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# RISK ASSESSMENT AND RISK ENGAGEMENT IN THE CONSTRUCTION INDUSTRY WITHIN CONFLICT ZONES

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Stakeholders throughout the construction industry deal with risks and uncertainties, which are particularly important where they lead to poor construction development. Very few studies have examined stakeholders' perception of risk in the construction industry especially in conflict zones. However, it is important to identify how risk is perceived and dealt with effectively in order to successfully implement different strategies of dealing with risks. To achieve this, an initial framework is developed from current practices, applied and then refined based on the data gathered. Data collection has been carried out in Palestine using semi structured qualitative interview. A range of risk variables were uncovered, including movement restrictions, limitations in the locations of construction and problems related to specific governmental policies. The findings also confirmed the significant influence of some existing theories: cultural, social and psychometric, and revealed others including the process of policy implementation and validation. The interviewees considered that risks relating to inappropriate implementation of policies is the main cause of poor achievement of construction development, followed by restrictions in movement and poor land management. Therefore, there is a need to provide stakeholders and policymakers with better knowledge of how risk is perceived and dealt with in order to enhance construction development in these risky locations.

Keywords: risk perception, risk engagement, conflict zones

## INTRODUCTION

Achieving sustainable development in the construction industry is a vital factor affecting the environment, social and economic sectors (Brennan and Cotgrave, 2014; Akadiri and Fadiya, 2013). Current practises demonstrate various factors that affect construction development including cost, risk, lack of information and communication (Rostami and Thomson, 2017). In conflict zones, different factors and problems affect achieving sustainable development compared with non-conflict zones (Enshassi, 2005). These factors include financial constraints, lack of understanding the development concept and inadequate institutional structure. Despite the focus of existing studies on delivering potential development for the construction industry in conflict and non-conflict zones, there is little research that considers identifying how stakeholders shape their perceptions and respond to risk variables, especially in the

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context of the construction industry within conflict zones. The application of risk perception and its related aspects provides the opportunity to deal with risks in the construction industry effectively in order to achieve the desired development. Identifying the factors that affect how stakeholders construct their perceptions assists in providing better knowledge and useful information regarding particular risk events. Therefore, this paper reviews different approaches of risk perception and its relevant aspects together with analysing how they can be implemented in order to achieve sustainable development in the construction industry in conflict zones. It will identify the significant relationship between risk perception and construction development through multiple stakeholders' perspectives. The paper explores different views of participants and current practices in order to contribute to the existing knowledge of risk perception.

### *Background to Risk Perception*

Because little has been written about the application of risk perception to construction, this paper begins by considering this and particularly its application to the construction industry within conflict zones. Risk perception is defined as the subjective decision or assessment that people make to describe a particular risk events and its consequences (Sjoberg *et al.*, 2004). Risk perception is conceptually different from the objective aspects of risk that can be evaluated and measured using naturalist models of risk assessment (Jasanoff, 1998). Wogalter *et al.*, (1999) presented a general concept of risk perception and defined it as a broad notion of awareness and knowledge regarding particular risk, and likelihoods of consequences of a situation that may lead to potential harm. Examining risk perception is related to two main approaches. These are the cultural approach which was developed by Douglas and Wildavsky (1982), and the psychometric approach. The psychometric approach has dominated risk perception studies during recent decades (Slovic, 2000). It takes into consideration both qualitative and subjective aspects (Slovic, 1992). This approach assumes that risk perception is considered as multidimensional and can be evaluated by identifying the unique features regarding a particular risk resource. Fischhoff *et al.*, (1978) claimed that risk factor analysis revealed that there are unique characteristics for risk sources and these characteristics affect the way in which risk is perceived. Nine different factors were found to have a significant effect on risk perception and its resources. These include knowledge about the risk by the individuals who are exposed to that potential risk, voluntariness of risks, control over the risk, knowledge about risk in literature (science), old or new risk (familiarity), catastrophic levels of risk (a risk that may affect just one person at a time or affect groups or large number of individuals at once), common or dread risk (a risk that can be managed and accepted calmly by people or a risk that people dread), severity of consequences and immediacy of effect (Fischhoff *et al.*, 2000). Familiarity and dread were found to be the most important dimensions that need to be considered in examining risk perception.

