts such as disaster response, recovery and reconstruction / reinstatement.

This paper is based on the EU funded project titled Built Environment Lifelong Learning Challenging University Responses to Vocational Education (BELLCURVE). BELLCURVE aims to modernise the HEIs in order for them to be more responsive to the labour market skills needs. In doing so, the focus of this paper is on the role HEIs play in continuous improvement of the skills and knowledge on disaster resilience among the construction professionals.

Section 2 provides an introduction to the research project BELLCURVE. The construction labour market skills and its changing nature are discussed in Section 3. Section 4 analyses the role of built environment professional in the context of disaster, specifically focusing on demand and supply side issues. Responsiveness of Higher education through governance reform is then discussed followed by the conceptual framework. Finally the conclusion and the way forward of the project are provided.

2. Built Environment Lifelong Learning Challenging University Responses to Vocational Education (BELLCUREVE)

BELLCURVE (Built Environment Lifelong Learning Challenging University Responses to Vocational Education) is an EC (European Commission) funded research project currently being conducted at the Centre for Disaster Resilience, School of the Built Environment, University of Salford, UK, in collaboration with Department of Construction Economics and Property Management, Vilnius Gediminas Technical University, Lithuania and Department of Building Production, Tallinn University of Technology, Estonia. This project address issues associated with the mismatch between graduate skills and labour market requirements as this mismatch has been identified as one of the main factors behind graduate unemployment and employer dissatisfaction, particularly in the Built Environment (BE) sector. Universities in the main tend to offer the same courses to the same group of academically best-qualified young students and fail to open up to other types of learning and learners, e.g. retraining courses for graduates or gap courses for students not coming through the traditional routes. This has slowed down innovation in curricula and teaching methods and hindered the provision of training/retraining opportunities to increase skills and competency levels in the workforce. Thus universities should be able offer innovative curricula, teaching methods and training/retraining programmes which include broader employment-related skills along with the more discipline specific skills. This requires a much clearer commitment by universities to lifelong learning opportunities. Lifelong learning presents a challenge, in that it will require universities to be more open to providing courses for students at later stages in the life cycle.

In addressing this, BELLCURVE considers ‘student engagement’ as a continuous through-life process rather than a temporary traditional engagement limited by the course duration. This through-life

studentship defines the essence of the new innovative "Lifelong University" concept, whereby providing an opportunity for learners to acquire and develop skills and knowledge enabling responds to changing construction labour market needs on a continuous basis. Thereby, universities will increasingly become significant players in the economy, able to respond better and faster to the demands of the labour market through providing opportunities to different types of learning and learners. Universities will not become innovative and responsive to change unless they are given real autonomy and accountability. This requires a reform in governance systems based on strategic priorities to respond labour market needs effectively while promoting lifelong learning agenda.

BELLCURVE aims to promote the concept of 'lifelong university' in modernising Higher Education Institutes (HEI) to be more responsive to labour market skills needs. 'Lifelong university' encourages graduates who are either employed or unemployed to inform their university on labour market skill requirements. This will provide the opportunity for HEIs to be appropriately responsive to provide the required mix of skills for the labour market through training / retraining programmes.

The project focuses on governance reforms in HEIs delivering Built Environment programmes across the EU, emphasising the ERASMUS programme's objective "to contribute to the development of quality lifelong learning and to promote high performance, innovation and a European dimension in systems and practices in the field". To achieve this objective, the existing interactions between the HEIs and the labour market are to be investigated and any improvements that could possibly be imposed on the nature of such interactions needs to be analysed. This demands the concept of lifelong university to be structured into a framework, identifying the possible components which will either directly or indirectly have an impact on the way the lifelong university has to function. In this context the objectives of this project are formulated as, to develop a framework for HEI's to promote the concept of lifelong university in capturing and responding to labour market skill needs in the Built Environment; to refine, test and validate the developed framework through existing HEI Built Environment programmes; to provide recommendations on governance reforms for HEIs to become 'continuing education centres' for graduates while responding to labour market skill needs.

3. Construction labour market skills

3.1 Employability skills

In the global market, modern organisations face high levels of competition. In the wake of increasingly competitive world market the future survival of most companies, depends mostly on the dedication of their personnel to companies. Employee or personnel performances such as capability,

knowledge, skill, and other abilities play an important role in the success of an organisation (Güngör et al. 2009). Selection of qualified human resources, therefore, is a key success factor for an organisation. Due to the competitive nature of the labour market, the individuals are expected to increase their level of employability in order to get selected. The term 'Employability' has been defined in various ways. A review of the literature suggests that employability is about work and the ability to be employed (Hillage & Pollard, 1998). This includes the ability to gain initial employment; the ability to maintain employment and made 'transitions' between jobs and roles within the same organisation to meet new job requirements; and the ability to obtain new employment if required. According to Centre for Employability, University of Central Lancashire, it has been defined as "A set of skills, knowledge and personal attributes that make an individual more likely to secure and be successful in their chosen occupation(s) to the benefit of themselves, the workforce, the community and the economy" (Dacre Pool and Sewell, 2007).

Employability skills are those basic skills and capabilities required for getting, keeping and doing well on a job (Robinson, 2000). UK commission for Employment and Skills (UKCES, 2008) has identified the employability skills under two categories as 'Personal skills' and 'Function skills'. The personal skills consist of self-management; thinking and solving problems; working together and communicating; and understanding the business, whereas the functional skills consist of using effectively the numbers, IT and language. Curtis & McKenzie (2002) have identified communication; problem solving; personal skills; numeracy; information technology and competence in a modern (foreign) language as core skills required for an employee in the United Kingdom. The employers, when recruiting graduates, mainly look for a good degree; specific skills; generic or transferable skills; experience; and personal attribute (Gilleard, 2010). This shows that in addition to the academic achievement, one should be able to demonstrate a good level of skills and competencies to succeed in the employment in today's competitive world.

