

PROJECT RESILIENCE DIMENSIONS RANKING FROM MALAYSIAN AND INTERNATIONAL PERSPECTIVES: A DELPHI STUDY

KOK CHING WEN^{1*}, AMRAN RASLI², MCXIN TEE², NGA ELSIE², KHAIRUDIN³ AND IMELDA HERMILINDA ABAS⁴

¹Faculty of Engineering and Quantity Surveying, INTI International University, 71800 Nilai, Negeri Sembilan, Malaysia.

²Faculty of Business and Communications, INTI International University, 71800 Nilai, Negeri Sembilan, Malaysia. ³Faculty of Teacher Training and Education, Universitas Bung Hatta, 25586 Sumatera Barat, Indonesia. ⁴School of Liberal Arts, Shinawatra University, 12160 Pathum Thani, Thailand.

*Corresponding author: chingwen.kok@newinti.edu.my

Submitted final draft: 9 August 2023

Accepted: 22 August 2023

<http://doi.org/10.46754/jssm.2023.11.002>

Abstract: Prior studies on resilience focused on parameters that influence the recovery following a disaster. Few scholars have examined project resilience determinants as a strategy for achieving sustainable growth and advancement. Using a Delphi method with two rounds, this study aims to discover the factors regarded as essential for project resilience from Malaysian and international perspectives. Using Kendall's coefficient of concordance, the consistency of the ranking of eight dimensions was then evaluated. The importance of the eight dimensions indicated by the Delphi technique is as follows: (1) Leadership, (2) Project Agility, (3) Interpersonal Skill, (4) Team Trust, (5) Risk Management and Vulnerability, (6) Perception and Awareness, (7) Persistence and Crisis Preparedness, and (8) Emotional Intelligence. The relationship between the previously listed dimensions and project resilience is discussed. The authors suggest future scholars conduct other forms of quantitative and mixed-method research based on the eight dimensions identified for a deeper understanding of the interplay between the dimensions and also to decrease potential bias caused by triangulation.

Keywords: Kendall's coefficient of concordance, Delphi method, disaster, project resilience

Introduction

The world's situation is growing volatile, unpredictable, complex, and ambiguous (Millar *et al.*, 2018). According to statistics collected by the Centre for Research on the Epidemiology of Disasters (CRED), the University of Louvain in 2022, climate-induced disasters dominated the year 2021, accounting for the majority of 432 recorded events that resulted in 10,492 deaths, 101.8 million individuals are influenced, with at least US\$252.1 billion in damages to the economy (CRED, 2022). Disasters have impacted an ever-increasing number of global communities. Various industries extensively use the phrase project managers, including information technology, banking and finance, petrochemical, oil and gas, agricultural, government departments, and construction. Project managers have unique positions as leaders. The involvement of a project manager at the level of individual resilience will significantly

impact the degree of team resilience, thereby enhancing society's resilience (Karlsen & Berg, 2020). Professionals in Project Management (PM) require a resilience skillset (as an attribute and a method) and a robust capacity to react swiftly to participatory recovery tasks and crises. Disasters occur in unpredictable, unforeseen, and abrupt ways.

Unpredictability is a leading cause of poor project performance and failure. Risk identification and responses are the cornerstones of conventional strategies for managing project unpredictability (transfer, avoidance, acceptance, and mitigation). These risk-based methods help safeguard projects against known dangers. However, a project's success or failure cannot be ensured under significant uncertainty. The need for a pattern change from risk-based to resilience-based tactics has become more urgent. Enhancing project resilience-the ability

to tolerate known and unknowable volatility is the primary goal of a resilience-based strategy (Cavallo & Ireland, 2014; Rahi, 2019; Rahi *et al.*, 2019; Rahi *et al.*, 2021; Rahi *et al.*, 2022).

The construction industry represents a significant percentage of investments in every country. It is crucial to continuous economic expansion, especially in developing countries. Many public projects were delayed or abandoned due to the coronavirus disease (COVID-19), which had a detrimental economic impact on the entire world. The limited scope of existing public projects has left little room for implementing new ones. To ensure the construction industry is well-equipped to handle future challenges, this Delphi study aims to gather a valuable qualitative perspective on the insights gained from the COVID-19 outbreak and its associated positive and negative impacts (Ogunnusi *et al.*, 2021).

However, although organisational and larger levels of society can observe the causes and impacts of disruptions, the main influences are commonly the result of disruptions at the individual, team, or community that cascade up through projects and development, causing the breakdowns. Consequently, earlier studies at the levels of individuals, networks, teams, societies, and organisations must be integrated into the project level.

Literature Review

Resilience has been utilised for decades across various fields and viewpoints. Hence, its meaning varies depending on what is being discussed in concern (such as a person, a piece of essential infrastructure, a company, or a construction endeavour), and even when only one entity is the focus, the concepts of resilience can vary greatly (Rahi 2019; Rahi *et al.* 2019; Naderpajouh *et al.*, 2020; Rahi *et al.*, 2021; Rahi & Bourgault, 2022).

Dimensions Defining Resilience

The two pillars of resilience are ecological and engineering resilience. Hollnagel *et al.* (2011)

explained engineering resilience as the capacity to endure force (rigidity). In contrast, the ability of an ecosystem to regenerate, reorganise, and evolve is what ecological resilience means (Holling, 1973). Engineering resilience strongly emphasises predictability, stability, and efficiency (Walker *et al.*, 2004). However, ecological resilience emphasises systems' adaptability, dynamic evolution, and ability to continue despite perturbations to stabilise higher thresholds of functioning (Holling, 1973; Gunderson, 2000). Over time, these pillars of resilience have progressed, resulting in different definitions.

Blay (2017) has stated that project resilience is defined as a project's ability to anticipate, respond to, and lessen the effects of disruptions brought on by a changing environment and project complexity. Resilience is comprised of proactivity, coping skills, adaptability, and perseverance. Coping ability is the power to handle and manage stress caused by project disruptions. Proactivity is the project's ability to anticipate how its efforts will be affected. In addition, persistence is the capability to persevere through adversity, whereas a project's ability to manage disruption by permitting change while eventually ensuring that the goal is maintained is known as flexibility.

Leadership and Project Resilience

Transformational leadership, leadership behaviour, and soft skills are among the critical project management capabilities to which project management talents aspire (Alvarega *et al.*, 2019; Moradi *et al.*, 2020). According to Moradi *et al.* (2020), construction projects run into the danger of failing when incompetent leadership of the team are apparent. Having no well-known project manager and having a bad relationship with the team and stakeholders are the leading causes of low and failing performance in building projects (Kapogiannis *et al.*, 2021). The impact of soft skills and transformational leadership on project managers was empirically demonstrated in Indonesia, where these factors determined the success of challenging projects

(Rogo *et al.*, 2020). Fareed *et al.* (2021) have estimated that inadequate leadership is to blame for the failure of 80% of projects in Pakistan.

