

Mindful Project Management:
A Framework to enhance
underperformance managing large hospital
builds by incorporating principles adapted
from High Reliability Organizations

Robert R. Feldbauer

This thesis is submitted in partial fulfilment of the requirements of the

Doctor of Business Administration

University of Liverpool

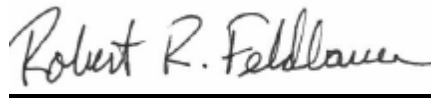
Supervisor: Iain Reid, PhD

May 2019

Declaration by researcher

I hereby certify that this material which I now submit for assessment on the programme of study leading to the award of Doctor of Business Administration is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

Signed:


Robert R. Feldbauer

Print Name:

Robert R. Feldbauer

Date:

May 30, 2019

Abstract

The aim of this research is to present and discuss enhancing management of complex hospital construction builds by adapting mindful principles found in High Reliability Organizations (HRO) as soft skills to supplement traditional project management tools and techniques.

Significant hospital building construction projects to support initiatives such as improving and replacing aging facilities, improving patient access, adding new technology and services, increasing market share, etc., has resulted in seemingly unabated hospital construction with \$1 billion+ projects becoming commonplace worldwide (Robeznieks, 2010). For example, multiple hospital systems across the globe have \$1 billion+ (US dollars) hospital new construction, with two recently announced expansions in excess of \$2 billion+ (Paavola, 2017). This researcher recently worked for a 12-hospital healthcare system in the Middle East that had three separate \$1billion+ replacement hospital builds under construction simultaneously.

These large building projects have become a global challenge for healthcare organizations, as significant cost overruns and considerable schedule delays, among other issues, has resulted in far too many being seen as ineffectively managed by the organization. A survey of US-based healthcare executives found that nearly 40% of their construction projects had budget and/or schedule issues (Burmahl et al, 2017, p.21), which is further evidenced by a seemingly interminable public reporting of cost and/or schedule overruns or related issues related to large hospital construction projects.

The literature confirms that modern projects have become increasingly complex, with large hospital construction projects being among the most complex. Yet, traditional project management tools and methods employed to manage large construction projects are engineering-based linear processes designed to manage projects with a clearly defined scope

and foreseen or limited risk. With complex projects, however, the environment is dynamic therefore unforeseen or unexpected issues are unavoidable.

High Reliability Organizations (HRO) have achieved operational and safety success in extreme hazard environments such as nuclear power plants by employing increased anticipation and quick adaption and resolution of unexpected events. Researchers Weick and Sutcliffe identified five mindful principles based on cognitive processes used by HROs for managing the unexpected – failure, simplification, operations, resilience and expertise (2001, 2007, 2015). Concepts from HROs are being studied and adapted in organizations and by professional fields not traditionally defined as HROs, such as healthcare, where HRO concepts are being applied to improve clinical quality and patient safety outcomes exacerbated by increasingly complex medical issues, technology, clinical processes, etc.

Through an action research study consisting of data collection of expert panel members in an initial Pilot Study followed by Real-Time Delphi Study, with qualitative and quantitative analysis of the data, a conceptual framework was designed to enhance managing large hospital builds. The framework, coined by this researcher as Mindful Project Management, was determined applicable and useful to improve managing major hospital building projects regardless of location or country of origin. The action research study thus resulted in providing theory-in-practice value in the form of a framework for practitioners to implement soft skills derived from high reliability principles, concepts and practices to enhance managing large hospital building projects.

Acknowledgements

I express my deep love and gratitude to my wife, Melody Hoover, MD for her patience, love, moral support and many solitary evenings and weekends while I pursued this personal grand adventure of attaining a DBA part-time while simultaneously working full-time and living our daily lives.

I thank my thesis supervisor Iain Reid, PhD for his support and sage advice. I learned and improved significantly as an academic-practitioner researcher and am forever grateful.

I am indebted to each of the participants of the Pilot Study and Delphi Study. The research and thesis benefitted greatly as a direct result of your involvement and contribution.

Table of Contents

Declaration by researcher	ii
Abstract	iii
Acknowledgements	v
Table of Contents.....	vi
List of Tables and Figures.....	ix
Chapter 1: Introduction	1
1.1 Introduction.....	1
1.2 Background to the investigation.....	3
1.4 Research methodology.....	7
1.5 Motivations for this study	9
Chapter 2: Critical Literature Review.....	12
2.1 Introduction.....	12
2.2 Projects	12
2.3 Public Building Projects	22
2.4 Hospital Building Projects	25
2.5 High Reliability Organizations	27
2.6 Mindfulness and healthcare management	36
2.7 Research Gap and Study Justification	
2.8 Summary.....	40
Chapter 3: Research Methodology	43
3.1 Introduction.....	43

3.2	Reflection of Literature Review	43
3.3	Philosophical Considerations	45
3.4	Research Design	50
3.5	Delphi Method	52
3.6	Delphi Data Collection and Analysis	56
3.7	Ethical Considerations	57
3.8	Summary	58
Chapter 4: Findings		59
4.1	Introduction.....	59
4.2	The Pilot Study Findings.....	59
4.3	The real-time Delphi survey for the main study	66
4.4	Delphi Analysis Results	72
4.5	Results of preliminary analysis of R2	89
4.6	Results of Thematic Analysis of Survey Questions Q11, Q17, Q23, Q29, and Q35	93
4.7	Summary	98
Chapter 5: Discussion and Analysis		100
5.1	Introduction.....	100
5.2	Mindlessness.....	100
5.3	Summary from the Literature and Sub-Research Questions around the Mindful Project Management Framework Conceptual Mode	101
5.4	The Process of Implementing Mindful Project Management Framework.....	117
5.5	Mindful Project Management Framework.....	119
5.6	Summary	121
Chapter 6: Summary Discussion		122

6.1	Introduction.....	122
6.2	Summary of Two Main Research Questions.....	122
6.3	Summary of Original Objectives.....	126
6.4	Summary.....	128
Chapter 7: Contributions and Reflection.....		129
7.1	Introduction.....	129
7.2	Contributions.....	129
7.3	Limitations and Recommendations.....	130
7.4	Reflection.....	131
7.5	Summary.....	132
Appendices.....		149
Appendix A	The survey questionnaire of the pilot study.....	149
Appendix B	The real-time Delphi survey questionnaire.....	152
Appendix C	Delphi Expert Panel Member information.....	155
Appendix D	Sample from Delphi Survey: Open-Ended Comments/Suggestions.....	157

List of Tables and Figures

Table 2.1: Modern Project Management Key Developments 1950s - Present.....	15
Table 2.2: Newer Approaches to Project Management	18
Table 2.3: Theory ABOUT Practice, Direction 1. (Winter et al, 2006, p.642)	21
Table 2.4: Synthesis of HRO literature related to Mindfulness (adapted from Saunders, 2015, p.28).....	35
Table 2.5: Reductionist and Pragmatic views of HROs. (olde Scholtenhuis & Doree, 2014, p.662)	41
Table 3.1: Research Approaches (Remenyi et al, cited in Holden & Lynch, 2004, p.8)	48
Table 3.2: Summary of Classic Delphi and Real Time Delphi (adapted from Davidson, 2013, pg.53).....	54
Table 3.3: Summary of Expert Panel Members titles and organizations	55
Table 4.1: Frequency counts (%) of responses for questions Q14 to Q21.....	60
Table 4.2: Analysis results for Q22.....	65
Table 4.3: Analysis results for Q23.....	65
Table 4.4: Analysis results for Q24.....	65
Table 4.5: Analysis results for Q25.....	65
Table 4.6: Analysis results for Q26.....	66
Table 4.7: Analysis results for Q27-Q33.....	66
Table 4.8: Summary of survey results regarding participants' perception of preoccupation with failure.....	75
Table 4.9: Summary of survey results regarding participants' perception of reluctance to simplify.	77
Table 4.10: Summary of survey results regarding participants' perception of sensitivity to operations.....	79

Table 4.11 Summary of survey results regarding participants' perception of commitment to resilience.	81
Table 4.12: Summary of survey results regarding participants' perception of deference to expertise.....	84
Table 4.13: Summary of survey results regarding participants' perception of mindful project management, Q36-Q40.	86
Table 4.14: Summary of survey results regarding participants' perception of mindful project management, Q41-Q42.	87
Table 4.15: Descriptive statistics and Pearson's correlations of participants' perceptions of Mindful Project Management and each HRO mindfulness principle. N=23.....	87
Table 4.16: Summary of survey results regarding participants' perception of how that HRO mindfulness principle could be taught or learned in managing a project (Q10 for preoccupation with failure, Q16 for reluctance to simplify, Q22 for sensitivity to operations, Q28 for commitment to resilience, and Q34 for deference to expertise).93	
Table 5.1: MPM component related to preoccupation with failure	104
Table 5.2: MPM component related to reluctance to simplify.....	107
Table 5.3: MPM component related to sensitivity to operations.....	109
Table 5.4: MPM component related to commitment to resilience	112
Table 5.5: MPM component related to deference to expertise.....	115
Table 5.6: Mindful Project Management implementation per project phase.....	118
Figure 3.1: Overall research design process including Delphi study (adapted from Vidal et al, 2013).	50
Figure 3.2: Assessing your firm's Vulnerability to Mindlessness (Weick and Sutcliffe, 2007 pg. 89).	51

Figure 4.1: Bar chart of responses of Q6 (Years working professionally in or supporting the healthcare industry)	61
Figure 4.2: Bar chart of responses of Q7 (Years working professionally in a project role or environment).....	61
Figure 4.3: Bar chart of responses of Q8 (Best description of current role)	62
Figure 4.4: Bar chart of responses of Q9 (Approximate U.S. dollar value of all healthcare projects during career).....	62
Figure 4.5: Bar chart of responses of Q10 (Approximate U.S. dollar value of single largest healthcare project you have been involved).....	62
Figure 4.6: Bar chart of responses of Q11 (My healthcare project experience has primarily been)	62
Figure 4.7: Bar chart of responses of Q12 (My familiarity with project management body of knowledge such as PMBOK.)	63
Figure 4.8: Bar chart of responses of Q13 (My familiarity with High Reliability Organizations (HRO)	63
Figure 4.9: Histogram plot of scores of vulnerability to mindlessness.....	63
Figure 4.10: Bar chart of potential for mindlessness.....	63
Figure 4.11: Scatter plots of perceptions of Mindful Project Management and the five HRO mindfulness principles.	88
Figure 5.1: The Mindful Project Management and Conceptual Model	120

Chapter 1: Introduction

1.1 Introduction

This first chapter serves to provide an overview of the thesis by providing concepts and literatures that serve as the basis for this research, including research questions, methodology and motivation for the study.

As general background, modern project management emerged as a social practice post-World War II as new quantitative methods to manage projects “resting on the premise that project activities and their interrelationships are fixed and measurable” (Padalkar & Gopinath, 2017, p.688). With origins in operational research, these epistemologically positive based methods were developed to plan, monitor and control the engineering and production of sophisticated programs in the aerospace and defence industries. The adoption of these project management methods, tools and techniques grew steadily over the next couple of decades, expanding into other business sectors. By the 1990s, most major international businesses considered implementing project management methodologies “no longer a choice but a necessity” (Baptista et al, 2016, p.147). These project management methodologies remain prevalent in practice today and serve as the foundation of the professional bodies of knowledge associated with project management.

In a systematic review of the literature, Rezvani and Khosravi (2018) found that “project success in project management literature is based upon the combination of ... meeting time, cost and quality goals” (p.116). Indeed, many “studies show that most projects are late, over budget, and do not deliver their expected requirements” (Stefanovic & Shenhar, 2015, p.213). Currently, there is debate on of defining project success beyond these three traditional terms. The challenge in redefining success is that most large projects have multiple stakeholders, and

success can have different meaning to the various stakeholders and individuals (Rezvani & Khosravi, 2018).

Furthermore, there is both academic and practitioner interest of how project management methods influence project success or failure. Research has provided empirical evidence that project management methodology neither guarantees project success nor eliminates project failure (Coombs, 2015). Certainly, it is noteworthy that blindly following project management methodologies has shown to be harmful and can lead to project failure (Gerald et al, 2008). There is research concluding that an understanding and appropriate management of complexity can reduce project failures (Zhu & Mostafavi, 2017). Sargut & McGrath (2009) distinguished three properties associated with complexity, including multiplicity (number of potentially interacting elements), interdependence (how connected the elements are), and diversity (the degree of their heterogeneity). Putting these three properties into a project context, Llewellyn (2015) contends that “the greater the degree that each of these elements exist within a project, the more complex it becomes” (p.11). This suggests, “managing complex projects requires a further dimension to the project management toolkit – the ability to understand and manage relationships” (p.13).

It is offered that project complexity is a growing concern, and that complex projects require management skills beyond those found in traditional project management. The focus of this study is enhancing the managing of large hospital building projects, which are by size and nature complex. Rezvani et al (2016) observed that managing complex projects requires skills beyond traditional project management. One issue, however, is that project management bodies of knowledge remain based in largely on traditional project management methodologies which are increasingly viewed as “less applicable to the more pluralistic context within which project management is [now] being applied” (Hodgson & Paton, 2016, p.353). Winch (2010) found that “project managers are intendedly rational decision-makers, satisficing in face of uncertainty,

whose rationality is both bounded and shaped by impulse. This implies that moving through the project life cycle is essentially a process of structured sense making” (p.13).

Fellows and Liu (2016) agree with the importance of sense making on projects, finding it an important element towards achieving a common understanding, trust and commitment, and an appreciation of interdependency within the project team. Sense making in organizations has its roots in social psychology, with a seminal publication being *The Social Psychology of Organizations* (Weick, 1979). Weick’s later work related to sense-making include High Reliability Organizations (Weick et al, 1999; Weick & Sutcliffe, 2001, 2007, 2015) where his research found that HROs have fostered superior situational awareness leading to earlier identification and management of unexpected events in comparison to typical organizations. Weick and Sutcliffe labelled this as mindfulness, which they define as a way of noticing, to include being aware of context, seeing the ‘big picture’, and having a quality of attention that leads to a “clear and detailed comprehension of emerging threats and on factors that interfere with such comprehension” (2007, p.32).

The current debate of defining and achieving project success, especially given the complexity of modern projects including large hospital builds, has led project management research to expand beyond its traditional focus areas of methods or the tripartite achievement of original scope, budget and schedule. The following sections provided a background to the investigation and will further discuss the relevance of sense making, in particular mindful principles found in HROs, towards enhancing managing of large hospital building projects.

1.2 Background to the investigation

A Project Management Institute (PMI) study found that “almost 11 percent of every project dollar is at risk” (Swanson, 2014, p.42). Other studies have that figure as high as 20 – 45 percent, with no noted improvement over the last 70 years (Prater et al, 2017). Large hospital building projects are no exception. One survey of hospital and health system executives found only 46%

of hospital construction projects on budget and/or schedule (Hoppszallern & Vesley, 2015). A US Government Accounting Office investigation of new hospitals built by the Department of Veteran Administration found “on average, the hospital construction projects reviewed were about three years late and \$360 million over budget” (USGPO, 2016, p.2).

Large hospital building projects are inherently complex (CIOB, 2011, Dehe, 2014, Dehe & Bamford, 2017) with a whole host of internal and external stakeholders and project team members from a multitude of organizations (owner, planners, architects, contractors, suppliers, etc.). They are generally managed using established planning, design and construction project management methods. As explored in Section 1.1, traditional project management methods use fixed and measurable linear processes. This is problematic in the face of complexity in large hospital building projects, which by nature progress in a non-linear fashion due to complexity and uncertainty. In an empirical study of hospital construction projects in France, it was determined crucial for project management teams to have adaptability in facing non-linear progression “in order to avoid delay, rework, cost-overrun, and conflict” (Pauget & Wald, 2012, p.204).

The literature (see Chapter 2) supports a clear need for a “fit-for-purpose decision framework to effectively manage complexity comprehensively where and when required” (Wood et al, 2014, p.9). Large hospital building projects are by nature complex, with numerous examples of cost and schedule overruns. Having shown the acknowledge need and growing interest both in academics and practice to understand project performance improvement in terms of complexity, the next section will focus on high reliability theory and practice in managing complex organizations and conditions.

1.2.1 High Reliability Organizations

The study of high reliability began with an interest in organizations that operate under extreme hazard conditions yet have remarkably good safety records. Examples of organizations

originally studied for high reliability include nuclear power generation plants, naval aircraft carriers, and air traffic control. While the initial research focused on the unique structural features of HROs, Weick, as a relative latecomer, instead focused on their collective sense making. Weick asserts that collective sense making “is near impossible in the absence of social processes that lead to collective mindfulness” (Maitlis & Sonenshein, 2010, p. 557). Initially using a sense-making lens, Weick et al (1999) found that stable cognitive processes allowed HROs to effectively manage unexpected events much better than typical organizations. They labelled this interpretation of HROs as mindfulness, and suggested five distinct principles: preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and under-specification of structures (Weick et al, 1999, pp.88-89). Weick and Sutcliffe (2001, 2007, 2015) have since relabelled under-specification of structures as deference to expertise.

1.2.2 HRO in construction projects

Using a HRO lens for research of construction related projects can “avoid the confines of the reductionist arguments as it redirects minds and action on productive and practical research to achieving more reliable construction project performance” (olde Scholtenhuis & Doree, 2014, p.658). Saunders (2015) argues that in managing construction projects “many of the features of high reliability organizations make good practical sense” (p.26), further explaining that in a project context “the behaviours, organizational structures, and cultures associated with high reliability organizing can be evidenced in the ways of doing things of project management professionals” (p.30). olde Scholtenhuis and Doree (2014) and Saunders (2015) are two of the handful of researchers who have begun researching high reliability theory, in particular HRO mindful principles, applicability to construction project management. Further discussion of high reliability theory/practice in relation to complex construction projects, including large hospital building projects, is provided in Chapter 2.

1.3 Research Questions

As a healthcare senior-level administrator with professional experience managing several large, multi-billion dollar (USD) projects in the United States, Qatar, and United Arab Emirates, this thesis combines my academic and professional interest enhance managing large hospital building projects using mindful principles derived high reliability theory regardless of location/country. To examine the applicability and usefulness of adapting HRO mindful principles to enhance managing large hospital building projects, the following two research questions were developed based on the literature:

- R1. What potential do mindful processes derived from high reliability organization (HRO) practice have to improve managing large hospital building projects?
- R2. How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management?

The first objective of the main research questions is to determine the applicability and usefulness of HRO mindful principles to enhance managing of large hospital building projects. The second objective is to determine if a conceptual framework, incorporating tools adapted from HRO mindful principles, is perceived useful and would be used by global experts as soft skills to supplement traditional hospital construction project management.

In order to do so, sub-research questions were developed based on the literature review of both project management and high reliability organizations and examined during this study using a real-time Delphi (RTD) consisting of expert panel members from the United States, Europe and the Middle East, each with significant experience in large hospital building projects. The sub-research questions associated with the two primary research questions are:

- R1. What potential do mindful processes derived from high reliability organization (HRO) practice have to improve managing large hospital building projects?
 - SR1.1 What vulnerability do practitioners have to mindlessness?

SR1.2 How clear do practitioners find the concept of utilizing processes developed from HRO mindful practices?

R2. How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management?

SR2.1 How useful is a voluntary reporting system?

SR2.2 How useful is a project charter?

SR2.3 How useful is a common project diary?

SR2.4 How useful is an in/on boarding process?

SR2.5 How useful is periodic reflection sessions?

The research questions and sub-research questions are based on the overarching theme from the literature that projects are increasingly complex and managing project complexity requires more than enhanced technical project management skills. Furthermore, improvements to leadership and management performance (known as 'soft skills') to advance project management practice is required in order to maintain the projects overall objectives and scope of work.

1.4 Research methodology

A literature review is conducted to examine project management, hospital building projects, and HROs. This includes characteristics and processes, case studies applied to HRO processes in organizations not defined by the traditional definition of HRO, key features and characteristics related to HRO mindful practices to improve individual and team performance, and studies that examined the applicability of high reliability to building projects. A pilot study is conducted to first test the initial line of enquiry, with the primary aim to assess the vulnerability of mindlessness (based on Weick and Sutcliffe's (2007) 'Vulnerability to Mindlessness' audit, p.89) of expert panel participants. This is considered an important initial inquiry, as a vulnerability to mindlessness can conceivably cause project managers to "impose old categories to classify

what they see, act with some rigidity, operate on automatic pilot, and mislabel unfamiliar new contexts as familiar old ones. A mindless mental style works to conceal problems that are worsening” (Weick & Sutcliffe, 2007, p.88). If the pilot study, therefore, finds a high proportion of a vulnerability to mindlessness among seasoned hospital build project leaders, it serves to further justify studying the applicability of HRO mindful processes to enhance managing large hospital building projects.

The central investigation of the action research study is conducted via a Real-Time Delphi study. A Delphi study is considered an appropriate research method when “the problem does not lend itself to precise analytical techniques but can benefit from subjective judgments on a collective basis” (Linstone & Turoff, 1975, p.4). Its use in research has included developing concepts and frameworks (Okoli & Pawlowski, 2004), an important consideration for investigating the study’s conceptual Mindful Project Management framework. An important characteristic of a Delphi study “is the anonymity of the expert panel members who remain unknown to each other” (Davidson, 2013, p.55). The primary benefit of using a web portal (Calibrium, 2015) to conduct this research’s Delphi study is it allowed each expert panel member, located across multiple countries and time zones, to participate in real-time asynchronously through a secured, online survey process without knowing or being able to identify other participants. Other benefits included the speed of data collection and time to completion in comparison to other means of conducting surveys, and the data collected through the portal was easily interchangeable into a variety of electronic formats.

As noted, the Real-Time Delphi study utilized a global (US, Europe and Middle East) and diverse panel of experts with significant large hospital building project experience to include CEOs, planners, architects, contract project managers, hospital administrators, hospital engineers, and hospital information technology managers. Also included was a physician with extensive experience in implementing high reliability principles, and a university professor with research interest and publications in healthcare projects. No participants were solicited from this

researcher's place of employment to eliminate any potential or perceived conflict or ethical considerations. The Delphi study also served as a basis to refine the conceptualized Mindful Project Management framework. An initial depiction drawn when conceptualizing the framework was a rudimentary drawing with a base with five pillars on top, the base symbolizing project management knowledge and experience with the five pillars indicating the five HRO mindful principles (Weick & Sutcliffe, 2001, 2007, 2015). Through this action research study, a Mindful Project Management conceptual model was developed (Figure 5.1, p.120).

1.5 Motivations for this study

This researcher has worked in healthcare organizations for more than twenty years, and personally possess a wide professional network having served multiple years on committees with the American Society for Healthcare Engineering (ASHE), an elected officer of the American College of Healthcare Executives (ACHE) Middle East-North Africa (MENA) group, extensive consulting globally for the hospital accreditation consulting agencies Joint Commission Resources (US-based) and Joint Commission International, and through working relationships having been employed six years with two major healthcare organizations in the Middle East each building new \$1 billion+ (USD) hospitals (one greenfield and four replacement hospitals in total). The review of the literature confirmed my long held professional opinion that projects could be better managed, including issues resolved more skilfully, if project teams were provided with leadership and management tools and training beyond the technical proficiency found with traditional project management.

Furthermore, the research tied into my professional exposure of high reliability theory and practice in the field of healthcare, including experience developing and implementing high reliability improvement processes. Additionally, in the Doctor of Business Administration (DBA) program, one module concentrated largely on Weick's enacted sense making (1988). This combination led to an increased interest and continued study of Professor Weick's career,

theories, and published research/books. As should be evident, this research merges my professional and academic interests.

The study provides empirical action research consisting of expert panel member with significant practiced-based experience providing input to the pilot study and the Real-Time Delphi. The study also provides a theoretical contribution to knowledge by adding to the limited understanding and motivation to study high reliability theory and practice as a means to improve managing projects. The initial concept of the Mindful Project Management (MPM) framework was designed with Kvalnes' (2016) opinion in mind that a "significant way that project management can benefit from embracing uncertainty is making activities attractive and meaningful for potential and actual project participants" (p.102). Finally, given this researcher's professional background, while a conscious attempt was made to take a general view applicable to all parties associated with a large hospital building project, the MPM framework itself may be biased towards an owner's perspective given potential bias given this researcher's professional experience on large hospital builds in strictly as an owner's representative.

1.6 Structure of the Thesis

This thesis consists of seven chapters. This chapter provides an introduction, background and aims of the study. Chapter 2 provides a review of the literature of project management and high reliability organizations including noted synergies between the two. Chapter 3 provides the philosophical approach, research paradigm, and process of investigation used for this study. Chapter 4 presents the findings from the Pilot Study and Delphi Study. Chapter 5 presents a discussion of the findings in relation to the Pilot Study and all sub-research questions introduces the Mindful Project Management Conceptual Model. Chapter 6 serves to answer the study's two main research questions. Chapter 7 offers a conclusion and presents the claimed contributions to practice and knowledge and the limitations of this study.

1.7 Summary

This first chapter provided an overview of the thesis by providing concepts and literatures that serve as the basis for this research, including research questions, methodology. This researcher's motivation for the study was also provided.

In the next chapter, relevant literature will be reviewed to provide a comprehensive understanding and key insights of principal concepts associated with the fields of both hospital building project management and high reliability organizations.

Chapter 2: Critical Literature Review

2.1 Introduction

The objective of this research is to investigate enhancing the managing of large hospital building projects using concepts adapted from high reliability, in particular the five mindful principles displayed by High Reliability Organizations (Weick et al, 1999, Weick & Sutcliffe, 2001, 2007, 2015). Furthermore, the research aims to investigate the applicability and perceived usefulness of a conceptual framework designed to employ procedures adapted from HRO mindful principles to enhance managing large hospital building projects. The literature review, thus, serves to facilitate gaining a comprehensive understanding of two primary research questions: R1) What potential do mindful processes derived from high reliability organization (HRO) practice have to improve managing large hospital building projects? and R2) How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management? This chapter presents the core themes related to projects and project management, the impact of complexity on modern projects, and an examination of the literature related to large hospital building projects. The chapter also explores the literature of HROs to include current practice and research related to the five mindful principles associated with HROs, and practical applications of HRO processes used by healthcare organizations. The final section considers the intersections and connections between the five HRO mindful principles and their interconnectivity towards enhancing managing large hospital building projects.

2.2 Projects

A basic definition of a project is a temporary endeavour to create a unique product or service (PMI, 2018, p.23). A broadened description is “a temporary organization to which resources are

assigned to undertake a unique, novel and transient endeavour managing the uncertainty and need for integration in order to deliver beneficial objectives of change” (Turner & Müller, 2003, p.7). The concept of ‘temporary organizations’ was originally defined by Goodman and Goodman (1976) as “a set of diversely skilled people working together on a complex task over a limited period of time” (p.494). Temporary organizations are a means “in which members of the project (usually staff members) are seconded by their affiliated organizations (generally firms) as they carry out specific, project-oriented tasks” (Ding et al, 2017, p.544). Concerning uniqueness within a project context, it “refers to the innovativeness of the deliverable” (Chiocchio et al, 2015, p.21). Turner (2014) makes an important differentiation between temporary or routine tasks undertaken by an organization (for example, the maintenance department personnel installing new equipment, or the completion of identical, off-the-shelf work frequently labelled as projects) versus “a temporary organization specifically created to deliver the project” (p.3). He advises, “not to label things as projects when more routine management approaches may be more appropriate for their delivery” (p.3). This viewpoint, principally, is that work that has established processes, procedures or follow prescribed steps, even if requiring a degree of expertise, will likely not be managed most effectively using project management techniques therefore should not be identified as such (Davidson Frame, 2016, p.38). Clearly, hospital builds are projects given they are “a complex and dynamic set of operations” (Dehe & Bamford, 2017, p.1177).

The literature supports viewing construction projects as being “carried out in temporary organizations” (Ekeskar & Rudberg, 2016, p.174). This study aligns with that viewpoint, as managing a large hospital building project is much more than planned sequence of activities. It is illustrated best as a temporary organization in that large hospital building projects necessitate a whole-host of internal and external stakeholders for successful accomplishment. A temporary organization (project team) for a large hospital building project often includes, but is not limited to, the board of governors, the senior administrative leadership team, end-user clinical staff,

multiple government regulatory stakeholders, members to manage financing of the project including bonds, loans, endowments and fundraising, design teams consisting of planners, architect and engineering teams, a construction manager/prime contractor, multiple construction subcontractors, materials suppliers, specialty vendors, medical equipment planners and suppliers, information technology design and procurement, etc. While hospitals typically call the temporary organization the project team, it could more fittingly be termed a 'project coalition' (van Reedt Dortland et al, 2013).

Large hospital building project teams, including the construction management firm (CM), predominantly use established planning, design and construction project management scheduling, budgeting, and other control methods that remain prevalent in the wider building and infrastructure construction industry. As such, a summary overview of project management is merited and presented in the following section.

2.2.1 Project Management

It is common for organizations to use traditional project management (PM) methods to manage most types of building and infrastructure construction projects. A general definition of project management is "the application of knowledge, skills, tools, and techniques to project activities to meet project requirements" (PMI, 2013, p.4). A summary of key developments of modern project management is provided in the table 2.1. The intellectual framework for 'traditional' project management (originating from US military and aerospace industry projects in the 1950s) is a functionalist approach using quantitative engineering-based techniques adopted from the field of operational research (Hodgson & Cicmil, 2016). These traditional PM tools and methods exhibit linear input-outcome relationships (Ahern et al, 2014) and are consistent with the 'transformation theory of production' dominant in operations management in the twentieth century (Koskela & Howell, 2002, p.295). From this theoretical perspective, projects are "implemented by competent project team members to achieve predetermined targets, such as

cost, time, and scope” (Ahern et al, 2014, p.1424) through an assembly-type orientation by being “broken down into smaller chunks, analysed and dealt with in a systematic and rationalized way” (Gustavsson & Hallin, 2014, p.570).

Table 2.1 Modern Project Management Key Developments 1950s – Present

	Project Management (PM) Developments
1950s	<ul style="list-style-type: none"> • Engineering-based PM models developed initially by US military and aerospace industry • Focus on “cost, time and scope” (Ahern et al, 2014, p.1424) • Newer PM tools included Program Evaluation Review Technique (PERT), Critical Path Method, and Graphic Evaluation and Review Technique (GERT)
1960s & 1970s	<ul style="list-style-type: none"> • PM techniques increasingly adopted by various industries in US and Europe • Professional Associations founded, such as Project Management Institute (PMI) (US), Association of Project Management (APM) (UK), Australian Institute of Project Management (AIPM) • Newer PM tools included Work Breakdown Structure (WBS), Earned Value, Configuration Management, Value Engineering, Precedence Scheduling and Resource Allocation
1980s	<ul style="list-style-type: none"> • Emergence of PM related research conferences and journals • Introduction of sophisticated software programs for project scheduling, control and risk analysis • Bodies of Knowledge developed by professional organizations; initial focus on scheduling and cost control
1990s	<ul style="list-style-type: none"> • Critiques of limitations of traditional PM approach, including Morris (1994) • Wider social science perspectives of PM emerge, including Scandinavian School of Project Studies (Hodgson & Cicmil, 2016) • Newer PM tools included Critical Chain, Earned Schedule, and portfolio management tools
2000s	<ul style="list-style-type: none"> • Political and sociological perspectives factored into projects • Soft skills and emphasis on human relations given increasing prominence • PMI adds Stakeholder Management to Guide to Project Management Body of Knowledge (PMBOK) • Recognition of complexity managing projects • New PM structures such as program management, partnering, supply chain management, lean production (Pryke & Smyth, 2006, p.3)

The field of project management, which has strived to develop itself as a specialized profession through professional societies and their respective bodies of knowledge, has grown substantially over the last 60+ years. While project management and its methodologies continue to largely retain its “worldview inherited from engineering and the more positivist variants of management research” (Hodgson & Cicmil, 2016, p.745), there have been changes and deviations. For example, more recently research of project management has been from a social

science perspective. One of the early influential critiques of modern project management came from Morris (1994, 2004, and 2013). Morris' (1994) main argument is that traditional project management tasks, such as scheduling, cost control, work breakdown structures, etc., are inadequate in and of themselves to successfully manage projects. This critique has remained prevalent in project management research, for example, Pinto and Winch's (2016) opinion that by "focusing so closely on the actual delivery of the project that it comes perilously close to ignoring the larger context within which the project is idealized, validated, and shaped by multiple stakeholder forces", p.238). Another notable criticism came from what is known as the "Scandinavian School" of thought. In taking a social science perspective of projects, their premise is that "contemporary prepositions for the improvement of project management knowledge and practice were ill-conceived, reflecting fundamental misconceptions in the field" (Cicmil & Hodgson, 2006, p.117). This view aligns metaphorically with Packendorff (1995), who first recognized projects as temporary organizations versus the widely accepted metaphor of project management being a tool.

Furthermore, Söderlund (2011) conducted a methodical literature review of 305 project management research related articles found in 30 leading management and organization journals published over a 50-year period. Based on the review, Söderlund (2011) suggested that project management research has "seven distinct schools of thought:

- 1) Optimization School (logic-based, prescriptive research drawing on management science, optimization techniques and systems analysis);
- 2) Factor School (empirical research relying on descriptive statistics on the criteria and factors of project success and failure);
- 3) Contingency School (empirical research, case study-based and survey-based research on the differences between projects, characteristics of projects and contextual dimensions;

- 4) Behavioural School (interpretative and descriptive research on organizational behaviour, processes and learning in projects;
- 5) Governance School (prescriptive research on governance and contract problems in projects;
- 6) Relationship School (descriptive case study research on relations between actors in projects; and
- 7) Decision School (descriptive and interpretative research on politics and decision-making in projects)” (p.158).