Based on the aforementioned facts, it is evident that there is a strong connection between the skills and employability. The more skills and knowledge one will demonstrate the more chances available for him getting employed. Therefore reducing or minimising the gap identified between the skills requirements and skills supply will help to increase the level of employability. The HEIs, as a responsible body for knowledge creation and sharing, need to place greater emphasis also on the employability skills of their own graduates in order to prepare them to be competitive and to face the challenge.

3.2 The changing nature of the skills requirement in construction

Construction labour market, due to its labour-intensive, multi-disciplinary and highly fragmented nature, relies highly on the skills and competencies of its workforce. As it involves workers with various disciplinary backgrounds, the industry uses a wide range of technical and managerial skills. For construction project leaders, decision-making, leadership, motivation and communication have been identified as most important skills, in addition to their technical skills (Odusami, 2002). The labour market requirements of the construction industry are of dynamic nature, changing from time to time, due to various factors. Some of the factors contributing to the construction labour market skills crisis and thus affecting the skills shortfalls have been identified (Dainty *et. al.,* 2005). They are demographic decline in the number of people entering the labour market; the changing and fluctuating nature of the market and the related decline in the operative skills; the introduction of the new technologies; the growth in self employment and the use of specialist and labour only sub contractors; the fragmentation of the industry; the decline in the training and related resources; the changes in the industrial structure, wastage rates and industrial competition; and considerable market expansion. In addition to above factors, the recent developments in the economic recession have made a reduction in the labour demand and vacancy levels for construction workers. The employers are thus trying to achieve the maximum utilisation with the minimum numbers of workers. This has resulted in the existing construction workers to concentrate more on acquiring or developing new skills in order to retain in the industry and to meet various skills demand. In relating to this, Dainty *et. al.,* (2005) has identified that the employers need the employees to be able to work in more than one trade area and this has created a need for multi skilled workers. It is, therefore, of utmost important to gain insight into the problems companies face with the level of skills of their own staff and how do they want such skills to be improved. Hence, possessing up-to-date skills and competencies has become a vital role in the construction sector.

4. Role of Built Environment Professional in the context of Disaster

4.1 Demand side issues

Disasters cause a considerable amount of damage around the world every year (Ofori, 2001). There has been an increase in the number of natural disasters over the past few years, and the impact in terms of human, structural and economic losses has increased considerably. According to official statistics issued by the ISDR (2010a) natural disasters have caused the death of more than 780,000 people over the past ten years and destroyed a minimum of US$ 960 billion worth of property and infrastructure. Disasters create significant challenges to the EU which includes the loss of lives and hindering the social economic capacity of the member countries and also of the union as a whole. According to CRED & UNISDR (2009) in the past 20 years, 953 disasters killed nearly 88,671 people in Europe, affected more than 29 million others and caused a total of US$ 269 billion economic losses. Compared to the rest of the world, economic loss per capita is high in Europe mainly because it is very densely

populated. Disaster scholars who have investigated the relationship between development and vulnerabilities have identified that the impact of disasters are likely to increase in the future (Aini & Fakhrul-Razi, 2010).

4.1.1 The impact disasters towards the built environment and vice versa

Constructed facilities represent most of every nation's savings and are vital to the pursuit of economic activities as they provide space needed for the production of all goods and services and offer people the opportunity to enhance their quality of life (Ofori, 2008). It is evident that, most of the material damages of disasters have been on engineering related facilities of the built environment such as buildings, roads, bridges, water supply plants, communication and power services, harbours, etc. and therefore clearing, salvaging, rehabilitation and reconstruction work fully or partly require serious effort of the construction sector. On the other hand the severity of the impact by natural disasters is directly linked to unplanned urban development and ecosystems (ISDR, 2010b). Haiti Earthquake which hit on 12 January 2010 resulted in the death of more than 200,000 people and made up to a million homeless which is an extreme illustration of either unplanned or total lack of development activity required for disaster risk reduction. According to Witte and Llana (2010), the powerful earthquake that struck Chile on 27 February 2010 was far stronger than the one that struck Haiti in January, but the damage was much more contained, with a death toll of 214 which is a thousand times lower than that of Haiti's. It is identified that prevalence of disasters are related to how the built environment is planned, designed, built, maintained and operated (Bosher et al., 2007). Therefore it is important to implement measures such as disaster risk reduction in development activities in order to prevent or mitigate the adverse impacts of future disasters and such measures should be incorporated in policies, programmes and investments of national and local governments (Secretary-General, 2006). In the recent years there has been a growing recognition that the construction industry and the built environment professionals have a vital role in contributing to society's improved resilience which required a multi sectoral and inter disciplinary approach for disaster risk reduction (Haigh & Amaratunga, 2010).

4.1.2 The need to respond, recover, rebuild or reinstate the built environment affected by disaster

The need to respond, recover, rebuild or reinstate the built environment affected by disaster can be identified as a major challenge for the countries affected by disasters. According to Haigh and Amaratunga (2010) the built environment discipline at each stage of disaster management process has invaluable expertise and key role to play in the development of society's resilience to disasters. Disaster management can be defined as a "collective term encompassing all aspects of planning for and responding to disasters, including both pre- and post-disaster activities" (CERO, 2004). It may refer to the management of both the risks and consequences of disaster. According to Aini & Fakhrul-

