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Professional doctorates: applicability to the construction industry in increasing societal resilience to disasters

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Abstract

With the increase in occurrence of high impact disasters, the role of Higher Education Institutes (HEIs) in enhancing the disaster related knowledge and skills of construction professionals is highly recognised. HEIs are expected to contribute to both theory and practice in the development of societal resilience to disasters through the development of curricular and modules to update the knowledge and skills that employees have obtained in the past. Doctoral education is identified as one of the methods in upgrading the knowledge of the construction professionals in this regard. Due to the shortcomings of the traditional doctoral programmes in addressing the needs of the industry and professionals, professional doctorates have become increasingly recognised. As such professional doctoral programmes have been considered as more appropriate in developing knowledge and skills of the construction professionals. Accordingly, a EU funded project, CADRE, aims to develop and test an innovative professional doctoral programme that integrates professional and academic knowledge in the construction industry to develop societal resilience to disasters. As part of this project, the paper aims to analyse the applicability of professional doctorates to the construction industry in developing societal resilience. Based on an extensive review of literature, paper introduces the concept of professional doctoral programmes and its applicability to the construction industry in developing societal resilience.

Keywords: Professional doctorates; disaster resilience; construction; education

1. Introduction

The trend of natural disasters is becoming more frequent causing widespread damage to human and property. Indian Ocean tsunami in 2004, hurricane Katrina in 2005, Haiti earthquake in 2010, New Zealand earthquake in 2011, Japan earthquake and tsunami in 2011, Typhoon Haiyan in 2013, Nepal earthquake in 2015 are some of the major catastrophic disasters over the past decade, which caused devastating and long-term impacts to the affected communities, countries and to the entire nation. Meeting the cost related to natural disasters has increased from US\$ 50 billion a year in the 1980s to US\$200 billion a year in the last decade (Georgieva, 2014). The damage to built environment accounts for most of the economic losses of disasters and its failure often determine the amount of fatalities (Witt et al., 2014) where collapsing of buildings and infrastructure pose one of the main threats. Accordingly, rehabilitation and reconstruction of the built environment places a huge demand on the funds available for recovery where housing and infrastructure development often account for up to 50% of recovery disbursements (Max Lock Centre, 2009). Consequently, authors such as, Boshier et al. (2007), have highlighted the inadequate role of the construction sector in contributing to disaster risk management. Accordingly, with the increase in occurrence of high impact disasters, together with the increase in economic losses, the role of Higher Education Institutes (HEIs) in enhancing the disaster related knowledge and skills of construction professionals is highly recognised. HEIs are expected to contribute to both theory and practice in the development of societal resilience to disasters through the development of curricular and modules to update the knowledge and skills that employees have obtained in the past. Doctoral education is identified as one of the methods in upgrading the knowledge of the construction professionals in this regard. Due to shortcomings of the traditional doctoral programmes in addressing the needs of the industry and professionals, professional doctorates have become increasingly recognised. As such, professional doctoral programmes have been considered as more appropriate in developing knowledge and skills of the construction professionals. In the context, the paper reports initial findings of an EU funded research project, CADRE (Collaborative Action for Disaster Resilience Education) which aims to develop a professional doctorate to integrate the professional and academic knowledge of the construction in developing societal resilience to disasters. Accordingly, it is intended to develop a structured professional doctoral programme, which reflects how the construction sector and its professionals could contribute in achieving resilience for increasing threats from natural and human induced hazards. As part of this project, the paper aims to analyse the applicability of professional doctorates (DProfs) to the construction industry in developing societal resilience.

The paper is based on review of existing literature in order to explore the applicability of professional doctorates to the construction industry in developing societal resilience. The literature review has been conducted by referring books, journal articles, conference proceedings, reports and websites published by various institutions. Accordingly, the paper provides an introduction to the CADRE project and presents a synthesis of literature related to disaster resilience education to construction professionals. The paper then provides an introduction to

professional doctorates and concludes by analysing its applicability to construction sector in developing societal resilience to disasters followed by the way forward.