Söderlund’s (2011) interpretation of the literature illuminates that project management research is conducted from a variety of theoretical foundations. This should be expected, as projects, by definition, are unique, thus the highly diverse inquiries requiring differing theoretical viewpoints from which to conduct the research. As such, differing approaches to project management research should not be considered either right or wrong, rather dependent on the appropriate perspective needed to answer the research question or problem at hand. This research study necessitates using a Behavioural School lens, as this viewpoint acknowledges the necessity for sense making with the dynamic nature of temporary organizations (Söderlund, 2011, p.162).

2.2.2 Current thinking in Projects and Project Management

Project management has realized multiple adaptations of its traditional methods, resulting in newer functional approaches that differ from, yet remain complementary to, traditional project management methods (Hodgson & Cicimil, 2006). These newer functional approaches generally consist of varying organizational structures with adhocracies of experts forming project teams (Mintzberg, 2013, p.76). The literature reveals these new adaptations borrow processes principally from manufacturing, such as Agile, Lean, and Supply Chain Management (Brown & Adams, 2000, p.328). A summary sample of newer project management practices with growing applications are as follows:

Table 2.2 Newer Approaches to Project Management

PM Methodology	Summary
Agile	Short delivery milestones known as “sprints”. Mostly used on small software projects with highly collaborative teams. Agile has spawned a subset of methods such as scrum (specific rules for iterative processes), crystal (focus on people and their interactions) and Kanban (visual framework for agile process).
Waterfall	Based upon traditional project management methods with sequential, linear approaches. Best used for simple, unchanging projects. Commonly used in manufacturing and for smaller construction projects.
Adaptive	First introduced by Robert Wysocki. Used for projects where scope can vary during the project. Often used by businesses creating new product/service ideas or business development opportunities.
Lean	Emphasizes the prevention of waste with a focus on improving quality while reducing lead times and total costs.
Critical Chain	First introduced by Eliyahu Goldratt. Focuses on resource levelling based on methods derived from Theory of Constraints.

In general, newer PM methods being developed primarily concern changes in organizational structure and in the flow of materials and information (Koskela, 2003). They retain similarities to traditional project management methods in that they are largely reductionist oriented with linear processes.

Concerning project management research, it is noteworthy that it still significantly focuses on the technical aspects of managing projects (Pasian, 2015). However, project management research has been slowly diversifying away from “adoption of normative tools in project management towards a deeper consideration of the role of projects and their nature” (De Meyer et al, 2002, p.656). For example, the traditional paradigm of project success being defined as delivering anticipated outputs associated with scope, budget and schedule is being redefined to include other outputs such as the achievement of long-term organizational and business goals associated with the project (Rezvani & Khosravi, 2018, p.120). Additionally, there is a noted shift towards the understanding that “many project success factors center on human relationships” (Pollack, 2007, p.270) with ‘soft skills’ competency a growing area of concern and inquiry (Gillard, 2009). The literature presents a growing understanding that having enhanced soft skills is necessary for “a more holistic approach where focus is on a complexity

that cannot be reduced or understood by breaking down into pieces” (Gustavsson & Hallin, 2014, p.570).

This research study aligns with the mounting evidence that traditional project management tools and methods alone are not suffice to successfully manage modern, complex hospital building projects, and that enhanced soft skills is a worthwhile subject for project management research to improve practice. To support this assertion, the next section provides an overview of the literature related to soft skills in managing projects.

2.2.3 Soft Skills in Project Management

The literature supports the opinion that technical project management expertise alone is not sufficient for successfully managing complex projects. Yet, at present, a majority of the global project management community views the profession of project management in the terms in which Project Management Institute (PMI) defines it in their document ‘A Guide to the Project Management Book of Knowledge’. Known as PMBOK (pronounced ‘pim bock’) it is regarded by PMI to be unique, codified knowledge. The PMBOK is based on “traditional practices that are widely applied” (PMI, 2018, p.1). Given that, it is striking that the PMBOK only has one paragraph concerning soft skills, referring to them simply as “interpersonal skills and ability to manage people to balance the conflicting and competing goals of project stakeholders” (PMI, 2018, p.53). That could be attributed to the view that dissimilar soft skills are “required for different types of projects” (Fisher, 2011, p.996), or the argument that this lack of concern in the PMBOK is “an old-fashioned view of project management as tool-based, ignoring the broader context and treating [...] people essentially as an interchangeable commodity” (Morris, 2004, p.2). It is, to be sure, hard not to conclude based on current bodies of knowledge and related professional certifications that enhanced soft skills are not viewed as critical or important as technical project management skills.

Yet, despite the fact that project management's "technical and technological domains [are] becoming more complicated and extended, the focus of project managers in practice is mostly tended to human [soft skills] aspect" (Tohidi & Jabbari, 2012, p.837). This growing acknowledgement of the need for advanced soft skills supports the belief that all management is contextual (Griseri, 2002), and all projects by definition are unique (Loch et al, 2006, p.1), so projects therefore require management based on individual context (Morris, 2013). While some might argue that projects can be similar and therefore not unique, for example "off-the-shelf" packages, it is important to recall the earlier discussion (section 2.2, pp.12-14) to not label things as a project if it can be accomplished best using another management approach (Turner, 2014).

To be fair to PMI, the growing recognition of the need for enhanced soft skills includes its recent funding of research concerning complexity within projects and project management, including the development of soft skills for project managers. Importantly, proficient soft skills require "knowledge [that] should be based on sound, academically rigorous research" (Bredillet, 2010, p.5). Since projects are unique, however, improving soft skills in an effort to improve practice is a conundrum of "determining at what point such knowledge becomes so generalized that it is of limited value, and what point it is so specific that it is no longer generalizable" (Morris, 2004, p.6). The literature supports that soft skills knowledge and training should include not only general leadership and interpersonal skills, but also knowledge of complexity and uncertainty, systems thinking, and experiential learning related to effective decision-making. For example, a case study of Information Technology (IT) projects found that "soft skills [are] needed to run effective IT projects. These soft skills extend beyond the analytical base often possessed by programmers [...] and are often neglected by organizations" (Petter & Randolph, 2009, p.55). The conclusion applies to managing projects in general, not just within the realm of IT project management. For example, a case study of several hospital construction projects in France similarly found that large hospital building projects require that project managers

possess advanced soft skills training, including “the ability to actively create and develop collaborative relationships” (Pauget & Wald, 2013, p.200). The growing evidence of the need for project managers to possess advanced soft skills aligns with this researcher’s professional opinion based on 20+ years’ experience managing significant hospital building projects (see section 1.5, p.9-10).

2.2.4 Projects and Project Management Summary

Project management largely retains an epistemologically positivist viewpoint and is based upon operations management practice prevalent in 20th century. This includes the research of construction projects, which tend to use “a positivist approach and subsequently... quantitative research design because of its objectivity and the practical reality and reliability” (Kwofie et al, 2018, p.125). While project management in general “is a relatively young field of study as an academic discipline” (Bredillet, 2010, p.5), it has begun diversifying in practice and research. The literature is clear that new frameworks for project management should include enhanced soft skills, as well as “that conventional project management theory should [not] be abandoned, only that there is a need now to develop this field beyond its current foundations” (Winter & Smith, 2006, p.13). Winter and Smith’s (2006) proposed direction for future research in project management serves as a useful guide, specifically the recommendation to focus project management research on complexity versus on the lifecycle model of projects and project management:

Table 2.3 Theory ABOUT Practice, Direction 1. (Winter et al, 2006, p.642)

The Lifecycle Model of Projects and PM	→	Theories of the Complexity of Projects and PM
From: the simple lifecycle-based models of projects as the dominant model of projects and project management		Towards: the development of new models and theories which recognize and illuminate the <i>complexity</i> of projects and project management, at all levels.
And from: the (often unexamined) assumption that the lifecycle model is (assumed to be) the actual 'terrain' (i.e. the actual reality 'out there' in the world).		And towards: new models & theories which are explicitly presented as only <i>partial</i> theories of the complex 'terrain'.

The next section pivots by providing a summary overview of the literature specifically concerning building construction projects and project management.

2.3 Public Building Projects

While modern project management was initially developed in the 1950s by the U.S. military complex, the building construction industry also made important early contributions in developing tools and techniques such as “the critical path method (CPM) from a technique devised in the field of operations research” (Bredillet, 2010, p.5). In the 1960s, the construction industry began heavily adopting project management methods with large public building projects such as universities and hospitals (Morris, 1994). Today, most of the project management techniques used within the building construction industry remain based on this positivist paradigm including the assumption of being able to predict and control (Fellows & Liu, 2013). At the same time, public (institutional) building projects, such as large hospital builds, have become seen as increasingly complex (CIOB, 2011). These projects are complex by design as they consist of “loosely coupled and dynamic network of specialist organizations contracted to specific aspects of the build” (Harvey et al, 2018, p.108). Furthermore, large construction projects have a “continual need for improved speed, cost, quality, safety, together with technological advances, environmental, issues and fragmentation throughout the construction industry” (Ochieng et al, 2013, p.307). Other reasons adding to complexity includes the often low speed of decision-making and poor management (Doloi, 2013) and key stakeholders’ inability to make to make decisions that are robust and transparent, yet efficient and flexible (Dehe & Bamford, 2015).

It has been “suggested that the increasing complexity of construction projects could be a significant factor in contributing to the poor success rates of construction projects” (Wood & Ashton, 2010, p.1119). Given that major public institutional projects are complex, it is inevitable their progression will be nonlinear due to unforeseen challenges (Ochieng et al, 2013). Yet, as

noted previously, most construction projects continue to be managed using linear plans and schedules. This explains, in part, why large construction projects are often “plagued by a track record of poor performances; the average one finishes a year behind schedule and runs 30 percent over budget” (Asvadurov et al, 2018). One challenge of public building projects, including large hospital builds, is that while risk management tools can identify and thus manage foreseeable risks, they do not account for unforeseen risks or issues, which are increasingly common due to the increased complexity of projects. Notwithstanding this difficulty, unforeseen issues could be managed better on complex construction projects as issues “can arise from the unanticipated interaction of many events, each of which might, in principle, be foreseeable” (De Meyer et al, 2002, p.62). However, construction project management methods do not provide a concerted means to detect unforeseen, yet potentially foreseeable, issues in their early stages before becoming serious problems. These factors combine to explain the ongoing interest in academia and in practice to improve project success, including recent developments covered in the next section of newer project management methods used to manage large building projects.

2.3.1 New PM Methods used on Public Building Projects

Recall the earlier discussion of newer approaches to project management (table 2.2, p.18). To synopsise these newer project management methods and their application in large construction projects, it is necessary to provide an example. Using lean project management as one example of the newer approaches being applied in construction, its roots come from manufacturing production management, which has two main theories: theory of production (transformation, flow and value generation) and theory of management (planning, executing, and control) (Henrich & Koskela, 2006, p.6). Within academia, there is debate concerning the appropriateness of lean production-based project management tools and techniques for construction projects that are ‘one-off’ (unique) (Ballard & Koskela, 2011). The focus of lean project management is to design better production systems (simplification) and on waste

reduction (Tommelein, 2015). This has shown some project outcome improvement such as lowered costs (Ballard & Koskela, 2011). However, from the perspective of complexity and uncertainty associated with large hospital build projects, lean project management's focus on minimizing waste and costs essentially "shrinks the repertoire of resources available to the organization" (Weick & Sutcliffe, 2015, p.110) to identify early and rapidly respond to unforeseen issues. Furthermore, lean project management also uses the traditional project management "linear progression of tasks" (Lostuvali et al, 2014, p.166), whereas large building projects, as noted, progress in a nonlinear fashion due to complexity.

Neither lean project management, nor the other predominant newer project management methods, address project complexity, nor do they address the increasingly acknowledged need for enhanced soft skills for project managers and teams. The focus continues to be "tailored project management methodology" (Sohi et al, 2016, p.258). Toyota, the renowned leader in lean process, had several major crises in short order that severely affected the organization and its reputation; including significant vehicle recall issues in 2009 – 2010. In their internal review, Toyota found the major cause not to be processes but rather a failure of continued human resource development, specifically leadership soft skills (Liker and Convis, 2012). Their conclusion encapsulates nicely the contention supported by the literature that processes alone are not suffice; rather enhanced soft skills are required of those managing the processes.

2.3.2 Large Public Building Project Summary

Project management methods within the public building project sector remain primarily based on a positivist paradigm (Fellows & Liu, 2013). The literature supports that public building projects are complex, therefore inherently progress non-linearly. Thus, new project management methods that address managing complexity and the uncertainty associated with modern, complex building projects is required (Winter et al, 2006). The need for new models is also recognized in practice, as illustrated by British Petroleum (BP) guidelines for major projects

which states that their future project successes would be achieved through improved project leadership “rather than in processes and tools” (cited by Morris et al, 2010, p.349). Based on the literature, the opinion “that conventional project management theory should [not] be abandoned, only that there is a need now to develop this field beyond its current foundations” (Winter & Smith, 2006, p.13) has merit for this study. Specifically, it provides the opportunity to determine if high reliability theory and practice can enhance managing large hospital build projects.

In line with the focus of this research study, the next section provides a summary overview of the literature specific to large hospital building projects. The healthcare sector is considered “among the most important [sectors] in developed economies” (Pauget & Wald, 2013, p.204). Likewise, hospital building projects to support the increasing need for access to healthcare is deemed universally among society’s highest priorities.

2.4 Hospital Building Projects

Within the broad spectrum of providing patient care, hospitals remain “critical to the overall performance of health care” (Chung et al, 2017, p.926). Indeed, hospitals are universally considered “major determinants of our quality of life” (Armony et al, 2015, p.146) and are a basic resource and a key economic driver for their communities. Because of their importance, there is near global aspiration “to strengthen and deliver health systems for the next generation” (Fulman et al, 2018, p.2260). The driving force behind hospital building projects is multi-fold, to include the rise of aging societies and a prior “lack of investment in buildings and infrastructure” (Pauget & Wald, 2012, p.204). Thus, in many countries the healthcare market is currently a huge procurer of construction, with billion-dollar hospital construction projects becoming commonplace (Robeznieks, 2010). In the United States alone, healthcare construction has an annual spend over \$500 billion (U.S. Census Bureau, 2018). Despite the recognized importance, a simple online search results in far too many examples of large hospital building projects facing significant delays, cost overruns, and other crises. For example, a new hospital

project in the US experienced “years of scheduling delays and more than \$1 billion in cost overruns” (Ogrysko, 2018). Another hospital in Qatar fired its prime contractor on a \$2.3 billion new hospital project after significant delays, resulting in an international lawsuit and the hospital opening years after its initial projected opening (Quirke, 2014). Additionally, a 2017 survey found that nearly 40% of hospital construction projects had cost overruns and/or schedule issues (Burmahl et al, 2017, p.21).

Constructing a large hospital is a complex endeavour. First, the building systems and technology infrastructure alone are complex engineered systems with many integrations and interfaces among building systems, information systems, and medical equipment (Barlow & Koberle-Gaiser, 2009). They are also complex projects to manage as hospitals typically have a multiplicity of stakeholders (Fanelli et al, 2017). For example, in a new, \$1 billion+ hospital construction project this researcher was directly involved as a practitioner, there were 38 prominent external stakeholders. This number excludes hundreds of internal (clinical and operational) stakeholders. Furthermore, the project managers of large hospital builds “must coordinate numerous subcontractor organizations, work to a tight schedule, and keep agreements with local stakeholders to minimize disruption” (Harvey et al, 2016, p.6). Another challenge for a majority of large hospital building projects is that “real estate development is not the core business of health organizations” (van Reedt Dortland et al, 2013, p.17).

The literature supports the contention that developing new models to enhance managing large hospital building projects is justified. As noted, reasons include the global *and* local societal and economic importance of these projects; the increased complexity of large hospital building projects is not an emphasis of traditional project management methods; and the poor performance in terms of cost and schedule overruns of far too many of these projects. The aim of this research study is to investigate enhancing the managing of large hospital building projects regardless of country or location. There are a handful researchers who have begun studying the applicability of ‘High Reliability Organization’ (HRO) principles to construction

project management (Harvey et al, 2016; Saunders, 2016; Browning & Ramasesh, 2015; olde Scholtenhuis & Doree, 2014). This study aims to build upon the limited research by examining if high reliability mindfulness principles, applied pragmatically using enhance soft skills embedded in the form of a framework, would enhance managing large hospital building projects. In order to do so, a review of HRO literature is necessary.

2.5 High Reliability Organizations

A 'High Reliability Organization' (HRO) is a label given by the initial researchers studying organizations they pre-determined exhibiting consistently safe operations while working under constant, extreme hazardous conditions with dire consequence of failure, such as nuclear power plants, naval aircraft carriers, air traffic operations, etc. (Bourrier, 2011). The researchers drew upon Perrow's normal accident theory (1984) as a framework with the aim of "understanding the conditions whereby complex systems do not fail" (Lekka, 2011, p.4). The common characteristic of HROs is their "unique ability to operate high-hazard technology systems in a nearly error-free manner" (Vogus & Welbourne, 2003, p.878) over a long time period measured in years. There are those who contend, however, that HROs should not be defined solely "on accident statistics as evidence that an organization meets the 'high reliability' criterion" (Lekka, 2011, p.5). The argument is that such a narrow definition lacks objectivity and misperceives reliability as being the same as safety. Indeed, one of the initial researchers was concerned about the label 'High Reliability Organization', stating:

"This choice [the label High Reliability Organizations] ...was both necessary and unfortunate. Necessary because some label is needed to identify organizations which...are indeed clearly distinguishable from those that have been the subject of most historical study and analysis in the organizational literature. Unfortunate because the term implies that our evaluation is based on some absolute, and static, standard of performance rather than on

relative evaluation of the dynamic management of a difficult and demanding technology in a critical and unforgiving social and political environment” (Rochlin,1993, p.12).

Rochlin (1993) further stated that a better choice of labelling HRO may have been that of ‘reliability-seeking’ or ‘reliability-enhancing’ organizations. Other high reliability researchers agree, for example Roberts et al (1994) argue that HROs should be defined as social systems that have developed a resilient culture for dealing with uncertainty and threats. Waller and Roberts (2003) maintain that the oft-cited contention “that HROs cannot provide useful information to ‘normal’ organizations due to their ‘exotic’ contexts...is simply no longer relevant” (p.814). Nonetheless, they cautioned that HRO principles and processes cannot simply be lifted and applied to other organizations. Rather, they advised researchers to “focus on the difficult job of distilling the essence of core reliability processes from HRO and create new knowledge – both theoretical and empirical – regarding these processes and their suitability for other organizations” (p.814).

The early HRO researchers examined the unique structural features, such as an intense sense of mission, a strong technical and professional culture, the presence of redundancy in equipment design and operating procedures, etc. Weick and Sutcliffe (2001, 2007, 2015) were relative latecomers researching HROs, and instead focused on an HROs displayed sense making ability to collectively think and perform differently, yet not uniquely, from other organizations. Weick and Sutcliffe found that HROs display cognitive processes which results in “determined efforts to act mindfully” (2007, p.18). It is HRO mindful features, rather than its organizational structures, that is of principal interest to this study. As such, a summary overview of high reliability mindfulness is necessary.

2.5.1 Mindfulness

The topic of mindfulness has recently become trendy, mostly a result of “the Buddhist-derived approach popularized by Kabat-Zinn in which the experience of mindfulness is to be

found in the experience of meditation practice” (Carmody, 2014, p.48). These centuries old eastern philosophy of mindful practice consists of five different levels of mental modes (Olendzki, 2014). These include (pp.66-68):

- 1) Human experience is a rapid flow of occurrences unfolding one after another that we typically engage/interpret at a high level.
- 2) Being consciously aware is to focus attention versus merely responding to environmental stimuli.
- 3) Mindful attention is achieved through wholesome morals and consciousness; unethical or harmful thoughts divert mindfulness.
- 4) Mindfulness is to see things how they are without favoring or opposing, which allows for a nonattachment to all experience.
- 5) The ultimate condition is to understand experience instead of merely experiencing it.

The foundation of the eastern practice of mindfulness is to reach a radical acceptance internally through meditation in order to avoid suffering and attain wellbeing (Djikic, 2014, p.142).

The western perspective of mindfulness, on the other hand, is a recent alternative perspective based in cognitive psychology. Put forward initially by Langer (1989, 1997, 2005, 2009, 2014), this perspective of mindfulness is defined as “drawing novel distinctions, which results in being situated in the present, sensitive to context and perspective, and guided (but not governed) by rules and routines” (Djikic, 2014, p.140). This perspective deems mindlessness as the principal problem. Mindlessness is described as “a style of mental functioning in which people follow recipes, impose old categories to classify what they see, act with some rigidity, operate on automatic pilot, and mislabel unfamiliar new contexts as familiar old ones” (Weick & Sutcliffe, 2007, p.88). The western-based perspective of mindfulness requires a radical challenge of any single answer, perspective, authority, judgment, or outcome (Djikic, 2014). Its approach to mindfulness is through actively noticing novelty and challenging interpretations, perspectives and cognitive biases (Langer, 2014).

While project managers might benefit from meditation and the eastern-perspective of mindfulness, especially given the stress inherent in managing large complex projects, the interest of this research study is the western-based philosophy of mindfulness' potential in improving organizational development in the form of enhancing managing of large hospital building projects. A review of the five HRO principles of mindfulness (Weick & Sutcliffe, 2001, 2007) is provided in the next section.

2.5.1.1 Five Principles of Mindfulness

It is important to reiterate that HRO mindfulness is “a set of principles that describes how organizations can enhance reliability of their performance” (olde Scholtenhuis and Doree, 2013, p.941). It should not be confused with existing, step-by-step quality tools designed to eliminate or mitigate specific, *known or foreseeable* risks or failures, such as failure mode effects analysis or fail-safe engineering design. Again, HRO principles' root is from the western perspective of mindfulness, which enhances sense making and combats mindlessness, thereby increasing reliability under conditions of complexity and uncertainty.

The first HRO principle of mindfulness is 'preoccupation with failure' (Weick & Sutcliffe, 2007). It is the notion that “detailed operating procedures, missteps, missing resources, miscommunications, or mistakes have to be found and put right before they can turn into a tragic flaw” (Perin, 2004; cited in Weick & Sutcliffe, 2007, p.47). One hallmark of organizations with a preoccupation with failure is they actively encourage “employees to report unexpected events, near misses and problems, instead of making it sound like they're complaining” (van Dalen et al., 2009, p.40). Detecting failure is not always straightforward; it can often start with a gut-feeling (Weick & Sutcliffe, 2007). In order to act on such an instinctive response or on pure gut-feelings, people need to be encouraged to speak up and share information. This is important as candor “improves the quality of data available for learning, introduces corrections earlier when emerging problems are more manageable, and reaffirms the truth that we're all

fallible and most dangerous when we think we aren't" (p.49). One way of encouraging this behavior is to reward employees who speak up. For example, olde Scholtenhuis and Doree's (2013) case study of three utility reconstruction projects located in the Netherlands investigated HRO mindfulness in relation to managing construction projects. In relation to preoccupation with failure, they found "that most site supervisors and contractors had a fairly comprehensive view of which unwanted onsite events could occur. Our dialogues with practitioners, for example, showed that they were able to provide detailed example of events that had held up construction. These were, for example, blind-cutting, detecting potentially hazardous objects and poor weather conditions. Despite their knowledge of such failures, we did not observe work planners taking this into account when developing construction plans" (p.945). Their finding is not atypical in far too many construction projects and supports the view for project team cultures that support preoccupation with failure. Loch et al (2006) similarly state that "project teams must be able not only to tolerate but to seek failures, especially early in the project, and learn quickly from these failures" (p.267).

The principle of 'reluctance to simplify' is the observation that while simplification of activities allows people to stay focused, "less simplification allows you to see more" (Weick & Sutcliffe, 2007, p.10). It allows one to see more "with its insistence on closer attention to context, categories, and expectations" (p.53). By assuming the world to be "complex, unstable, unknowable, and unpredictable" (p.10), HROs find it necessary to welcome and seek out diverse experience and even skepticism. In order to avoid simple explanations or jumping to conclusions, people in HROs develop and mutually accept a critical attitude. Weick and Sutcliffe (2007) conclude every organization "makes assumptions about how complex a project will be, what resources are needed to complete the project, and how to avoid entrapment. Those assumptions can be rough or nuanced. Resilience lies in the direction of nuanced" (p.12). Where uncertainty (rather than highly verifiable predictability) is prevalent, "resilience makes more sense because we cannot know which possible risks will actually become manifest"

(Wildavsky, 1991, p.221). In staying with olde Scholtenhuis and Doree's (2013) case study of utility reconstruction projects in the Netherlands, during the course of their investigation they "were told by experienced project managers that they assume ideal and unhampered construction progress almost every time when they make construction schedules. Their logic seemed to be: 'you never know when hold ups will occur'. In the end, such simplified plans and schedules do not contain contingencies and are, not surprisingly, waylaid by unexpected problems during the project's execution" (p.945). This serves to illustrate the need for a reluctance to simply mindset within a project context.

Sensitivity to operations is principally concerned with seeing and knowing what work is actually happening, regardless of plans or intentions (Weick & Sutcliffe, 2007). This is critical in large, complex projects. This principle is similar to situational awareness or seeing the 'big picture'. In order to attain this condition, organizations "set in place operating practices that help people develop a collective map of operations at any given moment" (Weick & Sutcliffe, 2007, p.63). This includes all organizational members keeping "each other updated on the process and current state of affairs, so that they can adjust their actions and anticipate problems at an earlier stage" (van Dalen et al, 2009, p.52). In this era of 'big data', HROs view quantitative and qualitative knowledge equally, since, often, the early detection of changes or failures is because of careful scrutiny for small changes (Weick & Sutcliffe, 2007). olde Scholtenhuis and Doree (2013) found in project management meetings that "many discussions were blocked because of a client's limited knowledge of interrelated operational activities. One reason for this is that subcontracting policies distanced clients from actual construction processes. Further, fragmented ownership of the utility network and ambiguous lines of command-impeded clients' awareness of interrelated operational processes. Since no client was formally in command of overall project coordination, they all approached their projects as isolated processes, neglecting the management of interfaces with related construction activities" (p.945). Loch et al (2006) found that normal project operations including meetings "often reveal observations that have no

immediate consequence but are 'free lessons' that could signify the development of unexpected events.

Preoccupation with failure, reluctance to simplify, and a sensitivity to operations are concepts Weick and Sutcliffe (2007) classify as anticipatory, or an organization's "capacity to anticipate 'unexpected' problems" (p.9). Their next two HRO mindful concepts, commitment to resilience and deference to expertise, has "more to do with capacity to contain them" (p.9). A commitment to resilience assumes mistakes and errors will happen and that organizations need mitigating processes to correct errors before they cause harm or worsen (Weick & Sutcliffe, 2007). They do this by "developing general resources to cope with and respond to change quickly" (p.73). HROs build a commitment to resilience both through simulated training and through learning from experience. Furthermore, HRO mindful principles can present an ability to learn from errors and "implement that learning through fast negative feedback, which dampens oscillations" (p.69). For example, people in HROs are also trained to be "able to switch between various methods of work when sudden unexpected events occur" (van Dalen et al, 2009, p.57). Continuing with olde Scholtenhuis and Doree's (2013) case study, they "found that project managers hardly had back-up strategies in-place. Besides, re-planning and improvisation was inefficient as many work changes needed to be formally approved through time-consuming procurement procedures" (p.945). This behavior and associated time-consuming approval processes are typical in large, complex projects. They are often managed in a transactional manner, which inhibits the flexibility needed to quickly manage unexpected problems or events. Unfortunately, with the increasing complexity of projects, "no matter how well one prepares, the unexpected will happen" (Loch et al, 2006, p.267).

The second HRO mindful principle for containment, deference to expertise, refers to pushing decisions down to the lowest level possible where persons with direct and specific knowledge can make a swift decision in order quickly to alleviate the potential issue or problem (Roberts et al., 1994). HROs find this necessary as senior leaders often have filtered

information thus are not in position to fully understand the issue or potential ways to quickly eliminate or mitigate it (Weick & Sutcliffe, 2007). HROs regard a deference to expertise as being a “flexible and adaptive organization” (p.77). To promote a deference to expertise, HRO team members share knowledge and have “people talk about their own expertise on a regular basis, so that it is shared more broadly within the organization” (van Dalen et al, 2009, p.65). In essence, deference to expertise increases an organization’s sense making capabilities (Weick & Sutcliffe, 2015). olde Scholtenhuis and Doree’s (2013) study noted that “during unplanned, unexpected situations, contractors [...] directly contact the appropriate manager or supervisor. As an outcome, practitioners informally agree to quickly reschedule small project components or temporarily suspend construction” (p.946). A likely reason, however, was not processes that supported deference to expertise, rather than “site managers were often unable to explain the formal organizational structure and the positions of the ‘partners’ on site” (p.945) therefore instead relying on quick, informal agreements to address the immediate issue at hand. This aligns with deference to expertise where “decision making is pushed down the organization [there is] faster decision making, more knowledge at the decision-making level, and more variety in approaches” (Loch et al, 2006, p.267).

A synthesis of the literature of the characteristics of the HRO principle of mindfulness is provided in Table 2.4:

Table 2.4 Synthesis of HRO literature related to Mindfulness list (adapted from Saunders, 2015, p.28)

HRO principle of Mindfulness	Key authors with year of publication
<p>Cognitive processes The importance of organizational processes and structures</p>	<p>Weick et al, 1999; LaPorte & Consolini, 1999; Weick & Sutcliffe, 2001; Vogus & Welbourne, 2003; Weick & Sutcliffe, 2006; Weick & Sutcliffe, 2007; Hines et al, 2008; Vogus, Rothman, Sutcliffe & Weick, 2014; Weick & Sutcliffe, 2015; Milosevic et al, 2018</p>
<p>Preoccupation with Failure Constant vigilance and anticipation of potential threats</p>	<p>Rochlin, 1993; Weick & Sutcliffe, 2001; Coutu, 2003; Weick & Sutcliffe, 2007; van Dalen et al., 2009; Weick & Sutcliffe, 2015; Hales et al, 2016; Ogliastris & Zuniga, 2016 Weick, Sutcliffe, and Obstfeld (2008), Saunders, 2015, Harvey et al, 2016; Day et al, 2018</p>
<p>Reluctance to Simplify Attuned to weak signals and avoid making assumptions</p>	<p>Weick et al, 1999; Weick & Sutcliffe, 2001; Weick & Sutcliffe, 2007; Boin & Schulman, 2008; Weick, Sutcliffe, and Obstfeld (2008); Weick & Sutcliffe, 2015, Saunders, 2015, Harvey et al, 2016; Fox et al, 2017; Ford, 2018</p>
<p>Sensitivity to Operations Gather diverse input and value intuitive knowledge</p>	<p>Weick et al, 1999; Weick & Sutcliffe, 2001; Coutu, 2003; Weick & Sutcliffe, 2007; Weick, Sutcliffe, and Obstfeld (2008); Weick & Sutcliffe, 2015, Saunders, 2015, Harvey et al, 2016; Davenport et al, 2018.</p>
<p>Commitment to Resilience Effective in improvising when responding to surprises</p>	<p>Weick et al, 1999; Weick & Sutcliffe, 2001; Weick & Sutcliffe, 2007; Weick, Sutcliffe, and Obstfeld (2008); Weick & Sutcliffe, 2015, Saunders, 2015, Harvey et al, 2016, Ford, 2018</p>
<p>Deference to Expertise Defer to person(s) with specific knowledge related to the event</p>	<p>Weick et al, 1999; Mannarelli et al, 1996; Rijpma, 1997; Weick & Sutcliffe, 2007; Weick & Sutcliffe, 2015, Saunders, 2015, Harvey et al, 2016; Vogus & Sutcliffe, 2017; Godlock et al, 2017; Berthod et al, 2017</p>

2.5.1.2 Mindfulness Summary

Weick and Sutcliffe (2007) contend that any individual or reliability-seeking organization can develop mindfulness by focusing on “small, cumulative changes that help you add mindfulness to your current practices” (p.139). Indeed, mindfulness has begun to be studied and

practiced as enhanced soft skills (Loch et al, 2006) outside of traditionally defined High Reliability Organizations. In the case study cited here within of the three construction projects in the Netherlands, olde Scholtenhuis and Doree (2013) concluded that managing of construction projects could benefit by applying the five principles of mindfulness (p.946). In their research of HRO principles in construction projects, Harvey et al (2016, p.9) also concluded that construction projects could benefit from HRO mindfulness in terms of better seeing the “big picture”, building relationships, encouraging adaptability, and maintaining vigilance through a skeptical attitude. Although the number of researchers studying the applicability of HRO principles of mindfulness to project management is relatively small, the conclusion drawn from the literature is that it is a suitable subject for further research. This study aims to understand the usefulness of mindful principles specific to enhance managing large, hospital building projects. It is therefore necessary to review current applications of mindful principles within healthcare organizations.

2.6 Mindfulness and healthcare management

A key aim of this study is determining if healthcare organizations would understand and apply concepts adapted from HROs to enhance large hospital builds. The healthcare industry has been studying reliability, including high reliability, for several years. Reliable performance in healthcare can be a life-or-death matter at the individual (patient) level, and yet the industry as a whole has not performed in a consistently safe and reliable manner. The magnitude of clinical safety issues associated with healthcare was brought to the forefront by the landmark and highly influential Institute of Medicine (IOM) study entitled *To err is human: Building a safer health system* (Kohn et al., 2000). This report detailed the collectively high number of US hospital acquired infections, injuries, errors, adverse events, and preventable deaths, and highlighted system complexity as the leading factor for continued unintentional harm to patients, in sharp contrast to the prior orthodoxy that errors were purely the result of individual

carelessness. Related studies have reported similar findings globally (Bagnara et al., 2010, p.714). Even with the increased focus and prioritization, the healthcare field as a whole failed to improve on the IOM statistics to any measurable degree. As a result, interest grew in holistic approaches that could supplement traditional preventative approaches. Several healthcare organizations turned to studying reliability from organizations outside of healthcare.