Razi (2010), sequential development of disasters can be categorised under three different periods namely, pre disaster, disaster and post disaster. “Pre-disaster” is before the hazard interacts with the vulnerable community to cause a disaster (Haigh & Amaratunga, 2010) which includes, operation, incubation, forewarning and activation phases (Aini & Fakhrul-Razi, 2010). “Disaster” deals with the immediate aftermath of the disaster (Haigh & Amaratunga, 2010) but according to the Aini & Fakhrul-Razi (2010) disaster phase includes onset and rescue and recovery efforts. “Post-disaster” is the period of recovery until return of the community to a normal condition (Haigh & Amaratunga, 2010) but according to the Aini & Fakhrul-Razi (2010) post disaster period includes inquiry and reporting, feedback, social justice and social and legislation reforms. Therefore disaster management can be identified as a cycle of inter related activities. According to Warfield (2004), the disaster management cycle illustrates the ongoing process by which governments, businesses, and civil societies plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred. Therefore it is important to take appropriate actions at all points in the disaster management cycle and it will lead to greater preparedness, better warnings, reduced vulnerability or prevention of disasters (Adams and Wisner, 2003). There is a widespread agreement in the literature that disaster management is a continuous process and has no specific end point.

Construction industry and built environment disciplines have a major responsibility in responding to the above context. The expertise of the construction sector is required at the design, construction and operation phases which includes, preliminary phase, pre construction phase, construction phase and post completion phase (Bosher et al, 2007). Apart from the physical construction process the knowledge and the experience of the construction professionals are essential in the disaster mitigation process which can be mainly divided in to two sectors, namely, structural mitigation where construction sector should play an important role and non structural mitigation where an influence of developers and planners are required (Bosher et al, 2007). Structural mitigation refers to strengthening of buildings and infrastructure exposed to hazards via building codes, engineering designs and construction practises etc. and non structural mitigation includes new development away from hazard locations through land use planning and regulations and relocating existing developments to safer areas and maintaining protective features of natural environment.

4.1.3 Peculiarities of post-disaster reconstruction

According to Masurier et al. (2006) the procurement system of a disaster reconstruction project need to address the following factors which explains the unique nature of disaster reconstruction.

- *Short time for rebuilding:* is an important factor in any disaster reconstruction project in order to ensure timely restoration of affected community. In order to ensure speedy reconstruction

different approaches need to be adopted in terms of technology, materials and construction methods.

- *Low cost:* Many poorer countries are reliant on external assistance in the form of loans or a grant to meet their post disaster reconstruction needs (Freeman, 2004). Therefore the low-cost housing is one of the most important components of post-disaster reconstruction (Lizarralde, 2000) and it is important to integrate advanced technologies with available local materials to enable a low cost, local response to disaster reconstruction work.
- *Use of local material, labour and plant:* To ensure a speedy re- construction at low cost it is important that local material, labour and plants are utilised. The parties affected by the disaster could be employed keeping them occupied and also allowing them to make some extra money for their existence.
- *Well developed communication links between parties:* Number of different stakeholders exists in a reconstruction project compared to a normal construction project and therefore a higher level of coordination and management would be needed for programmes of reconstruction following a larger disaster (Rotimi et al, 2006) together with well established communication links.
- *Well developed relationships between parties including trust and respect between parties:* A well developed relationship between parties including trust and respect is of paramount importance in the satisfactory implementation of the re-construction programme. If the parties do not work like a team the entire programme could get retarded.

In addition to the above the post disaster reconstruction differs from normal construction based on following.

- *Funding arrangements:* Unlike developed economies, governments of poorer countries are reliant on external assistance in the form of loans or grants to meet their post-disaster reconstruction needs (Freeman, 2004). Therefore in post disaster reconstruction a complex nature of funding arrangements exist with a combination of governmental funds and external assistance.
- *Project planning and monitoring:* Due to the involvement of international organisations and donors, they may require different methods and tools for project planning and monitoring which require new skills.
- *Stakeholder involvement:* Stake holder involvements in disaster reconstruction projects are greater compared to the normal construction. The main stake holders of a disaster reconstruction projects are client; contractor; consultant; donor; NGO's; INGO's; government and, the beneficiary. It is of paramount importance to form an authority with full powers to monitor, control and guide the re construction work. Many INGOs with little knowledge of the local

regulations and condition would be involved with the re-construction work they will require lot of guidance and assistance in carrying out their work. Further it should be a powerful body which could take quick decisions which the other stake holders would adhere to without hesitation.

- *Adaptation of disaster risk reduction strategies:* Developing and adopting resilient technologies is of paramount importance in order to prevent the vulnerabilities to future disasters. Therefore the key construction stakeholders should be responsible for integrating resilience in to design, construction and operation process (Bosher et al, 2007).

In recognition of the devastating and long term impacts of disasters the term "resilience" has been widely adopted by researchers and policy makers in an attempt to describe the way in which the society's susceptibility to the threats created by disasters can be minimised (Haigh & Amaratunga, 2010). The resilience need to be systematically built in to the whole design, construction and operation process and not simply added on as an afterthought (Bosher et al, 2007). Therefore it is important to integrate disaster risk reduction strategies in to design, construction and operation process in order to ensure more resilient built environment. Mileti (1999) too have identified the importance of improved engineering for buildings and infrastructure in order to minimise the adverse impacts of disasters. Hence it is necessary to provide the construction industries with the requisite capacity and capability to enable them to plan, design and attend to their construction work in such a way so as to reduce their vulnerability to disasters, and to respond effectively to disasters to save and protect lives, rehabilitate vital infrastructure, and reinstate economic activities (Ofori, 2004).