Additionally, their empirical results suggest combining intelligence quotient (IQ) and emotional intelligence (EQ) is crucial to project success. The success of public sector undertaking is also significantly impacted by transformative leadership. Podgórska and Pichlak (2019) nicely echoed this comparable circumstance in Poland. Similar research done in Brazil by Alvarenga *et al.* (2019) has verified a rise in the significance of soft skills and reaffirmed the necessity of developing project knowledge and closing the gap between practice and theory.

Albeit the importance of leadership, the study aims to recognise other factors that impact project resilience and discover how these factors are ranked to address the abovementioned questions. A series of research questions were formulated to address the purpose above: How accurate is the assertion that leadership is the most vital factor in project resilience during COVID-19? Should any additional factors be considered while developing a resilient project for sustainable growth? If so, how consistent are these factors ranked?

Methodology

This preliminary study uses the Delphi technique to identify and rank factors that promote project resilience for sustainable growth during COVID-19. According to Thompson (1990), the Delphi technique is an approach for incorporating expert opinions on the assumption that the group of experts are neutral. The Delphi technique uses designed tools to elicit experts' opinions, assessments, and consensus (Dalkey & Rourke, 1972). Miller (1994) describes the Delphi technique as a qualitative and systematic procedure for predicting that entails raising a series of questions to the experts. The Delphi method used by Tee *et al.* (2022) demonstrates its adaptability and suitability, particularly when improving comprehension of problems, opportunities, solutions, or projections is the goal (Skulmoski *et al.*, 2007). The Delphi

method is appropriate for studying contentious, ambiguous, or controversial themes (Iqbal & Pippon-Young 2009). It can also serve as a stand-in for scientific evidence, as in this study (Dalkey & Helmer, 1963; Dalkey & Rourke, 1972).

Developing the Delphi Method Instrument

In this Delphi method, 30 experts with sufficient expertise and a minimum of two years of experience in their discipline of project resilience were asked. They are academicians or practitioners from Malaysia and internationally on the study's panel of experts. It is worth mentioning that some of the respondents are expatriates and Malaysians who have worked abroad to assess project resilience from both Malaysian and international perspectives (refer to Table 1). The first round consisted of only two questions: 1) List as many of your opinions on factors that positively impact the project's resilience and emerging dimensions of project resilience; 2) For this study, "Project Resilience" should be interpreted broadly. By presenting the themes and agreeing to the various dimensions, the questions give the experts a more meaningful role in ranking the dimensions based on the grouping of themes. There is no defined formula for determining a Delphi method's required number of experts. The authors feel that 30 experts are necessary to guarantee acceptable group performance because the attrition rate in later rounds will impact the conclusion of the Delphi technique. Numerous numbers of panels have been suggested, including 5–10 for heterogeneous experts (Gustafson *et al.*, 1986), 15–30 experts for homogenous experts (Clayton, 1997), and 5–20 experts (Rowe & Wright, 2001). The number of experts in the second round remained constant at 30 and fell within the recommended range. In addition, the backgrounds of the Delphi panels were checked to ensure some degree of homogeneity (Clayton, 1997).

The responses to the previous question in the first round were analysed. Common responses were reworded to prevent duplication

and subsequently grouped into dimensions based on thematic analysis. These replies were gathered into a list and incorporated into the second-round questionnaire. The second round of the Delphi technique provided a summary of the first round’s replies.

The second round of the Delphi technique computed the group rank and mean for each theme. The loss of expertise was anticipated even after constant reminders. The Delphi method was deemed reliable because of the several rounds done and the fact that the unchanged experts were continuously informed of the results of prior rounds.

Despite difficulties in ensuring anonymity among the contributing experts and the possibility of attrition as the Delphi technique progressed, it proved to be an efficient method for achieving rapid results. The research was completed within three months. The process flow of the Delphi technique is presented in Figure 1.

Results

First Round of the Delphi Method

From September 2022, the first round of the Delphi technique received a favourable response from 30 experts, as shown in Table 1. A total of 15 experts are from the industrial sectors, while another 15 represent higher education institutions.

The outcome from the first round of the Delphi technique presented 34 themes collected from the 30 experts. The themes were synthesised and grouped into eight dimensions. Two themes represent Interpersonal Skills, 6 represent Team Trust, 2 represent leadership, 3 represent Risk Management and Vulnerability, 9 themes represent Project Agility, another 9 represent Perception and Awareness, 2 represent Emotional Intelligence, and lastly, 1 represents Persistence and Crisis Preparedness. The themes and dimensions are compiled and presented in Table 2.

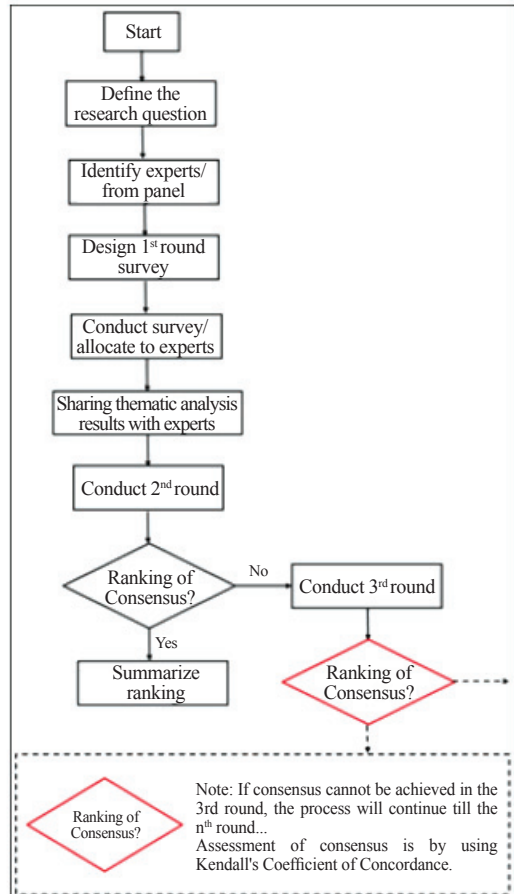


Figure 1: The Delphi Process Flow (Tee et al., 2022)

Second Round of the Delphi Method

The second round of the Delphi technique was conducted in November 2022. The responses submitted by the experts who joined the first round were synthesised and grouped into eight dimensions: Interpersonal Skill, Team Trust, Leadership, Risk Management and Vulnerability, Project Agility, Perception and Awareness, Emotional Intelligence, Persistence and Crisis Preparedness. The same experts were reached and asked to answer the inquiry: On a scale of 1 to 8, where 1 is the most essential, please list the factors that have been found to improve project resilience during the COVID-19 pandemic. This study does not use the Likert scale, normally used to measure agreement, as this study aims to rank the importance of the dimensions. The scale