2.6.1 Mindfulness and healthcare management research

The literature shows significant study of the application of HRO mindful principles in healthcare (Chassin & Loeb, 2013). Organizations such as The Joint Commission (the primary hospital quality accreditation organization in the United States and the parent company of Joint Commission International, which accredits hospitals globally) and the Agency for Healthcare Research and Quality (AHRQ) have studied the applicability to healthcare of HRO processes. The Joint Commission is the recognized leader in hospital quality and safety accreditation having over 4,000 accredited organizations in the US (TJC, 2016) in addition to over 800 healthcare organization accredited worldwide (outside of the US) through its subsidiary Joint Commission International (JCI, 2016). It also conducts health services research, which has included research relating to the similarities between HROs and healthcare organizations. Their studies conclude that despite the increased scrutiny and focus on quality and safety, hospitals remain quite far from achieving HRO-level safety records (Chassin & Loeb, 2011; 2013). In studying various HRO reliability-enhancing principles, they concluded that Weick and Sutcliffe's (2007) five mindful principles are "the most compelling depiction of how high-reliability organizations (HROs) stay safe" (Chassin & Loeb, 2013, p.461). Most compelling was Weick and Sutcliffe's argument that their principles are not just related to traditional HROs, but "that many organizations are just as exposed to threats as HROs are, and just as much in need of mindfulness" (2007, p.19). Chassin and Loeb (2013) contend that the healthcare industry is in dire need of collective mindfulness yet remains quite far from utilizing Weick and Sutcliffe's five

HRO mindful principles to guide their actions and responses. Based on their research of HROs, and taking into account these aforementioned principles of mindfulness, Chassin and Loeb (2013) identified three requirements they believe hospitals need in order to become more reliable organizations, including a leadership commitment to reliability and safety, an organizational culture of safety as a main priority, and effective reliability-enhancing process improvement tools and methods. Dr. Chassin, who serves as President of The Joint Commission, used findings from his research as a rationale to add new, and strengthen existing, accreditation standards related to these three key areas for both U.S. and global hospitals seeking accreditation.

The Agency for Healthcare Research and Quality (AHRQ), a research branch of the US Department of Health and Human Services, has also studied the applicability of High Reliability Organizations in healthcare. AHRQ research found that the concepts and approaches used by HRO can “be applied and adapted to face hospitals’ challenges” (Hines et al, 2008, p.3). In 2005, AHRQ convened leaders from 19 U.S. healthcare systems over an 18-month time period to review the applicability of high reliability concepts in healthcare and to identify and describe how they can be applied in this context. The outcome of their efforts was the publication *Becoming a High Reliability Organization: Operational Advice for Hospital Leaders* (Hines et al, 2008). Today, there are several prominent healthcare organizations renowned for their broad commitment to the application of HRO principles including mindfulness.

The key for this study is whether healthcare organizations would also apply HRO mindful principles outside of the patient quality and safety arena, in particular in managing large, complex hospital building projects. Given that several prominent healthcare organizations have endorsed or adopted HRO mindful principles with reported successes, it reasonable to assume healthcare organizations would consider reviewing whether business practices to benefit from reliability-enhancing processes. One of the greatest business and financial risks undertaken by healthcare organizations are large building construction projects, which as noted many now

reach over \$1 billion. This study aims to investigate this assumption through its two primary research questions (section 2.1, p.12).

2.7 Research Gap and Study Justification

The literature review resulted in the following understandings:

- 1) there is significant spend globally in new hospital builds, which are complex projects;
- 2) there are numerous individual projects globally in excess of \$1 billion USD;
- 3) high percentage of hospital build projects suffer significant budget and schedule issues;
- 4) traditional project management methods do not account for complexity;
- 5) mindful principles have shown the ability to improve managing complexity in HROs; and
- 6) healthcare has embraced high reliability principles in practice and research.

2.7.1 Use of HRO mindful concepts in large hospital building projects

The literature supports that further study is warranted to determine the ability to exploit parallels or synergies between project management and HRO theory/thinking. Additionally, initiatives for enhancing managing of large hospital construction projects should not be merely improved tools and techniques, rather a focus on “a set of behaviours, routines, and ways of working that are directed at improving project management performance” (Fernades et al, 2014, p.82). Given the healthcare industry has been one of the more active non-traditional organizations to adopt HRO mindful principles (section 2.6, pp.36-39), it is reasonable to study as a sector that might understand and willingly apply HRO mindful principles to enhance managing large hospital builds. This serves as the starting point and rationale for this thesis.

The literature confirmed it is an appropriate to study the potential that HRO mindful principles have to enhance soft skills for managing large building projects and, given HRO applications already used and promoted in healthcare organizations, a fitting organization to study. It will be important to overcome the perceived challenges of transitioning to a new

conceptual framework given that “competing sources of sense-making, legitimacy and power may come into play in any attempt to develop or refine a common body of knowledge and understanding about project management” (Bresnen, 2015, p.333). Therefore, any new framework should be implemented “in an ordered way...to create new, interdisciplinary ways of thinking” (Morris, 2013, pp.247-248).

2.8 Summary

The review of literature related to both project management and HRO mindful principles shows that, while there does not appear to be a direct theoretical connection, there does appear to be parallels between the two. Saunders (2015) highlights the similarities and key differences based on her literature review comparing HRO operations with projects, concluding there is “sufficient evidence to argue that the environment of the project is sufficiently similar to the operational context to apply the theories of high reliability organizing” (p.29). In managing complex projects, for example, there is frequently a “need to make decisions in loosely structured situations where there may be a paucity of relevant information (leading to uncertainty)” (Leybourne & Sadler-Smith, 2006, p.483).

The mindful principles displayed by HROs can serve as advanced soft skills to improve abilities to manage unforeseen conditions and decision making under uncertainty and, just as importantly, overcome the mindlessness often associated with managing projects. If HRO mindful principles are to be deemed appropriate for large hospital building projects, one must agree to not define HROs from its traditional definition based largely on a reductionist view of accident statistics, rather pragmatic view of HROs being reliability-seeking. The difference is highlighted in the following table:

Table 2.5 Reductionist and Pragmatic views of HROs. (olde Scholtenhuis & Doree, 2014, p.662)

	Reductionist View	Pragmatic View
Unit of Analysis	'Traditional' HRO organizational structure	Organizational processes
Meaning of Reliability	Reliability as an absolute	Reliability as a process
Function of HRO lens	Distinguish HROs by organizational structure	Understanding principles and processes to enhance reliability
Main Assumptions	Organizations are either HRO or not; concepts do not apply beyond safety	HRO lens applicable to common organizations seeking to enhance reliability

The pragmatic view is aligned with Weick and Sutcliffe's (2001, 2007, 2015) HRO principles of mindfulness. They emphasize that not just HROs, but most organizations, have to guard against "optimistic plans, insufficient staff, misestimated complexity, broken promises, overlooked details, turf battles, loss of control, [and] unanticipated consequences" (2007, p.17). As noted, a project is a temporary organization (section 2.2, p.12). With large hospital building projects being multi-year endeavors through the entire lifecycle of planning, design, construction and start-up operations, the temporary organizations established to manage them would appear to benefit from HRO mindful principles. A key question is, are there other reliability frameworks to draw from other than HRO? For comparison, the Cynefin Framework for Sense-Making (Snowden & Boone, 2007) was considered, as it appears to deal with complexity in practice. However, HRO mindful principles had two distinct advantages. First, they more urgently address unexpected issues before and after they arise. The Cynefin Framework deals with complexity by conducting iterative experiments within boundaries over time. This is more suited in an ongoing operational environment than a project environment. Second, Weick's focus on labels ensure that HRO mindfulness principles can use of language that makes the best sense to the people with whom you are working (National Advanced Fire and Resource Institute, 2007). In other words, it is encouraged to label the five mindful principles using language that makes sense to the organization. This should allow for easier integration into practice, as the introduction of new

language is not required. Furthermore, while HROs spend a lot of time on plans and planning, they also take caution of planning as explained by Weick and Sutcliffe (2007, pp.66-67):

- Since “plans are built from assumptions and beliefs [...] they embody expectations. Strong expectations influence what people see, what they choose to take for granted, what they choose to ignore, and the length of time to recognize small problems”.
- Plans specify contingent actions, which are doubly “blind because they restrict attention to what is expected”.
- Plans presume good outcomes if past successful activities are repeated, which does not account for managing unexpected events during implementation.

Weick and Sutcliffe’s (2001; 2007) mindfulness principles, therefore, was determined by this researcher to be a better fit for developing a conceptual framework for enhancing managing of large hospital building projects.

The next chapter presents the research methodology and considerations used for this thesis.

Chapter 3: Research Methodology

3.1 Introduction

This chapter is structured as follows: A brief summary of the literature is provided, which contributes to the theoretical context and knowledge to support answering this study's two primary research questions. This is followed by an overview of required philosophical considerations, including those considered for this study, as well as a review of reliability, validity and trustworthiness in research. An examination and justification of the research methodology and design used for this study is presented, including in-depth examination and justification of the Delphi method and the processes in which data was collected and analyzed. The chapter concludes with a review of ethical considerations taken for this study and chapter summary.

3.2 Reflection of Literature Review

The literature review (Chapter 2) presented theories, knowledge and historical insight to assist in refining this study's two main research questions:

- R1. What potential do mindful processes derived from high reliability organization (HRO) practice have to improve managing large hospital building projects?
- R2. How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management?

The literature review identified links between project management and high reliability theory/thinking warranting examination. For example, studies concluded that HRO principles are applicable in project settings (Saunders, 2015), especially when applying a pragmatic interpretation of high reliability (olde Scholtenhuis & Doree, 2014). The adoption of high reliability by healthcare organizations was also explored in the literature review. The conclusion

was that given the significant spend globally in hospital builds, with a significant number of projects over budget and schedule, combined with the fact that healthcare organizations have already embraced high reliability, that examining how high reliability principles might be of benefit to enhance deficiencies in managing large hospital builds is worthy of doctoral study.

As such, this study intends to contribute to new knowledge by examining if global experts involved in large hospital building projects view high reliability mindful principles, in the form of a framework coined Mindful Project Management, useful towards improved managing of large hospital building projects. Sub-research questions were added to refine the exploration of this topic. The two sub-research questions developed to support answering R1 are:

SR1.1 What vulnerability do practitioners have to mindlessness?

SR1.2 How clear do practitioners find the concept of utilizing processes developed from HRO mindful practices?

As explored in the literature review (section 2.5.1, pp.28-30), the western perspective of mindfulness considers *mindlessness* as the leading challenge as people mentally apply wrong classifications or biases, fail to challenge assumptions, or fail to notice uniqueness when interpreting things. Identifying vulnerability to mindlessness is a necessary first step to determine the usefulness of HRO mindful principles to assist better managing large hospital building projects. The five sub-research questions for R2 are specific tactics identified by this researcher resulting from a literature query of high reliability organizations, more specifically each of the HRO five mindful principles, respectively: preoccupation with failure (SR2.1), reluctance to simplify (SR2.2), sensitivity to operations (SR2.3), commitment to resilience (SR2.4), and deference to expertise (SR2.5). The five sub-research questions are:

SR2.1 How useful is a voluntary reporting system?

SR2.2 How useful is a project charter?

SR2.3 How useful is a common project diary?

SR2.4 How useful is an in/on boarding process?

SR2.5 How useful is periodic reflection sessions?

These sub-research questions are based on concepts from the literature of both project management and high reliability principles. The objective of these sub-research questions is to determine global experts' view of a) the perceived applicability of HRO mindful principles in managing large hospital building projects, and b) the perceived usefulness of the Mindful Project Management framework conceptualized based on this literature review to supplement existing technical practices. The rationale for developing this framework is to foster team and individual mindfulness as a soft skill to improve noted deficiencies in managing complex hospital builds.

The remainder of the chapter describes the research paradigm, methodology and process utilized to support this research study.

3.3 Philosophical Considerations

The initial philosophical consideration for this research was determining why the topic should be studied (Holden & Lynch, 2004). It is important to first to clarify the research design, determine an appropriate research design approach, and establish how to conduct the research (Easterby-Smith et al, 2008). The last consideration is particularly important for practitioner-researchers, as “experiences often sit alongside, or even give rise to, interest in particular philosophical or intellectual perspectives” (Reason & Bradbury, 2008, p.16). A researcher’s lived experiences can significantly influence insider-research. Practitioner-researchers, therefore, must consider the influence of one’s social knowledge shaped by life experiences (Reason & Bradbury, 2008).

For this study, the potential influence of social knowledge was considered. For example, as a practitioner, this researcher has extensive professional experience as a healthcare executive including managing significant large hospital building projects in multiple countries. Additionally, as a doctoral student, formal study may have influenced this study to include the literature review. Furthermore, there was a concerted effort to understand the impact on this study related to the participants’ social knowledge, each who undoubtedly brought their own

understanding and lived experience. The philosophical consideration for this study, therefore, necessitated research that integrates scholarship and lived experience. With that philosophical underpinning decided, it is necessary to next consider ontological and epistemological factors.

3.3.1 Ontological Considerations

Ontology is “a method or activity of enquiry into philosophical problems about the concept or facts of existence” (Jacquette, 2002, p.3), or, in other words, the way reality is viewed by the researcher (Creswell, 2007). There are two principal ontological considerations: objective reality and subjective reality. An objective reality perspective assumes things can be measured and generalized, while subjective reality assumes reality is socially constructed (Eden & Spender, 1998). Based on the previously discussed philosophical considerations for practitioner-researchers, this study is not justifiable from an objective reality perspective.

The subjective reality perspective is that a true representation can only be “determined by people rather than by objective and external factors” (Easterby-Smith, 2008, p.59). This often involves researchers immersing themselves into the subject community, thus preventing dispassionate knowledge (Thorpe & Holt, 2008). Based on the previously discussed philosophical considerations for practitioner-researchers, a subjective reality perspective is most appropriate for this inquiry. The next section reviews the epistemological considerations required.

3.3.2 Epistemological Considerations

Epistemology is a segment “of philosophy that investigates the foundations of knowledge and understanding” (Singleton & Straits, 2010, p.45). Two main traditions associated with epistemology are positivism and social constructionism (Easterby-Smith et al, 2008). Positivism has been “the dominant epistemological orientation of the management disciplines” (Johnson & Duberley, 2000, p.12). Its goal is to produce empirical knowledge through a cause and effect

relationship (Thorpe & Holt, 2008). A social constructionism perspective interprets “contexts in which people live and work in order to understand the historical and cultural settings of the participants” (p.21). It holds the view that people rather than objective or external factors create meaning (Easterby-Smith et al, 2008).

Social constructionism closely relates with the epistemological needs of this study; however, this study would be enhanced using a pragmatic lens. Pragmatism is a sense-experience empiricism offering “an alternate epistemological paradigm” (Hall, 2013, p.19) with the viewpoint “that in the social world there are no pre-determined theories or frameworks that shape knowledge and understanding” (Easterby-Smith et al, 2008, p.76). Pragmatism accepts numerous methods in conducting research with the focus on the topic of inquiry rather than on methods used (Creswell, 2007). This epistemological approach also allows for developing actionable knowledge. The next section reviews research methodology considerations towards actionable knowledge.

3.3.3 Methodology

Methodology refers to how the research will be conducted (Holden & Lynch, 2004). In broad terms, the two main categories of research methods are quantitative and qualitative. As a general characterization, “qualitative research seeks to discover new knowledge by retaining complexities as they exist in natural settings, whereas quantitative research seeks to discover new knowledge by simplifying complexities in settings that tend to be contrived” (O’Dwyer & Bernauer, 2014, p.5). Quantitative research methods test a hypothesis in conclusive, verifiable terms. In social science, quantitative research is often used to define a given population through surveys and questionnaires. Qualitative research has grown as an alternate to quantitative research methods. While once considered a ‘lesser form’ of social research, it has become “accepted as a legitimate mode of inquiry” (Creswell, 2007, p.2). In attempting “to form a more complete picture of a phenomenon” (Shah & Corley, 2006, p.1832), qualitative and quantitative

methods have been combined as a ‘mixed methods’ research design. This design is often used when seeking complementary data to offset biases (Thorpe & Holt, 2008) or attempting to “build and refine theory” (Shah & Corley, 2006, p.1822). With this study’s aim to determine the applicability and usefulness of HRO mindful principles to enhance managing hospital build projects through an action-oriented, conceptual framework, a pragmatic approach using a mixed methods design is justifiable.

3.3.4 Research Approaches

The next consideration for this study was to select an appropriate research approach. The following table depicts different common research approaches and their respective applicability using either an objective or subjective worldview.

Table 3.1 Research Approaches (Remenyi et al, cited in Holden & Lynch, 2004, p.8)

Research Approaches	Objectivism	Subjectivism
Action Research		Strictly interpretivist
Case Studies	Have scope to be either	Have scope to be either
Ethnographic		Strictly interpretivist
Field Experiments	Have scope to be either	Have scope to be either
Focus Groups		Mostly interpretivist
Forecasting Research	Strictly positivist with some room for interpretation	
Futures research	Have scope to be either	Have scope to be either
Game or role playing		Strictly interpretivist
In-depth surveys		Mostly interpretivist
Laboratory experiments	Strictly positivist with some room for interpretation	
Large scale surveys	Strictly positivist with some room for interpretation	
Participant-Observer		Strictly interpretivist
Scenario research		Mostly interpretivist
Simulation and stochastic modelling	Strictly positivist with some room for interpretation	

One pragmatic approach to social science research is action research. Action research is “a systematic approach to investigation that enables people to find effective solutions to problems they confront in their everyday lives” (Stringer, 2014, p.1). It purports that “practices must be understood not solely from the perspectives of the individuals involved, but also in terms of the collective understandings and collective effects of those involved and affected by the practice” (Carr and Kemmis, 1986, p.191). Action research would align this study with a pragmatic worldview by collecting quantitative and qualitative data collection in an iterative manner and focusing the analysis on practical implications towards addressing the research problem. In a review of different action research approaches, it was determined a Delphi study could be beneficial to facilitate expert consensus building to advance an understanding of adapting HRO principles in the form of a conceptual framework to enhance managing large hospital building projects (Fletcher & Marchildon, 2014).

The next consideration was to determine if the research method and approach is rigorous. The next section provides a summary review of the concepts of reliability, validity and trustworthiness.

3.3.5 Reliability, Validity, and Trustworthiness

Reliability and validity are terms associated with quantitative research. Reliability refers to the consistency of a measurement used in the study, including repeatability, stability and similarity over time (Hasson & Keeney, 2011). Validity is “the extent to which measures and research findings provide accurate representation of the things they are supposed to be describing” (Easterby-Smith et al, 2008, p.334).

Lincoln and Guba (1985) made what is now considered a classic argument that rigor can also be demonstrated by the parallel label ‘trustworthiness’. Used in qualitative research, trustworthiness is considered in terms of credibility, transferability, and dependability/confirmability. Credibility is the method of research chosen, transferability relates to the context

of the data, and dependability/confirmability is the ability of others to audit the data. This study's research approach dictates validation via trustworthiness. The next section justifies the specific research design utilized for this study.

3.4 Research Design

There are six common mixed method approaches: convergent parallel, explanatory sequential, exploratory sequential, embedded, transformative, and multiphase (Caruth, 2013). The multiphase approach to mixed methods design examines the research topic through a number of studies (Creswell, 2014). This study's research design consists of two studies. First, a pilot study was conducted to specifically explore sub-research question SR1.1. The second study served as this research's primary inquiry, conducted using a real-time Delphi (RTD) survey with expert panel members as the primary data source. The research design is depicted as follows:

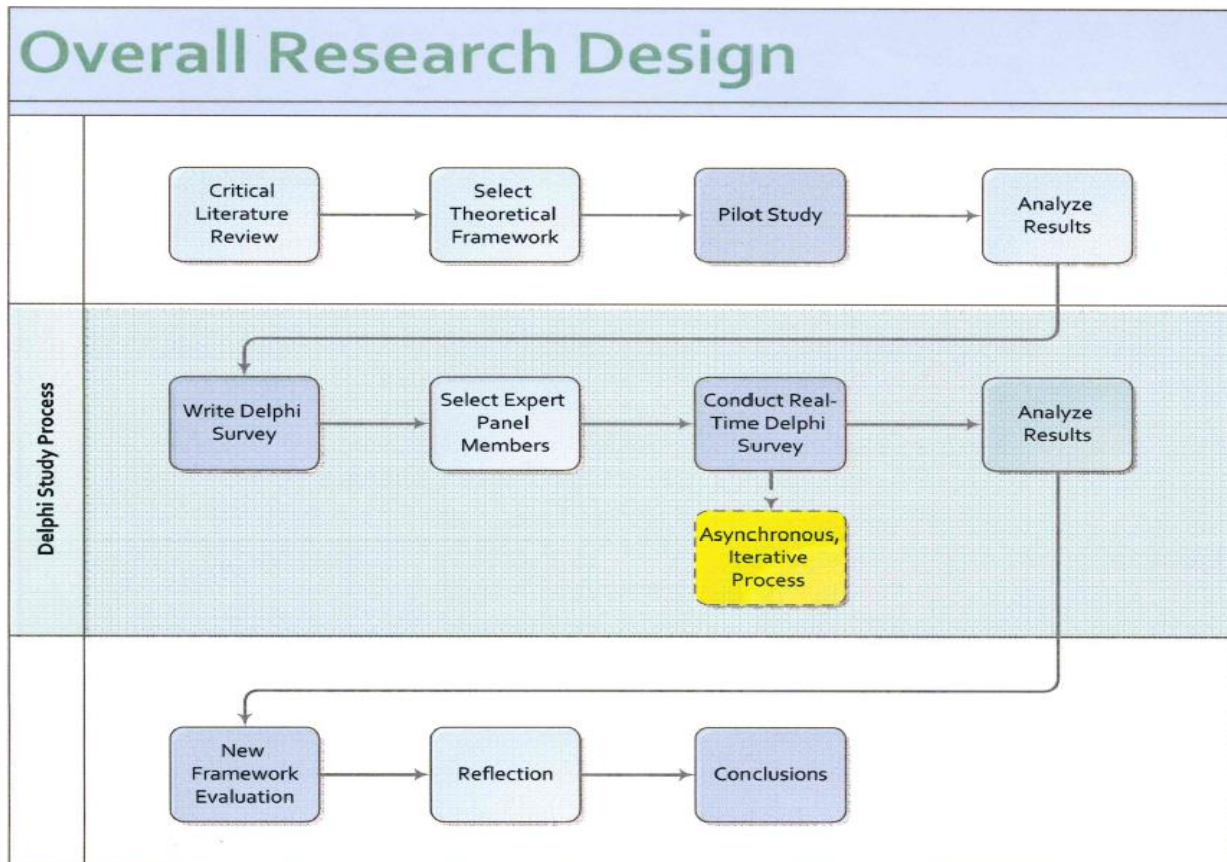


Figure 3.1 Overall research design process including Delphi study (adapted from Vidal et al, 2013)

3.4.1 Pilot Study

Pilot studies are not normally associated with Delphi studies (Avella, 2016). However, a pilot study was viewed advantageous to specifically answer sub-research question SR1.1 ‘What vulnerability do practitioners have to mindlessness?’ This was achieved by adapting the following Weick and Sutcliffe audit "Assessing Your Firm's Vulnerability to Mindlessness" (2007, p.89):

Audit 5.2: Assessing Your Firm’s Vulnerability to Mindlessness

How well do the following statements describe your work unit, department, or organization? Circle the number that best reflects your conclusion: 1 = not at all, 2 = to some extent, 3 = a great deal

1. Exceptions rarely arise in our work	1	2	3
2. We encounter the same kinds of situations and problems day after day.	1	2	3
3. People in this organization have trouble getting all the information they need to do their work.	1	2	3
4. People are expected to perform their jobs in a particular way without deviations.	1	2	3
5. People often work under severe production pressures (time, costs, growth, profits, or other).	1	2	3
6. Pressures often lead people to cut corners.	1	2	3
7. People have little discretion to resolve unexpected problems as they arise.	1	2	3
8. Many people lack the skills and the expertise they need to act on the unexpected problems that arise.	1	2	3

Scoring: Add the numbers. If you score higher than 16, the current potential for *mindlessness* is high, and you should be actively considering how you can immediately improve the capacity for mindfulness. If you score between 10 and 16, the potential for *mindlessness* is moderate. Scores less than 10 suggest a lower vulnerability to mindlessness.

Figure 3.2 "Assessing Your Firm's Vulnerability to Mindlessness" (Weick & Sutcliffe, 2007, p.89)

The questions for the pilot study were adapted from this audit tool. The data collected was analyzed in several ways. First, demographic results of the participants were summarized. Second, Cronbach’s alpha was used to determine the internal consistency with the survey questions developed based on Weick and Sutcliffe's (2007) "Assessing Your Firm's Vulnerability

to Mindlessness" audit. Weick and Sutcliffe's scoring method for this audit was then used to summarize the results of those questions to answer SR1.1. The outcome of the pilot study was its conclusion that the participants exhibited a high vulnerability to mindlessness, further supporting this study's inquiry. This was a critical first inquiry, as a finding of a high level of vulnerability to mindlessness would indicate that experts with significant large hospital build experience might benefit from HRO mindful principles. If the results show a low level of vulnerability, it would serve to contradict the conclusions drawn from the literature review that high reliability principles of mindfulness could aid to more effectively manage large hospital builds. The pilot survey secondarily served to ascertain how many potential panel experts for the Delphi would respond to this survey's request for participation and allowed for a review of the question and responses post-survey for their potential use in the Delphi. The pilot study results are found in Chapter 4 (section 4.2, pp.59-66). The next section provides an overview of the Delphi research method, which served as the study's principal means of data collection.

3.5 Delphi Method

A Delphi is a research method used to systematically collect and aggregate informed judgment from a panel of experts on specific questions and issues (Reid, 1988). It is based on the 'theory of errors' which "assumes that the aggregate of the group will provide a judgment/ forecast that is generally superior to that of most individuals within the group" (Rowe et al, 1991, p.238). The structured process allows for feedback of each expert's individual contribution, some assessment of the expert panel's views, opportunities for individual experts to revise their views, while ensuring anonymity of the panel experts to each other. It is used in a wide variety of disciplines to examine long and short-term forecasting, issue identification, priority setting, and development of concepts, frameworks, and strategies (Okoli & Pawlowski, 2004). The Delphi "remains a useful tool for gathering and validating expert opinion – whether consensus-based or not – in areas where knowledge is limited" (Fletcher & Marchildon, 2018, p.2).

An early, influential critic of Delphi was Sackman (1975) whose primary concern was reliability. Other criticism of Delphi includes examples of poor selection of expert panel members, the anonymity of the Delphi process (which could lead to lessened accountability), and the arguably arbitrary modifications of the original Delphi method (Linstone & Turoff, 2002; Powell, 2003; Kennedy, 2004; Landeta, 2006). Jilsson refuted Sackman's criticism and offered qualitative-based guidelines for establishing reliability when using Delphi (1975; cited in Keeney et al, 2011, p.99). Powell (2003) contends that Delphi is a reliable and valid method if the study incorporates goodness criteria, including detailed justification of the applicability, credibility, and validity of the research and its findings. Rowe et al (1991) reached a similar conclusion from a theoretical/mechanical perspective in regards to ensuring validity, which they principally related to the appropriate number and level of expertise of the participants in the expert panel. Another concern is that the timeframe to complete the conventional Delphi led to the methodological challenge of experts dropping out during the survey given the considerable time demands to complete the iterative process (Gnatzy et al, 2011).

Since the inception of Delphi, it has been modified in a variety of ways (Gupta & Clarke, 1996; Keeney et al, 2011; Davidson, 2013). In fact, there are so many variations that most Delphi Studies are now "often preceded by the word 'modified'" (Davidson, 2013, p.54). A sample of variations of the classic Delphi include Real Time Delphi, Policy Delphi, Decision Delphi, Technological Delphi, and Disaggregative Delphi. This study uses the Real Time Delphi. Initially developed by Gordon and Pease (2006), the aim was improved efficiency of the Delphi by simplifying opportunities for experts to participate through an online process. Their method provided immediate statistical and qualitative feedback, allowing elimination of sequential rounds used in the conventional Delphi method. The Real Time Delphi method has proven to better accommodate expert panel member availability thereby reducing dropout rates (Gnatzy et al, 2011, p.1681). The method "represents a considerable contribution to the scientific

community and reduces the complexity of the conventional Delphi approach” (Gnatzy et al, 2011, p.1692).

Table 3.2 Summary of Classic Delphi and Real Time Delphi (adapted from Davidson, 2013)

Classic Delphi	Developed to seek a set of convergent opinions from acknowledged experts. Important aspect is anonymity of expert panel members who remain unknown to each other. It is an iterative process, moving through a series of rounds. Each subsequent round provides inputs from the prior round, with the final round providing a summarized set of rankings.
Real Time Delphi (also referred to as Consensus Delphi)	Participants provided hyperlink to a secured, online welcome page where details of the approach provided as well as the questionnaire. Refined, real-time interface provides immediate feedback, thereby reducing issues found in Classic Delphi without losing content.

There were, however, weaknesses identified in the initial Real Time Delphi model, mainly the process being complicated for the facilitator to present real-time results while tracking progress over time (Gnatzy et al, 2011, p.1682). This study overcame the issue using a commercial, easy-to-use facilitator portal developed specifically for Real Time Delphi surveys that provided real-time graphical feedback (Calibrium, 2015). The portal was re-accessible to participants (located in the United States, Europe and the Middle East) at any time throughout the open 10-day survey period, allowing participants to review other participant’s responses and change or add to their individual responses. This study’s use of this commercially available web-based portal ensured anonymity, controlled feedback, statistical aggregation and provided the iteration. With real-time Delphi surveys, these four “elements increases the validity and reliability” (Gnatzy et al, 2011, p.1692). The iterative process built within the real-time Delphi doubly served as the iterative approach common with action research studies. The real-time Delphi design for this study resulted in a mixed method survey, with statistical measurements determining the consensus level of the participants combined with qualitative data gained from

comments provided by the expert panel members. Given the importance of expert panel members, additional discussion warranted and presented in the following section.

3.5.1 Qualified Expert Panel Members

Critics of the Delphi method cite frequent lack of proper selection criteria in the process of selecting expert panel members (Okoli & Pawlowski, 2004). This is important for validity given participants are not a random sample of a targeted population, rather, are selected for their “knowledge about a specific subject” (Keeney et al, 2011, p.7). Diversity amongst participants is also critical. Linstone and Turoff (2002) warned that expert panels that includes “friends recommending each other for panel membership can produce a cozy group of like-thinking individuals which excludes mavericks and becomes a vehicle for inbreeding” (pp.567-568). Instead, panel members “should be highly trained and competent within the specialized area of knowledge” (Hsu and Sandford, 2007, p.3). The diversity of this study was enhanced with expert panel members from differing countries with varying roles within the subject area of large hospital builds. The following is provided as a summary to Appendix C of this study’s participant’s professional title and respective organization type at the time the Delphi was conducted (asterisk signifies participants who also participated in the pilot study):

Table 3.3 Summary of Expert Panel Members titles and organizations

Participant/Profession	Organization
Medical Equipment Planner*	Project Management Firm
Professor/PhD	University
Chief Executive Officer	Architect-Engineering Design Firm
Senior Project Director*	Healthcare System
Facilities Planning & Design Director/ Registered Architect*	Academic Medical Center
Facilities Planning & Design Director/ Registered Architect	Academic Medical Center
Senior Vice President Facilities & Operations/ Professional Engineer	Healthcare System

Facilities & Construction Director	Hospital
Medical Equipment Planner/Critical Care Nurse*	Academic Medical Center
Registered Architect*	Architect-Engineering Design Firm
Facilities Project Manager*	Academic Medical Center
Chief Executive Officer	Contractor
IT Senior Project Manager*	Academic Medical Center
Regional Director Healthcare	Technology Provider
Facility Director	Healthcare System
Chief Executive Officer*	Healthcare System
Chief Executive Officer/Registered Nurse*	Healthcare Consulting Firm
Senior Operations Director*	Healthcare System
Chief Executive Officer/Registered Architect*	Architect-Engineering Design Firm
Chief Executive Officer	Healthcare Real Estate Development Firm
Facilities and Construction Director/ Professional Engineer	Healthcare System
Chief Executive Officer/PhD	Project Management Firm
Physician/High Reliability expert in healthcare	Healthcare System

There are no standards “found around the expert sample size and no criteria against which a sample size choice could be judged” (Akins et al, 2005, p.2). General guidance recommends using the minimal participants necessary; however, “Delphi studies with fewer than 10 participants are rarely conducted” (p.2). There were 23 total active participants in this study’s real-time Delphi. This was deemed empirically sufficient in terms of purposive sampling and availability of expert panel members willing to participate. The next section provides an overview of the data collection and analysis used in this study.

3.6 Delphi Data Collection and Analysis

The research questions developed were informed by the literature. The first research question, as a reminder, is R1: What potential do mindful processes derived from high reliability

organization (HRO) practice have to improve managing large hospital building projects? There are five sub-scales of HRO mindfulness: preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, deference to expertise (Weick & Sutcliffe, 2007). Survey questions related to R1, developed based on an informed review of the literature, were embedded within the five sub-scales of HRO. Each sub-scale is quantitatively measured by the corresponding five Likert-scale questions in the Delphi. A consensus is considered achieved if 80 percent or more of the participants rate the item in the same category using the 5-point Likert scale. Questions were also developed to examine research question R2: How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management? This question and the related sub-research questions SR2.1 through SR2.5 were also developed based on an informed review of the literature. A qualitative analysis was then undertaken using the survey's open comments or suggestions offered by expert panel members with significant large hospital build experience to uncover themes related to high reliability and managing projects.