The cultural approach also plays an important role in risk perception and its related aspects (Wildavsky and Dake, 1990). Douglas and Wildavsky (1982) developed four approaches to represent cultural theory including grid/group arrangement. Each approach relates to particular outlook of risk and specific social aspect. Grid refers to the degree to which individuals are restricted and constrained in their social role. In this category, tighter binding and social restriction bounds people control and their negotiations. The group approach refers to the extent to which people are restricted by feelings. More restrictions lead people to engage less with social events and have

less control on their personal decisions. Grid/group approaches include four categories: Individualist, Fatalist, Hierarchical and Egalitarian (Marris *et al.*, 1998). However, several studies exploring risk perception and applying the cultural theory measurements have failed to address the findings of Wildavsky and Dake (Marris *et al.*, 1998; Peters and Slovic, 1996; Oltedal and Rundmo, 2007). As with the psychological approach of risk perception, although the cultural approach has provided beneficial understandings into risk perception and its related aspects, limitations are evident. The cultural theory is based on hypothetical rather than empirical evidence (Hirsch and Baxter, 2011). Furthermore, Williamson and Weyman (2005) argued that the four categories of cultural theory provide a mobility (changeable) concepts. For instance, an individual's opinion regarding a particular situation is not constant and may change over time due to various factors such as personal, beliefs, values social identify or situation (Vandermoere, 2008). The lack of interaction between these categories leads to polarised perspective of people's opinions and fails to address the real perceptions of individuals and their possible actions. Therefore, Gaskell and Allum (2011) argued that risk perception should be considered as a subjective and socially constructed aspect, and that individuals are ambivalent with uncertain feelings and ideas regarding particular situations.

#### *Relevant Aspects of Risk Perception*

There are also different aspects that affect how risk is perceived and deal with. Uncertainty plays a vital role in constructing individuals' opinions, particularly in unpredictable, complex or ambiguous conditions, when people experience certain risks and are uncertain about their expectations or knowledge (Brashers, 2001). Moreover, uncertainty is associated with aspects that have a significant effect on the way that individuals respond to risks and make decisions (Powell *et al.*, 2007). For instance, when individuals are insecure about a risk event, they shape their thoughts and evaluate risks based on their own subjective perceptions. For this reason, Renn (2004) claimed that people's perception of certain risks is strongly affected by the availability of data about risks, the source of these data and the approaches that are adopted to explain and interpret it.

In terms of conformability, Cook and Bellis (2001) emphasised that individuals are capable of tolerating and dealing with risk events when they make their own decision using their own choices whether to engage or not with certain risks. This usually occurs when individuals are able to deal with risk and its possible consequences using their knowledge and experience (Sjoberg *et al.*, 2004). However, even if the risk is controlled and dealt with, individuals sometimes have either negative or positive reactions when they are involved in a specific risk situation. As an example, car drivers believe that the possibility of being involved in a car accident and exposed to possible risks is low when they are driving as they have the ability to control the vehicle and make their own informed decisions: nevertheless they believe that the likelihood of exposure to the same risk is relatively high when they are passengers and do not have the ability to make decisions (Sjoberg *et al.*, 2004). Kos and Clarke (2001) argued that some people often amplify the idea of dealing with risks, as they believe that they have greater abilities and skills to deal with risks compared with others. Familiarity is also one of the wide range of aspects that influence how people shape their perceptions (Paek *et al.*, 2016). The term familiarity is defined as the details and information about particular risk situations known by the affected individuals (Schmidt, 2004). Furthermore, when the situation is familiar to people, they usually perceive fewer risks and feel safer regarding this situation. It is argued

that individuals are often less concerned about risk and its consequences when the situation is familiar to them (Slovic, 2000; Fragouli and Theodoulou, 2015). In addition, high levels of awareness among individual's leads to increase in their familiarity about certain risks, consequently the likelihood occurrence of risk and its consequences become minimised (Schmidt, 2004). Klein *et al.*, (2010) claimed that individuals who are familiar with certain risk circumstances, are likely avoid following any protective or preventive considerations in order to deal with that risk. Although familiarity with risk has a significant influence in decreasing risk perception, individuals sometimes have a heightened sense of risk even if the risk situation is familiar to them (Brody *et al.*, 2008).