Table 1: Experts Who Participated in the Delphi Method

Experts	Age	Experience (In years)	Position	Academic Qualification	Company/Institution
Experts from Industrial Sectors					
E1	41	19	General Manager	BSc in Building Economics & QS, Post Grad in QS	BCISM Sdn Bhd
E2	36	14	Construction Manager	Master's in Forensic Engineering	Dasacon Sdn Bhd
E3	66	38	President	MSc in Construction Management	The Chartered Institute of Building Malaysia
E4	30	7	Senior Manager	Master's Degree	China Railway Engineering Corporation (M) Sdn Bhd
E5	61	31	Director	SPM	Dasacon Sdn Bhd
E6	61	41	Managing Director	STPM	Dasacon Sdn Bhd
E7	46	26	Chapter President/ Associate Director	MBA, Master's in Project Management	Project Management Institute Malaysia Chapter/ Turner & Townsend Malaysia
E8	66	38	Founding Member and Immediate Past President, CIOB	PhD in Engineering Business Management	CIOB Malaysia
E9	25	2	Director	BSc (Hons) in Quantity Surveying	Ta Engineering and Consultant
E10	32	8	Senior Audit Associate	BA (Hons) in Accounting	PwC Botswana
E11	43	22	Managing Director	Master's Degree	Telford Engineering (M) Sdn Bhd
E12	49	-	Solution Architect	Bachelor's Degree	-
E13	-	-	Senior Contracts Manager	-	Knusford Project Management Sdn Bhd
E14	55	30	Partner	LLM (Construction Law & Arbitration)	Contract Solutions-i
E15	63	20	Director	-	TEAM-3 Construction Sdn Bhd
Experts from Higher Education Institutions					
E16	53	30	Associate Professor	PhD (Strategic IT Management)	University of Malaya
E17	36	7	Senior Lecturer	PhD	University Malaysia Pahang

E18	33	6	Senior Lecturer, Head of Programme	PhD	INTI International University
E19	44	20	Senior Lecturer	Master’s Degree	
E20	58	35	Associate Professor	PhD Civil, MSc Arch: Building Econs & Mgt, MSc Const Law & Arb	Massey University
E21	45	20	Associate Professor	PhD	Heriot-Watt University Malaysia
E22	-	-	Lecturer, Asst HOP	-	
E23	40	15	Lecturer II	Master’s in Accounting	INTI International University
E24	35	8	Lecturer	Master’s Degree	
E25	45	21	Senior Lecturer	Master’s Degree	
E26	47	20	Associate Professor	0	University Putra Malaysia
E27	35	12	Head of Programme	PhD in Mechanical Engineering	
E28	37	8	Senior Lecturer, Head of Programme	Master’s in Construction Contract Management	INTI International University
E29	57	10	Senior Lecturer	Master of Business Administration (Strategic Management)	
E30	-	-	Senior Lecturer	-	University Technology Malaysia

Table 2: Consolidation of First-Round Delphi Findings

8 DIMENSIONS FOR POSITIVE IMPACT		
Dimensions	Themes	
Interpersonal Skills	<ul style="list-style-type: none"> • New ways of communication via advanced technology. • Being empathetic. 	2 themes
Team Trust	<ul style="list-style-type: none"> • Transparency. • Work together to deliver a win-win solution. • Closer bonding between client and contractor. • Decision-making at a faster rate and accuracy. • Increase knowledge, skills, and qualifications by attending virtual training. • Closer bonding between government and regional organisations. 	6 themes
Leadership	<ul style="list-style-type: none"> • Differentiate productive and unproductive staff. • Project manager and key stakeholders focus on “what matters most?”. 	2 themes
Risk Management and Vulnerability	<ul style="list-style-type: none"> • Enhancement of risk management, e.g., insurance indemnification. • Enhancement of supply chain and value chain. • Lean thinking to eliminate non-value-added processes. 	3 themes

Project Agility	<ul style="list-style-type: none"> • Embarking in digitalisation, e.g., robotics and artificial intelligence. • Learning new things through online webinars. • Accelerate the process from physical to digital. • Flexibility in the working environment with online work technology adoption. • Innovative in delivery (outcome) rather than process. • Embarking in digitalisation using new online tools for teaching and learning and Building Information Modeling (BIM) applications on contracts. • Flexible personal and working time management. • Enhance efficiency and productivity because of the absence of travel time. • Technology flexibility. 	9 themes
Perception and Awareness	<ul style="list-style-type: none"> • Sustainability transformation. • Sustainable design and construction. • Data storage on documentation improves information sharing. • The fourth industrial revolution (IR 4.0) implementation and adoption. • Perception on medical improvement. • Legislative changes. • Saving in carbon footprints as virtual meetings save travel by flight. • Technology awareness. • Ease transfer of knowledge and sharing of project experience. 	9 themes
Emotional Intelligence	<ul style="list-style-type: none"> • Self-awareness on behaviour. • Motivation to explore new software and applications. 	2 themes
Persistence and Crisis Preparedness	<ul style="list-style-type: none"> • Strengthen the action to expand/diversify the business. 	1 theme

used in the second round is from 1 to 8 because eight dimensions are identified from the first round as per the recommendations of Tee *et al.* (2022) and Mohd Noor *et al.* (2022). The experts were informed that there are no right or wrong answers while ranking the eight dimensions and that the rankings should not be duplicated to avoid difficulties during data analysis. All 30 experts who joined the first round of the Delphi technique completed the second round.

Table 3 shows that the mean ranking of the eight dimensions ranges from 3.47 to 5.80. The first dimension in the order of importance of the dimensions is leadership (3.47), Project Agility (3.77), Interpersonal Skill (4.27), Team Trust (4.37), Risk Management and Vulnerability (4.6), Perception and Awareness (4.73), Persistence and Crisis Preparedness (5.0) and finally Emotional Intelligence (5.80). What is more critical is Kendall's Coefficient

of Concordance (Kendall's W) of 0.088 and a p-value of 0.01. These means suggest that the second round of the Delphi technique's findings are significant. Therefore, performing the third round of the Delphi technique is unnecessary. However, Kendall's W value of 0.088 is low. It means there is weak consensus on the significance of the dimensions among the group of experts. The result is interesting, and further explanation will be discussed in the next section.