3.7 Ethical Considerations

Participants in all phases of this study were required give informed consent before participating. The informed consent developed specifically for this thesis was reviewed and approved by the University of Liverpool's Ethics Committee. Participants were assured in writing that both they as individuals and their organizations would remain confidential. This assurance was strengthened by use of the Delphi method, which requires anonymous participation and anonymized data reporting. In addition, secure processes for handling and storing of all material and records associated with this research project were put into place.

Confidentiality is another ethical consideration meant to ensure neither participant identity, setting, or data is revealed without proper permission of the participant. Equally important, participants should also not be identifiable internally among the participant group based

on the data presented. There have been studies in which participants were able to identify themselves and other participants based on the data presented, resulting in harm to the participants (Tolich, 2004). This study has been specifically designed to prevent that occurrence.

3.8 Summary

This chapter started with a review of philosophical, ontological, and epistemological considerations related to research. It was determined that a subjective reality ontological perspective with a pragmatic epistemological viewpoint was the most appropriate for this study. Next, a review of research methods and approaches was provided. It was determined that this study's aims are best served using an action research approach. The Delphi method, including the real-time Delphi method, was viewed appropriate for this study. The Delphi is an appropriate research design for Action Research (Murphy et al, 1998; Fletcher & Marchildin, 2014). The next chapter presents an analysis of the collected data.

Chapter 4: Findings

4.1 Introduction

In Chapter 3, details were provided into the research questions, considerations, design methods, including the rationale for employing a subjective reality ontological perspective with a pragmatic epistemological viewpoint and a mixed methods design using an action research approach in the form of a modified (real time) Delphi. This chapter is divided into two main parts. The first section summarizes the methods and analysis of findings from pilot study. The second section presents a detailed analysis of the mixed methods approach with quantitative and qualitative findings, using a Delphi Study, related to the inquiry into the study's two research questions and associated sub-research questions (presented in section 3.2, pp.43-45).

4.2 The Pilot Study Findings

The pilot study is a critical component to the overall research. The pilot survey questionnaire contains thirty-five questions (See Appendix A, pp.149-151). An international sample of 65 experts with extensive experience on healthcare projects were invited to participate in the survey. 21 experts (32%) completed the survey. Additionally, 11 of those participating (52%) agreed to be participants in the Delphi study. The foremost importance of the pilot study was adapting Weick and Sutcliffe's (2007) audit "Assessing Your Firm's Vulnerability to Mindlessness" (section 3.4.1, p.50-52) to assess the vulnerability of mindlessness of the participants acknowledged as having experience and expertise with large hospital building projects. Other objectives included gaining demographics of the participants and to assess the consensus of the responses to the questionnaire.

4.2.1 Summary of Results of Objective 1 – Vulnerability to Mindfulness

The results of Objective 1 are significant to this thesis' study for two principal reasons. First, it substantiates the conclusion drawn from the literature of the potential benefit of mindfulness to improve managing large hospital builds. Secondly, it served to answer SR1.1: What vulnerability do practitioners have to mindlessness? This is important, as vulnerability to mindlessness “reveal how strong people’s tendencies are to ignore the disruptions that unexpected events cause” (Weick & Sutcliffe, 2007, p.90). As previously discussed (section 2.5.1, p.28-30), this is a reflection of mental functioning or orientation (mindfulness) as opposed to an organizational process or system. The improved mental functioning exhibited by HROs through mindfulness is a primary focus of this study towards enhancing the underperformance found in managing large hospital builds. Table 4.1 shows the frequency counts and percentages for survey questions adapting Weick and Sutcliffe's (2007) audit of "Assessing Your Firm's Vulnerability to Mindlessness". The mean and standard deviation (SD) of the responses for each question are also presented.

Table 4.1 Frequency counts (%) of responses for questions Q14 to Q21.
1 = not at all, 2 = to come extent, 3 = a great deal. SD = standard deviation.

Survey Questions	Frequency counts (%) of responses			
	1	2	3	Mean (SD)
Q14: Changes rarely occur on large healthcare construction projects.	8 (38)	2 (10)	11 (52)	2.14 (0.96)
Q15: The same kinds of situations and problems are encountered on most projects.	1 (5)	12 (57)	8 (38)	2.33 (0.58)
Q16: On large healthcare construction projects people tend to have trouble getting all the information they need to properly do their work.	1 (5)	12 (57)	8 (38)	2.33 (0.58)
Q17: On large healthcare construction projects people are expected to perform their respective project roles in a particular way without deviation.	2 (10)	11 (52)	8 (38)	2.29 (0.64)
Q18: People often work under severe project pressures (time, costs, resources, or other).	0	7 (33)	14 (67)	2.67 (0.48)
Q19: Pressures often lead people to 'cut corners'.	1 (5)	14 (67)	6 (28)	2.24 (0.54)
Q20: People have little discretion to resolving unexpected problems as they arise.	3 (14)	14 (67)	4 (19)	2.05 (0.59)
Q21: Workers on large healthcare construction projects lack training or expertise needed to act upon and manage unexpected problems that arise.	2 (10)	14 (67)	5 (24)	2.14 (0.57)

Among the 21 participants, 19 (90%) had a high potential for mindlessness and 2 (10%) had a moderate potential for mindlessness. This finding is represented by a histogram plot of the scores of vulnerabilities to mindlessness in Figure 4.9:

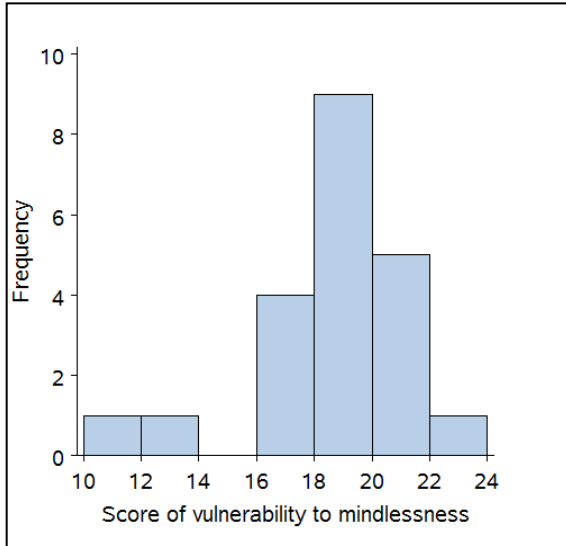


Figure 4.1 Histogram plot of scores of vulnerability to mindlessness

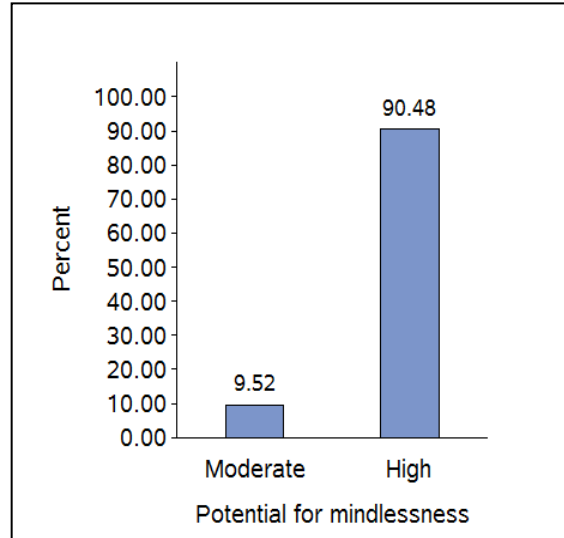


Figure 4.2 Bar chart of potential for mindlessness

The mean scores of vulnerabilities to mindlessness was 18.19 ($SD = 2.44$), with a minimum score of 11 and a maximum score of 22. Figure 4-10 shows the bar chart of potential for mindlessness.

4.2.2 Summary of Results of Objective 2: Demographics of Participants

The second objective of the pilot study was to gain preliminary knowledge on the demographics of the participants. The invited participants were an international sample meant to represent findings regardless of location, cultural or regulatory impact on large hospital builds (non-country specific). The demographics of the professional experience of the participants was considered a good representation of qualified experts when seeking panel members for the main Delphi survey. The results of the questions (Q6 – Q13) developed for the first objective are as follows in Figures 4.1 – 4.8:

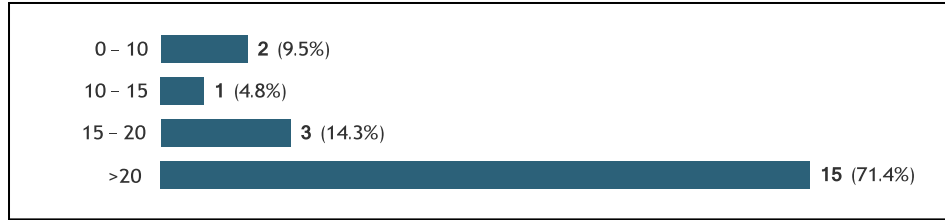


Figure 4.3 Bar chart of responses of Q6 (Years working professionally in or supporting the healthcare industry)

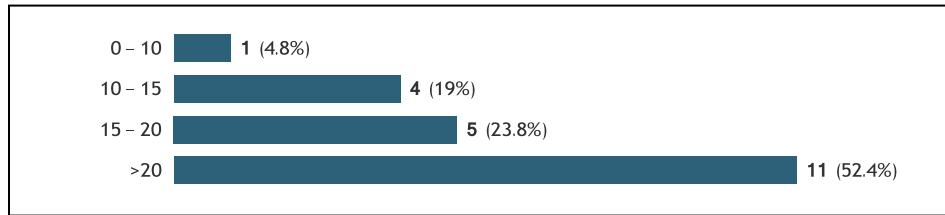


Figure 4.4 Bar chart of responses of Q7 (Years working professionally in a project role or environment)

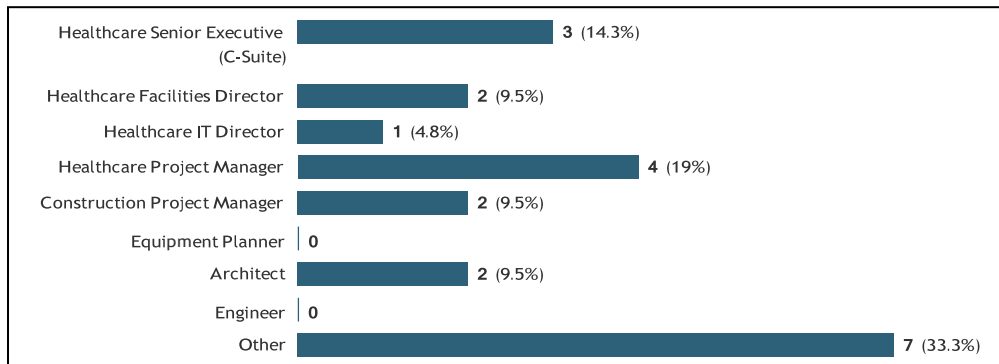


Figure 4.5 Bar chart of responses of Q8 (Best description of current role)

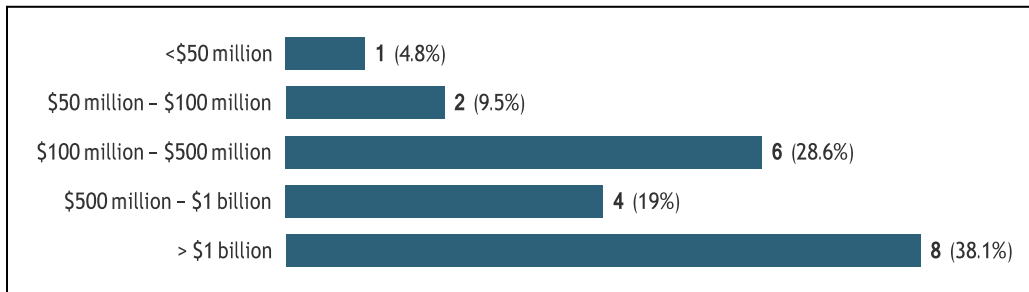


Figure 4.6 Bar chart of responses of Q9 (Approximate U.S. dollar value of all healthcare projects during career)

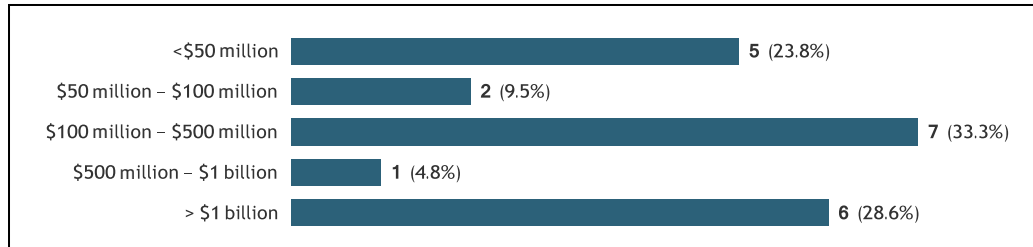


Figure 4.7 Bar chart of responses of Q10 (Approximate U.S. dollar value of single largest healthcare project you have been involved)

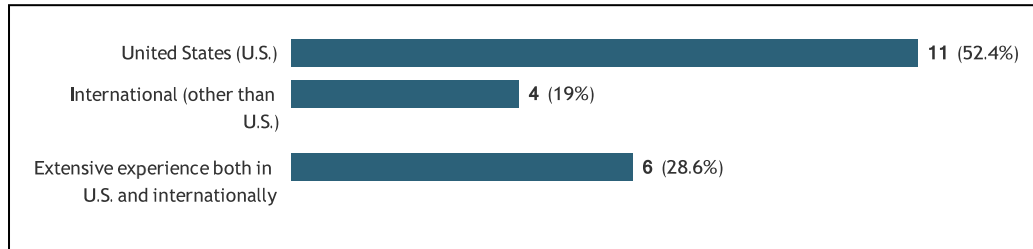


Figure 4.8 Bar chart of responses of Q11 (My healthcare project experience has primarily been)

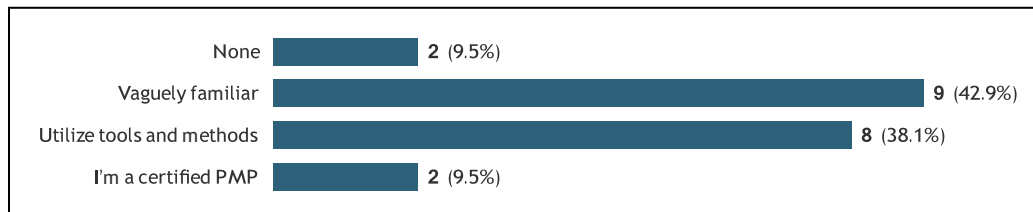


Figure 4.9 Bar chart of responses of Q12 (My familiarity with project management body of knowledge such as PMBOK.)

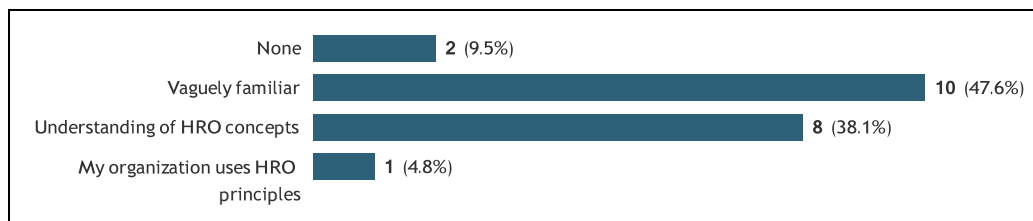


Figure 4.10 Bar chart of responses of Q13 (My familiarity with High Reliability Organizations (HRO))

4.2.3 Summary of Results of Objective 3: Consensus

Survey questions Q22 to Q34 were developed as trial questions to assess the consensus of the responses of the participants for this researcher’s review and consideration in developing the main Delphi Study questions. Several sub-questions informed by the literature were included for each of the questions.

Table 4.2 shows the results for survey question Q22 (Project teams prepare for unforeseen surprises by). There were three sub-questions under Q22: Q22_1 (Developing effective crisis management responses), Q22_2 (Developing formalized approaches to treat problems before the fact), and Q22_3 (Project leadership focuses on both approaches). Participants reached consensus on Q22_1.

Table 4.3 shows the results for survey question Q23 (Which of the following is generally the most successful approach for identifying early warnings of potential problems?). There were three sub-questions under Q23: Q23_1 (A formal early warning signs exercise/assessment), Q23_2 (Trust and good everyday communication), and Q23_3 (A collaborative culture across organizational interfaces). Participants reached consensus on all three sub-questions, suggesting all three are successful approaches for identifying early warnings of potential problems.

Table 4.4 shows the results for survey question 24 (Which of the following is the major reason early warning signs are recognized but not acted upon properly). There were three sub-questions under survey question 24: Q24_1 ('Political' pressure or agenda or other power effects), Q24_2 (Project actors insufficiently tough to tackle the conflict at its roots), and Q24_3 (No time to dwell on an identified early warning signal). Participants reached consensus on Q24_1.

Table 4.5 shows the results for survey question Q25 (Which of the following barriers is most prevalent of preventing the detection of early warning signs?). There were three sub-questions under Q25: Q25_1 (Optimism bias – Underestimate problems and risks), Q25_2 (Organizational complexity), and Q25_3 (An assumption formal reporting captures all issues including early warnings). Participants reached consensus on Q25_2.

Table 4.6 shows the results for survey question Q26 (The most "inspirational well" that develops into early warning signs). There were three sub-questions under Q26: Q26_1 ("Gut

feeling”), Q26_2 (Team brainstorming), and Q26_3 (Stakeholder analysis). Participants reached consensus on Q26_2 and Q26_3.

Table 4.7 shows the results for survey questions Q27 to Q33. Participants reached consensus on Q27 (A lot of project changes are related to the client) and Q28 (Project changes are also related to other influences i.e. – uncertainties, risks, etc.).

The results of the questions (Q22 – Q34) developed for the third objective are as follows in Tables 4.2 – 4.7:

Table 4.2 Analysis results for Q22.

	Frequency (%) for responses				Consensus analysis		
	Strongly disagree	Disagree	Agree	Strongly agree	Disagree	Agree	Consensus reached?
Q22_1	0	3 (15)	12 (60)	5 (25)	3 (15)	17 (85)	Yes
Q22_2	1 (5)	4 (20)	10 (50)	5 (25)	5 (25)	15 (75)	No
Q22_3	0	5 (25)	6 (30)	9 (45)	5 (25)	15 (75)	No

Table 4.3: Analysis results for Q23.

	Frequency (%) for responses				Consensus analysis		
	Strongly disagree	Disagree	Agree	Strongly agree	Disagree	Agree	Consensus reached?
Q23_1	0	1 (5)	13 (62)	7 (33)	1 (5)	20 (95)	Yes
Q23_2	0	1 (5)	10 (48)	10 (48)	1 (5)	20 (95)	Yes
Q23_3	0	0	3 (14)	18 (86)	0	21 (100)	Yes

Table 4.4: Analysis results for Q24.

	Frequency (%) for responses				Consensus analysis		
	Strongly disagree	Disagree	Agree	Strongly agree	Disagree	Agree	Consensus reached?
Q24_1	0	2 (10)	13 (62)	6 (28)	2 (10)	19 (90)	Yes
Q24_2	0	5 (24)	11 (52)	5 (24)	5 (24)	16 (76)	No
Q24_3	1 (5)	8 (38)	12 (57)	0	9 (43)	12 (57)	No

Table 4.5: Analysis results for Q25.

	Frequency (%) for responses				Consensus analysis		
	Strongly disagree	Disagree	Agree	Strongly agree	Disagree	Agree	Consensus reached?
Q25_1	0	7 (33)	7 (33)	7 (33)	7 (33)	14 (67)	No
Q25_2	0	2 (10)	13 (62)	6 (28)	2 (10)	19 (90)	Yes

Q25_3	0	8 (38)	12 (57)	1 (5)	8 (38)	13 (62)	No
-------	---	--------	---------	-------	--------	---------	----

Table 4.6: Analysis results for Q26.

	Frequency (%) for responses				Consensus analysis		
	Strongly disagree	Disagree	Agree	Strongly agree	Disagree	Agree	Consensus reached?
Q26_1	0	7 (35)	9 (45)	4 (20)	7 (35)	13 (65)	No
Q26_2	0	2 (10)	12 (60)	6 (30)	2 (10)	18 (90)	Yes
Q26_3	0	3 (14)	15 (72)	3 (14)	3 (14)	18 (86)	Yes

Table 4.7: Analysis results for Q27-Q33.

Responses: 1 = strongly disagree, 2 = disagree, 3 = neutral, but lean toward disagree, 4 neutral, but lean toward agree, 5 = agree, and 6 = strongly agree.

	Frequency (%) for responses				Consensus analysis		
	Strongly disagree	Disagree	Agree	Strongly agree	Disagree	Agree	Consensus reached?
Q27	0	0	0	5 (24)	9 (43)	7 (33)	0
Q28	0	0	0	2 (10)	11 (52)	8 (38)	0
Q29	0	4 (19)	3 (14)	1 (5)	9 (43)	4 (19)	7 (33)
Q30	0	2 (10)	3 (14)	6 (28)	8 (38)	2 (10)	5 (24)
Q31	0	4 (19)	2 (10)	4 (19)	9 (43)	2 (10)	6 (29)
Q32	0	3 (14)	4 (19)	8 (38)	3 (14)	3 (14)	7 (33)
Q33	1 (5)	4 (19)	8 (38)	5 (24)	2 (10)	1 (5)	13 (62)
Q27	0	0	0	5 (24)	9 (43)	7 (33)	0

As revealed in the analysis of the participants' vulnerability to mindlessness, the pilot study finding of the vulnerability of mindlessness is significant as it supports identifying opportunities for mindfulness to enhance managing large hospital building projects, which is the focus of the next section.

4.3 The real-time Delphi survey for the main study

The survey questionnaire for the real-time Delphi study contains forty-nine (49) questions developed by this researcher's informed understanding of the literature (See Appendix B, pp.152-154). The survey questionnaire consists of the following eight sections:

- Consent: Q1 to Q5

- Preoccupation with Failure: Q6 to Q11
- Reluctance to Simplify: Q12 to Q17
- Sensitivity to Operations: Q18 to Q23
- Commitment to Resilience: Q24 to Q29
- Deference to Expertise: Q30 to Q35
- Mindful Project Management: Q36 to Q42
- Demographics: Q43 to Q49

Preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise represent the five mindful principles of HROs (Weick & Sutcliffe, 2001, 2007). Participants' perception of each HRO mindful principle can be quantitatively measured by the first four survey questions in each section (survey questions Q6 to Q9 for preoccupation with failure, Q12 to Q15 for reluctance to simplify, Q18 to Q21 for sensitivity to operations, Q24 to Q27 for commitment to resilience, and Q30 to Q33 for deference to expertise). Additionally, participants were asked to provide comments regarding the first four survey questions, if there were any.

The fifth survey question in all sections was the researcher's idea, based on experience but informed by the literature, of how that HRO mindful principle could be adapted for use in managing a large hospital construction projects (survey question Q10 for preoccupation with failure, Q16 for reluctance to simplify, Q22 for sensitivity to operations, Q28 for commitment to resilience, and Q34 for deference to expertise).

The sixth survey question in all sections gave participants opportunity to offer comments or suggestions concerning the HRO mindful principle and its applicability to managing large hospital construction projects (Q11 for preoccupation with failure, Q17 for reluctance to simplify, Q23 for sensitivity to operations, Q29 for commitment to resilience, and Q35 for deference to expertise).

The first five survey questions in all sections were 5-point Likert scale questions, with 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree. The sixth survey question in all sections was an open-ended question. For each HRO mindful principle, composite scores were created by averaging the responses of the first four survey questions in each section. The composite scores range from 1 to 5. Higher scores indicated more positive perception of the HRO mindful principle.

The Mindful Project Management framework can be used to see if participants would use the various concepts on future projects (survey questions Q36 to Q40) and if they understood the concepts (survey questions Q41 to Q42). Survey questions Q36 to Q40 were 5-point Likert scale questions, with 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree. Survey question Q41 was a 3-point Likert scale question, with 1 = not clear, 2 = somewhat clear, 3 = very clear. Survey question Q42 was a 3-point Likert scale question, with 1 = not useful, 2 = somewhat useful, 3 = very useful. To measure participants' perception of Mindful Project Management, composite scores were created by averaging the responses of survey questions Q36 to Q40. The composite scores range from 1 to 5. Higher scores indicated more likely, the participants would use the various concepts on future projects.

Demographic information of the participants was reviewed and presented using bar charts. The demographics discussed include years of experience in a supporting role, years of experience in a project role, current role, US dollar value of all healthcare projects, US dollar value of single largest healthcare project, primary healthcare project experience, familiarity with project management body of knowledge, and familiarity with High Reliability Organizations (HRO).

4.3.1.1 Analysis methods for R1

R1 (What potential do mindful processes derived from high reliability organization (HRO) practice have to improve managing large hospital building projects?) was answered both

quantitatively and qualitatively. The following three steps of data analysis were undertaken to answer R1:

- Step 1: Expert panel members' perception of each HRO principle
- Step 2: Expert panel members' perception of mindful project management
- Step 3: Investigating the relationship between mindful project management and each HRO principle

4.3.1.2 Participants' perception of each HRO principle

Recall that preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, deference to expertise represent the five mindful principles of HRO (Weick & Sutcliffe, 2007). Participants' perception of each HRO mindful principle can be quantitatively measured by the first four survey questions in each section (Q6 to Q9 for preoccupation with failure, Q12 to Q15 for reluctance to simplify, Q18 to Q21 for sensitivity to operations, Q24 to Q27 for commitment to resilience, and Q30 to Q33 for deference to expertise). Descriptive statistics (Mean and Standard Deviation) and frequency tables were used to present the participants' perception of each HRO mindful principle. Consensus of the responses for each statement of the HRO mindful principles were assessed. The first four survey questions in all sections were 5-point Likert scale questions, with 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree. Consensus was determined a priori (Braun & Clark, 2006). For an item to achieve consensus, 80 percent or more of respondents must have rated the item in the same category of perception using the 5-point Likert scale, i.e., 1 to 2 = disagree and 3 to 5 = agree.

Participants' comments regarding the first four survey questions in all sections were also assessed and summarized to gain insights regarding participants' perceptions of how mindful leadership characteristics and processes found in HRO can be applied towards improved

processes of problem identification and intervention in the management of large hospital building projects.

The quantitative analysis results were then enhanced by the results of the qualitative analysis. The goal of enhancing the quantitative results with the qualitative results was not to find a statistical correlation; rather, the goal was to assess the insight picture of the relationship between mindful leadership characteristics and processes found in HRO mindful principles and management of large hospital building projects. This included a thematic analysis of each section's open-ended questions in order to identify key themes resulting from the participants' responses.

4.3.1.3 Mindful Project Management

Mindful project management can be used to see if participants would use the various concepts on future projects (Q36 to Q40) and if they understood the concepts (Q41 to Q42). Descriptive statistics (Mean and Standard Deviation) and frequency tables were used to present the participants' perception of Mindful Project Management, whether they would use the various concepts on future projects and whether they understood the concepts. Consensus of the responses for each statement of the mindful project management were assessed. Survey questions Q36 to Q40 were 5-point Likert scale questions, with 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree. Survey question Q41 was a 3-point Likert scale question, with 1 = not clear, 2 = somewhat clear, 3 = very clear. Survey question Q42 was a 3-point Likert scale question, with 1 = not useful, 2 = somewhat useful, 3 = very useful. Consensus was determined a priori (Braun & Clark, 2006). For an item to achieve consensus, 80 percent or more of respondents must have rated the item in the same category of perception using the 5-point or 3-point Likert scale, i.e., for 5-point Likert scale: 1 to 2 = disagree and 3 to 5 = agree; for 3-point Likert scale: 1 = not useful/not clear and 2 to 3 = useful/clear.

Participants' comments regarding the survey questions regarding mindful project management were also assessed and summarized to gain insights regarding participants' perceptions of mindful project management.

4.3.1.4 Relationship between mindful project management and each HRO principle

The relationship between mindful project management and each HRO mindful principle was assessed. To measure participants' perception of Mindful Project Management, composite scores were created by averaging the responses of survey questions Q36 to Q40. The composite scores range from 1 to 5. Higher scores indicated more likely the participants would use the various concepts on future projects.

For each HRO mindful principle, composite scores were created by averaging the responses of the first four survey questions in each section. The composite scores range from 1 to 5. Higher scores indicated more positive perception of the HRO mindful principle.

In order to determine the relationship between the likelihood of using mindful project management on future projects and participants' perception of each HRO mindful principle, the Pearson's correlation coefficients was determined the best statistical method as it is the most widely used correlation statistic to measure and illustrate the strength of a linear association between two variables. The Pearson's correlation coefficients were computed for composite scores of mindful project management, and the composite scores of the five mindful principles of HRO, preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise. A p-value less than 0.05 indicated significance.

4.3.2 Preliminary analysis of R2

The second research question of this study was R2: How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project

Management? Comments from the fifth survey question and the responses of the sixth survey question (the open-ended question) in all sections of the HRO mindful principles were analyzed and summarized using thematic analysis (Braun & Clark, 2006; Fereday & Muir-Cochrane, 2006; Thomas, 2006; Miles & Huberman, 1994). The fifth survey question in all sections was the researcher's idea of how that HRO mindful principle could be adopted for use in managing a large hospital building project (Q10 for preoccupation with failure, Q16 for reluctance to simplify, Q22 for sensitivity to operations, Q28 for commitment to resilience, and Q34 for deference to expertise). The sixth survey question in all sections gave participants opportunity to provide comments or suggestions concerning the HRO mindful principle and its applicability to managing projects (Q11 for preoccupation with failure, Q17 for reluctance to simplify, Q23 for sensitivity to operations, Q29 for commitment to resilience, and Q35 for deference to expertise). All quantitative data analyses were conducted using SAS (SAS Institute, 2013).

4.4 Delphi Analysis Results

Twenty-three healthcare experts participated in the real-time Delphi. A majority of the participants have over 20 years of experience working professionally in or supporting the healthcare industry, with 65% having over 20 years of experience working professionally in a project role or environment. The current roles of the participants primarily included: healthcare senior executive (23%), project consultant (23%), healthcare project manager (14%), healthcare facilities director (14%), and architect (14%). The dollar value (US) of all healthcare building projects during their respective careers was over \$500 million for over half of the participants. Most of the participants (57%) had hospital build experience primarily in US, and the remaining had experience outside the US (13%) or in both US and internationally (30%). Participants were also asked about the familiarity with HRO. 22 percent were vaguely familiar with HRO, 74 percent understood HRO concepts, and 4 percent indicated that the organization uses HRO principles.

4.4.1 Analysis results for R1

Preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, deference to expertise represent the five mindful principles of HRO. The next five sections present the results by individual principle.

4.4.2 Preoccupation with Failure

The following four questions were asked for “preoccupation with failure”:

- Q6: In addition to traditional project management skills, tools and software, of equal importance is the need for behavioural skills in order to meet the increasingly complex activity and its related uncertainty.
- Q7: The first signs of problems will not be in missed schedules or poor work, it is generally seen in the members’ eyes, facial expressions, voice, and body language.
- Q8: Even among top performing project teams, the lack of real data about what uncertainty to expect and how to manage it well can result in conflict and strained relationships.
- Q9: There is a need to improve how owners and team members accept and manage project data or information that is contrary to their beliefs, assumptions or perspectives.

The frequency counts and percentage of the responses, the summary statistics, the consensus analysis results, and number of comments provided for these four survey questions are presented in Table 4-8. Among the four statements regarding preoccupation with failure, participants agreed the most with Q6 ($M = 4.61$, $SD = 0.58$) and the least with Q7 ($M = 3.48$, $SD = 0.79$). Participants reached consensus on all four statements.

17 participants commented on Q6. Participants greatly acknowledged the importance of behavioural skills, as commented by a CEO of a US based architectural firm: “Whenever there

is engagement with more than one person in an activity, behavioural skills are always important to achieve success". A healthcare senior project manager from an academic medical center located in the Middle East pointed out, *"I have seen many more projects fail because of lack of communications and collaboration than lack of tools and software."*

Participants somewhat agreed with the statement of Q7. Depending on *"member's personality and stress management skills"*, sometimes body language is more transparent than words. However, *"there are some cases that employees have facial expressions or strange body language while there is no problem of missing milestone or poor work."*

Nonetheless, for members, the observation and awareness of these elements is an important element and skill set. A medical equipment planner/critical care nurse located in the Middle East commented: "An astute manager will detect attitude changes in their staff by using these visual cues. An understanding of body language will give an early warning of a disconnected or disillusioned worker long before their performance falls off." A CEO of a healthcare consulting firm located in the US similarly agreed, stating, "Upon reading and recognizing these signs, then communicating an open, transparent management style, one [the manager] may avoid some problems [in the project]."

Survey question Q8 concerned the real data on what uncertainty to expect and how to manage it. Participants had mixed opinions about this issue. As *"uncertainty is difficult to rationalize with data"*, thus, data itself is not a solution for resolving conflict and strained relationships. On the other hand, some participants believed that *"the anticipation of needed data flows and the identification, establishment of need and cost management to the greatest extent possible is important in project process design and management"* and hence, the conflict and strained relationships could be less of a concern. The CEO of a US healthcare system stated, *"It is important to discuss how to handle unexpected results or problems at the beginning of any project."*

Participants mostly agreed with the statement of survey question Q9. A medical equipment planner’s comment summarized it well: “*Managing information that is contrary to an individual’s beliefs, assumptions or perspectives is essential as there may be unhelpful personal biases at play that influence how team members may react in certain situations.*” In order to achieve the goal, the following approaches were suggested: “*real-time data sharing between owners and the project team*”, “*pre-project team building activities*”, and “*a solid on-boarding document that outlines all of the expectation on data/information collection and archiving*”. The CEO of a US architectural firm commented that it is “*critical to develop a consensus opinion and vision for the project*”.