4.1.4 Response of built environment professionals towards contributing to disaster resilience

In post-disaster reconstruction, several factors need to be considered as explained above and therefore required specific knowledge and skills to effective and efficient coordination of various stakeholders, management and reporting of finances, and in terms of technology and construction methods. Different technology and construction methods are required to ensure timely reconstruction to restore the affected community back to normality at a reduced cost. It is encouraged to use local material, plant and labour for reconstruction activities in order to ensure community participation. The underlying theorem is that more the recovery relies upon local resource, the quicker the community will be able to move to self-sustainability, and thus from recovery to normalcy (Lawther, 2009). Also it is a key factor to note the importance of built environmental professionals in adopting risk reduction strategies in post disaster reconstruction, in terms of structural as well as non structural mitigatory measures to ensure proper disaster resilience. Therefore the built environment professionals need to adopt different strategies in planning, resourcing, implementing and monitoring of reconstruction activities after an occurrence of a disaster. According to Keraminiyage et al (2007), the construction

industry has a much broader role to anticipate, assess, prevent, prepare, respond and recover from disruptive challenges in the case of post disaster recovery. All reconstruction work should be well planned in order to avoid future vulnerabilities to disasters and in this regard the efforts of the construction professionals are very important in decision-making and implementation of reconstruction work.

In this context, educating the construction professional to make them act efficiently and effectively in a disaster situation is vital. HEIs delivering Built Environment programmes have a major responsibility to provide specific skills and knowledge that are necessary to be acquired and apply in a disaster situation by the construction professionals. The lifelong learning opportunities further enhance this provision as it will facilitate the HEIs to act as a continuing education centres providing skills and knowledge in a dynamic environment.

4.2 Supply side issues

The responsibility of higher education, in particular aimed at facilitating through-life learning, was highlighted in previous sections. This section briefly discusses the some of the relevant supply side issues.

4.2.1 Competency based learning vs Transformative learning

Built environment requires a diverse range of professionals such as Architects, Engineers, Surveyors, planners and others teaming up to deliver the products and services. Therefore, education and training of such professionals is a major aim of most built environment educational programmes in HEIs. This has resulted in competency based education being a major influencing factors for the design and conduct of BE HEIs. Newton (2009) argues that professional accreditation bodies have been advocates of competency based approaches to HEIs, and also note the nature of university education, where the constraints on course structure, the teaching traditions etc. collectively militate against effective competency based educational models. Newton (2009) also highlights the growing disagreements between educational providers, legislators and professionals associations about what competency means and what the nature of the expertise actually is. As a response transformative learning is presented as an alternative. This psyco-social approach moves the focus way the individual learner gaining a discrete body of abstract knowledge, acquired and subsequently applied in practice. It treats learning as an interpretive process in which understanding is related to action contexts, and not to prescribed conceptual structures.

4.2.2 Existing methods to improve the skills levels of construction labour market

All the construction related jobs are included within the list of shortage of occupancy which is frequently researched and published by the UK Boarder Agency. This clearly shows the pertaining

demand for the construction jobs and the difficulties of recruitment within the domicile of UK workers. The construction industry increasingly relies on migrant workers. However, it faces difficulties as the recruitment of new staff in England has been severely affected by the economic downturn (CITB Construction Skills, 2009).

The present conditions challenge the employees to possess and be able to demonstrate a range of skills in order for them to retain in their jobs. It demands the employees to improve their skills and acquire new skills. Further, the changing nature of the labour market and introduction of new technologies have also led the employees with no option but to enhance their skills. This can be achieved through training and development activities.

There are basically two types of training, namely on-the-job training and off-the-job training. The former helps employees to develop and improve their work skills whilst doing the job. This type of training includes demonstrations, instructions on how to perform the job effectively, learning by doing, etc. Employees are also encouraged to develop their skills through off-the-job training courses. These could include training from external professional or educational centres; undertake short courses, distance learning or sandwich courses that are useful for their job; and self-learning. In this regard, Personal Development Planning (PDP) contributes to increase the level of employability. PDP is directly relevant to employability and it helps students to translate their learning experiences into the language of employability. It also develops skills which could help students to sustain their employability (Ward, 2010).

Skills utilisation has been identified as another important factor which will contribute to meet the labour market requirements. One of the key gaps in the existing sources of labour market information is on the issue of how employers make use of the skills their employees possess (UKCES, 2010). Policy makers from across all four UK nations are now increasingly turning their attention to the issue of skill utilisation in the workplace and this is a development that is likely to exacerbate as there is a widening realisation that 'there is little value to an organisation having a skilled workforce if the skills are not used well' (UKCES, 2009: 11).

4.2.3 Challenges to integrated approaches

In the quest for creating the capacity for a disaster resilient built environment, the need for a multi-disciplinary approach has been highlighted (Haigh & Amaratunga, 2010). The need for capacity enhancement within different sectors of the society such as governments, institutions and communities in relation to built environment has also been pointed out (Ginige et al, 2010). Given the obvious role that the educational and training approaches to built environment professional play in this regard, it is worth investigating some of the observations made in the BE education literature.

There have been various efforts to promote integration between built environment disciplines including that of Latham (1994) and Egan (1998) reports. The need for integration in the delivery of built environment education has also been identified a considerable time ago (Wood, 1999). However, Wood (1999) reported the use of interdisciplinary, cross-disciplinary, inter-professional, multi-disciplinary and commonality in an interchangeable manner. Although they are closely inter-related, the need to recognise their subtle differences has been highlighted.

Three key barriers to interdisciplinary studies, namely faculty structures, staff relationships, resource pressures and the influence of external accreditation bodies have been reported (Wood, 1999). With specific reference to faculty structures and resource pressures, the study observed scepticism among BE academics. "... that the issue of interdisciplinary may be hijacked to achieve even more commonality and therefore save money. The quest for efficiency gains tends to put things into pigeon holes more than ever" (Wood, 1999, p 378).