Discussion

The following is the order of importance for the eight dimensions: (1) Leadership, (2) Project Agility, (3) Interpersonal Skill, (4) Team Trust, (5) Risk Management and Vulnerability, (6) Perception and Awareness, (7) Persistence and Crisis Preparedness, and (8) Emotional Intelligence. As expected, leadership is the most

Table 3: Second Round of Delphi Method

EXPERTS	8 DIMENSIONS							
	Interpersonal Skill	Team Trust	Leadership	Risk Management and Vulnerability	Project Agility	Perception and Awareness	Emotional Intelligence	Persistence and Crisis Preparedness
E1	4	2	1	7	6	3	8	5
E2	2	8	3	5	1	4	6	7
E3	8	7	5	3	1	4	6	2
E4	3	4	1	2	7	6	5	8
E5	3	8	1	5	2	4	6	7
E6	2	8	3	5	1	4	6	7
E7	2	4	3	5	1	6	7	8
E8	8	3	5	6	7	1	2	4
E9	6	2	1	5	3	8	4	7
E10	4	2	1	7	6	3	8	5
E11	3	4	1	2	7	6	5	8
E12	4	2	1	7	6	3	8	5
E13	6	5	4	8	7	3	1	2
E14	8	4	5	2	3	6	7	1
E15	3	6	2	1	4	7	8	5
E16	2	6	7	5	1	4	8	3
E17	4	1	5	2	8	6	3	7
E18	2	1	3	8	7	5	6	4
E19	8	4	5	3	6	2	7	1
E20	2	6	7	5	1	4	8	3
E21	7	6	3	2	1	5	8	4

E22	7	3	1	2	5	6	8	4
E23	1	5	6	8	3	7	2	4
E24	3	5	4	7	1	8	2	6
E25	3	2	1	7	6	5	4	8
E26	3	4	5	8	1	7	2	6
E27	6	1	7	3	2	4	5	8
E28	2	6	7	5	1	4	8	3
E29	5	6	3	1	7	2	8	4
E30	7	6	3	2	1	5	8	4
Mean	4.27	4.37	3.47	4.60	3.77	4.73	5.80	5.00
Group Rank	3	4	1	5	2	6	8	7

Kendall's W of 0.088; p-value of 0.01

important dimension to ensure project resilience. Elaboration on the other dimensions is presented accordingly.

Leadership

The first round of the Delphi technique revealed two leadership-related themes, as indicated in Table 2. In the second round, leadership was determined to be the most significant aspect associated with project resilience that will direct sustainability development. Project management talents strive for transformational leadership (Fareed *et al.*, 2021), leadership behaviour (Alvarega *et al.*, 2019; Moradi *et al.*, 2020), and soft skills (Alvarega *et al.*, 2019; Moradi *et al.*, 2020). When incompetent leaders lead a team, construction projects are at risk of failure. The lack of a well-known project manager in building projects and handling relationships with teammates and other interested parties (Kapogiannis *et al.*, 2021) causes poor performance and failure. This was empirically demonstrated in Indonesia, where the success of challenging undertakings was influenced by transformational leadership and soft skills (Rogo *et al.*, 2020). According to Fareed *et al.* (2021), inadequate leadership continues to cause the failure of 80% of Pakistani projects. In addition, their empirical findings indicate that combining IQ and EQ is a critical success element for projects. Moreover, public sector initiatives are significantly more likely to succeed under transformative leadership. There is insufficient research-based knowledge on the variety of settings that seem to require particular capabilities from project managers, according to a study conducted by Moradi *et al.* (2020), which used Finland and Norway as test cases. This is consistent with the proverb, “One size does not fit all.”

Project Agility

After performing a comprehensive literature study on agility as it relates to project management, Conforto *et al.* (2016) have stated that “definitions of agility found in the project management (PM) and agile project management

(APM) disciplines are inconsistent, incomplete, and lack clarity” (p. 660). They surveyed 171 projects and defined this project management construct as “the project team’s ability to rapidly modify the project plan in response to customer or stakeholder needs, market or technology demands to achieve improved project and product performance in an innovative and dynamic project environment” (Conforto *et al.*, 2016). This meaning brings several issues to prominence. Initially, agility is perceived as a skill (or a quality). The project team is the most significant group, but the project plan requires the most alteration or adaptation. A shift is necessary for agility must be made in response to various stakeholders’ or customers’ needs, market expectations, and technical requirements. This change does not have to be disruptive. Besides, Rahi (2019) contends that in contrast to proactivity, which refers to acts performed before a disruptive event, responsiveness (actions taken during or after a disruptive event) is more important for agility. It implies that agility emphasises adaptability to change, particularly consumer and stakeholder requirements. Agile techniques implicitly address issues that may come from consumers’ and stakeholders’ requirements and aspirations regarding risk management. In agile techniques, crucial components of risk management, such as the development of processes and rules, risk registries for tracking hazards, and mitigation plans, are neglected. This shows the absence of preventative measures within agile systems.

In conclusion, from a project management standpoint (Rahi, 2019; Rahi *et al.*, 2019; Rahi *et al.*, 2021; Rahi *et al.*, 2022), Since occurrences outside the boundaries of market change, technology demands, and stakeholders’ expectancies might disrupt certain project, thus relying merely on agility could leave the project exposed. Therefore, exploring new pathways that concentrate on handling disruptive actions and strengthening a project’s capacity to manage events that may affect it to depart from its key aims would be exciting. This research aims to make projects more robust, as these paths

demonstrate. Project managers’ knowledge and skills are inadequate to play a role in crisis occurrences in the unstable environment now by using current project management techniques. Accordingly, it is crucial to train project managers and members with the requisite resilience and readiness competencies to achieve local and global projects, particularly crisis recovery initiatives (Chang-Richards *et al.*, 2017; Amaratunga *et al.*, 2018). Project managers would benefit greatly from the addition of project managers’ crisis resilience and professionalism (Bowers *et al.*, 2017), adaptive resilience (Shenhar & Holzmann, 2017), and preparedness (Bowers *et al.*, 2017; Staupe-Delgado & Kruke, 2018) to techniques for developing resilience and disaster risk reduction (Ismail *et al.*, 2014; Pavez *et al.*, 2021). The stakeholders identified the main shortcomings of the built environment in the United Kingdom (Amaratunga *et al.*, 2018) and New Zealand (Chang-Richards *et al.*, 2017) as readiness, skill, and knowledge for crisis resilience. Observations and substantial studies reveal a lack of disaster resilience and preparedness in wealthy nations. An instant paradigm shift from response to crisis preparedness and disaster recovery is required (Whittaker *et al.*, 2020). According to the existing literature, examining crisis resilience and readiness awareness among project management professionals is beneficial.

Interpersonal Skills

According to Podgórska and Pichlak (2019), project management expertise is the subject of a fragmented body of knowledge generated by academics and professional bodies. Their analysis reveals that communication, influencing, contextual, emotional, knowledge and experience, professionalism, management, project management expertise, cognitive abilities, and personal skills and qualities are among the 81 competencies listed in the competency outline for a project manager, which is divided into 11 areas (Podgórska & Pichlak, 2019). Leadership, interpersonal/communication, and commitment are the most crucial abilities

in each project life cycle phase (Bower *et al.*, 2017; Alvarenga *et al.*, 2019). Various stakeholders with a wide range of interests and goals need to be coordinated to handle and complete the challenging work based on a layer of system integration (Shenhar & Holzmann, 2017; Alvarenga *et al.*, 2019). A sympathetic leadership, clear vision, and well-managed project communication and documentation processes were the cornerstones of its success (Bower *et al.*, 2017; Alvarenga *et al.*, 2019).