#### *Risk Perception in the Construction Industry*

Risks in construction projects can be categorized as either subjective or objective risks. Therefore, the analysis and management processes of these risks are mainly based on the type of risk. Objective project risks are described as the risks that are analysed and assessed using actual calculations and observations. These analyses are often related to probabilities and are quantitative in nature including complex calculations, experiences, experimental evidence or previous knowledge (Adams, 2008). However, subjective risks are analysed and assessed depending on people's beliefs and views. The analysis of this type of risk often uses qualitative methods based on personal experience and available knowledge. Applications and empirical studies of objective risks have been widely demonstrated and studied in the construction industry (Pouliquen, 1970; Bjornsson, 1977; Vidivelli *et al.*, 2017). On the other hand, there is a lack of consideration of subjective risks in the construction industry, especially in conflict zones. Therefore, this research focuses on dealing with subjective risks in construction projects within examination of the increased risk found within conflict zones. Furthermore, the absence of subjective information about particular risks leads to an exploration of people's perception and their estimations regarding these risks.

Numerous studies have evaluated/assessed risk perception in the construction industry in a range of ways including comparing different attitudes and groups of risk (Findley *et al.*, 2007), asking stakeholders to rate a list of risk factors according to their severity, importance and frequency (Holmes *et al.*, 1999; Enshassi *et al.*, 2009; Mahamid *et al.*, 2012), quantifying the way that people perceive risks using an objective algorithm approach (Jannadi and Almishari, 2003; Hallowell, 2010), requesting stakeholders to participate in ranking qualities of risks such as risk control, risk exposure and risk prevalence (Leiter *et al.*, 2009), and identifying the factors that affect health and safety aspects in construction projects in terms of people's perceptions and prevention strategies (Gambatese *et al.*, 2008; Schultz and Jorgensen, 2014). Therefore, it is vital to critically understand how risk is perceived in construction projects in order to be able to deal with it appropriately. In order to understand all construction stakeholders' perceptions, an industry-wide discussion about risk should be developed from a range of people in the construction industry (Saunders *et al.*, 2012).

#### *The Nature of the Construction Industry Within Conflict Zones*

Conflict can be relatively low-level between communities, or open-surface between states: it can be of short duration or extend over decades. It is considered as a dynamic process that can be changed and developed over time. In other words, the behaviours, attitudes and structures of people are constantly changing and affecting each other in different ways. As the conflict develops, the interests and needs of

people become impossible to fulfil, because those who are involved in the conflict continue to pursue their needs by developing disputing behaviours and hostile attitudes. As a result, the conflict continues to intensify over time and therefore affects different parties (Galtung, 1990). A range of factors directly or indirectly contribute to conflict between parties, including cultural characteristics, difficult living circumstances and personality traits (Staub, 2013). Conflict can happen between friends, communities, nations, groups, neighbourhood, within organizations or even between humans and animals (De Pourcq *et al.*, 2017; Jay *et al.*, 2017; Stephan *et al.*, 2017; Torres *et al.*, 2018). Violence issues such as extreme aggression and infrastructure damage which lead to slow the construction and economic development (Nathalie *et al.*, 2018). This study focuses on the ongoing armed (geopolitical) conflict between Palestine and Israel, because there is a lack in implementing potential construction development, understanding the situation and coping with problems and obstacle. A range of industries and businesses in both Palestine and Israel are seriously affected by this prolonged conflict. These effects include economic loss, investment problems, people's safety, infrastructure damage, environment and agricultural production losses (Harris, 2010; Arnon and Bamyra, 2015). The dominant factors that affect the construction industry in Palestine are restriction in movements, limited construction locations and policy-related problems (Enshassi and Mayer, 2005; Razia *et al.*, 2017). For example, there are unexpected road blockades and closures that limit the movements of people and road from time to time. These closures have directly weakened the potential development of Palestinian plans especially in the construction industry (UNCTAD, 2009). The unavailability of land to implement new construction projects and re-develop existing ones is associated with the devastation that exists in certain areas, which is caused by the ongoing conflict and its unexpected consequences (Arnon and Bamyra, 2015). Hence, there are difficulties in finding an appropriate development land and delivering the projects as planned, since both are affected by the closure polices and unsafe places in conflict areas. Due to the nature of conflict, there is a limited opportunity for policymakers to create and apply their development policies. This has led to the formulation of insufficient polices that are unable to meet the development requirements in terms of construction, infrastructure and public services ((UNCTAD, 2017). It is also challenging to transport and deliver construction goods and equipment as well as accessing public services for citizen due to the ongoing long-term conflict.