2. Collaborative Action towards Disaster Resilience Education (CADRE)

There are wide-ranging origins and causes to the many disasters that have affected communities across Europe and globally with ever-greater frequency. If construction researchers and practitioners are to be able to contribute to reduce risk through resilient buildings, spaces and places, it is important that capacity is developed for modern design, planning, construction and maintenance that are inclusive, inter-disciplinary, and integrative. In order to address this challenge, CADRE which is an ERASMUS multilateral project supported by an EU grant will develop an innovative professional doctorate programme that addresses the requirements for lifelong learning and actively promotes collaboration between European HEIs, industry and the community. This novel programme will address the career needs, and upgrade the knowledge and skills, of practising professionals working to make communities more resilient to disasters, and particularly those in, or who aspire to, senior positions within their profession. The candidates will undertake research aimed at making a contribution to the knowledge of professional practice and will involve applied rather than pure research. It will require candidates to establish the research problems from the viewpoint of industry and the community, thus encouraging healthy communication channels between industry, community and university (ICU) and establishing a strong platform for through life learning. In this context, the project, will improve the quality and relevance of higher education through active cooperation between HEIs and partners from outside academia, including construction professional bodies, local/national/international bodies and social partners. Project will achieve this aim by; 1) Establishing a framework for ICU integration to address societal concerns; 2) Developing and testing an innovative professional doctoral programme that integrates professional and academic knowledge in the construction industry to develop societal resilience to disasters; 3) Creating world-class curricula and modules to support the programme and address current and emerging capacity gaps in the development of societal resilience to disasters; 4) Exploiting ICT to enable cross-border cooperation in the sharing and delivery of educational resources that support the professional doctoral programme.

The next section highlights the importance of disaster resilience education to construction professionals.

3. Disaster resilience education to construction professionals

The built environment provides a core to many human activities and facilitates everyday life of human beings. In general terms, the built environment refers to human settlements, buildings and infrastructure (Max Lock Centre, 2009). Hazards cause various disruptions to built environment. The damage to built environment accounts for most of the economic losses of disasters and its

failure often determine the amount of fatalities (Witt et al., 2014). As such, professionals related to construction sector are expected to play a major role in mitigating such impacts of disasters. Boshier et al. (2007) identified two elements of mitigation, structural and non-structural. In structural mitigation, it is expected to strengthen the built environment exposed to hazards by way of better building codes, design and construction practises and in non-structural mitigation, it is expected to direct new developments away from hazards through better land use planning and regulations. Construction professionals therefore are required playing a significant role in contributing to both structural as well as non-structural mitigation. At the same time, it is the duty of the professionals attached to construction sector, to plan, design, construct and operate necessary risk reduction infrastructure and other services to protect the communities exposed to hazards. Besides, it is where the people turn for safety and shelter at a time of a disaster (Witt et al., 2014). As such built environment should be planned, designed, built and operated in such a way that it can withstand at a time of a disaster. Furthermore, disasters are now widely seen as a consequence of vulnerability, and the naturalness of natural disasters were questioned by authors such as O'Keefe et al. (1976) from 1970s. Accordingly, it was highlighted that disasters result from a combination of natural hazards and social and human vulnerability. In addition, as pointed out by Cutter et al. (2008) the immediate effects are attenuated or amplified as a result of the coping responses of social systems, natural systems and the built environment. Hence, poorly planned and designed buildings, housing stocks and infrastructure increase the risk of disasters. As such, construction industry is a key contributor in disaster management and mitigation (Chang et al., 2010) and the disciplines associated with the construction sector are required to become more involved with disaster risk reduction and management initiatives (Boshier et al., 2007). Therefore construction professionals are expected to provide a significant contribution to disaster risk reduction and management (Max Lock Centre, 2009, Boshier et al., 2007). Construction professionals are the professionals associated with planning, designing, constructing and maintaining the built environment. These professionals mainly include, architects, engineers, planners and surveyors (Max Lock Centre, 2009). Accordingly, a greater integration of input is required from all built environment related stakeholders, including those govern/ advise on the built environment and those who actually design, build and operate it (Boshier et al., 2007).