Team Trust

The ability of a project manager to interact with project members and other stakeholders must be strengthened (Kapogiannis *et al.*, 2021). The project manager and the teams' interaction and collaboration are enhanced by this engagement (Alvarenga *et al.*, 2019; Chapman *et al.*, 2020) and promote trust (McLaren & Loosemore, 2019; Kapogiannis *et al.*, 2021). Moreover, by increasing and cultivating the aforementioned key qualities, relationship-building among the team members would be facilitated and more effective (Kapogiannis *et al.*, 2021).

Risk Management and Vulnerability

Risks are events or situations that could happen (they have a chance of happening). If risks arise, they will either have a negative impact on the project's goals (threats, adverse impacts) or a good impact (opportunities) (Ward & Chapman, 2003; Project Management Institute, 2017). Hence, from the perspective of project management, the primary purpose of risk management is to limit negative risks while capitalising on favourable risks to fulfil project objectives (Ward & Chapman, 2003). There are two main types of risk analysis, according to Zhang (2011): risk as an objective truth and risk as a subjective concept. The "Risk as an Objective Fact" school of risk analysis asserts that danger exists independently of individuals' thoughts and beliefs. Risks are identified, evaluated, mitigated, and controlled using scientific methods and transparent procedures (Zhang, 2011). It is, therefore, possible to

classify this risk management strategy into two categories. Regardless of stakeholder perceptions, the first kind sees it as a system with clear objectives. Therefore, rational and systematic risk management methods and methodologies are implemented to address risks' logical and objective implications (Baccarini, 1996; Huchzermeier & Loch, 2001). The second group believes risk management is subjectively determined. In other words, individuals may react differently to objective threats. These strategies are frequently influenced by a person's experience, skills, expertise, and psychological and organisational factors (Ward & Chapman, 2003; Zhang, 2007). The approach that prioritises risk management over uncertainty management, as described by Ward and Chapman (2003), is one of the most significant techniques to address this kind of risk because "uncertainty management is not only about managing perceived threats, opportunities, and their implications" (p. 98). Understanding and managing the various sources of uncertainty that produce and shape our perceptions of risks and opportunities are necessary for this strategy (Ward & Chapman, 2003). The idea of vulnerability has since been expanded from the social sciences into fields like organisational management, information systems, politics, economics, and project management (Zhang, 2007; Podgorska & Pichlak, 2019; Crossweller & Tschakert, 2021).

Vulnerability is explored by Zhang (2007) as a redefining of the project risk process, drawing inspiration from Füssel and Klein's third project management school of thinking (Füssel & Klein, 2006). Zhang (2007) demonstrates the vulnerability of a project from two perspectives: capacity and exposure. The first dimension is the impact of organisational actions on the incidence of risk outcomes. The second dimension implies that as a project's capacity to respond to risk events increases, its vulnerability will decrease. The concept of vulnerability helps improve project risk management. "In order to maximise its ability to explain and elucidate, this approach disregards the layered interactions and feedback

between risk occurrences and project systems” (Zhang, 2007, p. 696). A project’s vulnerability is its sensitivity to unfavourable circumstances (Zhang, 2007; Vidal & Marle, 2012). Thus, the existence of threats is unrelated to the existence of vulnerabilities. A project vulnerability is a lack of qualified employees to do a specific task. This vulnerability could potentially result in suboptimal performance.

Consequently, a risk (“low-quality work”) can be produced by a vulnerability (“lack of trained staff”). A disruptive event (a risk that occurred) does not always follow from a vulnerability. In other words, the lower the vulnerability, the less likely disturbances will arise during the project’s life cycle. In contrast, the larger a project’s vulnerability, the greater its susceptibility to disturbances that may result in extinction (Zhang, 2007; Aleksic et al., 2017). The vulnerability approach of Vidal and Marle (2012) has improved the methodology of Zhang (2007). Similar to Zhang’s viewpoint, vulnerability refers to a project attribute subjecting it to destructive or disruptive events. Moreover, the ability of a project to withstand disruptive events is related to vulnerability. Hence, adapting to disruptions and recovering from them are complex subjects. In a similar vein, Proag (2014) claimed that “the idea of vulnerability suggests a measure of risk connected with the physical, social, and economic components and consequences coming from the system’s capacity to adapt to the ensuing crisis” (p. 375).

Perception and Awareness

Individuals perceive risks and adopt rules and procedures to mitigate them based on their perceptions. Moreover, individuals with various emotional and moral sentiments may choose and adopt unique risk management strategies. Consequently, combining circumstances, events, and responses makes recognising and evaluating risks easier (Zhang, 2011). This viewpoint (“hazards as a subjective construction”) is well-clarified by Kutsch and Hall (2005), who discovered that project stakeholders do

not recognise risks logically because they tend to deny, ignore, or avoid risks, whether on purpose or by accident. These behaviours (denial, ignorance, and avoidance) are related to environmental variables that influence stakeholders’ assessments of risks, the efficacy of risk mitigation techniques, and the project’s goals.

A comprehensive comprehension of the system’s external and internal components is known as awareness (McManus et al., 2008; Stephenson, 2010). This comprehension enhances response to disruptive events due to excellent system environment change monitoring (Coutu, 2002; Luthans et al., 2006). Therefore, awareness necessitates proactive activity toward disruptive occurrences and understanding the system’s inputs, outputs, and vulnerabilities (Hémond, 2013). Consequently, weaknesses in internal system connectivity links and a lack of accessible resources, among other things, are external and internal risks that raise a system’s susceptibility to disruptive occurrences (Hémond, 2013). Therefore, the longer a system remains susceptible, the more likely it is to experience disturbances and the greater its likelihood of failing (Zhang, 2007).

Achieving awareness demands the reduction of communication obstacles across departments of an organisation. These obstacles are frequently associated with employees’ cultural backgrounds, cognitive behaviours, and job experiences, resulting in ineffective working practices (Coutu, 2002; Sonnet, 2016). On the other hand, employees can encourage and support management in implementing organisational changes to achieve strategic goals in a workplace that promotes information exchange and excellent relationships with the management team (McManus et al., 2008; Stephenson, 2010; Sonnet, 2016). Keeping staff informed, forewarned, and alert to unforeseen situations is crucial in enhancing an organisation’s global consciousness (McManus et al., 2008; Stephenson, 2010; Demmer et al., 2011; Sapeciay et al., 2017).

Persistence and Crisis Preparedness

The idea of complex adaptive systems (CAS) in resilience is one of the most critical new paths from a systemic perspective (Cavallo & Ireland, 2014). The “blessing in disguise” notion emphasises a capability that arises in reaction to a perceived or actual systemic threat. The ability to adapt, keep one’s essential characteristics, and regain functionality after adversity are all examples of resilience. This method is not novel by nature. Research on ecological resilience pinpoints the self-organising mechanisms that encourage local genetic adaptation, produce spatial and temporal variability, maintain local biodiversity, and make an ecosystem more resistant to future shocks.