Chapman (2009) examined the andragogical challenges to interdisciplinary working in built environment education, the different instruments and approaches that are used in planning, design, development and property management; and the diverse interests at work at different spatial and temporal scales. "Built environment disciplines span a wide diversity of concerns and actions, from the realisation and management of development and places through to spatial planning at great territorial settings" (Chapman, 2009, p 10). "....integration of analysis and problem-farming between disciplines is an essential precursor to any possible integration of decision making. It is this that has the most transformative potential in the built environment education. In this the structures of the curriculum and the philosophy of programmes are important, but is vital that the framing of learning activities enable students to develop deeper appreciation of the interrelationships between diverse actions in space, time and purpose in the actual spaces that are our built environment" (Chapman, 2009, p 25)

Engagement with the industry is seen as a requisite to rapidly changing industry requirements (Heesom et al, 2008; Lambert Review, 2003; Leitch Review, 2006). Construction Knowledge exchange initiative centred around Continuing Professional Development (CPD) and action learning are used in the industry (Heesom et al, 2008).

Further, the lifelong learning is an emerging concept of acquiring new skills throughout the life of an employee. The CITB Construction Skills (2009) has identified that more employers are supporting the lifelong learning and have begun to use associated products and toolkits. Little has been realised by

the HEIs to adopt lifelong learning within their education system, despite the fact that lifelong learning is a core concept in modern education.

In this context, it is vital to explore the role of HEIs in the lifelong learning and how could they continuously support the construction workers, throughout their life time, through training and re-training programmes. This research will help HEIs to increase the duration of their student-engagement, which is presently limited to the course duration.

5. Responsiveness of Higher Education through Governance reform

The objective of this project is directly linked various strategies such as Lisbon strategy, EU 2020, E&T 2010, and Modernisation agenda for universities. Europe faces major structural challenges such as globalisation, climate change and an ageing population. The economic downturn has made these issues even more pressing. In order to address these challenges, Lisbon Strategy was set out, based on a consensus among Member States, to make Europe more dynamic and competitive, in a sustainable way and while enhancing social inclusion. The Lisbon strategy thus aims to stimulate growth and create more and better jobs, while making the economy greener and more innovative. (Europa press room). The 'EU2020' Strategy, the successor to the Lisbon Strategy, highlights education as a key policy area where collaboration between the EU and Member States can deliver positive results for jobs and growth. This strategy shows how the EU can come out stronger from the crisis and how it can be turned into a smart, sustainable and inclusive economy delivering high levels of employment, productivity and social cohesion (EC). If Europe is not to lose out to global competition in the education, research and innovation fields, this crucial sector of the economy and of society needs in-depth restructuring and modernisation. In this framework, higher education has an important role to play. Governments and higher education institutions are looking for ways to creating better conditions for universities. At the same time, the strategic framework for European co-operation in education and training ('ET 2020'), adopted by the Council in May 2009, underlines the need to promote the modernisation agenda for higher education to improve the quality and efficiency of education and training (Council of the European Union).

The main areas for reform identified in the agenda are (EC):

- Curricular reform: The three cycle system (bachelor-master-doctorate), competence based learning, flexible learning paths, recognition, mobility.
- Governance reform: University autonomy, strategic partnerships, including with enterprises, quality assurance.
- Funding reform: Diversified sources of university income better linked to performance, promoting equity, access and efficiency, including the possible role of tuition fees, grants and loans.

The modernisation agenda also supports the Bologna process, which was launched in June 1999, when higher education ministers from 29 countries (including the UK) signed a Declaration setting out what needed to be done to enhance the mobility and employability of European citizens and increase the competitiveness of European higher education through the creation of a single European Higher Education Area by 2010.

Since BELLCURVE focuses on integrating the construction labour market skill needs to the modernisation agenda of the HEIs in the Europe, the vision to increase corporation between the higher education and the enterprises is the core of this project. Challenges faced by construction enterprises are fed to the European higher education agenda through the lifelong learning feedback loop, thereby ensuring the subject content of the European HEIs is dynamic, and of high quality, to address the market needs.

One of the main areas of reform as identified in the modernisation of agenda is governance reform which is where the focus of the BELLCURVE lies. Governance of higher education has both direct and indirect links with the curriculum and funding systems. The reform in governance might therefore have an impact on the way a curriculum is developed and delivered and on the system of funding, and vice versa. In terms of response to the changing labour market requirements, the governance reform proposed through this project ensures that the HEIs will be more agile and dynamic in providing the appropriate mix of skills and knowledge, to the target audience at the appropriate time.

The Organisation of Economic Cooperation and Development (OECD) define governance as "The system by which business corporations are directed and controlled. The corporate governance structure specifies the distribution of rights and responsibilities among different participants in the corporation, such as the board, managers, shareholders and other stakeholders, and spells out the rules and procedures for making decisions on corporate affairs." Shattock (2006) defines university governance as: "the constitutional forms and processes through which universities govern their affairs". Shattock further adds that while governance and management are theoretically separate functions, they have close interrelationships in the higher education context, in a way not always seen in the corporate world because governance operates at many more levels in the university context than in many other fields. The governing body shall ensure compliance with the statutes, ordinances and provisions regulating the institution and its framework of governance and, subject to these, it shall take all final decisions on matters of fundamental concern to the institution. (Committee of University Chairs, 2009). Therefore, the governance of HEI is responsible for effective and efficient way of providing education which is of high quality and sustainable.

The Chair of the committee of University chairs, Sir Andrew Burns says 'In particular, universities and colleges must respond to heightened expectations from their students, from Government, from business and from their own academic and professional staff. Learners are more demanding. Government seeks to underpin economic growth and social inclusion. Business and industry look for graduates with stronger and more relevant skills to compete in the world economy. And those who work in the higher education sector have greater expectations of their career opportunities and progression' (Committee of University Chairs, 2009). He further states that governing bodies must therefore also be ambitious, as they seek to mould the circumstances which will convert those aspirations into successful outcomes within a robust and reliable framework of governance. (Committee of University Chairs, 2009). Therefore, when providing recommendations to the governance reform for HEIs to be more responsive to the construction labour market skills needs, the funding and curriculum issues will also be taken into consideration. The next section illustrates the conceptual framework developed for the project and briefly explains the outline research process.