Table 4.8: Summary of survey results regarding participants’ perception of preoccupation with failure. 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree.

	Frequency (%) for responses					Mean (SD)	Consensus analysis			Number of comments
	1	2	3	4	5		Disagree	Agree	Consensus reached?	
Q6	0	0	1(4)	7(30)	15(65)	4.61 (0.58)	0	23(100)	Yes	17
Q7	0	2 (9)	10(43)	9(39)	2(9)	3.48 (0.79)	2(9)	21(91)	Yes	17
Q8	0	2 (9)	2 (9)	15(65)	4(17)	3.91 (0.79)	2(9)	21(91)	Yes	14
Q9	0	1 (4)	5 (22)	9(39)	8(35)	4.04 (0.88)	1(4)	22(97)	Yes	14

4.4.3 Reluctance to simplify

The following four questions were asked for “reluctance to simplify”:

- Q12: Certain contract delivery models discourage and even ban improvisational responses to changing conditions.
- Q13: Project team behaviour should strive for a collaborative culture and the discipline to trust each other; unfortunately, a typical default is for self-protective measures when challenges arise.

- Q14: Open communication and integration is needed among all project teams (regardless of contract method) for an effective approach to reducing the impact of uncertainty.
- Q15: An ideal project culture is one, which values skeptics.

The frequency counts and percentage of the responses, the summary statistics, the consensus analysis results, and number of comments provided for these four survey questions are presented in Table 4.9. Among the four statements regarding reluctance to simplify, participants agreed the most with Q14 ($M = 4.70$, $SD = 0.63$) and the least with Q12 ($M = 3.57$, $SD = 0.79$). Participants reached consensus on all four statements.

Participants in general agreed with the statement of Q12 that certain contract delivery models discourage and even ban improvisational responses to changing conditions. As stated by a Chief Operations Officer of a healthcare system located in the Middle East, *“It depends on the nature of the contract and the project goals. Those strict controls also limit improvisational responses to what should not be changing conditions. With only a few controlled changes, the responses can be pre-planned and measured to deliver the same results regardless of conditions. The idea is to limit costs and exposure to risks [of a project].”*

Twelve participants have commented on Q13. In general, participants believed that project team behaviour depends highly upon the project leadership and culture. The Chief Operations Officer of a healthcare system located in the Middle East summed up the conversation, stating, *“If the culture is high blame, high reward for individual achievement, then self-protective and self-promotion measures will be the norm. If the leaders recognize and reward a collaborative approach, then the opposite would be true”*.

Survey question Q14 expressed the importance of open communication and integration in all project teams (regardless of contract method) in order to reducing the impact of uncertainty. Participants highly agreed with this statement. Although, open communication and integration is the key of success, a Regional Director of Healthcare technology firm warned that

it needs to be managed “to the extent that the communication and integration do not impair a team's ability to complete their specific project”.

Participants also expressed their opinions of skeptics in project culture (Q15). “An ideal project culture hears all voices”. To ensure the success of the project, “the project [leader] should encourage construction criticism along with responsible skepticism”. A US physician leader who is a noted expert in high reliability in healthcare commented that there should be “a balance between skepticism and relentless optimism”.

Table 4.9: Summary of survey results regarding participants' perception of reluctance to simplify. 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree.

	Frequency (%) for responses					Mean (SD)	Consensus analysis			Number of comments
	1	2	3	4	5		Disagree	Agree	Consensus reached?	
Q12	0	2 (9)	8 (35)	11 (48)	2 (9)	3.57 (0.79)	2 (9)	21 (91)	Yes	12
Q13	0	1 (4)	3 (13)	11 (48)	8 (35)	4.13 (0.81)	1 (4)	22 (96)	Yes	12
Q14	0	0	2 (9)	3 (13)	18 (78)	4.70 (0.63)	0	23 (100)	Yes	13
Q15	0	3 (13)	3 (13)	12 (52)	5 (22)	3.83 (0.94)	3 (13)	20 (87)	Yes	17

4.4.4 Sensitivity to operations

The following four questions were asked for “sensitivity to operations”:

- Q18: Most current project information and control systems focus on comparing past planned performance with past actual performance; far less emphasis is placed on future conditions.
- Q19: The root cause of a delayed response to uncertainty can often be tied to miscommunication or misunderstanding, especially with inexperienced owners or other inexperienced members.

- Q20: A project's diverse expertise (owners, architects, contractors, etc.) should be exploited by encouraging the challenging of all assumptions throughout the project lifecycle.
- Q21: Projects should allow the opportunity for project teams or members to explore alternate methods or develop more effective solutions to problems.

The frequency counts and percentage of the responses, the summary statistics, the consensus analysis results, and number of comments provided for these four survey questions are presented in Table 4.10. Among the four statements regarding sensitivity to operations, participants agreed the most with Q21 ($M = 4.35$, $SD = 0.78$) and the least with Q18 ($M = 3.70$, $SD = 0.88$) and Q19 ($M = 3.70$, $SD = 0.97$). Participants reached consensus on all four statements.

Participants agreed with the statement of Q18: Most current project information and control systems focus on comparing past planned performance with past actual performance; far less emphasis is placed on future conditions. Although “*it is extremely difficult to forecast performance*”, participants believed that “*the most important part is using the [current project] information to look forward and forecast*” and assess “*any impacts on or changes to future activities*”.

17 percent of participants did not agree with the statement of Q19: The root cause of a delayed response to uncertainty can often be tied to miscommunication or misunderstanding, especially with inexperienced owners or other inexperienced members. Some possible causes of a delayed response to uncertainty provided by the participants included: “*poor processes*”, “*uncertainty of how to respond*”, “*a reluctance to be transparent*”, “*lack of confidence in an inexperienced owner*”, and “*the reluctance to accept responsibility*”.

Participants agreed that a project's diverse expertise should be exploited by encouraging the challenging of all assumptions throughout the project lifecycle (Q20); “*however, this effort is best used prior to project initiation and at the onset of problems*”. Additionally, the challenge

should be done “*in a non-threatening manner*”. The CEO of a US based healthcare consulting firm noted, “*this rarely occurs unless the teams have progressed to a high level of trust.*”

Participants highly agreed that projects should allow the opportunity for project teams or members to explore alternate methods or develop more effective solutions to problems (Q21). However, “*The projects must be controlled and measured in a way the respects the overall project schedule. The activity of uncontrolled exploration can derail a project and allow scope creep*”.

Table 4.10: Summary of survey results regarding participants’ perception of sensitivity to operations. 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree.

	Frequency (%) for responses					Mean (SD)	Consensus analysis			Number of comments
	1	2	3	4	5		Disagree	Agree	Consensus reached?	
Q18	0	2 (9)	7 (30)	10 (43)	4 (17)	3.70 (0.88)	2 (9)	21 (91)	Yes	11
Q19	0	4 (17)	3 (13)	12 (52)	4 (17)	3.70 (0.97)	4 (17)	19 (83)	Yes	13
Q20	1 (4)	0	4 (17)	7 (30)	11 (48)	4.17 (1.03)	1 (4)	22 (96)	Yes	12
Q21	0	0	4 (17)	7 (30)	12 (52)	4.35 (0.78)	0	23 (100)	Yes	12

4.4.4.1 Commitment to resilience

The following four questions were asked for “commitment to resilience”:

- Q24: There is insufficient training provided for all project managers and supervisors to support proper behavioural aspects of recognizing and responding to early warning signs.
- Q25: Project actors are insufficiently tough or empowered to tackle conflict or issues at their roots.
- Q26: 'Political' pressure or agenda or other power effects such as social pressure is a major reason why early project warning signs are recognized but not acted on properly.

- Q27: When the unexpected occurs, it should be treated as a learning opportunity for the project and should also be captured and codified as knowledge for future use.

The frequency counts and percentage of the responses, the summary statistics, the consensus analysis results, and number of comments provided for these four survey questions are presented in Table 4.11. Among the four statements regarding commitment to resilience, participants agreed the most with Q27 ($M = 4.78$, $SD = 0.52$) and the least with Q25 ($M = 2.91$, $SD = 1.12$). Participants reached consensus on all 3 out of the 4 statements. In particular, participants had mixed opinions on Q25.

Most participants (83%) agreed with the statement of Q24: There is insufficient training provided for all project managers and supervisors to support proper behavioural aspects of recognizing and responding to early warning signs. As stated by a Senior Operations Director in the Middle East, "*not enough time or attention is given to the support early warning signs*". Also, a medical equipment planner/critical care nurse working for an academic medical center in the Middle East noted, "*behavioural and soft skills monitoring are something that traditionally project management has ignored*".

Survey question Q25 (Project actors are insufficiently tough or empowered to tackle conflict or issues at their roots) was the only statement participants did not reach consensus on. 43 percent of participants disagreed with the statement and 57 percent agreed with the statement. Participants generally thought that toughness is not the appropriate skill set. However, empowerment is important, and "*empowerment should be carefully managed within the team structure*". As noted by the participants, "*if the culture allows anyone to raise a concern, they typically do. If the culture suppresses voices of concern or conflict, then this will be ignored as a tactic of survival.*" A Facilities Director/Registered Architect for a US academic medical center argued all project actors should have "*a commitment to resolve conflict quickly and fairly and to not compromise where such compromise adversely affects project goals*".

Participants mostly agreed with the statement of Q26: 'Political' pressure or agenda or other power effects such as social pressure is a major reason why early project warning signs are recognized but not acted on properly. A number of reasons were given by the participants to explain why early project warning signs are recognized but not acted on properly, including, “*pressure to conform or members may be subject to group think*”, and “*fear of adverse consequences*”. Solutions to the issue were also offered by the participants, for example, “*teams should be educated in approaches, methodologies and tools that would help them to address this [early project warning signs are recognized but not acted on properly] better.*”

Participants highly agreed with the statement of Q27: When the unexpected occurs, it should be treated as a learning opportunity for the project and should also be captured and codified as knowledge for future use. Managing the unexpected within the context of the project “*is a very important step for the project team*”, however, as pointed out by a European-based professor with research interest and publications in project management, it “*is not consistently and systematically done*”.

Table 4.11 Summary of survey results regarding participants’ perception of commitment to resilience. 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree.

	Frequency (%) for responses					Mean (SD)	Consensus analysis			Number of comments
	1	2	3	4	5		Disagree	Agree	Consensus reached?	
Q24	1 (4)	3 (13)	5 (22)	8 (35)	6 (26)	3.65 (1.15)	4 (17)	19 (83)	Yes	12
Q25	1 (4)	9 (39)	7 (30)	3 (13)	3 (13)	2.91 (1.12)	10 (43)	13 (57)	No	12
Q26	0	3 (13)	5 (22)	12 (52)	3 (13)	3.65 (0.88)	3 (13)	20 (87)	Yes	9
Q27	0	0	1 (4)	3 (13)	19 (83)	4.78 (0.52)	0	23 (100)	Yes	13

4.4.4.2 Deference to expertise

The following four questions were asked for “deference to expertise”:

- Q30: The healthcare owner can have the most influence on the conduct of the project yet probably has the least amount of formal training in the discipline of managing construction projects.
- Q31: If there is insufficient collaboration, then often experts are left out of management discussions of developing a solution or are introduced at the last minute.
- Q32: A project team's culture should value expertise and experience over hierarchical rank.
- Q33: Projects should pre-identify who has what relevant specialized skills and knowledge in order to best respond quickly to unforeseen problems.

The frequency counts and percentage of the responses, the summary statistics, the consensus analysis results, and number of comments provided for these four survey questions are presented in Table 4.12. Among the four statements regarding deference to expertise, participants agreed the most with Q33 ($M = 4.39$, $SD = 0.66$) and the least with Q18 ($M = 4.00$, $SD = 1.00$). Participants reached consensus on all 4 statements.

Regarding survey question Q30 (The healthcare owner can have the most influence on the conduct of the project yet probably has the least amount of formal training in the discipline of managing construction projects), a few participants believed that this statement is very much dependent on “*the size of the health care organization*”, “*the location and owner*”. For example, “*larger systems or organizations often have well-seasoned individuals*”, however, as pointed out by a US-based architect, “many times the Owner only influence what he/she can control in terms of operations, methods and materials is a difficult subject for most owners to control but do have a lot of influence and many times with not contributing with the best of decisions.” To resolve this issue, a Facilities Director/Registered Architect for a US academic medical center stated, “*It is critical that this be recognized, and very clear specific and structured processes be*

put in place to manage this process. It is critical that such input be achieved in a timely manner relative to the needs of the project.” Furthermore, this individual stated, “This demands that there be team design, training, cultural awareness and development and an ongoing team management process.”

Survey question Q31 stated: If there is insufficient collaboration, then often experts are left out of management discussions of developing a solution or are introduced at the last minute. As pointed out by the CEO of a construction firm, this can be an issue, but fortunately, *“most of the time one of the key stakeholders are experts in their field”*. To avoid insufficient collaboration and lack of communication, *“the need for expert input should be identified very early in the project”* and, as noted by the physician with noted expertise in high reliability, it is ideal if the teams *“have a pattern of working together”*.

Participants in general agreed that a project team's culture should value expertise and experience over hierarchical rank (Q32). To implement collaboration regardless of hierarchical rank, the CEO of a healthcare system in the US noted, *“this must be agreed on in the beginning in order to be effective.”* The CEO of a healthcare architect firm noted, *“Leadership should provide an environment where this can occur.”* The CEO of a US based healthcare real estate development firm commented, *“The hierarchical rank needs to be respected when it comes to decision making. The culture should allow everyone an opportunity to speak their piece, but when it is time to make a decision, the team must respect the decision of the ultimate decision maker.”*

Participants agreed moderately high with Q33: Projects should pre-identify who has what relevant specialized skills and knowledge in order to best respond quickly to unforeseen problems, as *“this is a prerequisite for building the appropriate project management team.”* The CEO of a US-based architectural firm cautioned, *“We do not want to set up another hierarchical structure that dominates discussion and decisions. Open dialog will result in better solutions.”* The Chief Operations Officer for a Middle East based healthcare system noted the benefits of

doing so include, “*reducing the time to respond and assuring the team of the projects ability to manage well*”.

Table 4.12: Summary of survey results regarding participants’ perception of deference to expertise. 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree.

	Frequency (%) for responses					Mean (SD)	Consensus analysis			Number of comments
	1	2	3	4	5		Disagree	Agree	Consensus reached?	
Q30	0	2 (9)	5 (22)	7 (30)	9 (39)	4.00 (1.00)	2 (9)	21 (91)	Yes	11
Q31	0	0	3 (13)	14 (61)	6 (26)	4.13 (0.63)	0	23 (100)	Yes	11
Q32	0	1 (4)	4 (17)	9 (39)	9 (39)	4.13 (0.87)	1 (4)	22 (96)	Yes	14

4.4.4.3 Analysis results of Mindful Project Management

The following six questions were asked for “mindful project management”:

- Q36: I would recommend implementing a voluntary error reporting system on future projects.
- Q37: I would recommend a project charter on future projects.
- Q38: I would recommend a common project diary on future projects.
- Q39: I would recommend an in/on-boarding process on future projects.
- Q40: I would recommend periodic reflection sessions on future projects.
- Q41: How clear is the concept of utilizing HRO mindfulness processes to improve individual and team competence of managing projects to you?
- Q42: How useful is the concept of utilizing HRO mindfulness processes to improve individual and team competence of managing projects to you?

Mindful project management can be used to see if participants would use the various concepts on future projects (Q36 to Q40) and if they understood the concepts (Q41 to Q42).

The frequency counts and percentage of the responses, the summary statistics, the consensus analysis results, and number of comments provided for survey question Q36 to Q40 are presented in Table 4.13. Among the five statements regarding mindful project management, participants agreed the most with Q37 ($M = 4.39$, $SD = 0.94$) and Q39 ($M = 4.39$, $SD = 0.66$) and the least with Q36 ($M = 3.57$, $SD = 1.04$). Participants reached consensus on all five statements.

Regarding survey question Q36, “I would recommend implementing a voluntary error reporting system on future projects”, some participants were against the implementation of a voluntary error reporting system as it “*has been proven to be unsuccessful and very difficult personally for the reporting person*”. Rather, they supported “*a mandatory error reporting system*” “*with complete and open transparency*” and under the circumstances that “*there is a culture of no-blame but of problem solving*”.

A majority of the participants would recommend a project charter on future projects (Q37). A healthcare Senior Operations Director argued, “*this [a project charter] is a foundational step and supposedly standard practice for project management professionals*”. A project charter should be developed in a format that “*fosters communication, flexibility, and creativity.*”

Participants in general believed that a common project diary on future projects is a good idea (Q38). A common project diary “*promotes transparency and learning on an active project*”. Though, “*the need for and responsibility for such a process should be a team development activity, including the owner.*”

Participants would recommend an in/on-boarding process on future projects (Q39). One participant interpreted the in/on-boarding process as “*recognition of what may have gone wrong, how it was resolved, and how to avoid problems in the future*”, suggesting that it may not be clear to some participants as to what constitutes an in/on-boarding process. The CEO of a construction firm mentioned that the process should be moderate, as “*some in/on-boarding is helpful, but too much and the major messages would get lost.*”

Participants would also recommend periodic reflection sessions on future projects (Q40), “with a structured plan and timeframe defined”. “Reflection [sessions] should be on-going and at all levels of the project team”. For example, the CEO of a healthcare architectural firm stated, “this [reflection sessions] should be part of the design / owner team meeting agenda. Periodic sessions could be timed with critical benchmark schedule events”.

Table 4.13: Summary of survey results regarding participants’ perception of mindful project management, Q36-Q40. 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree.

	Frequency (%) for responses					Mean (SD)	Consensus analysis			Number of comments
	1	2	3	4	5		Disagree	Agree	Consensus reached?	
Q36	0	4 (17)	7 (30)	7 (30)	5 (22)	3.57 (1.04)	4 (17)	19 (83)	Yes	9
Q37	0	2 (9)	1 (4)	6 (26)	14 (61)	4.39 (0.94)	2 (9)	21 (91)	Yes	6
Q38	0	1 (4)	5 (22)	11 (48)	6 (26)	3.96 (0.82)	1 (4)	22 (96)	Yes	5
Q39	0	0	2 (9)	10 (43)	11 (48)	4.39 (0.66)	0	23 (100)	Yes	6
Q40	0	1 (4)	1 (4)	11 (48)	10 (43)	4.30 (0.76)	1 (4)	22 (96)	Yes	6

The frequency counts and percentage of the responses, the summary statistics, the consensus analysis results, and number of comments provided for survey question Q41 to Q42 are presented in Table 4.14. It appeared that the concept of utilizing processes adapted from HRO mindful principles to improve individual and team competence of managing large hospital building projects was quite clear and useful to the participants ($M = 2.70$, $SD = 0.47$ for Q41; $M = 2.78$, $SD = 0.42$ for Q42). Participants reached consensus on both statements.

Although the concept of utilizing processes adapted from HRO mindful principles to improve individual and team competence of managing large hospital construction projects was quite clear and useful to the participants, they were not sure “how this kind of thinking can be transferred to other organizations in the short-term”. The concerns included: “It might take longer than the length of the project before teams are dispersed”, and “it would be a major culture shift”. However, “this is not possible with hospital project management and the nature of

construction projects". Thus, a CEO summarized the problem as, *"leadership must find a way to open communications, welcome input, and respect and take advantage of experience and minimize risk with real data."*

Table 4.14: Summary of survey results regarding participants' perception of mindful project management, Q41-Q42. For Q41, 1=not clear, 2=somewhat clear, 3=very clear. For Q42, 1=not useful, 2=somewhat useful, 3=very useful.

	Frequency (%) for responses			Mean (SD)	Consensus analysis			Number of comments
	1	2	3		Not clear/Not useful	Clear/Useful	Consensus reached?	
Q41	0	7 (30)	16 (70)	2.70 (0.47)	0	23 (100)	Yes	6
Q42	0	5 (22)	18 (78)	2.78 (0.42)	0	23 (100)	Yes	4

4.4.4.4 Relationship between Mindful Project Management and each HRO mindful principle

Table 4.15 shows the descriptive statistics and Pearson's correlations of participants' perceptions of mindful project management and each HRO mindful principle. Participants had a moderately high perception of mindful project management (M = 3.73, SD = 0.43), indicating a moderately high chance that the participants would use the various concepts of mindful project management on future healthcare building projects.

For the five HRO mindful principles, deference to expertise had the highest mean (4.16) and commitment to resilience had the lowest mean (3.75), indicating that participants had the positive perception of deference to expertise and the least positive perception of commitment to resilience.

Table 4.15 Descriptive statistics and Pearson's correlations of participants' perceptions of Mindful Project Management and each HRO mindfulness principle. N=23.

	Mean	SD	Pearson's correlation coefficient with mindful project management (p-value)
Mindful project management	3.73	0.43	
Preoccupation with failure	4.01	0.43	0.06 (0.7854)
Reluctance to simplify	4.05	0.50	-0.04 (0.8541)
Sensitivity to operations	3.98	0.57	0.17 (0.4371)
Commitment to resilience	3.75	0.64	0.39 (0.0630)

	Mean	SD	Pearson's correlation coefficient with mindful project management (p-value)
Deference to expertise	4.16	0.51	0.66 (0.0006)

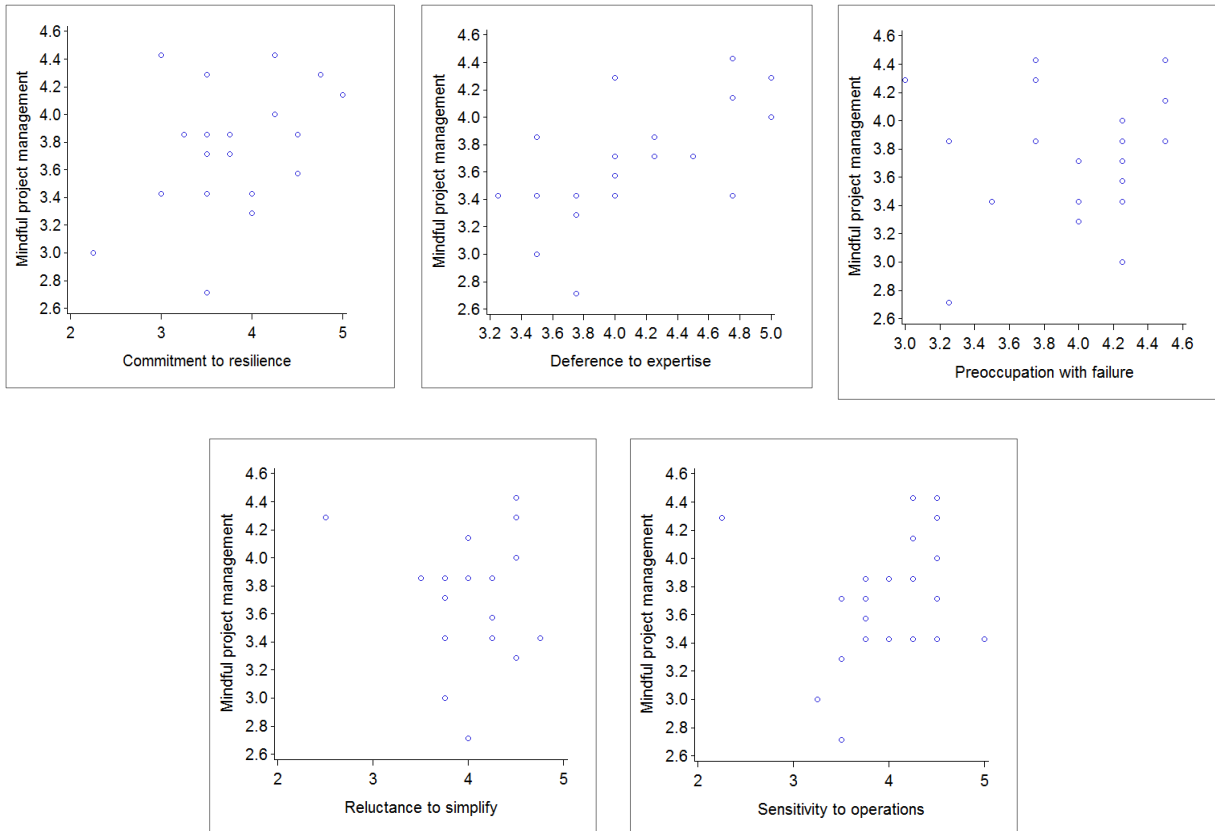


Figure 4.11 Scatter plots of perceptions of Mindful Project Management and the five HRO mindfulness principles.

Figure 4.11 shows the scatter plots of perceptions of mindful project management to each of the five HRO mindful principles. The dot pattern in Deference to Expertise from lower left to upper right indicates a positive correlation. The results of Pearson's correlations (Table 4.15) indicated that there was a statistically significantly positive relationship between perception of mindful project management and perception of deference to expertise ($r = 0.66$, $p = 0.0006$). This indicated that participants with a more positive perception of deference to expertise would be more willing to use the various concepts of mindful project management on future projects.

There was no statistically significant relationship between perceptions of mindful project management and the other four HRO mindful principles of preoccupation with failure, reluctance to simplify, sensitivity to operations, and commitment to resilience.

4.5 Results of preliminary analysis of R2

The second research question of this study was R2: How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management? Comments of the fifth survey question and the responses of the sixth survey question (the open-ended question) in all sections of the HRO mindfulness principles were analyzed and summarized.

4.5.1 Participants' perception of how that HRO principle could be used in managing a large hospital building project

The following five questions were asked regarding participants' perception of how that HRO mindful principle, developed by this researcher based on the literature, could be adapted for use in managing a large hospital building project (Q10 for preoccupation with failure, Q16 for reluctance to simplify, Q22 for sensitivity to operations, Q28 for commitment to resilience, and Q34 for deference to expertise):

- Q10: Projects could benefit from implementing a voluntary (and anonymous if desired) error reporting system (similar to hospital incident reporting systems) in support of a preoccupation with failure.
- Q16: Projects could benefit from a practical, workable and relevant charter or vision/values statement that describes the principles that will underpin culture, relationships and communication.
- Q22: Projects could benefit from establishing a common project diary, which all major actors have access and authority to contribute to capture detailed and

comprehensive perceptions of what actually happened towards current and future project learning.

- Q28: Projects could benefit from an in/on-boarding process to include collaboration and culture expectations, a review of knowledge from prior, similar projects, and scenario exercises to identify risks and practice management response to unforeseen problems.
- Q34: Projects could benefit from periodic 'reflections' to revise, update, and add to new knowledge that the team possesses, including facts, perceptions, experience, judgment and folklore.

These five questions were developed respectively based on the five questions above as the basis for answering sub-research questions SR2.1 through SR2.5, which were:

SR2.1 How useful is a voluntary reporting system?

SR2.2 How useful is a project charter?

SR2.3 How useful is a common project diary?

SR2.4 How useful is an in/on-boarding process?

SR2.5 How useful is periodic reflection sessions?

The frequency counts and percentage of the responses, the summary statistics, the consensus analysis results, and number of comments provided for Q10, Q16, Q22, Q28, and Q34 are presented in Table 4.16. Participants agreed the most with Q28 ($M = 4.52$, $SD = 0.73$), followed by Q16 ($M = 4.44$, $SD = 0.66$), Q34 ($M = 4.39$, $SD = 0.66$), and Q22 ($M = 4.13$, $SD = 0.76$). Participants agreed the least with Q10 ($M = 3.57$, $SD = 0.79$). Participants reached consensus on all five statements.

4.5.2 Comments for Survey Question Q10

Participants somewhat agreed with the statement of Q10: Projects could benefit from implementing a voluntary (and anonymous if desired) error reporting system (similar to hospital

incident reporting systems) in support of a preoccupation with failure. However, a voluntary reporting system was less desired. As an IT senior project manager put it: *“If it is voluntary, a person can rationalize why it should not be reported. All errors should be reported to avoid future repeat and possible catastrophic consequences.”* Thus, the reporting system should be “mandatory”. A US based hospital Facilities Director suggested that *“a no-blame environment”* should be made available to *“recognize that mistakes happened, and the objectives are to resolve problems promptly, understand why they happened and correct the cause, and prevent them from happening again.”*

4.5.3 Comments for Survey Question Q16

Participants highly agreed with the statement of Q16: Projects could benefit from a practical, workable and relevant charter or vision/values statement that describes the principles that will underpin culture, relationships and communication.

For example, a participant expressed it as *“This is the nature of all successful working relationships. Putting it down on paper is a valuable exercise.”* However, a caveat would be it is *“difficult to follow through as a project may have thousands of participants who would have little or no interest in this activity”*.

The Chief Operating Officer of a healthcare system located in the Middle East clearly defined what a project charter with a vision/values statement could serve, *“A vision/ values statement describes the foundation of the culture and answers questions about how we function and why it's important... [it] could also be transformative for newly minted project teams”*

4.5.4 Comments for Survey Question Q22

Participants moderately agreed with the statement of Q22: Projects could benefit from establishing a common project diary, which all major actors have access and authority to

contribute to capture detailed and comprehensive perceptions of what actually happened towards current and future project learning.

Participants generally think that establishing a common project diary is a great idea for “*establishing group knowledge*”, “*learning*”, “*improving communication*”, and “*being used as a teaching tool*”. However, some precaution should be taken as “*a repository verses a proactive tool*”. A US based healthcare system Facilities Director/Professional Engineer advised that a common project diary “*should be discussed and designed during the team development phase before project launch*”.

4.5.5 Comments for Survey Question Q28

Participants highly agreed with the statement of Q28: Projects could benefit from an in/on-boarding process to include collaboration and culture expectations, a review of knowledge from prior, similar projects, and scenario exercises to identify risks and practice management response to unforeseen problems.

Participants believed that “*projects definitely need an on boarding process*”. A senior healthcare executive stated, “*Organizations which have a comprehensive in/on-boarding process have been documented to have fewer unresolved conflicts and are more responsive to problems at the source.*” The CEO of a healthcare architectural firm advised, “*this should occur at every level of the team organization. In addition, we have found it helpful to meet and or exchange lessons learned up and down the project hierarchy.*” One healthcare system CEO simply stated, “Great idea!”

However, participants also expressed some concerns regarding how to “*implement*” the in/on-boarding process, including “*cost and expedience*”. In addition, time required to “*adapt to a culture*” and “*continuous coaching*” and are the other two things that need to be addressed before a successful launch of the in/on-boarding process”

4.5.6 Comments for Survey Question Q34

Participants greatly disputed the statement of Q34: Projects could benefit from periodic 'reflections' to revise, update, and add to new knowledge that the team possesses, including facts, perceptions, experience, judgment and folklore.

A US based healthcare system Facility Director clearly distinguished between project management and “*active professional team process management*”: “*Projects can benefit from active professional team process management and ongoing assessment. This is separate from Project management. This refers to professional management of team dynamics, communication, skills, needs and changes.*” A US based healthcare architect pointed out that active professional team process management also “*serves as team bonding*”.

Table 4.16 Summary of survey results regarding participants’ perception of how that HRO mindfulness principle could be taught or learned in managing a project (Q10 for preoccupation with failure, Q16 for reluctance to simplify, Q22 for sensitivity to operations, Q28 for commitment to resilience, and Q34 for deference to expertise). 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, and 5 = strongly agree.

	Frequency (%) for responses					Mean (SD)	Consensus analysis			Number of comments
	1	2	3	4	5		Disagree	Agree	Consensus reached?	
Q10	0	2 (9)	8 (35)	11 (48)	2 (9)	3.57 (0.79)	2 (9)	21 (91)	Yes	14
Q16	0	0	2 (9)	9 (39)	12 (52)	4.44 (0.66)	0	23 (100)	Yes	12
Q22	0	0	5 (22)	10 (43)	8 (35)	4.13 (0.76)	0	23 (100)	Yes	16
Q28	0	0	3 (13)	5 (22)	15 (65)	4.52 (0.73)	0	23 (100)	Yes	11
Q34	0	0	2 (9)	10 (43)	11 (48)	4.39 (0.66)	0	23 (100)	Yes	7

4.6 Results of Thematic Analysis of Survey Questions Q11, Q17, Q23, Q29, and Q35

Survey questions Q11, Q17, Q23, Q29, and Q35 were the open-ended questions in all sections of HRO mindfulness principles that allowed participants to provide additional comments. Survey

question Q11 for preoccupation with failure, Q17 for reluctance to simplify, Q23 for sensitivity to operations, Q29 for commitment to resilience, and Q35 for deference to expertise.

4.6.1 Comments from Survey Question Q11

Nineteen comments were given for Q11 (preoccupation with failure). Two themes were discovered and discussed as follows.

4.6.2 Theme 1: What is preoccupation with failure?

As stated by the participants, a preoccupation with failure really means that “*identification of possible points of failure and of means of mitigation and prevention*” and that “*errors are expected and planned for*”. Moreover, preoccupation with failure is an equivalent to “*anticipation for success*” and “*knowledgeable anticipation of risks and costs*”. This concept is essentially “*articulating a need for a more comprehensive list of potential risks which should be identified and mitigated, such as resource behavioural skills, cultures, beliefs, personality, etc.*” The term “*apprehension to failure*” was suggested by one of the participants instead of “preoccupation with failure” for a better fit and understanding with typical language used by healthcare building project managers.

4.6.2.1 Theme 2: The implementation of preoccupation with failure in practice

Participants contributed several suggestions regarding how to implement the system of preoccupation with failure in practice. A preoccupation with failure would benefit the project’s staff the most, if they feel that they can “*speak up, without fear of retribution*”, when they identify potential problems on a project. Also, “*a discussion with an organized team about the elements of a successful project at the very beginning [of the project]*” and setting “*ground rules about discovering mistakes and reporting them should be agreed upon*” which would be beneficial.