Preparedness for crisis entails preparing society and response systems to address identified risks in a given area. Once the threats have been identified, a strategy for risk management can be adopted to prepare the individuals to deal with them. After a hazard has been recognised, the technical sectors of response can be deconstructed into packages of actions, plans, and instructions that can be addressed separately (Cavallo & Ireland, 2014). Modern crisis preparedness techniques often prioritise bolstering resilience in the face of identified crisis vulnerabilities. Nevertheless, disasters are characterised by interconnected and systemic risks that may result in unforeseen cascade effects. The ‘unexpected’ is already a part of the lives of many societies.

Thus, there is an urgent need to develop strategies for preparing for the unforeseen and non-communicable. Crisis preparedness can be conceptualised as a System of Subsystems. A reductionist method reduces the threat to a series of autonomous joint actions. Clients are community members. This technique is based on linear causal relationships, such as cause one leading to effects 1, 2, and 3. Network effects are very seldom addressed (Cavallo & Ireland, 2014).

Emotional Intelligence

Podgórska and Pichlak (2019) accurately reflected this situation in Poland. The empirical results expounded upon the influence of the project manager’s leadership, emotional intelligence, and managerial abilities on project success. Moreover, Podgórska and Pichlak (2019) suggested that depending on the nature of the project, its success relied on other competencies. A project manager’s scientific leadership is vital to a company’s success, especially in dynamic situations.

A similar study in Brazil by Alvarenga *et al.* (2019) verified an increasing tendency toward soft skills. Alvarenga *et al.* (2019) reaffirmed the necessity to increase project knowledge and close the gap between practice and theory. The study examines the relationship between the project manager’s leadership and the project’s performance. Alvarenga *et al.* (2019) investigate various project types and focus on establishing these relationships in economies in transition. Their findings showed that leadership gives direction for the durability of a project by fostering a feeling of shared understanding.

Conclusion and Recommendations

The authors feel that resilience should be adopted as a new strategy for achieving sustainable growth and advancement. Project resilience offers a novel conceptual method for understanding the underlying risks of project systems and expediting project adaptation to known and unknowable risks, enhancing risk management strategies. The major contribution of this study is the application of the Delphi method to determine the following eight dimensions to facilitate project resilience: (1) Leadership, (2) Project Agility, (3) Interpersonal Skill, (4) Team Trust, (5) Risk Management and Vulnerability, (6) Perception and Awareness, (7) Persistence and Crisis Preparedness, and (8) Emotional Intelligence. Based on the methodology applied, the Delphi has been proven to be rapid, robust and effective whilst showing the vitality or importance of the dimensions

simultaneously, i.e. the first dimension being the most significant and the eighth dimension being the least significant.

Despite its numerous strengths, this study has several shortcomings. The first is that the data were collected from 30 experts only (25 from Malaysia, 1 from Africa, 1 from New Zealand, 1 USA, and 2 UK). Secondly, the authors believe that the low Kendall's W value is attributed to the 'not-so-perfect' homogeneity of the composition of the experts because some of the experts are from abroad, and an equal number of experts represent higher education institutions and industries.

A Kendall's coefficient of concordance (Kendall's W) value of 0.088 indicates a low level of agreement among the raters. A value of Kendall's W below 0.2 indicates poor agreement. However, the context and application determine the acceptability of a low Kendall's W value. As in this preliminary study, a relatively low Kendall's W value may be acceptable in some cases. Thus, additional rounds of the Delphi method are not required. However, a higher level of agreement may be required in other studies, as in medical diagnoses.

Future researchers can apply the systematic literature review (SLR) using the Scopus or Web of Science databases to assess project resilience during COVID-19 conforms to the eight dimensions identified from the Delphi method. As a result, the authors encourage other researchers to look into expanding this research using SLR and the (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) PRISMA process in the near future.

Future researchers could undertake investigations with additional experts from other nations using the present tools for comparison with this study. In addition, the authors believe that future scholars can construct survey questions that assess the eight characteristics and combine other variables to do significant quantitative analysis. The data gathered and examined were cross-sectional, meaning the Delphi technique provided a picture of what

transpired throughout the two rounds with the experts. The authors strongly advise that future studies employ mixed methods research to gain a deeper knowledge of the phenomenon and to limit the possibility of bias through triangulation (Dewasiri *et al.*, 2018). Finally, future research should investigate the applicability of these indicators (such as confirmatory and exploratory factor analysis) in various project types (such as pharmaceutical and information technology), to give more trustworthy indicators to judge the project's capacity to effectively and efficiently manage disruptive happenings.

Acknowledgements

The authors would like to thank the management of INTI International University for the publication grant as well as the experts who participated in the Delphi Method.

References

- Aleksic, A., Puskaric, H., Tadic, D., & Stefanovic, M. (2017). Project management issues: Vulnerability management assessment. *Kybernetes*, 46(7), 1171-1188. <https://doi.org/10.1108/K-08-2016-0218>
- Alvarenga, J., C., Branco, R., R., Guedes, A., L., A., Soares, C., A., P., & Silva, W., d.S.e. (2019). The project manager core competencies to project success, *International Journal of Managing Projects in Business*, 13(2), 277-292. <https://doi.org/10.1108/IJMPB-12-2018-0274>
- Amaratunga, D., Malalgoda, C., I., & Keraminiyage, K. (2018). Contextualising mainstreaming of disaster resilience concepts in the construction process, *International Journal of Disaster Resilience in the Built Environment*, 9(4/5), 348-367. <https://doi.org/10.1108/IJDRBE-10-2017-0057>
- Baccarini, D. (1996). The concept of project complexity—A review. *International Journal of Project Management*, 14(4), 201-204. [https://doi.org/10.1016/0263-7863\(95\)00093-3](https://doi.org/10.1016/0263-7863(95)00093-3)