## **METHODOLOGY**

This study aims to identify how risk is perceived and dealt with in the construction industry in conflict zones in order to provide richer understanding of particular risk situations and respond to it effectively. In order to achieve this aim, the semi-structured interview approach was used in order to gain a deep understanding of the information provided by the participants. The interview approach emphasises that participants have the opportunity to express their views as long as the guidelines of the research are followed. Thus, the reliability of the interview procedures is for specific sample size unrelated to the need and can be selected based on the need for further collection of data (Newton, 2010; Stott, 2014). There are different methods to justify the sample size including precedent where researchers consider identifying studies that adopted the same design, and following recommendations by methodologists (Marshall *et al.*, 2013). For this reason, most stakeholders were recommended by the Palestine Engineers Association and had more than 10 years' experience in the

construction industry and are aware of the construction policies applied. Different stakeholders who involved in the construction industry were invited to participate in this study. Those stakeholders included three contractors, two owners, two consultants, two academics and two policy makers. The process of the semi-structured interviews continued until the stakeholder was either unable to provide more information or repeated the same information. The semi-structured interview process demonstrated that the findings vary among different stakeholders and sometimes unexpected findings may be obtained. All interviews were recorded, transcribed and then translated from Arabic into English. Content analysis is utilised to provide a valid inference from transcripts and compressing several terms and words of text into groups based on particular coding rules (Bryman and Bell, 2007).

## FINDINGS AND DISCUSSION

The findings emerging from this research confirm that risk perception in the conflict zones is significantly influenced by various theories including cultural, social and psychometric. Other factors also affect how risk is perceived, such as familiarity, trust, heuristics and controllability. However, the existing literature of risk perception fails to address other aspects that affect stakeholders' perception including the implementation and validations of policies (Sjoberg, 2000). The findings suggest that the implementation processes of policies have significant effects on the way that stakeholders' construct their perceptions. Participants also indicated that it is vital to consider both duration of exposure to risks and imitations - ie situations where stakeholders replicate another's actions or behaviours. Addressing these aspects, along with the existing aspects and variables of risk perception, assists in providing better understanding of how risk is perceived in the construction industry especially in conflict zones, and therefore can facilitate the processes of achieving construction development.

### *Risk as Imitation*

Participants claimed that dealing with risk is sometimes related to the situation and the action that is followed to use other stakeholders' approach. The existing literature of risk and its related aspects especially in the construction industry has limited coverage of imitative behaviour (Holmes *et al.*, 1997; Findley *et al.*, 2007; Mahamid *et al.*, 2012). Therefore, the findings showed that risk imitation has a significant influence on how stakeholders perceive and deal with risks. Participants also argued that in many situations where they are insecure about the risk or reluctant to engage or not with risk events, they usually choose to copy what other stakeholders do in order to deal with particular risk regardless of its potential consequences. In this case, most participants who choose to just imitate what others do, have lesser concern about the likelihood of risk effects and engage more with risks as they simply follow others' action without significant knowledge or thinking. So, the decisions-making process of the followers whether to participate or not in a certain risk is mainly dependent on their ability to do exactly what other stakeholders do in terms of dealing with and responding to risks.

### *Risk as Polarised*

Different aspects of polarization emerged from the findings and provided important issues to be considered in dealing with risk and risk perception. Although the current practices of risk and risk perception evaluated how risk is perceived, and identified the differences of people's opinion, there is still a lack in providing a holistic insight regarding particular risk events especially in the construction industry within conflict



zones (Slovic, 2000; Arnon and Bamy, 2015). The findings indicated that stakeholders perceive similar risks differently, either with positive or negative consequences based on their experience and knowledge. This leads to providing different identifications and evaluations of certain risks, divides stakeholders' perspectives and leads to difficulties in dealing with risks as these risks carry different estimations. This is very common in conflict zones as the situation is unstable and several factors are likely to change over the duration of a construction project including restrictions in movements and implementation of policies. Therefore, it is vital to consider polarisation-related aspects when evaluating and responding to risks as they assist in providing a better understanding of particular risks from different viewpoints and identifying possible changes that may affect the perception of risk.