6. Conceptual Framework

A conceptual framework explains, either graphically or in narrative form, the main things to be studied – the key factors, constructs or variables – and the presumed relationships among them (Miles and Huberman, 1994: 18). Accordingly, this project has developed an initial conceptual framework and this will be continuously improved as the project progresses. The Figure 1 illustrates the initial conceptual framework.

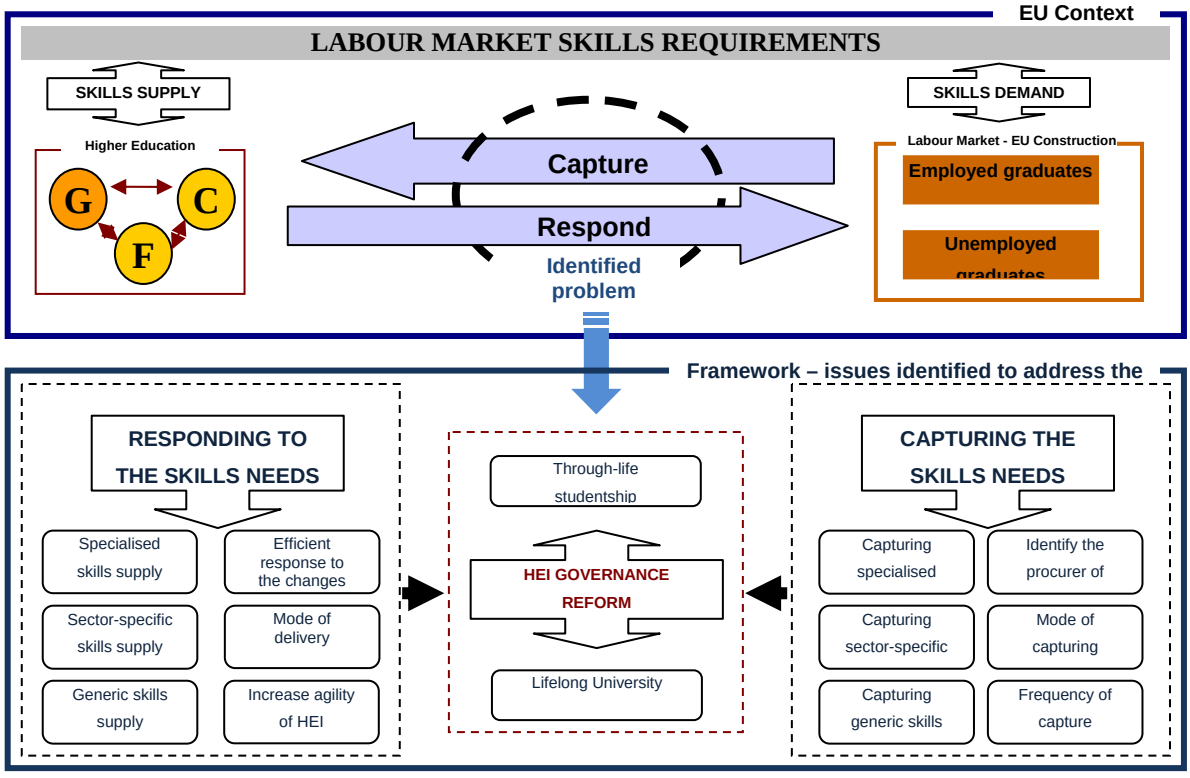

Figure 1: Conceptual framework

As discussed in Section 4, the labour market skills requirements for built environment professional in a context of disaster are perceived with the demand and supply side issues. As a body for knowledge creation and sharing, the HEIs are expected to fulfil the labour market requirements. However, the problem was spotted within the process of capturing the skills requirements of the EU construction labour market and the process of appropriately responding to such requirements by HEIs, despite that HEIs are one of the major suppliers of skills and knowledge. In order to address this problem, it is important to consider the process of capturing and responding to the needs as a whole.

As shown in Figure 1, all three areas of reform that are Governance (G), Funding (F), and Curriculum (C) are identified as the major components to deal with within the higher education system. Nevertheless, the major focus of the research will be on governance reform where it aims to minimise the mismatch identified between the skills demand and the skills supply. In this regard, three major elements such as Capturing skills needs (Demand), Responding to the skills needs (Supply), and HEI Governance reform have been identified and included within the initial framework as shown in Figure 1. All the issues associated with these 3 elements will be analysed in order to address or minimise or resolve the identified problem. This process involves 4 phases such as framework development, framework refinement, framework validation and research conclusion. In order to provide the initial input for the framework, a thorough literature analysis will be conducted. This will help to identify the issues associated with the framework development. The developed framework will then be refined based on expert interviews and focus group. The purpose of this phase is to ensure that the developed framework captures all the important components associated with the identified research problem. Once the framework is developed and refined, then it needs to be validated for its practicality. A case study strategy has been chosen to achieve this purpose. As a contribution of the research carried out in all 3 phases, recommendations will be provided on governance reform for HEIs to become continuing education centres for graduates while responding to labour market skills needs. These will be in the form of best practice guidelines and policy documents which will finally be disseminated to the stakeholders of the EU HEIs and construction labour market. This will ultimately lead the HEIs to provide lifelong learning to the graduates and in turn to become lifelong universities.