For project managers, they need to be *“intuitive and well versed with soft skills and experts at people management”* in order to pick up on the visual cues long before the behaviours they foretell develop into less productive behaviours. In other words, *“project management skills should include training to anticipate errors and engage in tasks to detect and mitigate them”*.

Teamwork training was also suggested by the participants for better practice of preoccupation with failure: *“Formal teamwork training has proven to reduce errors in high-stress environments such as military aviation, combat casualty units and emergency departments. Findings point to the effectiveness of formal teamwork training for improving team behaviours, reducing errors, and improving staff attitudes among the trained hospitals that I have been affiliated with.”*

Furthermore, the system should be developed into *“a learning system”*. Consequently, *“using a failure mode analysis during project conception and then throughout the project should provide all team members with a better understanding of how the project fits into an overall scheme.”*

Among others, checklist, third party review and validation, and accurate data analysis were also proposed by the participants for reducing errors: *“HRO often practice scenarios to reduce errors through the use of check list, third party review and validation, and accurate data analysis. HRO have learned how to think about failure or if you will how to reason out the possibilities of failure so that it can be accounted for. Project managers need to account for failure in all assignments, all tasks and milestones. The practice of risk registers does not adequately account for failure. Failure is usually the result of a cascade of errors that have gone undetected until the failure event occurs. Risk registers won't detect the cascade although it might pick up on individual errors.”*

4.6.3 Comments from Survey Question Q17

Eight comments were given for survey question Q17 (reluctance to simplify). One theme was discovered and discussed as follows.

4.6.3.1 Theme 1: The cause and solution of reluctance to simplify

According to the participants, the cause of reluctance to simplify includes, “*management wishes to prove the complicity of the project thus justifying their existence*” and a “*reluctance to create less complexity and relax control.*” Both were contributed to “*the personality of the project manager*” and/or “*the competence of the team*”.

“*Skeptics, integration and collaboration*” and time to deal with the issue are the main elements that could support the reluctance to simplify. As stated by the participants, “*the identification and legitimization of this process [reluctance to simplify] very early in the project team development is important and will be helpful.*” and “*a leader must be able to communicate to stakeholders at many levels of complexity*”. Furthermore, it is important that no team member be surprised by a need to examine and validate what they are doing. An academic medical center facilities director argued that it needs to be understood and recognized that “*all parties to the project, no matter how small the role, should be integrated and included in communication and should be valued as members of the team*”.

Finally, as organizations are buried in procedures or requirements that stifle creativity, a US based architect stated that “*having a challenge document to Owner related procedures or products that get reviewed with cost alignment, benefits to the project and/or anticipated improvement of schedule may be beneficial*”.

4.6.4 Comments from Survey Question Q23

Eight comments were given for Q23 (sensitivity to operations). Two themes were discovered and discussed as follows.

4.6.4.1 Theme 1: The key elements of sensitivity to operations

The first key element of sensitivity to operations is *“having open communication and sharing information”* with project team. Regarding how to put this in practice, a medical equipment planner in the Middle East stated, *“A share point function where each team member can contribute would facilitate communication, but this should have a moderator or manager to channel and manage the communications.”*

The second element of sensitivity to operations is *“establishment of an atmosphere of trust”*. The third element of sensitivity to operation is *“starting a collaborative, very diverse and integrated process early in the project”*.

Moreover, time for implementation is also important: A US-based healthcare facilities director stated that *“Most needs should be identified and addressed as a part of team development prior to project launch”*. This is because an early-defined process can allow contract entities *“to plan and estimate appropriately”*.

4.6.5 Comments from Survey Question Q29

Seven comments were given for Q29 (commitment to resilience). One theme was discovered and discussed as follows.

4.6.5.1 Theme 1: The importance of commitment to resilience

Resilience speaks to *“experience, learning, trust, leadership and commitment”* and *“a commitment to resiliency is essential to successful project management especially in healthcare renovation projects”* as *“it [commitment to resilience] represented return to and consistency with the goals and vision of this specific project”*.

A Senior Operations Director in the Middle East further emphasized the importance of commitment to resilience: *“I believe commitment to resilience should be studied as a major reason while some project teams succeed in highly stressed environments. Project delays and*

cutbacks, along with unexpected poor outcomes will not deter a resilient team. It might explain how some team overcome catastrophic events on projects.”

4.6.6 Comments from Survey Question Q35

Five comments were given for Q35 (deference to expertise). One theme was discovered and discussed as follows.

4.6.6.1 Theme 1: Implementation of deference to expertise

Several approaches to ensure the occurrence of deference to expertise were proposed by the participants, including:

- *“Less reliance on hierarchical structures and more openness and access to expertise from members ranked lower on the org structure would be beneficial”.*
- *“Those with requisite expertise must be willing to be flexible and creative”.*
- *“Timely applied” of the expertise is important. “The project team management process should be focused on finding and incorporating the needed expertise when needed. The process must also provide for how to deal with 'Expertise' that is not timely, how to manage its impact and how to protect the project and process from adverse impact.”*

4.7 Summary

This chapter presented the analysis of the findings of the research conducted, including a pilot survey and real-time Delphi survey towards investigating the study’s two research questions. In conclusion, the pilot survey results suggest healthcare building project participants can improve their aptitude for mindfulness. The Delphi study results reached consensus in agreeing that HRO mindful principles can be beneficial to enhance managing large hospital building projects.

In the next chapter, the findings presented in this chapter will be discussed related to the literature towards refining the conceptualized Mindful Project Management framework.

Chapter 5: Discussion and Analysis

5.1 Introduction

This chapter serves to develop the conceptual Mindful Project Management (MPM) framework based on Chapter 1, 2, and 4. The foundation of the MPM framework is based on the work of Weick and Sutcliffe's (2001, 2007), in particular sense making in the form of mindfulness found within HROs to "organize themselves in such a way that they are better able to notice the unexpected in the making and halt its development" (2007, p.18). The initial idea for the MPM framework was informed by the literature, including the opinion that "the most productive conceptual frameworks are often those that bring in ideas from outside the traditionally defined field of your study [...] or theories that no one had previously connected" (Maxwell, 2013, p.40). This chapter also serves to address each of the study's sub-research questions and the practical implications of HRO principles in the context of managing large hospital building projects. The chapter concludes by presenting the final MPM Framework.

5.2 Mindlessness

Mindlessness is defined as a "tendency to apply previously formed mindsets to current situations" (Haigh et al, 2011, p.12). People are especially vulnerable to mindlessness because of cognitive biases, which cause "people [to be] blinded to new ways of thinking by the perspectives they acquired through past experience, training, and success" (Snowden & Boone, 2007, p.70).

Initially, mindlessness was addressed in the pilot study with sub-research question SR1.1 is: What vulnerability do practitioners have to mindlessness? The data revealed that 90 percent of the participants have high potential for mindlessness with 10 percent having a moderate potential for mindlessness (table 4.1, p.60). Given the considerable experience of the

participants (figures 4-3 through 4-8, pp.60-61) with years of honed project management expertise, the pervasiveness of potential mindlessness is surprising at first glance, but should not be given the aforementioned cognitive biases, which promote mindlessness. Mindfulness, on the other hand, “is the process of actively noticing new things, relinquishing preconceived mindsets, and then acting on the new observations” (Feinberg, 2010, p.43). The context of Mindful Project Management practice is presented in the following sections.

5.3 Summary from the Literature and Sub-Research Questions around the Mindful Project Management Framework Conceptual Mode

To recall, this study’s two primary research questions are R1. What potential do mindful processes derived from high reliability organizations (HRO) practice have to managing large hospital projects? R2. How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management? The two sub-research questions for R1 were SR1.1 What Vulnerability do practitioners have to mindlessness? SR1.2 How clear do practitioners find the concept of utilizing processes developed from HRO mindful practices? The sub-research questions were an important component of determining how clear and useful global experts with large hospital building project experience found the concept of applying HRO mindful principles in the form of the Mindful Project Management Framework conceptual model to improve practice.

5.3.1 SR1.1 - What Vulnerability do Practitioners have to Mindlessness?

The vulnerabilities of practitioners understanding of mindlessness was explained in section 5.2. The data revealed that 90 percent of the participants have high potential for mindlessness with 10 percent having a moderate potential for mindlessness (figure 4.2, p.61). The result substantiated the supposition drawn from the literature of the potential benefit of mindfulness to enhance managing large hospital builds, a critical finding as it indicates that

experts with significant large hospital build experience could benefit from mindful principles. Given the considerable experience of the participants with years of honed large hospital building project management expertise, the pervasiveness of potential mindlessness is surprising at first glance, but should not be given the aforementioned cognitive biases, which promote mindlessness. With the poor performance of large hospital builds (section 2.4, pp.25-27), this has obvious implications as “a mindless mental style works to conceal problems that are worsening” (Weick & Sutcliffe, 2007, p.88). Just as troublesome in acknowledging and dealing with issues inevitable in complex hospital builds, mindlessness can act to “narrowly limit the range of solutions we might seek” (Langer, 2014, p.57). Mindfulness, on the other hand, “is the process of actively noticing new things, relinquishing preconceived mindsets, and then acting on the new observations” (Feinberg, 2010, p.43).

5.3.2 SR1.2 - How clear do practitioners find the concept of utilizing processes developed from HRO mindful practices?

A key finding to this study was the full consensus of the expert panel members that utilizing processes from HRO mindful principles to enhance managing of large hospital building projects was considered quite clear and useful (table 4.14, p.87). While the consensus on usefulness was clear, there were concerns expressed of the ability for adoption given hospital building projects are temporary endeavours, as well as the leadership buy-in and support required to be successful. To the first concern, large hospital building projects are characterized as temporary organizations (section 2.2, p.12-14). In their case study of a French hospital construction project, Pauget and Wald (2013) found the importance of “the social and human aspects related to working in temporary organizations [...] relying less on formal structures and routines and more on interpersonal coordination” (p.201). HRO mindful principles, as adapted by the MPM framework conceptual model, addresses this concern by providing a process by which people are integrated into the project, identify and address issues, and communicate

across disciplinary boundaries (Pauget & Wald, 2013). Furthermore, the MPM Framework allows for individually and collectively noticing new things (Feinberg, 2010), gaining “multiple perspectives in problem solving” (Langer & Moldoveanu, 2000, p.2), and cultivating resourcefulness in response to the unexpected (Weick & Sutcliffe, 2007). Another finding presented Delphi study was the importance of leadership. Indeed, the literature supports that project management improvement efforts have a better chance for success if it is the pet project of the sponsor organization’s CEO or other high level senior executive who reports directly to the board and who “is willing to stick it out when the going gets tough” (Reason & Hobbs, 2003, p.175). Fernades et al (2014) found that adopters of new project management initiatives must be motivated and predisposed to change. Within large hospital building projects, this motivation and predisposition must clearly derive from the project sponsor/owner. The project owner must perceive usefulness and “be convinced that [the Mindful Project Management framework] will help them to meet their objectives in a cost-effective manner, both directly and indirectly through enhanced organizational performance” (Fernades et al, 2014, p.87). The CEO of a leading healthcare-focused architectural firm noted in the Delphi survey, that the MPM framework serves to place “*a clinical structure around good project management*”.

The MPM framework conceptual model includes “an action-oriented, pragmatist approach to projects [which] provides a more realistic account of what goes on when people join forces to engage in small-scale and large-scale project work” (Kvalnes, 2016, p.107). Furthermore, it provides a process for leadership to develop teambuilding and a desired culture, especially important given that “whether these specialists and consultants from different organizations (e.g., firms, institutes) feel they belong in their immediate organization or project, has become one of the most common and important challenges in the construction industry” (Ding et al, 2017, p.552).

The next section serves to provide discussion based on the findings and the literature related to the sub-research questions for R2, which were SR2.1 How useful is a voluntary

reporting system? SR2.2 How useful is a project charter? SR2.3 How useful is a project diary? SR2.4 How useful is an in/on-boarding process? SR2.5 How useful is periodic reflection sessions?

5.3.3 SR2.1 - How useful is a voluntary reporting system?

HROs actively engage in preoccupation with failure because of their fundamental view that an organization’s “knowledge of the situation, the environment, and their own group is incomplete” (Weick & Sutcliffe, 2015, p.46). The basic concept of preoccupation with failure is to continuously seek new information given that “the earlier you catch a discrepancy, the more options you have to deal with it” (2007, p.47). Weick and Sutcliffe caveat, however, that “preoccupation is not enough. You have to report the failing” (2015, p.56). A healthcare architect noted in the Delphi study that with large hospital builds, “*preoccupation with failure is an equivalent to anticipation for success.*” The MPM component designed to support preoccupation with failure, based on the literature review and the findings, is a reporting system. The relationship is represented in Table 5.1.

Table 5.1 MPM component related to preoccupation with failure

HRO Mindful Principle	Contingent On	MPM Component	Specific Behaviors to promote Mindfulness
Preoccupation with Failure	Actively seeking information	Reporting System	Scrutinize small issues or failures

Current voluntary reporting systems used on hospital building projects are mainly reporting systems to report safety-related incidents during the construction phase only (Saurin et al, 2015). Project risks, on the other hand, are typically identified throughout a project’s lifecycle using a risk register. As a senior healthcare operations executive working in the Gulf Coast Countries (GCC) region of the Middle East pointed out in the Delphi study, however, “*the practice of risk registers does not adequately account for failure*”, which can be attributed to the obvious inability to fully predict the unforeseen or unexpected. A voluntary reporting system,

therefore, is intended to fill the gap between risk registers, which cannot predetermine all possible risks given the inherent uncertainties associated with large hospital building projects, and of current project reporting tools, which do not dependably display early warning of potential issues or failures. A reporting system supports preoccupation to failure by “calling attention to failures once they happen, even if others do not notice that a mistake of failure has occurred” (Weick & Sutcliffe, 2015, p.58). Key factors identified by the expert panel members during the Delphi study as required to successfully adopt a reporting system for reinforcing preoccupation with failure include the necessity of a no-blame culture and providing appropriate training to support reporting requirements, covered respectively in the next two sections.

5.3.3.1 No-Blame Culture

In this no-blame culture, the CEO of a US healthcare real estate development firm who also has significant international experience commented, “*projects can benefit from staff who feel they can speak up, without fear of retribution, when they identify potential problems on a project*”. Indeed, the expectation to actively seek out and report any potential error or issues requires a culture that does not tolerate blame or fear of retribution. This is essential on large hospital building projects as “sometimes people who are lower in a hierarchy fail to raise questions or act on concerns out of fear” (Weick & Sutcliffe, 2015, p.127).

In designing processes for a reporting system, project leadership should take a realistic view of current cultural norms while the expected mindful culture is maturing to determine whether a person can report anonymously (McKay et al, 2004). Project organizations should allow for anonymous reporting at least until a no-blame culture is firmly established. Instead of placing blame, the examination of issues reported should focus on systems and “what can be learned to improve the organization” (van Dalen et al, 2009, p.41). There is heeded caution, however, that especially in a project context a no-blame culture should not mean a culture that lacks accountability (Hodgson & Cicmil, 2006).

5.2.3.2 Training to support a reporting system

The literature also supports the value of training to promote and encourage reporting and ensure intended use (Hewitt & Chreim, 2015). For example, Hewitt and Chreim (2015) reported that most healthcare practitioners do not report situations or near misses if they can resolve the issue themselves. This practice of non-reporting enhances the risk of normalizing exceptions and deviances, not identifying unwanted recurring behaviours, and reducing opportunities for organizational learning. Their study also concluded that to get the envisioned benefit of reporting systems “communication and training on what should be reported, why and how should be considered” (p.308). While this theme focuses on practitioners’ level, the next section will provide evidence from a project level.

5.3.3.2 SR2.2 - How useful is a Project Charter?

HROs have been found to be “sensitive to variety and to descriptions and actions that pinpoint or hide that variety” (Weick & Sutcliffe, 2015, p.62). The basic HRO concept of Reluctance to Simplify is “that a certain level of predictability and order exists in the world [...which] encourages simplifications that are useful in ordered circumstances. Circumstances change, however, and as they become more complex, the simplifications can fail” (Snowden & Boone, 2007, p.70). Attention, therefore, must be paid to “context, categories, and expectations” (Weick & Sutcliffe, 2007, p.53). Trust is especially crucial for this mindful principle as “organizing for reluctant simplification also means organizing for a more complex form of openness” (Weick & Sutcliffe, 2015, p.68). A Facilities Director/Registered Architect at a large academic medical center, noted that reluctance to simplify on large hospital projects means a culture of “*all parties to the project, no matter how small the role, should be integrated and included in communication and should be valued as members of the team*”.

The MPM component designed to support preoccupation with failure, based on the

literature review and this research’s findings, is a project charter. The Project Management Book of Knowledge (PMBOK) defines a project charter as a “document issued by the project initiator or sponsor that formally authorizes the existence of a project [and] documents the business needs, assumptions, constraints, the understanding of the customer’s need and high-level, and new product, service, or results that is intended” (PMI, 2013, p.71). While that definition includes mission (project purpose) and vision (success criteria), it excludes values expected to be upheld on the project linked to the project sponsor’s values or to the project charter’s mission and vision. Within the literature, the term ‘value’ in relation to project charters typically describes requirements related to sustainability or corporate social responsibilities (Khalili-Danghani & Tavana, 2014). Given the diverse set of stakeholders, regulators, designers, contractors, suppliers, and multiple others associated with a large hospital building project, a project charter that includes values is recommended as the starting point to socialize the process of building trust, which is vital for openness and an important component to the principle of reluctance to simplify. The relationship is represented in Table 5.2.

Table 5.2 MPM component related to reluctance to simplify

HRO Mindful Principle	Contingent On	MPM Component	Specific Behaviors to promote Mindfulness
Reluctance to Simplify	Trusting Culture	Project Charter	Culture that supports values such as an openness to skeptics and argumentation

Fostering a culture which supports openness cannot be successful “unless top management conveys a clear preference for mindfulness in its beliefs, values, and actions” (Weick & Sutcliffe, 2007, pp.116-117). A vision statement is an “important way of providing an ultimate design or ideal state which provides a reference point for guiding thinking and action” (Coffey, 2010, p.82).

A project charter was found by this research’s expert panel members to be an excellent document to begin realizing this envisaged value. As a CEO commented, the project charter is a

useful document to stipulate “*rules for engagement*”. The omission of values in a project charter is a meaningful oversight and provides a significant opportunity for the project sponsor to establish a desired culture of openness from the onset. Weick and Sutcliffe (2015) believe that any HRO mindful framework should be viewed from the “notion of organizational culture” (p.130). This is, therefore, the most critical component of the MPM framework as the lack of a supporting organizational culture and its underpinning values including openness jeopardizes the successful adoption of the MPM framework since culture-driven values determine the “ways of doing business” (p.134). This research found the project charter’s inclusion of a cultural values statement as the first step to support openness, with an additional requirement being supportive and open communication, detailed in the next section.

5.3.3.3 Open Communication

A healthcare architect commented in the Delphi study that “*it needs to be understood and recognized that all parties to the project, no matter how small the role, should be integrated and included in communication and should be valued as members of the team*”. This is important as “diverse views tend to be disproportionately distributed toward the bottom of the organization, which means that those most likely to catch the unanticipated warning signals have the least power to persuade others that the signal should be taken seriously” (Weick & Sutcliffe, 2015, p.75). Open communication also includes also listening to skeptics. Weick and Sutcliffe (2015) urge those involved to “treat skepticism as a form of redundancy [and] an independent effort to confirm or refute the [original] report” (p.74). One participant to the Delphi study, however, cautioned to be wary of cynics who can “*derail the [project with] best of intentions for no valuable reason*”. Skepticism, versus cynicism, “counteracts complacency and provides a more nuanced description of the context of operations that may in turn suggest more ways to deal with it” (Weick & Sutcliffe, 2007, p.155). Similarly, empirical studies have concluded that groups that allow for “devil’s advocacy, and other interaction techniques that

compel group members to debate and disagree about different decision alternatives, facilitate superior decision-making” (Ayoko et al, 2014, p.223).

5.3.4 SR2.3 - How useful is a common Project Diary?

The HRO principle of Sensitivity to Operations means “to view ongoing work as the reconstituting of an evolving present [to include] a mixture of agency, motion, construction, enacting, remembrance, and revision” (Weick & Sutcliffe, 2007, p.82). The basic concept of sensitivity to operations is to develop foresight through a comprehensive view of current operations. Organizations facilitate sensitivity to operations by “having leaders and managers maintain continuous contact with the operating system or front line” (p.98). A CEO commented concerning sensitivity to operations that for large hospital builds, “*open communication and leadership is very important.*”

The MPM component designed to support sensitivity to operations, based on the literature review and the findings, is a project diary. The relationship is represented in Table 5.3.

Table 5.3 MPM component related to sensitivity to operations

HRO Mindful Principle	Contingent On	MPM Component	Specific Behaviors to promote Mindfulness
Sensitivity to Operations	Monitoring what is being done and what emerges	Project Diary	Seeing what is <i>actually</i> being done regardless of intentions, designs, and plans

A project diary is a method to bring unique knowledge to the surface by providing a mechanism, which fosters “people to raise questions and reveal information not widely shared” (Weick & Sutcliffe, 2015, p.93). This study’s literature and data findings support employing a project diary developed with current market available user-friendly technology features. This research’s expert panel members identified considerations and recommendations for content related to a project diary, covered respectively in the next two sections.

5.3.4.1 Project Diary considerations

A GCC-based senior healthcare operations executive commented that project diary would cultivate “*transparency and learning on an active project*”. A professional engineer practicing in the US with significant healthcare experience commented, “*The need for and responsibility for such as process [project diary] should be a team development activity, including the owner*”. Several considerations should be given to creating and using a project diary. Cavanaugh (2012) cautions that “a [project] diary demands strong self-discipline, which is rarely sustained, especially when under time/resource pressure” (p.65). He further adds, “unfortunately this will be when an accurate record is probably going to be most needed” (p.65). Three other participants shared the same concern; however, it was acknowledged that the ability to keep an active diary “*becomes easier with the current technology*” thereby reducing barriers faced in the past. Several of the Delphi study participants noted the concern that a project diary would only be utilized and thus beneficial “*as long as it is easy to use and readily accessible*”.

5.3.4.2 Project Diary content

A determination must be made of which documents and information are included in a project diary. Cavanaugh (2012) suggests “formal meeting minutes, [...] informal conversations, decisions made, and the reason for those decisions in the face of alternate approaches” (p.66). This study reached similar findings with the addition of incorporating lessons learned, therefore it is recommended to include the documents identified by Cavanaugh (2012) and on-going lessons learned. One Delphi study participant, however, went another route in suggesting that a project diary instead be designed as “*a blog all of the stakeholders can contribute to*”.

There can be many creative project diaries ideas at hand, given the currently available technological tools to create a user-friendly project diary. An illustrative example, a ‘comments

section' could be added for each document similar to that found at the end of online newspaper articles or other postings. This would serve several purposes. By having access to the project diary, all project members have access to recent and relevant documents, information and decision-making, allowing for familiarity of project operations beyond their own personal scope within the project. The comment section, though, provides the opportunity to add to the original line of thought, challenge the original line of thought, and even branch off into a new line of thought. In this manner information is disseminated but also allows reflection not only of the official documents and meeting minutes but also of the posted comments, which can lead to greater awareness in reconstituting the evolving present (Weick & Sutcliffe, 2007). This example resolves one of the Delphi participant's fear that a project diary consisting of "*unedited version of meeting notes and can create more problems than it solves*" as the meeting notes themselves would remain unedited, much like an online article is not considered edited based on the comments section.

5.3.5 SR2.4 - How Useful is an In/On-boarding Process?

Weick and Sutcliffe consider the trademark of a "HRO is not that it is error-free, but that errors don't disable it" (2015, p.95). The basic HRO concept of Commitment to Resilience "is to be mindful of errors [...] and to correct them before they worsen and cause more serious harm" (2007, p.68). In a large building project context, a barrier to achieve commitment to resilience is having the appropriate organization-wide skills and training "to cope with and respond to change swiftly" (2007, p.73). A medical equipment planner with significant large hospital build experience stated that commitment to resilience leads to "*collective wisdom [that] can only contribute positively to outcomes.*" A Facilities Director noted that, "*a commitment to resiliency is essential to successful project management especially in healthcare renovation projects.*"

The MPM component designed to support commitment to resilience, based on the literature review and the findings, is training. The relationship is represented in Table 5.4.

Table 5.4 MPM component related to commitment to resilience

HRO Mindful Principle	Contingent On	MPM Component	Specific Behaviors to promote Mindfulness
Commitment to Resilience	Cultivating resourcefulness	Training	Training and learning that increases response repertoires

A medical equipment planner on a \$1 billion+ (USD) new hospital building project in the GCC (who has a critical care nursing background) commented that training for resiliency is *“something that traditionally project management has ignored. This is a glaring omission and should be addressed in order to produce a highly performing team”*. The key factors identified by this research’s expert panel members to successfully adopt training related to commitment to resilience include the approach used for training, the on-boarding training process, scenario-based training, and lessons learned, covered respectively in the next four sections.

5.3.5.1 Approach to Training

While training typically consists of rehearsing anticipatory responses to pre-identified risks, training for commitment to resilience instead requires a very different approach. Instead, it requires cultivating resourcefulness in order to respond to any event, whether pre-identified or an unexpected event (Weick & Sutcliffe, 2007). Training to develop commitment to resilience therefore requires assessing what the project organization collectively knows it is adept at and how it can quickly recombine when and as needed for response, in particular to unexpected issues. In other words, training is required that provides organizational “capabilities to sense the unexpected in a stable manner and yet deal with the unexpected in a variable manner” (Weick & Sutcliffe, 2007, p.67). For project organizations, resiliency training can initially be provided as part of on-boarding, developed further in scenario-based training, and incorporated into lessons learned.

5.3.5.2 On-boarding Training

An on-boarding program is principally associated with an organization's human resources process of moving new employees through the company's hiring process (Schweer et al, 2012), whereas project management training programs are mostly related to using project management tools and information systems or project management practices associated with the developed body of knowledge (Egginton, 2012). A training program related to commitment to resilience is neither a typical on boarding or project management tools and technical training; rather, it is team training programs focused on developing resourcefulness for quick responses to unexpected events or problems by recombining its collective expertise for prompt resolution. Training should ideally be provided at the beginning of a project to best ensure a baseline of knowledge is provided from the project's initiation (Milton, 2005), thus this researcher's suggested approach is to provide initial team resiliency training as part of an on-boarding process. A physician, who practices at a world-renowned healthcare institution and who is a noted healthcare quality and HRO expert, commented in the Delphi study that on-boarding training "*helps, but adapting to a culture takes time and continuous coaching*". The Director of Facilities Planning and Design for a US academic medical center shared a similar concern of needing continuous reinforcement, stating "*this could probably be done at project inception and then [again] at key milestones*". In agreeing with this perspective, additional training to include scenario-based training and training, which incorporates lessons learned, is also recommended.

5.3.5.3 Scenario-based Training

Scenario based training for resiliency should include a pre-identified risk as well as positing an 'off-the-wall' scenario that allows for a more profound "insight into the complexities of a given situation" (Cavanaugh, 2012, p.71). It is important to note, however, "the simulation scenarios must be developed or chosen to appropriately trigger the required competencies"

(Salas et al, 2009, p.565). An example of a training program that cultivates resourcefulness is crew resource management (CRM) used in the airline industry, which trains for “teamwork with equal concentration on cognitive processing and interpersonal skills” (Weick & Sutcliffe, 2015, p.103). A notable consideration in developing a scenario-based training program is that theoretical knowledge is most effectively learned through prerequisite education prior to participating in the simulation session. This suggests lectures be provided first to ensure baseline knowledge is received before conducting scenario-based training to cultivate project team resourcefulness.

5.3.5.4 Lessons Learned

Another aspect to training is the lessons learned. A European-based university professor with research interest in healthcare projects commented in the Delphi study, that learning from unexpected occurrences “*is not consistently and systematically done*”. This aligns with Duffield and Whitty’s (2015) observation that the “project management literature suggests that in practice lessons learned processes rarely happen” (p.311) and Cavanaugh’s (2012) contention that lessons learned on projects has “largely [been] a wasted effort” (p.66). Zall Kusek et al (2013), in a study conducted for the World Bank regarding improving project successes, found that many “international organizations are reluctant to admit failure or mistakes” (p.64) which suppresses possibilities of benefiting from lessons learned. A US-based healthcare CEO commented in the Delphi study “*it [is] helpful to meet and or exchange lessons learned up and down the project hierarchy. This includes contractors, owner staff and designers at all levels*”. His position concurs with Duffield and Whitty’s study which found that an “alignment of the people and system elements has the potential to positively influence the success of an organizations lessons learned processes” (2015, p.321). In a case study, which focused on lessons learned from five building projects, the study’s conclusion is that “the orientation towards project goals [...] helps in facilitating the learning” (Hartmann & Dorée, 2015, p.350).

5.3.6 SR2.5 - How Useful is a Periodic Reflection Session?

Channelling decisions to the appropriate person or team capable of quick decision making to alleviate the problem or reduce the consequence of decision-making errors is “one of the most cited properties of HROs” (Weick & Sutcliffe, 2015, p.115). The basic HRO concept of Deference to Expertise is to go to the level within the organization necessary in order to “to answer the questions “what is going on, what else could be going on, what has gone on, and [what] the observer expects or intends to happen” (Woods et al, 2002, cited by Weick & Sutcliffe, 2015, p.120). An architectural firm CEO noted in the Delphi study that in large hospital builds, *“often, an expert has more data, more examples, and more knowledge of outcomes which need to be considered and judged.”*

The MPM component designed to enhance deference to expertise, based on the literature review and the findings, is periodic reflection sessions to review decision making processes and other essential project demands as needed. Periodic reflection sessions should include “going back to experiences, re-assessing them in the current context and learning from this [...for] professional practice or as a mind-set to be cultivated and spread” (Prilla, 2014, p.293). The relationship is represented in Table 5.5.

Table 5.5 MPM component related to deference to expertise

HRO Mindful Principle	Contingent On	MPM Component	Specific Behaviors to promote Mindfulness
Deference to Expertise	Engaged listening in decision making	Periodic Reflection Sessions	Migrating sensemaking to a person or team based on particular knowledge or expertise

Prilla (2014) advises “that in order to set reflection in practice there is a need to have one or more persons promoting reflection, being responsible for reflection in an organization and implementing it” (p.307). Within a project organization, this must be the project sponsor. A healthcare organization CEO and a hospital-employed architect each summed it up well in the

Delphi study commenting respectively that “*this must be agreed on in the beginning in order to be effective. It is also the leader's responsibility to initiate this culture*” and that it “*means that those of higher rank must have trust and confidence in the project team*”. As an example of how one building project conducted periodic reflection sessions, the organization held periodic two-day meetings “with the entire core team of internal and external parties [...] to work on a common focus, close relationships and learning to understand each other’s language” (van Dalen et al, 2009, p.22). The case study of this example concluded, “as a result of these sessions, people worked from the common goal and understood each other better” (p.23).

Cavanaugh (2012) makes the important caveat “that unless the project stakeholders reflect [...] with total (non-accusatory) honesty and openness, the lessons learned from these latter phases will never be understood, articulated, captured or appropriate process changes made” (p.55). Two significant topics identified by expert panel members in this research related to deference to expertise are collaboration in decision-making and the pre-identification of specialized skills within the project team. These two subjects, covered respectively in the next two sections, are recommended to be included in periodic reflection sessions.

5.3.6.1 Collaboration in decision-making

The findings identified a concern of an unwillingness to concede to subject matter experts who are lower in the organization’s hierarchy. An architect stated in the Delphi study that collaborating in this manner “*may be challenging at times for various contractual or political reasons*”. A CEO agreed that collaboration *should* include the appropriate experts, however conceded, “*decisions are so often made at high levels with inadequate knowledge or information*”. This is common in “hierarchical organizations, [where] important choices are made by important decision-makers” (Sutcliffe, 2011, p.140). Yet, in times of emerging crisis, it is often “knowledgeable people [who] self-organize into ad hoc networks to provide problem solving” (Weick & Sutcliffe, 2007, p.78). By allowing “decision-making to migrate in tandem with

problems” (Sutcliffe, 2011, p.140), project teams can build in flexibility “to deal with inevitable uncertainty and imperfect knowledge” (Weick & Sutcliffe, 2007, p.78). Periodic reflection sessions can be used to reflect on collaboration and adjust decision-making processes as needed to achieve the high reliability principle of deference to expertise. Having clarified this, the following section explains the skill set, as well as process of implementation.

5.3.6.2 Pre-identify specialized skills

The need to pre-identify specialized skills within the project organization in order to best respond quickly to unforeseen issues, a regional director for a healthcare technologies company agreed strongly and argued in the Delphi study that it “*is a prerequisite for building the appropriate project management team*”. A CEO also considered this important because “*often, an expert has more data, more examples, and more knowledge of outcomes which need to be “considered and judged”*”. Another CEO agreed adding that “*identify[ing] skills of the team would be an excellent project management resource*”. These comments essentially agree with making certain “people are aware of each other’s unique skills and knowledge and when problems arise take advantage of the unique skills of their colleagues (Sutcliffe, 2011, p.139). This can be especially advantageous on large building projects given that expertise is mostly fragmented (Ramasesh & Browning, 2014, p.193). Given the fragmentation and the fact that different individuals or teams join and leave the project organization at various times throughout the project’s lifecycle, identifying and updating the identification of specialized skills as new members are added to the project is a warranted exercise during the periodic reflection sessions.