#### *The Theme of Risk Engagement and Thought Process*

The theme of risk engagement emerged from this study. This describes the process of capability and intention of stakeholder whether to engage or not with particular risk events to attain desired shared outcomes. The current studies of risk perception and risk management focus only on dealing with the factors that influence stakeholders to take risks from an individual's view point, rather than exploring the variables that affect individuals and groups in engaging with risk (Lumpkin and Dess, 2001; Hillson and Webster, 2007). Understanding of risk engagement requires attending to the practices and dynamics of risk in everyday life, in addition to identifying how these are embedded among people (Marston and King, 2006). Although some decisions to engage with certain risks are complicated, others are clear, and it is easy to make an informed decision to engage with them. Hoskisson *et al.*, (2016) argued that managers usually take risks within their organizations in order to improve performance. To explain this, a risk taking-attitude seeks to often obtain personal benefits without taking into consideration the potential adverse effect on individuals or workers. However, the aspects of risk engagement concern other stakeholders and groups when experiencing particular risk events. For this reason and due to the ongoing conflict, stakeholders and organizations in the construction industry are required to engage with risk together, rather than as individuals, and consider possible risk consequences on others, in order to achieve their accepted outcomes. The participants also argued that there are different thinking processes that affect shaping their perception and make informed decision. These processes include impacting where stakeholders identify positive or negative effects, alternative process refers to identify available choices or plans, competence concerns of being able to achieve something and informed decision where stakeholders construct their perception and decide to engage or not with particular risk events.

## **CONCLUSIONS**

Construction development is a complex area that requires not just quantitative analyses but the evaluation of qualitative approaches and the acknowledgment of several perspectives, especially when considering aspect-related risk perception. Risk perception plays an important role to achieve the effectiveness of risk management and is considered as a source of significant influence on the process of decision-making. People's different perceptions influence the process of risk management. Therefore, it is vital to understand how stakeholders construct their perception in order to improve the process of risk management. This paper has provided an overview of risk perception and its aspects through presenting the most important approaches including psychometric, social and cultural. This overview has led to the realisation that risk perception and its related aspects focus only on certain areas and have created

limited understanding of risk perception in the construction industry. The concept of risk perception has the capability to support different issues to deal with risk. However, it was seen that the aspects of construction development in conflict zones require multiple perspectives to understand how stakeholders perceive and respond to risk, rather than applying the current practices of risk perception. Several perspectives of construction stakeholders were identified. It is believed that the application of risk perception is able to provide a holistic insight in the conceptual understanding of construction development. This study is useful for allowing both stakeholders and policy makers in construction especially in conflict zones, to better understand the dynamic approach of risk and achieve the desired outcomes of development. Future research is required to validate the knowledge presented in this paper and provide better application to support it within both conflict and non-conflict zones.