However, recent literature concerning disasters has highlighted the inadequate engagement of the construction industry in mitigating the impacts of disasters (Chang et al., 2010). Agreeing with Chang et al. (2010), Boshier et al. (2007) also highlighted the inadequate involvement of professions associated with the construction sector and development, with the stakeholder groups who are integral to the mainstreaming of disaster risk management. This emphasise the need to improve the engagement of construction professionals with the stakeholders who are integral to mainstreaming the disaster risk management to ensure societal resilience to disasters. Therefore, as argued by Ofori (2004), it is of importance to provide construction industries with the necessary capacity and capability to plan, design and build structures in a way that will reduce their vulnerability to disasters and to respond effectively to disasters in order to save and protect lives, rehabilitate vital infrastructure, and reinstate economic activities. In doing so, it is necessary to provide knowledge and skills related to disaster resilience and management to construction professionals.

Disaster resilience education is all about strengthening the disaster resilience knowledge and capabilities of relevant stakeholders and industries. As a result of prominent gaps in knowledge, Sendai Framework for Disaster Risk Reduction (2015-2030) has identified the need of enhancing the capacities of relevant stakeholders and industries. Accordingly, the framework suggested to “*build the knowledge of government officials at all levels, civil society, communities and volunteers, as well as the private sector, through sharing experiences, lessons learned, good practices and training and education on disaster risk reduction, including the use of existing training and education mechanisms and peer learning*” (UNISDR, 2015). As previously highlighted, professionals attached to construction sector play an important role in disaster resilience and management and it is therefore important to design educational and training courses to enable them to successfully fulfil this role (Witt et al., 2014). Therefore as argued by Boshier et al. (2007), risk and hazard awareness training needs to be integrated systematically into the professional training of architects, planners, engineers, developers, etc.

Education and training for construction professionals are generally provided by HEIs; vocational education and training providers; built environment professional bodies; construction organisations, and training and development authorities (Thayaparan et al., 2015). Out of these, higher educational institutes are expected to play a key role in developing capacities of built environment professionals in contributing to disaster resilience (Witt et al., 2014, Thayaparan et al., 2015). Learning opportunities provided by HEIs can mainly be categorised as formal learning through organised programmes recognised by a qualification or part of a qualification (OECD, 2004). However, studies such as Siriwardena et al. (2013), highlights that providing disaster management education as a degree programme is ineffective due to the complexity and multi-disciplinary nature of the subject. Furthermore, the study highlights, lack of industry involvement and the lack of research and development activities on disaster management by construction sector professionals as a hindrance to effective disaster management education. Accordingly, it has suggested the need of continuously updating the skills and knowledge of construction professionals, in order to contribute effectively to disaster resilience (Thayaparan et al., 2015). Thus, in overcoming the challenges of existing approaches of disaster management education, lifelong-learning has been identified as the most appropriate approach to educate construction professionals in the context of disaster resilience and management by the authors such as Thayaparan et al. (2015) and Siriwardena et al. (2013).

In supporting the concept of lifelong learning and in overcoming the identified challenges of existing approaches to disaster resilience education, it is therefore proposed to develop a professional doctorate on disaster management to construction professionals. By developing a professional doctorate, it is expected that challenges such as, complexity and multi-disciplinary nature of the subject; lack of industry involvement; and lack of research and development activities on disaster management by built environment professionals, could tackle successfully. Moreover, a DProf is intended to be a form of in-service professional development and much significant at a time when “continuing professional development” and “lifelong learning” have had an important influence on the policy climate, and when the intellectual climate of curriculum development has shifted from the development of initial skills and competencies to critical reflection, reflective practice and continuous professional development and is concerned with

making a research-based contribution to practice within the context of upselling construction professionals with disaster resilience expertise. However, before discussing the specific applicability of professional doctorates, it is important to understand what constitutes a professional doctorate. Accordingly, the next section provides an introduction to the professional doctorates.