5.4 The Process of Implementing Mindful Project Management Framework

The Mindful Project Management framework has five components, based on each the five HRO mindful principles (detailed in the previous section), that can be implemented as a

whole or separately. The literature supports that introducing new processes for managing large hospital building projects should be “adapted and modified in order to suit the organizations’ needs [...and] existent practices” (Fernades et al, 2014, p.93). As a temporary organization, a large hospital building project should consider a staggered implementation based on phase of the project lifecycle. A proposed scenario is presented in the following table:

Table 5.6 Mindful Project Management implementation per project phase

PROJECT PHASE	Program Concept	Schematic Design	Design Development	Bidding	Construction	Start-up Operations / Post Occupancy Evaluation
MINDFUL PROJECT MANAGEMENT	Approve Project Charter Identify training needs and develop program	Implement Project Diary Conduct initial training	Hold initial Reflection session	Conduct training for new project partners Hold Reflection session	Employ Reporting System Hold Periodic Reflection Session(s)	Reflection Session for Lessons Learned
MINDFUL CONCEPT	Create Mindful culture	Open communication and transparency Awareness of high reliability concepts and Mindful Project Management	Reflect on team culture and collaboration	Explore Alternative methods Conduct scenario-based training	Cultivate resourceful response Reflect on identification and resolution of unexpected events	Celebrate Success Develop Post Occupancy Evaluation

In the recommendations presented in Table 5.6, the proposed implementation of the MPM framework begins in the program phase of the project with an approved Project Charter. This is a key first step in order to inspire “a shared vision and commitment to project goals” (Ding et al, 2017, p.552). During the design phase, it is recommended to introduce a Project Diary and conduct initial training, to include an initial reflection session. During the bid/award phase for construction, initial training is conducted for the successful contractors and major suppliers, and scenario-based training is conducted for the entire project team soon after contractor mobilization. Another reflection session also occurs during this timeframe, to include exploring any alternative methods that may have been proposed by bidding contractors. During the actual construction phase, a reporting system is deployed, as well as periodic reflection sessions during the construction phase (typically a multi-year phase for large hospital building

projects). Lastly, a final reflection session is held as part of the post occupancy evaluation process. These recommendations lead to the final Mindful Project Management Framework Conceptual Model, which is presented in the next section.

5.5 Mindful Project Management Framework

The conceptualized MPM Framework serves to apply soft skill techniques designed to increase HRO mindful principles (Weick & Sutcliffe, 2001, 2007, 2015) to enhance managing large hospital building projects (olde Scholtenhuis & Dorée, 2014; Saunders, 2015; Saunders et al, 2016). The MPM Framework favors the considered opinion that “the most productive conceptual frameworks are often those that bring in ideas from outside the traditionally defined field of your study [...] or theories that no one had previously connected” (Maxwell, 2013, p.40). The Mindful Project Management framework, developed based on chapter 1, 2 and 4, is depicted by Figure 5.1, p.120.

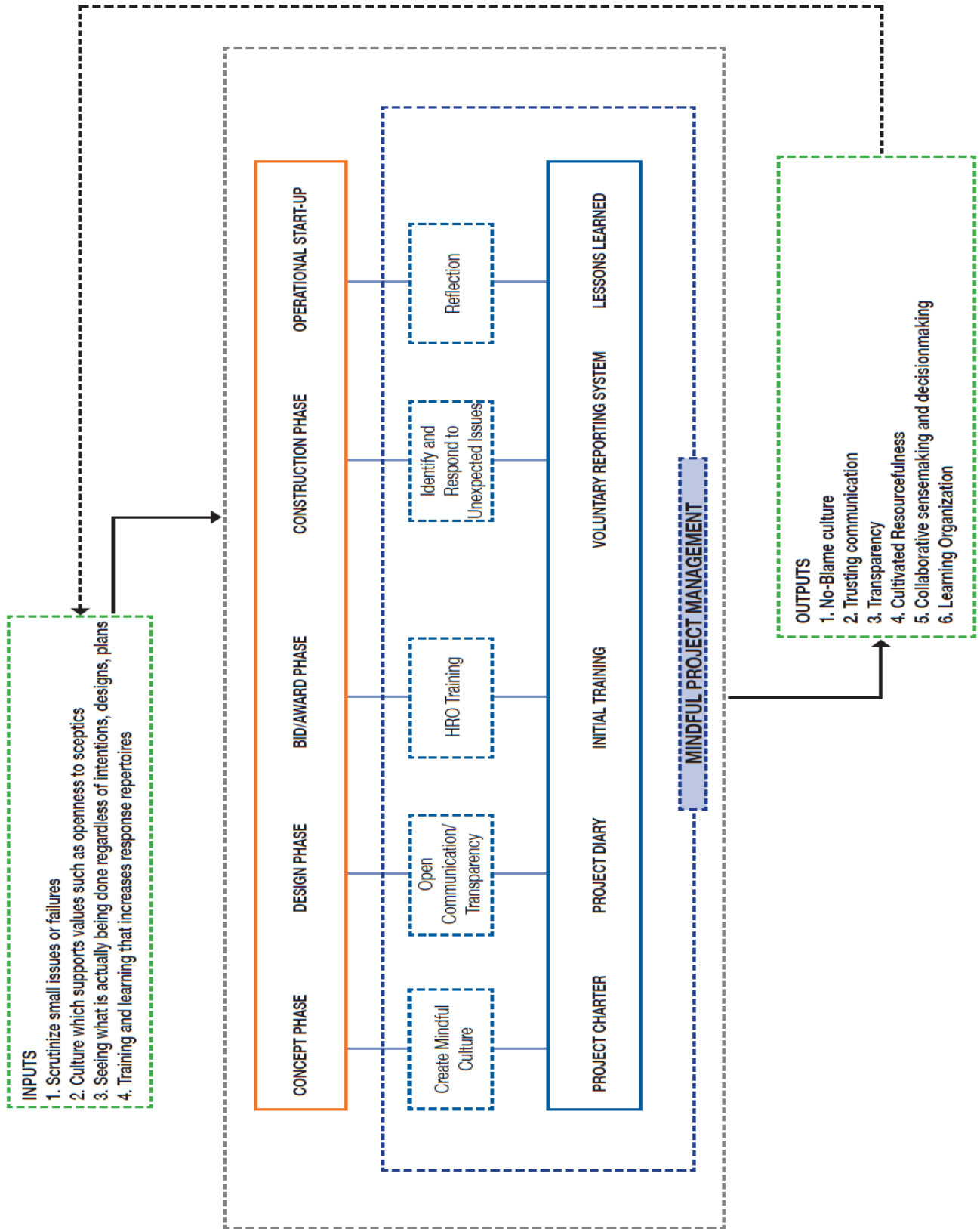


Figure 5.1 The Mindful Project Management Conceptual Model

It is important to note that the MPM Framework does not supplant technical project management tools and techniques, rather serves as a complementary soft skills model to address complexity based on high reliability theory. The inputs associated with the MPM Framework stem from HRO Mindful principles explained by Weick and Sutcliffe (2001, 2007) as means by which HROs consistently and successfully manage the unexpected. To recapitulate, HRO mindfulness is grounded in the western perspective (section 2.5.1, pp.28-30), which combats mindlessness using “a set of principles that describes how organizations can enhance reliability of their performance” (olde Scholtenhuis and Doree, 2013, p.941).

The MPM Framework inputs, based on the five HRO principles of mindfulness (Weick & Sutcliffe, 2001; 2007) were found useful by this study to enhance managing large, complex hospital building projects. The MPM framework provides a suggested course for implementation of the various tools/techniques timed with the major project phases. The outputs are key benefits derived from the MPM Framework on large hospital building projects, which coincide with critical ways HROs act and learn in order to achieve higher reliability than other organizations facing complexity and uncertainty (Weick & Sutcliffe, 2001; 2007; Maitlis & Sonenshein, 2010; Chassin & Loeb, 2013; olde Scholtenhuis & Dorée, 2014; Saunders, 2015; Saunders et al, 2016).

5.6 Summary

This chapter presents a summary of the literature and the findings related to addressing the study’s sub-research questions and the Mindful Project Management framework. This chapter then presented a recommended timing to implement the Mindful Project Management Framework on hospital building projects based upon the project’s phase. Finally, the Mindful Project Management framework is presented. The next chapter serves answers the two main research questions.

Chapter 6: Summary Discussion

6.1 Introduction

This chapter serves to address the study's two main research questions. To recall, the two main research questions were R1) What potential do mindful processes derived from high reliability organization (HRO) practice have to improve managing large hospital building projects? and R2) How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management? A summary of the study's original objectives is presented, followed by a chapter conclusion.

6.2 Summary of Two Main Research Questions

The research concerning large construction projects continues to principally focus on the technical aspects (Wood et al, 2014). There has been, however, recent recognition of the importance of soft skills in managing projects. The literature and findings support that developing soft skills to enhance managing large hospital building projects should be “based on sound, academically rigorous research” (Bredillet, 2010, p.5). High reliability theory is research based, with HRO mindful principles (Weick & Sutcliffe, 2001, 2007, 2015) identified as key attributes to maintain reliability under conditions of complexity and uncertainty. With far too many large hospital projects facing significant schedule and cost overruns (section 2.4, p.25-27), this study's two main research questions served to understand and develop a conceptualized framework based on high reliability concepts to enhance managing large hospital building projects through “activities attractive and meaningful for potential and actual project participants” (Kvalnes, 2016, p.102). The two main research questions are summarized in the next two sections, respectively.

6.2.1 Summary assessment of research question R1 – What potential do mindful processes derived from High Reliability Organizations (HRO) practice have to improve managing large hospital building projects?

The applicability of HRO mindful concepts to managing large construction projects have been studied by previous researchers (e.g., olde Scholtenhuis & Doree, 2014; Saunders, 2015) with the opinion that in taking a pragmatic view, HROs offer important competencies resulting from their approaches that could be relevant to managing projects. While Weick and Sutcliffe's (2001; 2007) first two editions of *Managing the Unexpected* focused on HRO processes, the third edition (2015) focused on foundations, where they emphasized the transferability of HRO mindful principles to other organizations, stating:

“All organizations develop precautions [...] that are set out in norms, regulations, procedures, rules, guidelines, job descriptions, and training materials. And all organizations accumulate unnoticed events that are at odds with accepted beliefs about hazards. These very similarities encourage transfer of the lessons of HROs to other organizations where possible hazards take the forms of threats to assets, careers, reputations, legitimacy, credibility, support, trust, or goodwill” (Weick & Sutcliffe, 2015, p.19).

Research question R1 and its supplementary sub-research questions SR1.1 and SR1.2 achieved consensus, resulting in the learning that noted experts of large hospital building projects, located and working actively in multiple regions of the world including the United States, Europe, and the Middle East, established that HRO mindful principles have potential to improve managing large hospital building projects. Furthermore, this research contributed to new knowledge by way of the thematic analysis of open-ended questions in each section of the Real-Time Delphi Study (section 4.6, pp.93-98). Three insights related to R1 were uncovered, providing new knowledge applicable to practice.

First, the expert panel members found the HRO term “preoccupation with failure” a counterintuitive expression for those managing large hospital-building projects. While they agreed and understood this HRO principle, the term “apprehension to failure” was one suggested term deemed a better fit and understanding with the typical language used in managing large hospital building projects. In other words, they encouraged to label this mindful principle using language that makes sense to the organization. This concern was addressed by Weick, who has advised to use language that people best understand (National Advanced Fire and Resource Institute, 2007).

Second, the expert panel members established that project leadership, in particular the personalities of key project leaders, as well as the Owner’s organizational procedures, are key elements on large hospital building projects related to reluctance to simplify. The noteworthy expert opinion was that in order to be effective on large hospital building projects, the Owner must provide both the processes and leadership necessary to ensure that *“all parties to the project, no matter how small the role, should be integrated and included in communication and should be valued as members of the team”*.

Third, the expert panel members determined that a key element of open communication and information sharing to support the HRO principle of sensitivity of operations is to establish it early in the project. Furthermore, the Owner must establish a trusting atmosphere. This insight resulted in the recommendation within the MPM Framework that the Project Charter (build trust) and Project Diary (open communication) be implemented early in the project (figure 5.1, p.120).

The research findings provided specific context in terms of language, key processes and timing of implementation towards successfully adapting HRO mindful principles in the form of the MPM Framework. The achieved consensus of global experts of large hospital building project experts of R1 concerning the potential of HRO principles to improve managing large hospital building projects gave merit in determining if experts of large hospital building projects

also found useful the conceptualized MPM framework, which was the basis of research question R2.

6.2.2 Summary assessment of research question R2 – How useful do practitioners involved with large hospital building projects find a conceptualized framework of Mindful Project Management?

The conceptualized MPM Framework was found useful by a global expert panel to enhance managing large hospital building projects as shown by research question R2 and its associated sub-research questions SR2.1 through SR2.5 all achieving consensus. Furthermore, this research contributed to new learnings by way of the thematic analysis of open-ended questions in each section of the Real-Time Delphi Study (section 4.6, pp.93-98). Three insights related to R2 were discovered, resulting in new knowledge for practice.

First, the expert panel members provided several recommendations to ensure the practicality of preoccupation with failure in practice. This includes the Owner providing *“formal teamwork training for improving team behaviours, reducing errors, and improving staff attitudes”*. This was deemed by the experts as crucial in large hospital building projects as project leaders must be *“well versed with soft skills”* related to managing people and all team members must feel they can *“speak up, without fear of retribution”*.

Second, the expert panel members identified commitment to resilience particularly important to the overall usefulness of the MPM Framework, determining it to be *“essential to successful project management especially in healthcare renovation projects”* and a *“major reason why some project teams succeed in highly stressed environments”*. This finding aligns with an increased focus of commitment to resilience outside of HRO, including engineering and ecology (Bhamra et al, 2011).

Third, the research found a positive correlation between mindful project management and deference to expertise (figure 4.11, p.88), indicating that those with a positive perception of deference to expertise would be more likely to consider the MPM Framework on future projects.

The expert panel members identified that successful implementation of deference to expertise must include *“less reliance on hierarchical structures and more openness and access to expertise from members ranked lower on the org structure”*. Often, deference on large hospital building projects is based on project hierarchy, with the architects, engineers and primary contractor viewed as the experts. Deferring to those closest to the problem when applicable allows the project team to capture details that those higher in the hierarchy are not aware or missed. This supports another study’s suggested opportunity for HRO principles to improve managing construction projects being to “enhance workers’ understanding of the “big picture” to build relationships between subcontractors and prevent silo working” (Harvey et al, 2016, p.9).

Hence, the research provided affirmation through the achieved consensus of global experts of large hospital building project experts of the demonstrated usefulness of the MPM Framework to enhance managing large hospital building projects. The research found that teamwork training and a commitment to resilience were particularly important components of the mindful project management. Notably, the research’s identification of a positive correlation between deference to expertise and mindful project management provides a means to inquire about an organization or project teams’ willingness to utilize mindful project management tools, including the MPM Framework.

6.3 Summary of Original Objectives

As presented in the Introductory Chapter, this study originated from the belief that large hospital building projects are complex and that “one significant way that project management can benefit from embracing uncertainty is making activities attractive and meaningful for potential and actual project participants” (Kvalnes, 2016, p.102). In Chapter 2, the literature summarized three bodies of knowledge: project management and theory, large hospital building projects, and high reliability theory and organizations. Concepts from project management theory, including viewing projects as temporary organizations (Ding et al, 2017; Turner, 2014) and using a

Behavioural School lens (Söderlund, 2011) best allowed for the pragmatic research view identified as best suited to answer the research questions. Additionally, the research used a pragmatic lens regarding high reliability theory, building on previous studies of high reliability and construction projects (olde Scholtenhuis & Doree, 2013; Saunders, 2015, Harvey et al, 2016). Furthermore, parallels between project management and HRO theory was apparent in the literature and deemed worthwhile to attempt exploiting to enhance managing large hospital building projects. This study confirmed that industry experts agree with that assertion. Large hospital building projects were selected, in part, as healthcare organizations have broadly embraced high reliability principles in practice and research, which may have contributed to this finding.

The research suggests that applying high reliability methods derived from HRO mindful principles (Weick & Sutcliffe, 2001, 2007, and 2015) in the form of the Mindful Project Management Framework provides large hospital building project teams and members the soft skills necessary to enhance managing these complex projects. A mixed methods design using an action research approach with a preliminary pilot study as part of the action research iterative process and a Real-Time Delphi Study consisting of expert panel members from the United States, Europe and the Middle East revealed that high reliability mindful principles are considered useful in the form of the conceptualized MPM Framework. Based on the literature and findings, the MPM Framework was linked to the typical phases associated with large hospital building project (table 5.6, p.118), providing Owners the roadmap for implementation.

In summary, this research found the MPM Framework useful as a methodology to incorporate high reliability principles as soft skills to supplement technical project management skills to enhance managing large hospital building projects. Furthermore, the research highlighted key insights based on the considered contributions of the large hospital building project experts that were deemed essential to best ensure successful implementation and utilization of the framework.

6.4 Summary

This chapter presented the final Mindful Project Management Framework conceptual model developed directly from Chapters 1, 2, 4 and 5. A summary was provided of the findings related to the two main research questions followed by a summary of how the research met its original objectives. The next (and final) chapter (Chapter 7) provides this research's claimed contribution to practice, limitations and recommended future research, and captures a reflection of my journey as a Doctor of Business Administration (DBA) practitioner-researcher.

Chapter 7: Contributions and Reflection

7.1 Introduction

This final chapter provides the claimed contribution and new knowledge for practice resulting from research, limitations of this study, and recommended future research. The chapter concludes with a personal reflection.

7.2 Contributions

The overall aim of this research was to enhance managing large hospital building projects through soft skills adapted from the high reliability principle of mindfulness (Weick & Sutcliffe, 2001, 2007, 2015; olde Scholtenhuis & Dorée, 2013, 2014; Harvey et al, 2016; Saunders et al, 2016; Winter & Smith, 2006) in the form of a conceptualized model coined by this researcher as the Mindful Project Management (MPM) Framework. This research claims a contribution to practice and new knowledge by adapting HRO mindful practices, rooted in the western-based philosophy of mindfulness, as enhanced soft skills to improve the underperformance of managing large, complex hospital build projects.

7.2.1 Contribution to Practice

It was established in literature that new models are required to better manage large hospital building projects given the global and local importance of the projects, their increasing complexity, and the poor performance of far too many regardless of country or location. This research identified high reliability concepts as useful regardless of location to enhance managing large hospital building projects through tools and techniques based on soft skills adapted from HRO mindful principles (Weick & Sutcliffe, 2001, 2007, and 2015). Furthermore, this research provided theory-in-practice value in the form of a framework for practitioners to

implement soft skills derived from high reliability principles, concepts and practices to enhance managing large hospital building projects. The framework serves as a pragmatic tool with recommended implementation of its various tools and techniques tied to the phase of the project. Finally, and most importantly, the analysis provided of the qualitative comments offered by the expert panel members in the Real-Time Delphi study contributed to practice through meaningful insight and key understandings of how high reliability principles and the Mindful Project Management Framework can be used and implemented to enhance managing large hospital building projects.

7.2.2 Contribution to Knowledge

While project management research continues to focus primarily on technical aspects, there is an increasing call to examine complexity (Winter et al, 2006), human relationships (Pollack, 2007) and soft skill competency (Gillard, 2009; Pasian, 2015). This study is a response to that call, and specifically extends the limited research and knowledge of using high reliability theory and concepts to improve managing of construction projects (olde Scholtenhuis & Doree, 2013; Saunders, 2015; Harvey et al, 2016). A methodological contribution to knowledge is claimed by demonstrating how a pragmatic action research approach, incorporating responses of expert panel members in a pilot study followed by iterative responses from a Real-Time Delphi, with mixed methodology analysis, provides for a deep understanding of the research topic and findings.

7.3 Limitations and Recommendations

This research was not designed or intended to be the final word on the applicability of high reliability principles to enhance managing large hospital building projects, rather offers results that suggest the applicability and usefulness of doing so. The following limitations/ recommendations are offered:

- While a Delphi study is considered an appropriate for developing frameworks (Okoli & Pawlowski, 2004), and the research evidence offers a feasible framework that can be utilized to enhance managing large hospital building projects, an empirical examination through case studies is recommended as next steps. While confident in the validity and reliability of the research findings, the MPM Framework can be further established and refined through observed corroboration.
- This research exclusively focused on large hospital building projects. Based on the literature review, it seems appropriate to extend the findings to non-healthcare building projects, as well as research into the applicability of high reliability concepts to projects other than construction.

7.4 Reflection

The University of Liverpool Doctor of Business Administration (DBA) degree program, including the DBA thesis, allowed this researcher to combine academic and professional interests. As described in the Introduction (section 1.5, pp.9-10) the researcher has 20+ years healthcare large building project experience, with a long-held opinion that managing large, complex hospital building projects could be enhanced if project teams were provided with advanced soft skills training beyond the typical technical (hard) skills training normally obtained. Furthermore, working in healthcare, the researcher had exposure of high reliability theory and practice, and learned of organizational sense making (Weick, 1988) in one module of the DBA program. The thesis provided an opportunity to combine these professional and educational interests while simultaneously beginning to establish expertise in the limited research field concerning the use of high reliability concepts in managing construction projects.

The research has provided me an opportunity to develop as a practitioner-researcher. In using an action research design, it allowed a more pragmatic approach than conventional research criteria by empowering noted global experts in the field to reiterate through a Real-

Time Delphi survey to reach consensus through their own understanding while providing qualitative statements for issues or statements they deemed important. This was important, as “action research is a systematic approach to investigation that enables people to find effective solutions to problems they confront in their everyday lives” (Stringer, 2014, p.1). The mixed methods design provided the opportunity to utilize quantitative and qualitative research analysis tools, further developing research skills needed as a practitioner-researcher.

The researcher’s future goals as a DBA practitioner-researcher is two-fold. First, to promote and continue research of high reliability and project management. The researcher has spoken on the subject at professional conferences in the United States, Qatar and United Arab Emirates, and had numerous inquiries and comments after this research was mentioned in an online magazine profile of the researcher (HealthSpaces, 2018). The researcher has developed a website (<http://www.mpmglobal.com>) and started a podcast to promote the research and MPM Framework. Currently a Vice President of Facilities at a major academic healthcare system in the United States, the researcher has been able to apply MPM concepts in a \$66 million new construction project to great effect. This researcher plans to serve as an educator to project management professionals on the limitations of technical project management skills to manage complexity associated with modern projects.

7.5 Summary

This researcher is undoubtedly different personally, professionally and academically having gone through the DBA program. It has provided insight into theory and practice, strengthening leadership and managerial competencies while providing a solid foundation for practice-related research and teaching.

References

- Ahern, T., Leavy, B. and Byrne, P. J. (2014) 'Complex project management as complex problem solving: A distributed knowledge management perspective', *International Journal of Project Management*, 32 (8), pp.1371-1381.
- Armony, M., Israelit, S., Mandelbaum, A., Marmor, Y.N., Tseytlin, Y., Yom-Tov, G.B. (2015) 'On Patient Flow in Hospitals: A Data-Based Queueing-Science Perspective', *Stochastic Systems*, 5 (1), pp.146-194.
- Asvadurov, S., Brinded, T., Ellis, M. (2018). 'From pyramids to pipelines: the importance of soft leadership skills', *McKinsey & Company Leadership & Organization Blog*, [Online] Available from: <https://www.mckinsey.com/business-functions/organization/our-insights/the-organization-blog/from-pyramids-to-pipelines-the-importance-of-soft-leadership-skills> (Accessed: 1 Aug 2018).
- Avella, J.R. (2016) 'Delphi panels: Research design, procedures, advantages, and challenges', *International Journal of Doctoral Studies*, 11, pp.305-321.
- Ayoko, O.B., Ashkanasy, N.M. and Jehn, K.A. (eds.) (2014) *Handbook of Conflict Management Research*. Cheltenham, UK: Edward Elger.
- Baccarini, D. (1996) 'The concept of project complexity—a review', *International Journal of Project Management*, 14 (4), pp.201-204.
- Bagnara, S., Parlangei, O. and Tartaglia, R. (2010) 'Are hospitals becoming high reliability organizations?' *Applied Ergonomics*, 41 (5), pp.713-718.
- Ballard, G. and Koskela, L. (2011) 'A response to critics of lean construction', *Lean Construction 2011*.
- Baptista, A., Santos, F., Páscoa, J. and Sändig, N. (2016) 'Project Management Methodologies as Main Tool for Current Challenges in Global Economy Driving Historical Changes', *Journal of Advanced Management Science*, 4 (2), pp.146-151.
- Barlow, J. and Köberle-Gaiser, M. (2009) 'Delivering innovation in hospital construction: contracts and collaboration in the UK's private finance initiative hospitals program', *California Management Review*, 51 (2), pp.126-143.
- Bertelsen, S. (2003) 'Construction as a complex system', In Proceedings: *International Group for Lean Construction, 11th Annual Conference*, Blacksburg, VA.
- Bhamra, R., Dani, S. and Burnard, K. (2011) 'Resilience: the concept, a literature review and future directions', *International Journal of Production Research*, (49) 18, pp.5375-5393.

- Blatt, R., Christianson, M. K., Sutcliffe, K. M. and Rosenthal, M. M. (2006) 'A Sense making Lens on Reliability', *Journal of Organizational Behaviour*, 27 (7), pp.897-917.
- Bourne, L. and Walker, D.H.T. (2004) 'Advancing project management in learning organizations', *The Learning Organization*, 11 (3), pp.226-243.
- Bourrier, M. (2011) 'The legacy of the High Reliability Organization Project', *Journal of Contingencies and Crisis Management*, 19 (1), pp.9-13.
- Brady, T. and Davies, A. (2010) 'From hero to hubris – Reconsidering the project management of Heathrow's Terminal 5', *International Journal of Project Management*, 28 (2), pp.151-157.
- Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3, pp. 77-101.
- Bredillet, C. N. (2010) 'Blowing hot and cold on project management', *Project Management Journal*, 41 (3), pp.4-20.
- Brown, A. and Adams, J. (2000) 'Measuring the effect of project management on construction outputs: a new approach', *International Journal of Project Management*, 18 (5), pp.327-335.
- Browning, T.R. and Ramasesh, R.V. (2015) 'Reducing unwelcome surprises in project management', *MIT Sloan Management Review*, 56 (3), pp.53-62.
- Calibrium (2015). *Real-time Delphi study portal*, [Online] Available from: <http://www.calibrium.com> (Accessed: 12 May 2015).
- Carmody, J. (2014) 'Chapter 3: Eastern and Western Approaches to Mindfulness: Similarities, Differences, and Clinical Implications', *The Wiley Blackwell Handbook of Mindfulness* (eds. Le, A., Ngnoumen, C.T., and Langer, E.J.), pp.48-57.
- Carr, W. and Kemmis, S. (1986) *Becoming Critical. Education, knowledge and action research*. Lewes: Falmer.
- Caruth, G. (2013) 'Demystifying Mixed Methods Research Design: A Review of the Literature', *Mevlana International Journal of Education*, 3 (2), pp.112-122.
- Cavanagh, M. (2012) *Second order project management*. Burlington, VT: Gower.
- Chassin, M.R. and Loeb, J.M. (2011) 'The ongoing quality improvement journey: next stop, high reliability', *Health Affairs*, 30 (4), pp.559-568.
- Chassin, M.R. and Loeb, J.M. (2013) 'High-reliability health care: Getting there from here', *Milbank Quarterly*, 91(3), pp.459-490.

- Chiocchio, F., Rabbat, F., and Lebel, P. (2015) 'Multi-level Efficacy Evidence of a Combined Interprofessional Collaboration and Project Management Training Program for Healthcare Project Teams', *Project Management Journal*, 46 (4), pp.20-34.
- Chung, A.P., Gaynor, M., Richards-Shubik, S. (2017) 'Subsidies and Structure: The Lasting Impact of the Hill-Burton Program on the Hospital Industry', *The Review of Economics and Statistics*, 99 (5), pp.926-943
- Cicmil, S. and Hodgson, D. (2006) 'New Possibilities for Project Management Theory: a Critical Engagement', *Project Management Journal*, 37 (3), pp.111-122.
- Cicmil, S., D., Lindgren, M. and Packendorff, J. (2009) 'Project management behind the façade', *Ephemera: Theory & Politics in Organization*, 9 (2), pp.78-92.
- CIOB (2011) *Guide to good practice in the management of time in complex projects*. Chichester: Blackwell.
- Cleland, D.I. and Ireland, L.R. (2006) *Project Management: Strategic decisions and implementation*. New York, NY: McGraw-Hill.
- Coffey, G. (2009) *A Systems Approach to Leadership: How to Create Sustained High Performance in a Complex and Uncertain Environment*. Heidelberg: Springer.
- Coghlan, D. and Brannick, T. (2010) *Doing Action Research In Your Own Organization 3rd ed.*. London: SAGE Publications.
- Cooke-Davies, T., Cicmil, S., Crawford, L. and Richardson, K. (2007) 'We're not in Kansas anymore, Toto: Mapping the strange landscape of complexity theory, and its relationship to project management', *Project Management Journal*, 38 (2), pp.50-61.
- Coombs, C. (2015) 'When planned IS/IT project benefits are not realized: A study of inhibitors and facilitators to benefits realization', *International Journal of Project Management*, 33 (2), pp.363-379.
- Creswell, J. W. (2007) *Qualitative inquiry and research design: Choosing among five approaches (2nd ed.)*, London: SAGE Publications.
- Creswell, J. W. (2014) *Research design: qualitative, quantitative, and mixed methods approaches (4th ed.)*, Los Angeles, CA: SAGE Publications.
- Dalcher, D. and Söderlund, J. (2012) 'The nature of project management: A reflection on The Anatomy of Major Projects by Morris and Hough', *International Journal of Managing Projects in Business*, 5 (4), pp.643-660.

- Davidson, P. L. (2013) 'The Delphi Technique in Doctoral Research: Considerations and Rationale', *Review of Higher Education & Self-Learning*, 6 (22), pp.53-65.
- Davidson Frame, J. (2016) 'Philosophy of Project Management: Lessons From the Philosophy of Science', *Project Management Journal*, 47 (3), pp.35-47.
- Dehe, B. (2014) 'An Empirical Investigation into the Decision-Making Processes of New Infrastructure Development', Doctor of Philosophy, University of Huddersfield, Huddersfield, UK.
- Dehe, B. and Bamford, D. (2015) 'Development, test and comparison of two Multiple Criteria Decision Analysis (MCDA) models: A case of healthcare infrastructure location', *Expert Systems with Applications*, 42 (19), pp.6717-6727.
- Dehe, B. and Bamford, D. (2017) 'Quality Function Deployment and operational design decisions – a healthcare infrastructure development case study', *Production Planning & Control*, 28 (104), pp.1177-1192.
- De Meyer, A., Loch, C.H. and Pich, M.T. (2002) 'Managing project uncertainty: from variation to chaos', *MIT Sloan Management Review*, 43(2), pp.60-67.
- Ding, X., Li, Q., Zhang, H., Sheng, Z. and Wang, Z. (2017) 'Linking transformational leadership and work outcomes in temporary organizations: A social identity approach', *International Journal of Project Management*, 35, pp.543-556.
- Dixon, N.M. and Shofer, M. (2006) 'Struggling to invent high-reliability organizations in health care settings: Insights from the field', *Health Services Research*, 41 (4p2), pp.1618-1632.
- Djikic, M. (2014) 'Chapter 7: Art of Mindfulness: Integrating Eastern and Western', *The Wiley Blackwell Handbook of Mindfulness* (eds. Ie, A., Ngnoumen, C.T, and Langer, E.J.), pp.139-148.
- Doloi, H. (2013) 'Cost Overruns and Failure in Project Management: Understanding the Roles of Key Stakeholders in Construction Projects', *Journal of Construction Engineering & Management*, 139 (3), pp.267-279.
- Duffield, S. and Whitty, S. J., (2015) 'Developing a systemic lessons learned knowledge model for organizational learning through projects', *International Journal of Project Management*, 33 (2), pp.311-324.
- Easterby-Smith, M., Thorpe, R. and Jackson, P. (2008) *Management Research (3rd ed.)*, London: Sage.
- Eden, C. and Spender, J.C. (eds.) (1998). *Managerial and organizational cognition: theory, methods and research*. London: Sage.

- Egginton, B. (2012) 'Realizing the benefits of investment in project management training: evidence supporting the need for a more strategic approach', *International journal of managing projects in business*, 5 (3), pp.508-527.
- Fanelli, S., Lanza, G. and Zangrandi, A. (2017) 'Management Tools for Quality Performance Improvement in Italian Hospitals', *International Journal of Public Administration*, 40 (10), pp.808-819.
- Feinberg, C. (2010) 'The Mindfulness Chronicles: Pioneering social psychologist Ellen Langer on becoming your own placebo', *Harvard Magazine*, 113 (1), pp.42-45.
- Fellows, R. and Liu, A. (2013) 'Variability and delusions of precision', *Engineering Project Organization Journal*, 3 (3), pp.128-140.
- Fereday, J. and Muir-Cochrane, E. (2006) 'Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development', *International journal of qualitative methods*, 5 (1), pp.80-92.
- Fernandes, G. Ward, S. and Araújo, M. (2014) 'Developing a Framework for Embedding Useful Project Management Improvement Initiatives in Organizations', *Project Management Journal*, 45 (4), pp.81-108.
- Fisher, E. (2011) 'What practitioners consider to be the skills and behaviours of an effective people project manager', *International Journal of Project Management*, 29 (8), pp.994-1002.
- Fletcher, A.J. and Marchildon, G.P. (2014) 'Using the Delphi Method for Qualitative, Participatory Action Research in Health Leadership', *International Journal of Qualitative Methods*, 13 (1), pp.1-18.
- Fletcher, A.J. and Marchildon, G.P. (2018) 'Reflection/Commentary on a Past Article: "Using the Delphi Method for Qualitative, Participatory Action Research in Health Leadership"', *International Journal of Qualitative Methods*, 17, pp.1-3.
- Fullman, N., Yearwood, J., Abay, S.M., Abbafati, C., Abd-Allah, F., Abdela, J., Abdelalim, A., Abebe, Z., Abebo, T.A., Aboyans, V. and Abraha, H.N. (2018) 'Measuring performance on the Healthcare Access and Quality Index for 195 countries and territories and selected subnational locations: a systematic analysis from the Global Burden of Disease Study 2016', *The Lancet*, 391(10136), pp.2236-2271.
- Geraldi, J. G., Turner, R.J., Maylor, H., Söderholm, A., Hobday, M. and Brady, T. (2008) 'Innovation in project management: Voices of researchers', *International Journal of Project Management*, 26 (5), pp.586-589.
- Gilliard, S. (2009) 'Soft skills and technical expertise of project managers', *Issues in Informing Science and Information Technology*, 6, pp.723-729.