- Blay, K. B. (2017). *Resilience in projects: Definition, dimensions, antecedents and consequences* [Doctoral thesis, Loughborough University]. Loughborough's Research Repository. <https://hdl.handle.net/2134/27531>
- Bowers, C., Kreutzer, C., Cannon-Bowers, J., & Lamb, J. (2017). Team resilience as a second-order emergent state: A theoretical model and research directions. *Frontiers in Psychology, 8*, 1360. <https://doi.org/10.3389/fpsyg.2017.01360>
- Cavallo, A., & Ireland, V. (2014). Preparing for complex interdependent risks: A system of systems approach to building disaster resilience. *International Journal of Disaster Risk Reduction, 9*, 181-193. <https://doi.org/10.1016/j.ijdr.2014.05.001>
- Chang-Richards, Y., Wilkinson, S., Seville, E., & Brunson, D. (2017). Effects of a major disaster on skills shortages in the construction industry: Lessons learned from New Zealand. *Engineering, Construction and Architectural Management, 24*(1), 2-20. <https://doi.org/10.1108/ECAM-03-2014-0044>
- Chapman, M., T., Lines, R., L., Crane, M., Ducker, K., J., Ntoumanis, N., Peeling, P., ... & Gucciardi, D. F. (2020). Team resilience: A scoping review of conceptual and empirical work. *Work & Stress, 34*(1), 57-81. <https://doi.org/10.1080/02678373.2018.1529064>
- Clayton, M., J. (1997). Delphi: A technique to harness expert opinion for critical decision-making tasks in education. *Educational Psychology, 17*(4), 373-386. <https://doi.org/10.1080/0144341970170401>
- Conforto, E. C., Amaral, D. C., da Silva, S. L., Di Felippo, A., & Kamikawachi, D. S. L. (2016). The agility construct on project management theory. *International Journal of Project Management, 34*(4), 660-674. <https://doi.org/10.1016/j.ijproman.2016.01.007>
- Coutu, D. L. (2002). How resilience works. *Harvard Business Review, 80*(5), 46-56.
- CRED & UNDRR. (2022). *The non-COVID year in disasters*. Brussels: CRED
- Crosweiler, M., & Tschakert, P. (2021). Disaster management leadership and policy making: A critical examination of communitarian and individualistic understandings of resilience and vulnerability. *Climate Policy, 2*(2), 203-221. <https://doi.org/10.1080/14693062.2020.1833825>
- Dalkey, N., & Helmer, O. (1963). An experimental application of the Delphi method to the use of experts. *Management Science, 9*(3), 351-515. <https://doi.org/10.1287/mnsc.9.3.458>
- Dalkey, N. C., & Rourke, D. L. (1972). Experimental assessment of Delphi procedures with group value judgments. In Dalkey, N., C., Rourke, D., L., Lewis, R., and Snyder, D. (Eds), *Studies in the quality of life: Delphi and decision-making* (pp. 55-83). Lexington, MA: Lexington Books.
- Dewasiri, N. J., Weerakoon, Y. K. B., & Azeez, A. A. (2018). Mixed methods in finance research: The rationale and research designs. *International Journal of Qualitative Methods, 17*(1), 1609406918801730
- Gustafson, D. H., Delbecq A. L., & Van de Ven, A. H. (1986). *Group techniques for program planning-A guide to nominal group and Delphi processes*. Middleton, WI: Green Briar Press.
- Demmer, W. A., Vickery, S. K., & Calantone, R. (2011). Engendering resilience in Small And Medium-sized Enterprises (SMEs): A case study of Demmer Corporation. *International Journal of Production Research, 49*(18), 5395-5413. <https://doi.org/10.1080/00207543.2011.563903>
- Fareed, M. Z., Su, Q., & Awan, A. A. (2021). The effect of emotional intelligence, intellectual intelligence and transformational leadership on project success: An empirical study of public projects of Pakistan. *Project*

- Leadership and Society*, 2, 100036. <https://doi.org/10.1016/j.plas.2021.100036>
- Füssel, H. M., & Klein, R. J. T. (2006). Climate change vulnerability assessments: An evolution of conceptual thinking. *Climatic Change*, 75, 301–329. <https://doi.org/10.1007/s10584-006-0329-3>
- Gunderson, L. H. (2000). Ecological resilience—In theory and application. *Annual Review of Ecology And Systematics*, 31, 425–439. <https://www.jstor.org/stable/221739>
- Hémond, Y. (2013). *Concepts et démarche d'évaluation du potentiel de résilience d'une infrastructure essentielle* [Doctoral thesis, Polytechnique Montréal]. PolyPublie. <https://publications.polymtl.ca/1109/>
- Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4, 1–23. <https://www.jstor.org/stable/2096802>
- Hollnagel, E. (2011). Epilogue: RAG—the resilience analysis grid. In E. Hollnagel, J. Pariès, & J. Wreathall (Eds.), *Resilience engineering in practice: A guidebook* (pp. 275–296). London: CRC Press. <https://doi.org/10.1201/9781317065265>
- Huchzermeier, A., & Loch, C. H. (2001). Project management under risk: Using the real options approach to evaluate flexibility in R&D. *Management Science*, 47(1), 85–101. <https://doi.org/10.1287/mnsc.47.1.85.10661>
- Iqbal, S., & Pippon-Young, L. (2009). The delphi method. *The Psychologist*, 22(7), 598–601.
- Ismail, D., Majid, T. A., Roosli, R., & Ab Samah, H. N. (2014). A review of project management for post-disaster reconstruction project: from International NGOs (INGOs) perspective. *Research in Civil and Environmental Engineering*, 2(4), 199–215.
- Karlsen, J. T., & Berg, M., E. (2020). A study of the influence of project managers' signature strengths on project team resilience. *Team Performance Management: An International Journal*, 26(3/4), 247–262. <https://doi.org/10.1108/TPM-12-2018-0081>
- Kapogiannis, G., Fernando, T., & Alkhard, A. M. (2021). Impact of proactive behaviour antecedents on construction project managers' performance. *Construction Innovation*, 21(4), 708–722. <https://doi.org/10.1108/CI-02-2020-0029>
- Kutsch, E., & Hall, M. (2005). Intervening conditions on the management of project risk: Dealing with uncertainty in information technology projects. *International Journal of Project Management*, 23(8), 591–599. <https://doi.org/10.1016/j.ijproman.2005.06.009>
- Luthans, F., Vogelgesang, G., R., & Lester, P., B. (2006). Developing the psychological capital of resiliency. *Human Resource Development Review*, 5(1), 25–44. <https://doi.org/10.1177/1534484305285335>
- McLaren, M., & Loosemore, M. (2019). Swift trust formation in multi-national disaster project management teams. *International Journal of Project Management*, 37(8), 979–988. <https://doi.org/10.1016/j.ijproman.2019.09.003>
- Miller-Graff, L. E. (2022). The multidimensional taxonomy of individual resilience. *Trauma, Violence & Abuse*, 23(2), 660–675. <https://doi.org/10.1016/j.ijproman.2019.09.003>
- McManus, S., Seville, E., Vargo, J., & Brunsdon, D. (2008). Facilitated process for improving organisational resilience. *Natural Hazards Review*, 9(2), 81–90. [https://doi.org/10.1061/\(ASCE\)1527-6988\(2008\)9:2\(81\)](https://doi.org/10.1061/(ASCE)1527-6988(2008)9:2(81))
- Illar, C., C., J., M., Groth, O., & Mahon, J., F. (2018). Management innovation in a VUCA world: Challenges and recommendations. *California Management Review*, 61(1), 5–14. <https://doi.org/10.1177/0008125618805111>
- Miller, G., A. (1994). The magical number seven, plus or minus two. Some limits on our capacity for processing information. *Psychological Review*, 101(2), 343–52.