4. Introduction to professional doctorates

4.1 Professional doctorates

Before looking into the applicability of professional doctorates to disaster resilience education, it is important to understand what is a professional doctorate. Professional doctorates are now widely available in many UK universities for various disciplines. Most of these professional doctorates target practicing professionals and aim to integrate professional and academic knowledge in the selected discipline. These are available in an increasingly wide range of subjects, such as, education, engineering, health and social care, business, marketing, art and design, musical arts and clinical psychology (McGraw-Hill Education, 2014).

The development of professional doctorates began in 1990s and led to a reconsideration of the nature of the doctoral award (Maxwell, 2003). According to Kot and Hendel (2012), PhDs for many decades claimed as the most prestigious award in the academia. Accordingly, PhDs were offered in wide variety of disciplines including the professional disciplines. As noted by Bourner et al. (2001) the modern Doctor of Philosophy, was originated in Berlin University in the early 19th century and spread across the German universities due to the growth in the importance of research in universities. However, as noted by, Kot and Hendel (2012), during the first half of the twentieth century PhD tradition has been challenged and as a result new trends were emerged in PhD studies. One of the important trend emerged in number of countries was the creation of new forms of doctoral degrees, such as professional doctorates, applied doctorates, practitioner doctorates, clinical doctorates in various disciplines (Kot and Hendel, 2012). Out of these new forms of doctorates, professional doctorates were widely adopted in countries such as USA, UK and Australia and as of 2012, more than 50 professional doctorate awards were offered in the USA and in the UK, and around 20 in Australia and showed a steady increase in professional doctorates (Kot and Hendel, 2012). However, authors further revealed that there is no agreement within and across countries on the core characteristics and standards of professional doctorates. Accordingly Kot and Hendel (2012) noted that there is no standard definition to professional doctorates. As such professional doctorates may differ across institutions and subjects and even within subjects (Bourner et al., 2001). However, authors claimed that most of the professional doctorates have been designed to develop the research based career development for experienced practitioners in the profession whereas traditional PhDs intend to develop professional researchers. Accordingly, authors argued that professional doctorates are designed to develop 'researching professionals'. Agreeing to this, Neumann (2005) emphasised that the major difference between a PhD and professional doctorates is in the target populations and selection

criteria for students. In addition the amount of fees is another contrasting feature in some disciplines and in some institutions. However, The UK Council for Graduate Education has defined a professional doctorate as *'a programme of advanced study which, whilst satisfying the university criteria for the award of a doctorate, is designed to meet the specific needs of a professional group external to the University, and which develops the capability of individuals to work within a professional context'* (UKCGE, 2002). Accordingly, professional doctorates have certain characteristics that distinguish from a traditional PhD. According to McGraw-Hill Education (2014), *"professional practice, the development and/or application of expertise directly in the practice setting and practitioner research are central to professional doctorates"*. As such most professional doctorates expect the candidates to research on a topic, which relates to their own working lives (Bourner et al., 2001). Accordingly, candidates are expected to start the research with a problem in professional practice and to make original contribution to knowledge of professional practice through research (Bourner et al., 2001). Maxwell (2003) has identified two generations of professional doctorates; first generation sometimes referred to as 'PhD plus coursework' where more emphasis was given to academic over professional knowledge and outputs. In contrast, in the second generation, more emphasis was given to realities of workplace and to make improvements to the profession. The next section highlights the evolution of the professional doctorates in the UK.

4.2 Professional doctorates in the UK

Since early 1990s the form of the UK doctorates have diversified in order to accommodate the various needs of the student population (The Quality Assurance Agency for Higher Education, 2011). Accordingly, various forms of doctorates have emerged in response to the needs of the various professions. This resulted in the emergence of professional doctorates and practice-based or practice-led doctorates (The Quality Assurance Agency for Higher Education, 2011, Bourner et al., 2001). Accordingly, a number of Professional doctorates came to England in the decade of 1990s and by the end of the decade, professional doctorates were found in over three-quarters of the 'old' universities and a third of the 'new' universities (Bourner et al., 2001). Most of these doctorates have encompassed structured elements, such as lectures and seminars and focussed on acquiring professional knowledge and skills in addition to conducting original research (The Quality Assurance Agency for Higher Education, 2011). In addition, these doctorates provided the opportunity to undertake the research in the workplace and to select a topic, which has direct effect on improving the professional practice, related to the host organisation. These are usually open to experienced professionals employed in any area of work, including emerging professions and disciplines and often taken on part time while working at the host organisation; where successful completion normally leads to professional and/or organisational change (The Quality Assurance Agency for Higher Education, 2011). However, in some cases, candidates are registered as full time students while most of their time is spent working at industrial or professional organisation (Bourner et al., 2001).