7. Conclusions and way forward

BELLCURVE research project aimed at modernising the HEIs thorough governance reforms in order for them to be more responsive to the labour market skills needs, considers disaster resilience as one of the skill areas to be taken into account as a test case. The peculiarities of disaster contexts require

specific skills such as multi-disciplinary studies, as well as innovative delivery methods. The challenges to delivering integrative educational approaches have been identified, hence pointing out the need for further investigation. The conceptual framework of BELLCURVE recognises the interwoven nature of governance, curriculum and funding, and therefore will inform and guide the future stages of the research.

8. Acknowledgments and notes

BELLCURVE research project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Prof. Dilanthi Amaratunga is the principal investigator of this project. Dr. Chaminda Pathirage, Dr. Kaushal Keraminiyage, Dr. Udayangani Kulatunga & Mohan Siriwardena of the School of Built Environment, University of Salford, United Kingdom; Prof. Arturas Kaklauskas of Department of Construction Economics and Property Management, Vilnius Gediminas Technical University, Lithuania; and Prof. Irene Lill of Department of Building Production, Tallinn University of Technology, Estonia are co-investigators of this project. More information on BELLCURVE can be obtained from the project website http://www.disaster-resilience.salford.ac.uk/bellcurve

9. References

Adams, J. and Wisner, B. (2003), *Environmental health in emergencies and disasters: a practical guide* [online]. World Health Organization. Available from: http://www.who.int/water_sanitation_health/hygiene/emergencies/emergencies 2002/en/ [Accessed 19 May 2006].

Aini, M.S. and Fakhrul-Razi, A. (2010 in press), Development of socio-technical disaster model, *Safety Science,* DOI.

Bosher, L., Dainty, A., Carrillo, P. and Glass, J. (2007), Built-in resilience to disasters: a pre-emptive approach, *Engineering, Construction and Architectural Management,* 14(5), Pp 434-446.

Central Emergency Relief Organization- CERO (2004), *Disaster Management for Students, Managing Disasters* [online]. Barbados, Central Emergency Relief Organization. Available from: http://cero.gov.bb/pages/ students.html [Accessed 13 May 2006].

Chapman D. W. (2009), Knowing our places? Contexts and edges in integrating the disciplines in built environment education, *Journal of Education in the Built Environment*, 4(2), Pp 9-28

CITB - Construction Skills (2009), *CITB - Construction Skills: Annual Report and Accounts 2008* [Online], Construction Industry Training Board, Available from http://www.official-documents.gov.uk/document/hc0809/hc03/0326/0326.pdf. [Accessed May 2009].

Committee of University Chairs, (2009), *Guide for Members of Higher Education Governing Bodies in the UK*, HEFCE

Council of the European Union (2009), *Council Conclusions on a strategic framework for European cooperation in education and training ("ET 2020"),* 2941th Education, Youth and Culture Council meeting, Brussels, 12 May 2009

CRED and ISDR, (2009), *Floods, droughts and storms: a major threat for European countries* [online]. Centre for research on the epidemiology of disasters and International Strategy for Disaster Reduction – ISDR. Available from: http://www.preventionweb.net/english/professional/news/v.php?id=8229 [Accessed 13 May 2010].

Curtis, D. and Mckenzie, P. (2002), *Employability skills for Australian industry: Literature Review and Framework Development* [Online], Australian Council For Educational Research, Available from: http://www.decs.sa.gov.au/learningandwork/files/links/literature_researc_1.pdf.

Dacre Pool, L. and Sewell, P. (2007), The Key to Employability: Developing a practical model of graduate employability, *Education and Training*, 49 (4), Pp 277-289.

Dainty, A.R.J, Ison, S.G., and Briscoe, G,H. (2005), The construction labour market skills crisis: the perspective of small-medium-sized firms, *Construction Management and Economics*, 23, Pp 387-398.

European Commission (EC) (2010), Available at http://ec.europa.eu/education/higher-education/doc1320_en.htm [Accessed August 2010]

Egan, J. (1998), Rethinking Construction, [Online], Available: http://www.mosaicprojects.com.au/PDF/rethinking_construction.pdf, [Accessed March 2010]

Europa Press room (2010), available at http://europa.eu/press_room/press_packs/lisbon_strategy/index_en.htm [Accessed August 2010]

Freeman, P.K. (2004), Allocation of post disaster reconstruction financing to housing, *Building research and information, 32(5), Pp. 427-437*.

Gilleard, C. (2010), The graduate market place and what employers look for in graduates (Presentation), Association of Graduate Recruiters, *Careers and Employability Internal Conference*, Salford, 16 April 2010, The University of Salford.

Ginege, K., Amaratunga, D., and Haigh,R. (2010), Enhancing Capacities for Disaster Mitigation and Reconstruction in the Built Environment: A Case study from Sri Lanka, *CIB World Congress 2010: Building Better World*, May 10th - 13th, The Lowry, Salford Quays, United Kingdom

Güngör, Z., Serhadlıoğlu, G., and Kesen, S.E. (2009), A fuzzy AHP approach to personnel selection problem, Applied Soft Computing, 9 (2), Pp 641-646

Haigh, R. and Amaratunga, D. (2010), An integrative review of the built environment discipline's role in the development of society's resilience to disasters, *International Journal of Disaster Resilience in the Built Environment, 1(1), Pp. 11-24*.

Heesom, D., Olomolaiya,P., Felton,A., Franklin, R., and Oraifige, A. (2008), Fostering Deeper Engagement between Industry and Higher Education: Towards a Construction Knowledge Exchange Approach, *Journal for Education in the Built Environment*, 3(2), Pp 33-45

Hillage, J. and Pollard, E. (1998), *Employability: Developing a Framework for Policy Analysis – Research Brief No 85* [Online], Department for Education and Employment, Available from: http://www.dcsf.gov.uk/research/data/uploadfiles/RB85.pdf [Accessed October 2009].