## REFERENCES

- Alkhaddar, R, Wooder, T, Sertyesilisik, B and Tunstall, A (2012) Deep learning approach effectiveness on sustainability improvement in the UK construction industry, *Management of Environmental Quality: An International Journal*, 23(2), 126-139.
- Akadiri, P O and Fadiya, O O (2013) Empirical analysis of the determinants of environmentally innovation, *Construction innovation: Information, Process, Management*, 13(4), 352-373.
- Arnon, A and Banya, S (2015) *Economic and Politics in the Israeli Palestinian Conflict*. Available from [http://www.bgu.ac.il/~armona/aixbook2015\\_FINALLLLLL.pdf](http://www.bgu.ac.il/~armona/aixbook2015_FINALLLLLL.pdf) [Accessed 17 July 2016].
- Bjornsson, H C (1977) Risk analysis of construction cost estimates. In: *Transactions of the American Association of Cost Engineers*, 182-189.
- Brashers, D E (2001) Communication and uncertainty management, *Journal of Communication*, 5(1), 477-497.
- Brennan, M C and Cotgrave, A C (2014) Sustainable development a qualitative inquiry into the current state of the UK construction industry, *Structural Survey*, 32(4), 315-330.
- Brody, S D Zahran, S Vedlitz, A and Grover, H (2008) Examining the relationship between physical vulnerability and public perception of global climate change in the United States, *Environmental and Behaviour*, 40(1), 72-95.
- Cook, P A and Bellis, M A (2001) Knowing the risk: Relationship between risk behaviour and health knowledge, *Public Health*, 115(1), 54 - 61.
- De Pourcq, K, Thomas, E, Arts, B, Vranckx, A, Leon-Sicard, T and Van Damme, P (2017) Understanding and resolving conflict between local communities and conservation authorities in Colombia, *World Development*, 83(2), 125-135.
- Douglas, M and Wildavsky, A (1982) *Risk and Culture: An Essay on Selection of Technological and Environmental Dangers*. Berkeley: California University Press.
- Enshassi, A and Mayer, P E (2005) Barriers to the application of sustainable construction concepts in Palestine. In: *The 2005 World Sustainable Building Conference*, 27-29 September, Tokyo.
- Enshassi, A, Mohamed, S and Abushaban, S (2009) Factors affecting the performance of construction projects in the Gaza strip, *Journal of Civil Engineering and Management*, 15(3), 269-280.
- Findley, M, Smith, S Gorski, J and O'Neil, M (2007) Safety climate differences among job positions in a nuclear decommissioning and demolition industry: Employees' self-reported safety attitudes and perceptions, *Safety Science*, 45(2), 875-889.
- Fischhoff, B, Slovic, P, Lichtenstein, S, Read, S and Combs, B (2000) How safe is safe enough? A psychometric study of attitudes toward technological risks and benefits, *Policy Sciences*, 9(2), 127-152.

- Fragouli, E and Theodoulou, P (2015) The way people and societies perceive the nature and context of risk is different: Due to psychological cultural issues, *East-West Journal of Economics and Business*, 18(1), 22-38.
- Gambatese, J A, Behm, M and Rajendran, S (2008) Designs role in construction accident causality and prevention: Perspectives from an expert panel, *Safety Science*, 46(2), 675-691.
- Gaskell, G and Allum, N (2001) *Risk: Two Cultures of Risk*. The London School of Economics and Political Science: London.
- Hallowell, M (2010) Safety risk perception in construction companies in the Pacific Northwest of the USA, *Construction Management and Economics*, 28(3), 403-413.
- Hillson, D A, Grimaldi, S and Rafele, C (2006) Managing project risk using a cross risk breakdown matrix, *Risk Management*, 8(1), 61-76.
- Hirsch, R A and Baxter, J (2011) Context cultural bias and health risk perception: The everyday nature of pesticide policy references in London, *Risk Analysis*, 31(5), 847 - 865.
- Holmes, N, Lingard, H, Yesilyurt, Z and De Munk, F (1999) An exploratory study of meanings of risk control for long term and acute effect occupational health and safety risks in small business construction firms, *Safety Research*, 30(4), 251-261.
- Jasanoff, S (1998) The political science of risk perception, *Reliability Engineering and System Safety*, 59(1), 91-99.
- Jannadi O A and Almishari, S (2003) Risk assessment in construction, *Journal of Construction Engineering and Management*, 129(2), 492-500.
- Klein, W, Lipkus, I, Scholl, S, McQueen, A, Cerully, J and Harris, P (2010) Self-affirmation moderates' effects of unrealistic optimism and pessimism on reactions to tailored risk feedback, *Psychology and Health*, 25(10), 1195-1208.
- Kos, J M and Clarke, V A (2001) Is optimistic bias influenced by control or delay? *Health and Education Research*, 16(5), 533-540.
- Krane, H P, Rolstadas, A and Olsson, N O E (2010) Categorizing risks in seven large projects-Which risks do the projects focus on? *Project Management Journal*, 41(1), 81-86.
- Leiter, M P, Zanaletti W and Argentero P (2009) Occupational risk perception, safety training and injury prevention: testing a model in the Italian printing industry, *Journal of Occupational Health Psychology*, 14(1), 1-10.
- Mahamid, I, Bruland, A and Dmaid, N (2011) Delay causes in road construction projects, *Journal of Management in Engineering*, 28(3), 300-310.
- Marries, C, Longford, I H and O'Riordan, T (1998) A quantitative test of the cultural theory of risk perception: comparison of the psychometric paradigm, *Risk Analysis*, 18, 635-647.
- Marshall, B, Cardon, P, Poddar, A and Fontenot, R (2013) Does sample size matter in qualitative research? A review of qualitative interviews in is research, *Journal of Computer Information System*, 54(1), 11-22.
- Mason, M (2010) Sample size and saturation in PhD studies using qualitative interviews, *Forum: Qualitative Social Research*, 11(3).
- Nathalie, E, Ghimire, D and Snedker, K A (2018) Fear of violence during armed conflict: social rules and responsibilities as determinants of fear, *Social Science Research*, 71(1), 145-159.
- Oltedal, S and Rundmo, T (2007) Using cluster analysis to test the cultural theory of risk perception, *Traffic Psychology and Behaviour*, 10(3), 254-262.
- Onwuegbuzie, A J and Leech, N L (2007) A call for qualitative power analyses, *Quality and Quantity*, 41, 105-121.
- Paek, H J, Oh, S H and Hove, T (2016) How fear-arousing news message affect risk perceptions and intentions to talk about risk, *Health Communication*, 31(9), 1-12.