Various models of professional doctorates exist even within the UK, and these are usually summarised by the respective institution in their programme specification (The Quality

Assurance Agency for Higher Education, 2011). The UK model of professional doctorates usually consist with a taught component; focussing on the field of study and on research training (Bourner et al., 2001). Though credit is not normally assigned to doctoral degrees, credit may be awarded for successful completion of assessed structured elements (The Quality Assurance Agency for Higher Education, 2011). However, according to Bourner et al. (2001), the taught component is usually structured based on credit rated modules. The next section explores the applicability of professional doctorates for disaster resilience education.

5. Applicability of professional doctorates to the construction industry in developing societal resilience to disasters

As explained in earlier sections, disaster resilience and management is a multi-disciplinary subject area and multi stakeholder efforts are required for successful implementation. Some of the main stakeholders include national and local government institutes; NGOs, INGOs and other international organisations; academia; private sector; and community. Some of these stakeholders employ and/or consult professionals attached to the construction and expect various levels of knowledge and skills to fulfil their organisational needs in developing societal resilience to disasters. Accordingly stakeholders demand certain level of knowledge and skills from construction professionals to reduce the threats posed by natural and human induced hazard. If construction researchers and practitioners are to be able to contribute to reduce risk through resilient buildings, spaces and places, it is important that capacity is developed for modern design, planning, construction and maintenance that are inclusive, inter-disciplinary, and integrative. In order to address this challenge, it is proposed to develop an innovative professional doctorate to integrate professional and academic knowledge in the construction industry to develop societal resilience to disasters. By developing a professional doctorate, it is expected that challenges such as, complexity and multi-disciplinary nature of the subject; lack of industry involvement; and lack of research and development activities on disaster management by built environment professionals, could tackle successfully. Accordingly the aim of this section is to highlight the applicability of DProf programme to construction in developing societal resilience and therefore some of the salient features are highlighted below.

Contribution to theory and practice: In terms of disaster resilience and management, more applied research is required in order to develop the construction industry with necessary capacities to plan, design, build and operate resilient structures to increase societal resilience to disasters. The aim of a DProf programme is to integrate professional and academic knowledge in the selected discipline. Accordingly, it will provide opportunities to the candidates to undertake research aimed at making a contribution to the knowledge of professional practice and will involve applied rather than pure research. It will require candidates to undertake the research in the workplace and to select a topic, which has direct effect on improving the professional practice, related to the host organisation where successful completion normally leads to professional and/or organisational change. It will therefore strengthen not only the academic knowledge and cooperation between the universities and industries, but also the concerns, capabilities and

expectations of the relevant stakeholders related to disaster resilience and management. As such, professional doctorates are very much appropriate to construction sector in developing societal resilience to disasters. Accordingly, it will make a research-based contribution to practice within the context of upskilling construction professionals with disaster resilience expertise.

Cross-institutional supervisory teams and working environments – One of the main advantages of a DProf is that it enables cross-institution supervisory teams, as well as supervisors from industry. Due to the multi-disciplinary nature of the subjects, having cross-institutional supervisory teams will enhance the quality and relevance of the research and ultimately the contribution to the practice. Unlike a traditional PhD, having supervisors from the industries where research is based on can significantly add value to the research. In addition, DProfs allow students to be based at relevant industries, which will lead to pan stakeholder links, helping to promote inter-disciplinary and inter-sectoral working among candidates, as well as addressing the problem of social and intellectual isolation that is common in doctoral study.