- <https://doi.org/10.1037/0033-295X.101.2.343>.
- Moradi, S., Kähkönen, K., Klakegg, O., & Aaltonen, K. (2020). A competency model for the selection and performance improvement of project managers in collaborative construction projects: Behavioral studies in Norway and Finland. *Buildings*, *11*(1), 4. <https://doi.org/10.3390/buildings11010004>
- Naderpajouh, N., Matinheikki, J., Keeys, L., A., Aldrich, D., P., & Linkov, I. (2020). Resilience and projects: An interdisciplinary crossroad. *Project Leadership and Society*, *1*, 100001. <https://doi.org/10.1016/j.plas.2020.100001>
- Ogunnusi, M., Omotayo, T., Hamma-Adama, M., Awuzie, B., O., & Egbelakin, T. (2021), Lessons learned from the impact of COVID-19 on the global construction industry. *Journal of Engineering, Design and Technology*, *20*(1), 299-320. <https://doi.org/10.1108/JEDT-05-2021-0286>
- Pavez, I., Gómez, H., Laulié, L., & González, V. A. (2021). Project team resilience: The effect of group potency and interpersonal trust. *International Journal of Project Management*, *39*(6), 697-708. <https://doi.org/10.1016/j.ijproman.2021.06.004>
- Project Management Institute. (2017). *Project management job growth and talent gap 2017-2027*. Retrieved from <https://www.pmi.org/learning/careers/job-growth>
- Podgórska, M., & Pichlak, M. (2019). Analysis of project managers' leadership competencies: Project success relation: What are the competencies of Polish project leaders? *International Journal of Managing Projects in Business*, *12*(4), 869-887. <https://doi.org/10.1108/IJMPB-08-2018-0149>
- Proag, V. (2014). The concept of vulnerability and resilience. *Procedia Economics and Finance*, *18*, 369-376. <https://doi.org/10.3389/fpsyg.2017.01360>
- Rahi, K., Bourgault, M., & Robert, B. (2019). Benchmarking project resilience. *The Journal of Modern Project Management*, *7*(1), 181–193. <http://dx.doi.org/10.19255/JMPM01901>
- Rahi, K. (2019). Project resilience: A conceptual framework. *International Journal of Information Systems and Project Management*, *7*(1), 69–83. <https://doi.org/10.12821/ijispm070104>
- Rahi, K., Bourgault, M., & Preece, C. (2021). Risk and vulnerability management, project agility and resilience: a comparative analysis. *International Journal of Information Systems and Project Management*, *9*(4), 5–21. <https://doi.org/10.12821/ijispm090401>
- Rahi, K., & Bourgault, M. (2022). Validation of a new project resilience scale in the IT sector. *Project Management Journal*, *53*(6), 567–594. <https://doi.org/10.1177/87569728221114321>
- Rogo, V., Rarasati, A. D., & Gumuruh, H. (2020, April). The influence of transformational leadership and soft skills on project manager for project success factors. In *IOP Conference Series: Materials Science and Engineering*, *830*(2), 1-6. IOP Publishing. <https://doi.org/10.1088/1757-899x/830/2/022057>
- Rowe, G., & Wright, G. (2001). Expert opinions in forecasting: The role of the Delphi technique. In Armstrong, J. S. (Eds), *Principles of Forecasting*, (Vol. 1, pp. 125-144). Springer, Boston, MA. https://doi.org/10.1007/978-0-306-47630-3_7
- Sapeciay, Z., Wilkinson, S., & Costello, S., B. (2017). Building organisational resilience for the construction industry: New Zealand practitioners' perspective, *International Journal of Disaster Resilience in the Built Environment*, *8*(1), 98-108. <https://doi.org/10.1108/IJDRBE-05-2016-0020>
- Skulmoski, G., J., F., Hartman, T., & Krahn, J. (2007). The Delphi method for

- graduate research. *Journal of Information Technology Education*, 6, 1–21. <https://doi.org/10.28945/199>
- Shenhar, A., & Holzmann, V. (2017). The three secrets of megaproject success: Clear strategic vision, total alignment and adapting to complexity. *Project Management Journal*, 48(6), 29–46. <https://doi.org/10.1177/875697281704800604>
- Sonnet, M., T. (2016). Employee behaviors, beliefs, and collective resilience: An exploratory study in organisational resilience capacity [Doctoral dissertation, Fielding Graduate University]. ProQuest Dissertations Publishing: 10063554.
- Staupe-Delgado, R., & Kruke, B. I. (2018). Preparedness: Unpacking and clarifying the concept. *Journal of Contingencies and Crisis Management*, 26(2), 212–224. <https://doi.org/10.1111/1468-5973.12175>
- Stephenson, A. V. (2010). *Benchmarking the resilience of organisations* [Doctoral thesis, University of Canterbury]. <https://ir.canterbury.ac.nz/handle/10092/5303>
- Tee, M., Rasli, A., Toh, J., S., S., K., Abas, I., H., Zhou, F., & Liew, C. S. (2022). A Delphi method on the positive impact of COVID-19 on higher education institutions: Perceptions of academics from Malaysia. *Frontiers in Psychology*, 13, 1013974. <https://doi.org/10.3389/fpsyg.2022.1013974>.
- Thompson, P. A. (1990). Combination of expert opinion approach to probabilistic information retrieval, part 1: The conceptual model. *Information Processing and Management*, 26, 371–382. [https://doi.org/10.1016/0306-4573\(90\)90097-L](https://doi.org/10.1016/0306-4573(90)90097-L)
- Vidal, L., & Marle, F. (2012). A system thinking approach for project vulnerability management. *Kybernetes*, 41 (1/2), 206–228. <https://doi.org/10.1108/03684921211213043>
- Walker, B., Holling, C. S., Carpenter, S., & Kinzig, A. (2004). Resilience, adaptability and transformability in social–ecological systems [Online]. *Ecology and Society*, 9(2), 5. <http://www.ecologyandsociety.org/vol9/iss2/art5/>
- Ward, S., & Chapman, C. (2003). Transforming project risk management into project uncertainty management. *International Journal of Project Management*, 21(2), 97–105. [https://doi.org/10.1016/S0263-7863\(01\)00080-1](https://doi.org/10.1016/S0263-7863(01)00080-1)
- Whittaker, S., Khalfan, M., M., & UIHaq, I. (2020). Developing community disaster resilience through preparedness. *International Journal of Critical Infrastructures*, 16(1), 53–76. <https://doi.org/10.1504/IJCIS.2020.105411>
- Zhang, H. (2007). A redefinition of the project risk process: Using vulnerability to open up the event-consequence link. *International Journal of Project Management*, 25(7), 694–701. <https://doi.org/10.1016/j.ijproman.2007.02.004>
- Zhang, H. (2011). Two schools of risk analysis: A review of past research on project risk. *Project Management Journal*, 42(4), 5–18. <https://doi.org/10.1002/pmj.20250>