- Parvathy, P, Shivaprasad H C, Barkur, G and Kamath, G (2015) Risk assessment using AHP in south Indian construction companies: A case study, *International Journal of Engineering Management and Science*, 2(5), 283-295.
- Peters, E and Slovic, P (1996) The role of affect and worldviews as orienting dispositions in the perception and acceptance of nuclear power, *Journal of Applied Social Psychology*, 26(16), 1427-1453.
- Pouliquen, L Y (1970) *Risk Analysis in Project Appraisal*. Baltimore: The Johns Hopkins University Press.
- Powell, N, Dunwoody, S, Griffin, R and Neuwirth, K (2007) Exploring uncertainty about an environmental health risk, *Public Understanding of Science*, 16(3), 323-343.
- Ranasinghe, K A M K (1990) *Analytical Method for Quantification of Economic Risks During Feasibility Analysis for Large Engineering Projects*. PhD Thesis, University of British Columbia.
- Razia, B, Thurairajah, N and Larkham, P (2017) Understanding delays in construction in conflict zones. *In: International Research Conference*, Salford, Manchester, UK.
- Renn, O (2004) Perception of risks, *The Geneva Papers on Risk and Insurance*, 29(1), 102-114.
- Rostami, R and Thomson, C (2017) Sustainable development of the UK construction industry for future. *In: 2nd International Conference on Civil Engineering, Architecture and Crisis Management*, Tehran, Iran.
- Schultz, C S and Jorgensen, K (2014) Achieving sustainable construction health and safety, *CIB W99 conference*, 2-3 June, Lund University, Sweden.
- Sjoberg, L and Moen, B (2004) *Explaining Risk Perception: An Evaluation of the Psychometric Paradigm in Risk Perception Research*. Oslo, Norway, Norwegian University of Science and Technology, Department of Psychology.
- Slovic, P (2000) Perception of risk, *In: P Slovic (Ed.) Perception of Risk*. London: Earthscan, 220-231.
- Vandermoere, F (2008) Hazard perception, risk perception and the need for decontamination by residents exposed to soil pollution: The role of sustainability and the limits of expert knowledge, *Risk Analysis*, 28(2), 387-398.
- Vidivelli, B, Vidhyasagar, E and Jayasudha, K (2017) Risk analysis in bridge construction projects, *International Journal of Innovative Research in Science, Engineering and Technology*, 6(5), 8271-8284.
- Wildavsky, A and Dake, K (1990) Theories of risk perception: who fears what and why? *Daedalus*, 119, 41-60.
- Williamson, J and Weyman, A (2005) *Review of the Public Perception of Risk and Stakeholder Engagement*. Buxton, UK: Health and Safety Laboratory.
- Wogalter, M S, Dejoy, D M, Laughery, K R (1999) Organizing theoretical framework: A consolidated communication-human information processing (CHIP) model. *In: M S Wogalter, D M Dejoy, K R Laughery (Eds.) Warnings and Risk Communication*. London: Taylor and Francis, 15-24.