Career needs of practicing professionals: One of the main disadvantages of traditional doctorates is that it is not very attractive to the practicing professionals. As explained earlier, traditional doctorates more often contributes to theory of knowledge and as a result, is not much popular with the practicing professionals in the construction sector. As argued by Bourner et al. (2001) professional doctorates are attractive to those who aspire their own personal development and a commitment to furthering the cause of their profession. Therefore developing a professional doctorate will address the career needs, and will upgrade the knowledge and skills, of practising professionals working to make communities more resilient to disasters, and particularly those in, or who aspire to, senior positions within their profession. The education and training delivered will be more relevant to the world of work, which is vital for the labour market and for people's employability. It will further broaden and deepen the employees' understanding of the disciplines in which they are studying, upgrade their skills, promote inter-disciplinary working, and provide them with appropriate transferable skills. Accordingly it is expected that DProf programmes will attract learners, from the construction industry, to develop solutions to their labour market demands through doctoral studies.

Part time attendance: Another major barrier in traditional PhDs for construction practitioners is that, quite often they are unable to study full-time, and employers are not willing to invest for full-time PhDs. Therefore, in order to meet the needs of practising professionals and their employers, flexible study modes are offered in DProfs, with only part-time attendance necessary; the rest of the time the candidate is expected to spend in industry or a professional organisation. In contrast to traditional doctorates, this will enable universities to provide the structured support that is often missing for other part-time doctoral students.

Collaboration: DProfs promotes collaboration between HEIs and industries, which are key stakeholders in disaster resilience and management. The collaboration is further supported by facilitating cross-institutional supervisory teams and working-groups. Accordingly, it is expected to improve the quality and relevance of DProf programme through active cooperation between

HEIs and partners from outside academia, including construction professional bodies, local/national/international bodies and social partners.

Lifelong learning and continuous professional development: The DProf is intended to be a form of in-service professional development. Construction professionals will therefore benefit from the proposed professional doctoral programme, which will provide opportunities for learners to access lifelong, learning in increasing societal resilience to disasters. In overcoming the challenges of existing approaches of disaster management education, lifelong-learning has been identified as the most appropriate approach to educate construction professionals in the context of disaster resilience and management by the authors such Thayaparan et al. (2015) and Siriwardena et al. (2013). Therefore, developing an innovative professional doctorate will address the requirements for lifelong learning and will enhance not only academic knowledge, but also the concerns, capabilities and expectations of the relevant industries and communities. In turn, this will create the necessary intra Industry, Community and University feedback and feed-forward mechanisms to enable effective lifelong learning.

Customisable: In serving the needs of various stakeholders, it is proposed to develop a professional doctorate with a generic framework, which enables a wide range of professionals from the public, private and voluntary sectors to negotiate programmes that are customized to the needs of their own professions and organisations (Doncaster and Thorne, 2000) serving to reduce the risk of disasters. Accordingly, it is expected that all construction professionals serving all of stakeholder groups attached to disaster resilience and management will benefit from the developed programme.

6. Way forward

Development of the programme involves a substantial level of research activities to study and analyse market needs in order to capture the labour market requirements for disaster resilience and its interface with the construction industry and its professionals. Accordingly, the first phase of research involved, capturing the needs of 5 stakeholder groups associated in disaster resilience and management as well as current and emerging skills and ultimately competencies, applicable to built environment professionals towards enhancing societal resilience to disasters. Accordingly, 87 semi-structured interviews were conducted with national and local government organisations; community; NGOs, INGOs and other international agencies; academia and research organisations; and private sector. The interviews were aimed at capturing the needs as well as skills, applicable to built environment professionals towards enhancing societal resilience to disasters. Accordingly, a structured doctoral programme will be developed to cater the identified needs and skills. The programme will reflect how the construction sector and its professionals can contribute to achieving resilience in the case of increasing threats from natural and human induced hazards. The content of the DProf programme framework will generally attempt to include advanced discipline-based subject study with the relative proportions varying according to the needs that were identified through the market needs analysis; individual reflective professional development; research methodology training; and professional practice-based research projects.