ISDR. (2010a), *Earthquakes caused the deadliest disasters in the past decade* [online]. International Strategy for Disaster Reduction – ISDR. Available from: http://www.unisdr.org/news/v.php?id=12470 [Accessed 28 Feb 2010].

ISDR. (2010b), *Strategy outline for the 2010-2011 ISDR world disaster reduction campaign on building resilient cities, addressing urban risk* [online]. International Strategy for Disaster Reduction – ISDR. Available from: www.unisdr.org/.../campaigns/campaign20102011/.../230_CampaignStrategy.doc [Accessed 28 Feb 2010].

Keraminiyage, K., Haigh, R., Amaratunga, D. and Baldry, D. (2007), EURASIA: Role of construction education in capacity building for facilities and infrastructure development within a developing country setting, *Proceedings of the CIB World Building Congress 2007,* 14-18 May, Cape Town, South Africa.

Lambert, R. (2003), *Lambert review of business-university collaboration*, London: HM Treasury.

Latham, M. (1994), *Constructing the Team*. London: The stationary office.

Lawther, P.M. (2009) Community Involvement in Post Disaster Re-construction – Case Study of the British Red Cross Maldives Recovery Programme. *International Journal of Strategic Property Management*, 13, Pp153-169

Leitch,S. (2006), *Prosperity for all in the global economy – world class skills*, London: HM Treasury

Lizarralde, G. (2000), *Reconstruction management and post disaster low cost housing; the case for social reconstruction* [online]. Montreal: Available from: http://www.irec.net/upload/File/memoires_et_theses/252.pdf [Accessed 29 February 2010].

Masurier, J.L., Wilkinson, S., and Shestakova, Y. (2006), An analysis of the alliancing procurement method for reconstruction following an earthquake, *Proceedings of the 8th US national conference on earthquake engineering,* 18-22 April, California, USA.

Miles, M.B. and Hurberman, A.M. (1994), *Qualitative Data Analysis*, 2nd ed., Sage Publications, London.

Mileti, D. (1999), *Disasters by design: A reassessment of natural hazards in the United States*. Washington: Joseph Henry Press.

Newton S. (2009), Transformational Higher Education in the built environment*, Journal of Education in the Built Environment*, 4(1), Pp 100-112

Odusami,K.T. (2002), Perceptions of Construction Professionals Concerning Important Skills of Effective Project Leaders, *Journal of Management in Engineering*, 18 (2), 61-67.

Ofori, G. (2001), *Construction in Disaster Management* [online]. National University of Singapore. Available from: http://buildnet.csir.co.za/ cdcproc/docs/3rd/ofori02.pdf [Accessed 29 February 2006].

Ofori, G. (2004), *Construction Industry Development for Disaster Prevention and Response* [online]. National University of Singapore. Available from: www.grif.umontreal.ca/pages/i-rec%20papers/ofori.pdf [Accessed 27 February 2006].

Ofori, G. (2008), Construction in developing nations – towards increased resilience to disasters. *In:* L. Bosher, (Ed) *Hazards and the built environment- Attaining built-in resilience.* London and New York: Routledge, 39-60.

Robinson, J. P. (2000), *What Are Employability Skills?* [Online], The Workplace, Volume 1, Issue 3, Available from: http://www.aces.edu/crd/workforce/publications/employability-skills.PDF [Accessed April 2010].

Rotimi, J.O.B. Masurier, J.L. and Wilkinson, S. (2006), The regulatory framework for effective post-disaster reconstruction in New Zealand, *Proceedings of the Third International Conference on Post-Disaster Reconstruction: Meeting Stakeholder Interests. I-Rec 2006,* 17-18 May, Florence, Italy.

Secretary-General (2006), Implementation of the International Strategy for Disaster Reduction: Report of the Secretary-General to the Unite Nations General Assembly, available at:

http://www.unisdr.org/eng/about_isdr/basic_docs/SG-report/SG-report-61-229-eng.pdf [accessed 15 March 2010].

Shattock, M. (2006), *Managing Good Governance in Higher Education*, Open University press

Spence, R. and Kelman, I. (2004), Editorial: Managing the risks from natural hazards, *Building Research & Information*, 32(5), Pp 364–367.

UKCES - UK Commission for Employment and Skills, (2008), *Employability Skills Project* [Online], Available from: http://www.ukces.org.uk/upload/pdf/employability-skills-project-0608.pdf [Accessed March 2010].

UKCES - UK Commission for Employment and Skills, (2009), *Ambition 2020: World Class Skills and Jobs for the UK* [Online], Available from: http://www.ukces.org.uk/upload/pdf/UKCES_FullReport_USB_A2020.pdf. [Accessed April 2010]

UKCES - UK Commission for Employment and Skills, (2010), *Contributing to the Debate: Assessing the Evidence Base on Employment and Skills in the UK* [Online], Available from: http://www.ukces.org.uk/upload/pdf/Assessing%20the%20UK%20Evidence%20Base%20on%20Employment%20and%20Skills_1.pdf [Accessed April 2010].

Ward, R. (2010), The value of PDP in enhancing employability (Presentation), The Centre for Recording Achievement, *Careers and Employability Internal Conference*, Salford, 16 April 2010, The University of Salford.

Warfield, C. (2004). *The Disaster Management Cycle* [online]. Kobe, The Global Development Research Center. Available from: http://www.gdrc.org/uem/disasters/1-dm_cycle.html [Accessed 15 April 2006].

Witte, B. and Llana, S.M. (2010), *Chile earthquake much stronger than Haiti's but far less damage. Why?* [online]. Aailable from: http://www.csmonitor.com/ World/Americas/2010/0227/Chile-earthquake-much-stronger-than-Haiti-s-but-far-less-damage.-Why [Accessed 15 February 2010].

Wood G. (1999), Interdisciplinary working in the built environment education, Education + Training, 41(8), Pp 373-380