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References

- BOSHER, L., DAINTY, A., CARRILLO, P., GLASS AND, J. & PRICE, A. 2007. Integrating disaster risk management into construction: a UK perspective. *Building Research and Information*, 35, 163-177.
- BOURNER, T., BOWDEN, R. & LAING, S. 2001. Professional Doctorates in England. *Studies in Higher Education*, 26, 65-83.
- CHANG, Y., WILKINSON, S., SEVILLE, E. & POTANGAROA, R. 2010. Resourcing for a resilient post- disaster reconstruction environment. *International Journal of Disaster Resilience in the Built Environment*, 1, 65-83.
- CUTTER, S. L., BARNES, L., BERRY, M., BURTON, C., EVANS, E., TATE, E. & WEBB, J. 2008. A place-based model for understanding community resilience to natural disasters. *Global Environmental Change*, 18, 598-606.
- DONCASTER, K. & THORNE, L. 2000. Reflection and Planning: Essential elements of professional doctorates. *Reflective Practice: International and Multidisciplinary Perspectives*, 1, 391-399.
- GEORGIEVA, K. 2014. Disaster cost quadrupled in past decades. *Dailymail - mail online*, 5 June 2014.
- KOT, F. C. & HENDEL, D. D. 2012. Emergence and growth of professional doctorates in the United States, United Kingdom, Canada and Australia: a comparative analysis. *Studies in Higher Education*, 37, 345-364.
- MAX LOCK CENTRE 2009. The Built Environment Professions in Disaster Risk Reduction and Response - A guide for humanitarian agencies. Westminster, UK.
- MAXWELL, T. 2003. From First to Second Generation Professional Doctorate. *Studies in Higher Education*, 28, 279-291.
- MCGRAW-HILL EDUCATION. 2014. *Appraising professional doctorates: what, who and why?* [Online]. Available: <http://www.mheducation.co.uk/openup/chapters/9780335227211.pdf> [Accessed 15 June 2015].
- NEUMANN, R. 2005. Doctoral Differences: Professional doctorates and PhDs compared. *Journal of Higher Education Policy and Management*, 27, 173-188.
- O'KEEFE, P., WESTGATE, K. & WISNER, B. 1976. Taking the naturalness out of natural disasters. *Nature*, 260, 566-567.
- OECD. 2004. Lifelong learning. *OECD Policy Brief* [Online]. Available: <http://www.oecd.org/dataoecd/17/11/29478789.pdf> [Accessed 15 April 2015].
- OFORI, G. 2004. Construction industry development for disaster prevention and response. Available: http://www.grif.umontreal.ca/pages/i-rec_papers/ofori.pdf.
- SIRIWARDENA, M., MALALGODA, C., THAYAPARAN, M., AMARATUNGA, D. & KERAMINIYAGE, K. 2013. Disaster resilient built environment: role of lifelong learning and the implications for higher education. *International Journal of Strategic Property Management*, 17, 174-187.
- THAYAPARAN, M., SIRIWARDENA, M., MALALGODA, C. I., AMARATUNGA, D., LILL, I. & KAKLAUSKAS, A. 2015. Enhancing post-disaster reconstruction capacity through lifelong learning in higher education. *Disaster Prevention and Management: An International Journal*, 24, 338-354.
- THE QUALITY ASSURANCE AGENCY FOR HIGHER EDUCATION 2011. Doctoral degree characteristics.

- UKCGE 2002. Professional Doctorates UKCGE. Dudley, UK.
- UNISDR 2015. Sendai Framework for Disaster Risk Reduction 2015 - 2030. Geneva, Switzerland: UNISDR.
- WITT, E., BACH, C., LILL, I., PALLIYAGURU, R., PERDIKOU, S. & ÖZMEN, F. 2014. Determining Demand for Disaster Resilience Education through Capacity Analysis of European Public Authorities. *CIB INTERNATIONAL CONFERENCE 2014: W55/65/89/92/96/102/117 & TG72/74/81/83 Construction in a Changing World*. Kandalama, Sri Lanka.