- Gnatzy, T., Warth, J., von der Gracht, H., and Darkow, I-L. (2011) 'Validating an innovative real-time Delphi approach - A methodological comparison between real-time and conventional Delphi studies', *Technological Forecasting and Social Change*, 78 (9), pp.1681-1694.
- Goodman, R.A and Goodman, L.P. (1976) 'Some management issues in temporary systems: A study of professional development and manpower – The theater case', *Administrative Science Quarterly*, pp.494-501.
- Griseri, P. (2002) *Management Knowledge: A critical review*. London: Palgrave.
- Gupta, U. G. and Clarke, R. E. (1996) 'Theory and applications of the Delphi technique: A bibliography (1975–1994)', *Technological forecasting and social change*, 53 (2), pp.185-211.
- Gustavsson, T.K. and Hallin, A. (2014) 'Rethinking dichotomization: A critical perspective on the use of “hard and “soft” in project management research', *International Journal of Project Management*, 32 (4), pp.568-577.
- Haigh, E. A. P., Moore, M. and Kashdan, T. (2011) 'Examination of the Factor Structure and Concurrent Validity of the Langer Mindfulness/Mindlessness Scale', *Assessment*, 18 (1), pp.11-26.
- Hall, J.N. (2013) 'Pragmatism, evidence, and mixed methods evaluation', *New Directions for Evaluation*, 138, pp.15-26.
- Hartmann, A. and Dorée, A. (2015) 'Learning between projects: More than sending messages in bottles', *International Journal of Project Management*, 33 (2), pp.341-351.
- Harvey, E.J., Waterson, P. and Dainty, A.R.J. (2016) 'Applying HRO and resilience engineering to construction: Barriers and opportunities', *Safety Science*, pp. 1-11.
- Harvey, E.J., Waterson, P. and Dainty, A.R.J. (2018) 'Beyond ConCA: Rethinking causality and construction accidents', *Applied Ergonomics*, 73, pp.108-121.
- Hasson, F. and Keeney, S. (2011), 'Enhancing rigour in the Delphi technique research', *Technological Forecasting & Social Change*, 78 (9), pp.1695-1704.
- HealthSpaces (2018). *Leadership Series: Bob Feldbauer, UC Health*, [Online] Available from: https://info.healthspaceevent.com/blog/leadership-series-bob-feldbauer-uc-health?utm_medium=social&utm_source=linkedin (Accessed: 20 September 2018).
- Henrich, G. and Koskela, L. (2006) 'Evolution of Production Methods in Construction' [Online]. Available from: <http://laurikoskela.com/wpcontent/uploads/downloads/2012/09/EvolutionofPMMethods.pdf>. (Accessed: 14 July 2015).

- Hewitt, T. A. and Chreim, S. (2015) 'Fix and forget or fix and report: a qualitative study of tensions at the front line of incident reporting', *BMJ Quality & Safety*, 24 (5), pp.303-310.
- Hines S., Luna, K. and Lofthus J. (2008) 'Becoming a High Reliability Organization: Operational Advice for Hospital Leaders', *AHRQ*, Publication No. 08-0022.
- Hodgson, D. and Cicmil, S. (2006) *Making Projects Critical*, New York, NY: Palgrave MacMillan.
- Hodgson, D.E. and Paton, S. (2016) 'Understanding the professional project manager: Cosmopolitans, locals and identity work', *International Journal of Project Management*, 34 (2), pp.352-364.
- Holden, M. T. and Lynch, P. (2004) 'Choosing the Appropriate Methodology: Understanding Research Philosophy', *The Marketing Review*, 4 (4), pp.397-409.
- Hoppszallern, S. and Vesely, R. (2015) '2015 Hospital Construction Survey', *Healthcare Facilities Management* [Online]. Available from: https://www.hfmmagazine.com/articles/1474-hospital-construction-survey-results-are-in?dcrPath=%2Ftemplatedata%2FHF_Common%2FNewsArticle%2Fdata%2FHFM%2FMagazine%2F2015%2FFeb%2Fhfm-hospital-construction-survey (Accessed: 3 August 2018).
- Hsu, C. and Sandford, B.A. (2007) 'The Delphi technique: Making sense of consensus', *Practical Assessment, Research & Evaluation*, 12 (10), pp.1-9.
- Ivory, C. and Alderman, N. (2005) 'Can Project Management Learn Anything from Studies of Failure in Complex Systems?' *Project Management Journal*, 36 (3), pp.5-16.
- Ivory, C., Alderman, N., McLoughlin, I. and Vaughan, R. (2006) 'Sense-making as a process within complex projects', *Making projects critical*, pp.316-334.
- Jacquette, D. (2002) *Ontology*. New York, NY: Routledge.
- JCI (2016). *JCI-Accredited Organizations* [Online]. Available from: <http://www.jointcommissioninternational.org/about-jci/jci-accredited-organizations/>. (Accessed: 15 April 2016).
- Johnson, P. and Duberley, J. (2000) *Understanding Management Research*, London: Sage.
- Keeney, S., Hasson, F. and McKenna, H.P. (2011) 'Conducting the research using the Delphi technique', *The Delphi Technique in Nursing and Health Research*, pp.69-83.

- Kennedy H.P. (2004) 'Enhancing Delphi research: methods and results', *Journal for Advanced Nursing*, 45 (5), pp.504-511.
- Khalili-Damghani, K. and Tavana, M. (2014) 'A Comprehensive Framework for Sustainable Project Portfolio Selection Based on Structural Equation Modeling', *Project Management Journal*, 45 (2), pp.83-97.
- Kohn, L.T., Corrigan, J.M. and Donaldson, M.S. (eds.) (2000) *To err is human: Building a Safer Health System* (Vol. 6). National Academies Press.
- Koskela, L.J. (2003) 'Is structural change the primary solution to the problem of construction?' *Building Research & Information*, 31 (4), pp.85-96.
- Koskela, L.J. and Howell, G. (2002) 'The Underlying Theoru of Project Management is Obsolete', In *Proceedings of the PMI Research Conference* (pp.293-302). PMI.
- Kramer, E-H (2007) *Organizing Doubt: Grounded Theory, Army Units and Dealing with Dynamic Complexity*. Slovenia: Ola Hakansson.
- Kvalnes, O. (2016) 'Living with the Unknown Unknown: Uncertainty in Projects', *Project Management Journal*, 47 (3), pp.101-108.
- Kwofie, T.E., Botchway, E.A. and Amos-Abanyie, S. (2018) 'Examining the Performance Level of Project Management Competencies of Architects in Ghana Using Gap Analysis Approach', *Journal of Construction in Developing Countries*, 23 (1), pp.125-147.
- Landeta, J. (2006) 'Current validity of the Delphi method in social sciences', *Technological Forecasting and Social Change*, 73 (5), pp.467-482.
- Langer, E.J. (1997) *The power of mindful learning*. Boston, MA: Addison-Wesley.
- Langer, E.J. (2014) *Mindfulness*. Boston, MA: Da Capo Press.
- Langer, E.J. and Moldoveanu, M. (2000) 'Mindfulness Research and the Future', *Journal of Social Issues*, 56 (1), pp.129-139.
- Lee, N. and Lings, I. (2008) *Doing business research: a guide to theory and practice*. Los Angeles, CA: SAGE.
- Lekka, C. (2011) 'High reliability organisations: A review of the literature', *Health and Safety Executive United Kingdom*.
- Leybourne, S. and Sadler-Smith, E. (2006) 'The role of intuition and improvisation in project management', *International Journal of Project Management*, 24 (6), pp.483-492.

- Liker, J.K., and Convis, G.L. (2012) *The Toyota Way to Lean Leadership*. New York, NY: McGraw-Hill.
- Lincoln, Y.S. and Guba, E.G. (1985) *Naturalistic Inquiry*. Newbury Park, CA: Sage Publications.
- Linstone, H. A. and Turoff, M. (1975) *The Delphi method: techniques and applications*. Reading, MA: Addison-Wesley.
- Linstone, H.A. and Turoff, M. (eds.) (2002) *The Delphi Method: Techniques and Applications*. Reading, MA: Addison Wesley Publishing.
- Llewellyn, T. (2015) *Performance Coaching for Complex Projects: Influencing Behaviour and Enabling Change*. Farnham, England: Gower Publishing.
- Loch, C.H., De Meyer, A. and Pich, M.T. (2006) *Managing the Unknown*, New York, NY: Wiley.
- Maitlis, S. and Sonenshein, S. (2010) 'Sense making in crisis and change: Inspiration and insights from Weick (1988)', *Journal of Management Studies*, 47 (3), pp.551-580.
- Maxwell, J.A. (2013) *Qualitative research design: An interactive approach*. Thousand Oaks, CA: SAGE Publications.
- McDaniel, R. R., Jordan, M. E. and Fleeman, B. F. (2003) 'Surprise, surprise, surprise! A complexity science view of the unexpected', *Health Care Management Review*, 28 (3), pp.266-278.
- McKay, J., Bowie, P., Murray, L. and Lough, M. (2004) 'Attitudes to the identification and reporting of significant events in general practice', *Clinical Governance: An International Journal*, 9 (2), pp.96-100.
- Miles, M. and Huberman, A. (1994) *Qualitative data analysis: An expanded sourcebook*. Beverly Hills, CA: SAGE Publications.
- Milton N. (2005) *Knowledge Management: For Teams and Projects*. Oxford: Chandos Publishing.
- Mintzberg, H. (2013) *Simply Managing: What managers do – and can do better*. San Francisco, CA: Berrett-Koehler Publishers.
- Morin, E. (1999) *Seven Complex Lessons in Education for the Future*. Paris: UNESCO.
- Moore, Z.E. (2015) 'Addressing assumptions and clarifying conclusions in "assumptions and conclusions: Fundamental distinctions between tibetan buddhist and western approaches to happiness"'. *Journal of Rational - Emotive & Cognitive - Behavior Therapy*, 33 (4), pp.368-373.

- Morris, P.W.G. (1994) *The Management of Projects*. London: Thomas Telford Publishing.
- Morris, P.W.G. (2004) 'The Validity of Knowledge in Project Management and the Challenge of Learning and Competency Development'. In: Morris, PWG and Pinto, JK, (eds.) *The Wiley Guide to Managing Projects*. (pp. 1137-1149). Hoboken, NJ: Wiley.
- Morris, P.W.G. (2013) *Reconstructing Project Management*. Hoboken, NJ: John Wiley & Sons.
- Morris, P.W.G., Jamieson, A. and Shepherd, M.M. (2006) 'Research updating the APM Body of Knowledge 4th edition', *International Journal of Project Management*, 24 (6), pp.461-473.
- Morris, P. W. G., Pinto, J. K. and Sonderlund, J. (2010) *The Oxford Handbook of Project Management*. Oxford: Oxford University Press.
- Murphy, M.K., Black, N.A., Lamping, D.L., McKee, C.M., Sanderson, C.F., Askham, J. and Marteau, T. (1998) 'Consensus development methods, and their use in clinical guideline development'. *Health technology assessment*, 2 (3), p.i.
- National Advanced Fire and Resource Institute (2007) *High Reliability Organizing* [Online Video]. Available from: <https://www.youtube.com/watch?v=9IM6wxS8fDM> [Accessed: 2 June 2015].
- Ochieng, E. G., Price, A. D. F. and Ruan, X. (2013) 'The effect of cross-cultural uncertainty and complexity within multicultural construction teams', *Engineering, Construction and Architectural Management*, 20 (3), pp.307-324.
- O'Dwyer, L.M. and Bernauer, J.A. (2014) *Quantitative Research for the Qualitative Researcher*. Thousand Oaks, CA: Sage Publications.
- Okoli, C. and Pawlowski, S. D. (2004) 'The Delphi method as a research tool: an example, design considerations and applications', *Information & Management*, 42 (1), pp.15-29.
- olde Scholtenhuis, L.L. and Dorée, A. G. (2013) 'Welcoming high reliability organizing in construction management', In: Smith, S.D. and Ahiaga-Dagbui, D.D. (Eds), *Proceedings 29th Annual ARCOM conference*, Reading, UK, Association of Researchers in Construction Management, pp.939-948.
- olde Scholtenhuis, L. L. and Dorée, A. G. (2014) 'High reliability organizing at the boundary of the CM domain', *Construction Management and Economics*, 32 (7-8), pp.658-664.
- Olendzki, J. (2014) 'Chapter 4: From Early Buddhist Traditions to Western Psychological Science', *The Wiley Blackwell Handbook of Mindfulness* (eds. Ie, A., Ngnoumen, C.T, and Langer, E.J.), pp.58-73.
- Ogrysko, N. (2018) 'Construction on VA's biggest failure almost done, but with some exceptions', *Federal News Network* [Online]. Available from:

<https://federalnewsnetwork.com/veterans-affairs/2018/01/construction-on-vas-biggest-failure-is-almost-done-but-with-some-exceptions/> (Accessed: 3 September 2018).

- Pasian, B. (ed.) (2015) *Designs, Methods and Practices for Research of Project Management*. Burlington, VT: Gower Publishing.
- Pauget, B. and Wald, A. (2013) 'Relational competence in complex temporary organizations: The case of a French hospital construction project network', *International Journal of Project Management*, 31 (2), pp.200-211.
- Perrow, C. (1984) *Normal accidents: Living with high-risk systems*. New York, NY: Basic Books.
- Petter, S. and Randolph, A. (2009) 'Developing soft skills to manage user expectations in IT projects: Knowledge reuse among IT project managers', *Project Management Journal*, 40 (4), pp.45-49.
- Pich, M. T., Loch, C. H. and Meyer, A.D. (2002) 'On Uncertainty, Ambiguity, and Complexity in Project Management', *Management Science*, 48 (8), pp.1008-1023.
- Pinto, J. K. and Mantel, S. J. (1990) 'The Causes of Project Failure', *IEEE Transactions on Engineering Management*, 37 (4), pp.269-276.
- Pollack, J. (2007) 'The changing paradigms of project management', *International Journal of Project Management*, 25 (3), pp.266-274.
- Powell, C. (2003) 'The Delphi technique: myths and realities', *Journal of Advanced Nursing*, 41 (4), pp.376-382.
- Prater, J., Konstantinos, K., and Ma, T. (2017) 'Optimism bias within the project management context: A systematic quantitative literature review', *International Journal of Managing Projects in Business*, 10 (2), pp.370-385.
- Prilla, M. (2014) 'User and Group Behaviour in Computer Support for Collaborative Reflection in Practice: An Explorative Data Analysis', *COOP 2014 - Proceedings of the 11th International Conference on the Design of Cooperative Systems, 27-30 May 2014, Nice (France)*, pp.293-309.
- Pryke, S. and Smyth, S. (2006) *The Management of Complex Projects: A Relationship Approach*. Hoboken, NJ: Wiley-Blackwell.
- PMI Standards Committee (2013) *A Guide to the Project Management Book of Knowledge, 5th ed.* Newton Square, PA: Project Management Institute.
- Quirke, J. (2014) 'Spanish contractor sues Qatar charity after deal falls through', *Global Construction Review* [Online]. Available from:

<http://www.globalconstructionreview.com/news/spanish-contractor-sues-qatar-charity-after2523837/> (Accessed: 9 September 2018).

- Ramasesh, R. V. and Browning, T. R. (2014) 'A conceptual framework for tackling knowable unknown unknowns in project management', *Journal of Operations Management*, 32 (4), pp.190-204.
- Reason, P. and Bradbury, H. (eds.) (2008) *The SAGE Handbook of Action Research: Participative Inquiry and Practice (2nd ed.)*. London: SAGE Publications.
- Reason, J. and Hobbs, A. (2003) *Managing maintenance error: a practical guide*. Hampshire: Ashgate.
- Reid, N. (1988) 'The Delphi technique: its contribution to the evaluation of professional practice', *Professional competence and quality assurance in the caring professions*, pp.230-262.
- Rezvani, A., Chang, A., and Wiewiora, A. (2016) 'Project success in complex projects: A systematic literature review', In *Under New Management Innovating for sustainable and just futures: 30th annual Australian New Zealand Academy of Management (ANZAM) Conference*, 6-9 December 2016, Brisbane, Qld.
- Rezvani, A., and Khosravi, P. (2018) 'A Comprehensive Assessment of Project Success Within Various Large Projects', *Journal of Modern Project Management*, pp.114-122.
- Richards, L. (2005) *Handling Qualitative Data: A Practical Guide*, Thousand Oaks, CA: Sage.
- Roberts, K.H., Rousseau, D.M. and La Porte, T.R. (1994). 'The culture of high reliability: quantitative and qualitative assessment aboard nuclear-powered aircraft carriers', *The Journal of High Technology Management Research*, 5 (1), pp.141-161.
- Robeznieks, A. (2010) 'Just add nine zeros: Billion-dollar hospital projects becoming commonplace', *Modern Healthcare*, 40 (29), pp.28-30.
- Rochlin, G.I. (1993) 'Defining High-Reliability Organizations in Practice: A Taxonomic Prologomena', In Roberts, K.H.: *Challenges to Understanding Organizations*. New York, NY: MacMillan, pp.11-32.
- Rowe, G., Wright, G. and Bolger, F. (1991) 'Delphi: A re-evaluation of research and theory', *Technological Forecasting and Social Change*, 39 (3), pp.235-251.
- Rządeczka, M. (2018) 'Chapter 12: When being Right is Not Good Enough: How Systematic Cognitive Biases Affect Decision Making Strategies', *Poznan Studies in the Philosophy of the Sciences & the Humanities*, vol. 111, pp. 240-252.

- Sackman, H. (1975) *Delphi Critique*, Lexington, MA: D.C. Heath and Company.
- Salas, E., Wildman, J. L. and Piccolo, R. F. (2009) 'Using Simulation-Based Training to Enhance Management Education', *Academy of Management Learning & Education*, 8 (4), pp.559-573.
- Sargut, G. and McGrath, R.G. (2011) 'Learning to live with complexity', *Harvard Business Review*, 89 (9), pp.68-76.
- SAS Institute Inc. (2013) *SAS/STAT 13.2 User's Guide*. Cary, NC: SAS Institute Inc.
- Saunders, F.C. (2015) 'Toward High Reliability Project Organizing in Safety-Critical Projects', *Project Management Journal*, 46 (3), pp.25-35.
- Saunders, F.C., Gale, A.W., and Sherry, A.H. (2016) 'Responding to project uncertainty: Evidence for high reliability practices in large-scale safety-critical projects', *International Journal of Project Management*, 34 (7), pp.1252-1265.
- Saurin, T. A., Formoso, C. T. and Reck, R. (2015) 'Findings from the Analysis of Incident-Reporting Systems of Construction Companies', *Journal of Construction Engineering Management*, 141 (9), pp.05015007.
- Schoemaker, P. J. H. and Day, G. S. (2009) 'How to Make Sense of Weak Signals', *MIT Sloan Management Review*, 50 (3), p.81.
- Schweer, M., Assimakopoulos, D., Cross, R. and Thomas, R. (2012) 'Building a Well-Networked Organization', *MIT Sloan Management Review*, 53 (2), pp.35-42.
- Shah, S. and Corley, K. (2006), 'Building better theory by bridging the quantitative– qualitative divide', *Journal of Management Studies*, 43 (8), pp.1821–1835.
- Shi, Q. (2011) 'Rethinking the implementation of project management: A Value Adding Path Map approach', *International Journal of Project Management*, 29 (3), pp.295-302.
- Singleton, R.A. and Straits, B.C. (2010) *Approaches to Social Research*. 5th Ed. New York: Oxford University Press.
- Snowden, D. J. and Boone, M. E. (2007) 'A Leader's Framework for Decision Making', *Harvard Business Review*, 85 (11), pp.68-76.
- Söderlund, J. (2011) 'Pluralism in project management: navigating the crossroads of specialization and fragmentation', *International Journal of Management*, 13, pp.153-176.

- Sohi, A.J., Hertogh, M., Bosch-Rekveltdt, M. and Blom, R. (2016) 'Does lean & project management help coping with project complexity?', *Social and Behavioral Science*, 226, pp.252-259.
- Stefanovic, J. and Shenhar, A.J. (2015) 'Chapter 12: Does Strategic Alignment Contribute to Business Success' in *Linking Project Management to Business Strategy*, (eds. Shenhar, A.J, Milosevic, D., Dvir, D., Thamhain, H.), Project Management Institute, Inc., pp.213-227.
- Stringer, E.T. (2013). *Action Research*. Thousand Oaks, CA: Sage Publications.
- Sutcliffe, K. M. (2011) 'High reliability organizations (HROs)', *Best Practice & Research Clinical Anaesthesiology*, 25 (2), pp.133-144.
- Swanson, S. (2014) 'Disaster Averted', *PM Network*, 28 (7), pp.40-47.
- Thomas, D. (2006) 'A general inductive approach for analyzing qualitative evaluation data', *American Journal of Evaluation*, 27, pp. 237-246.
- Thorpe, R. and Holt, R. (2008) *The Sage Dictionary of Qualitative Management Research*, London: Sage.
- TJC (2016). *Facts about Hospital Accreditation* [online]. Available at: http://www.jointcommission.org/facts_about_hospital_accreditation/. (Accessed: 15 April 2016).
- Tohidi, H. and Jabbari, M. M. (2012) 'Role of human aspects in project management', *Procedia - Social and Behavioural Sciences*, 31 (1), pp.837-840.
- Tolich, M. (2004) 'Internal Confidentiality: When Confidentiality Assurances Fail Relational Informants', *Qualitative Sociology*, 27 (1), pp.101-106.
- Tommelein, I. D. (2015) 'Journey toward Lean Construction: Pursuing a Paradigm Shift in the AEC Industry', *Journal of Construction Engineering Management*, 141 (6), p.04015005.
- Too, E.G., and Weaver, P. (2014) 'The management of project management: A conceptual framework for project governance', *International Journal of Project Management*, 32 (8), pp.1382-1394.
- Turner, J.R. (2014) *The Handbook of Project-Based Management*, 4th ed., New York, NY: McGraw-Hill.
- Turner, J.R. and Müller, R. (2003) 'On the nature of the project as a temporary organization', *International Journal of Project Management*, 21 (1), pp.1-8.

- U.S. Census Bureau (2018) 'Monthly Construction Spending, June 2018', Release Number CB-116 [Online] Available from: <https://www.census.gov/construction/c30/pdf/release.pdf> (Accessed: 3 August 2018).
- U.S. Government Publishing Office (2016) 'Building a better VA: assessing ongoing major construction management problems within the department', *Hearing before the Committee on Veterans' Affairs, U.S. House of Representatives, One Hundred Fourteenth Congress, first session*, pp.1-87.
- van Dalen, B., Slagmolen, S. and Taen, R. (2009) *Mindful Organizing: How to Manage Unexpected Events and Unwanted Processes*. Netherlands: Apollo 13.
- van der Hoorn, B. and Whitty, S. J. (2015) 'A Heideggerian paradigm for project management: Breaking free of the disciplinary matrix and its Cartesian ontology', *International Journal of Project Management*, 33 (4), pp.721-734.
- van Reedt Dortland, M., Dewulf, G. and Voordijk, H. (2013) 'Project Coalitions in Healthcare Construction Projects and the Application of Real Options: An Exploratory Survey', *Health Environments Research & Design Journal*, 7 (1), pp.14-36.
- Vasilescu, A., Dima, A.M. and Vasilache, S. (2009) 'Credit analysis policies in construction project finance', *Management & Marketing*, 4 (2), pp. 79-94.
- Vogus, T.J. and Welbourne, T.M. (2003) 'Structuring for high reliability: HR practices and mindful processes in reliability-seeking organizations', *Journal of Organizational Behaviour*, 24 (7), pp.877-903.
- Waller, M. J. and Roberts, K. H. (2003) 'Editorial: High Reliability and Organizational Behaviour: Finally the Twain Must Meet', *Journal of Organizational Behaviour*, 24 (7), pp.813-814.
- Weick, K.E. (1979) *The Social Psychology of Organizing*. New York: McGraw-Hill.
- Weick, K.E. (1988) 'Enacted sense making in crisis situations', *Journal of management studies*, 25(4), pp.305-317.
- Weick, K.E. and Sutcliffe, K. (2001) *Managing the Unexpected, 1st ed.* San Francisco: Wiley
- Weick, K. E. and Sutcliffe, K. M. (2007) *Managing the Unexpected, 2nd ed.* San Francisco, CA: Wiley.
- Weick, K. E. and Sutcliffe, K. M. (2015) *Managing the Unexpected, 3rd ed.* Hoboken, NJ: Wiley.
- Weick, K.E., Sutcliffe, K.M., & Obstfeld, D. (1999) *Organizing for high reliability: Processes of collective mindfulness*. In R.S. Sutton & B.M. Staw (Eds.), *Research in Organizational Behaviour*, Vol. 1 (pp. 81-123). Stanford, CA: Jai Press.

- Wikimedia (2015) 'Pert chart colored', original uploader was Jeremy Kemp at en.wikipediaderivative work: Hazmat2(talk). Available from: https://commons.wikimedia.org/wiki/File:Pert_chart_colored.svg#/media/File:Pert_chart_colored.svg. (Accessed: 2 June 2015).
- Wildavsky, A. (1991) *Searching for Safety*. New Brunswick, NJ: Transaction.
- Williams, T. M. (1999) 'The need for new paradigms for complex projects', *International Journal of Project Management*, 17 (5), pp.269-282.
- Williams, T. (2004) 'Assessing and building on the underlying theory of project management in the light of badly over-run projects', paper presented at *PMI Research Conference*, London, UK.
- Winch, G.M. (2010) *Managing construction projects*. Chichester: John Wiley & Sons.
- Winter, M. and Smith, C. (2006) *Rethinking Project Management*. EPSRC Network.
- Winter, M., Smith, C., Morris, P. and Cicmil, S. (2006) 'Directions for future research in project management: The main findings of a UK government-funded research network', *International journal of project management*, 24(8), pp.638-649.
- Wood, H.L. and Ashton, P. (2010) 'Modelling project complexity'. In Proceedings: Egbu, C. (Ed) *26th Annual Association of Researchers in Construction Management Conference*, pp.1111-1120.
- Wood, H., Piroozfar, A. and Farr, E. R. (2014) 'Moving beyond project complexity: Exploring empirical dimensions of complexity in the construction Industry' [Online]. Available from: http://www.arcom.ac.uk/-docs/proceedings/ar2014-0885-0894_Wood_Piroozfar_Farr.pdf. (Accessed: 14 May 2015).
- Zall Kusek, J., Gorgens Prestidge, M. and Hamilton, B.C. (2013) *Fail Safe Management: Five Rules to Avoid Project Failure*. Washington, DC: The World Bank.
- Zhu, J., and Mostafavi, A. (2017) 'Discovering complexity and emergent properties in project systems: a new approach to understanding project performance', *International Journal of Project Management*, 35 (1), pp.1-12.

Appendices

Appendix A The survey questionnaire of the pilot study

No.	Question
Q1	I confirm that I have read and have understood the participant information sheet dated 10 April 2015 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
Q2	I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my rights being affected. In addition, should I not wish to answer any particular question or questions, I am free to decline.
Q3	I understand and agree that once I submit my data it will become anonymised and I will not be able to withdraw my data.
Q4	I understand that my responses will be kept strictly confidential. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.
Q5	I agree to take part in the above study.
Q6	Years working professionally in or supporting the healthcare industry
Q7	Years working professionally in a project role or environment
Q8	Best description of current role
Q8_1	If you selected Other, please specify:
Q9	Approximate U.S. dollar value of all healthcare projects during career
Q10	Approximate U.S. dollar value of single largest healthcare project you have been involved
Q11	My healthcare project experience has primarily been:
Q12	My familiarity with project management body of knowledge such as PMBOK.
Q13	My familiarity with High Reliability Organizations (HRO)
Q14	Changes rarely occur on large healthcare construction projects.
Q15	The same kinds of situations and problems are encountered on most projects.
Q16	On large healthcare construction projects people tend to have trouble getting all the information they need to properly do their work.
Q17	On large healthcare construction projects, people are expected to perform their respective project roles in a particular way without deviation.
Q18	People often work under severe project pressures (time, costs, resources, or other).
Q19	Pressures often lead people to 'cut corners'.
Q20	People have little discretion to resolving unexpected problems as they arise.
Q21	Workers on large healthcare construction projects lack training or expertise needed to act upon and manage unexpected problems that arise.

No.	Question
Q22	Project teams prepare for unforeseen surprises by:
Q22_1	Developing effective crisis management responses
Q22_2	Developing formalized approaches to treat problems before the fact
Q22_3	Project leadership focuses on both approaches
Q22_4	Comments:
Q23	Which of the following is generally the most successful approach for identifying early warnings of potential problems?
Q23_1	A formal early warning signs exercise/assessment
Q23_2	Trust and good everyday communication
Q23_3	A collaborative culture across organizational interfaces
Q23_4	Comments:
Q24	Which of the following is the major reason early warning signs are recognized but not acted upon properly:
Q24_1	'Political' pressure or agenda or other power effects
Q24_2	Project actors insufficiently tough to tackle the conflict at it roots
Q24_3	No time to dwell on an identified early warning signal
Q24_4	Comments:
Q25	Which of the following barriers is most prevalent of preventing the detection of early warning signs?
Q25_1	Optimism bias – Underestimate problems and risks
Q25_2	Organizational complexity
Q25_3	An assumption formal reporting captures all issues including early warnings
Q26	The most “inspirational well” that develops into early warning signs
Q26_1	“Gut feeling”
Q26_2	Team brainstorming
Q26_3	Stakeholder analysis
Q26_4	Comments:
Q27	A lot of project changes are related to the client
Q27_1	If you selected Other, please specify:
Q28	Project changes are also related to other influences i.e. – uncertainties, risks, etc.
Q28_1	If you selected Other, please specify:
Q29	There is a project culture of encouraging the raising of issues rather than suppressing inconvenient

No.	Question
Q29_1	If you selected Other, please specify:
Q30	When unexpected problems arise, the right experts (even if from outside the project) are involved.
Q30_1	If you selected Other, please specify:
Q31	Projects develop formalized capabilities to detect, contain, and bounce back quickly from inevitable errors and changes
Q31_1	If you selected Other, please specify:
Q32	Project leaders continuously ask, "What's new?", then listen intently, and act upon the information.
Q32_1	If you selected Other, please specify:
Q33	Most project members are mindful of their own mental blocks and fears that might keep them from seeing the unexpected.
Q33_1	If you selected Other, please specify:
Q34	If you have any feedback, comments, etc., please use the field below (Optional).
Q35	Contact details & email address:

Appendix B The real-time Delphi survey questionnaire

Category		Question
Consent	Q1	I confirm that I have read and have understood the participant information section on the front page of this survey.
	Q2	I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my rights being affected. In addition, should I not wish to answer any particular question or questions, I am free to decline.
	Q3	I understand and agree that once I submit my data it will become anonymised and I will not be able to withdraw my data.
	Q4	I understand that my responses will be kept strictly confidential. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.
	Q5	I agree to take part in the above study.
Preoccupation with Failure	Q6	In addition to traditional project management skills, tools and software, of equal importance is the need for behavioural skills in order to meet the increasingly complex activity and its related uncertainty.
	Q7	The first signs of problems will not be in missed schedules or poor work, it is generally seen in the members; eyes, facial expressions, voice, and body language.
	Q8	Even among top performing project teams, the lack of real data about what uncertainty to expect and how to manage it well can result in conflict and strained relationships.
	Q9	There is a need to improve how owners and team members accept and manage project data or information that is contrary to their beliefs, assumptions or perspectives.
	Q10	Projects could benefit from implementing a voluntary (and anonymous if desired) error reporting system (similar to hospital incident reporting systems) in support of a preoccupation with failure.
	Q11	Please provide comments or suggestions concerning preoccupation with failure and its applicability to managing projects. You may suggest alternative terms or add additional considerations.
Reluctance to Simplify	Q12	Certain contract delivery models discourage and even ban improvisational responses to changing conditions.
	Q13	Project team behaviour should strive for a collaborative culture and the discipline to trust each other; unfortunately, a typical default is for self-protective measures when challenges arise.
	Q14	Open communication and integration is needed among all project teams (regardless of contract method) for an effective approach to reducing the impact of uncertainty.
	Q15	An ideal project culture is one which values skeptics.

Category		Question
	Q16	Projects could benefit from a practical, workable and relevant charter or vision/values statement that describes the principles that will underpin culture, relationships and communication.
	Q17	Please provide comments or suggestions concerning a reluctance to simplify and its applicability to managing projects. You may suggest alternative terms or add additional considerations.
Sensitivity to Operations	Q18	Most current project information and control systems focus on comparing past planned performance with past actual performance; far less emphasis is placed on future conditions.
	Q19	The root cause of a delayed response to uncertainty can often be tied to miscommunication or misunderstanding, especially with inexperienced owners or other inexperienced members.
	Q20	A project's diverse expertise (owners, architects, contractors, etc.) should be exploited by encouraging the challenging of all assumptions throughout the project lifecycle.
	Q21	Projects should allow the opportunity for project teams or members to explore alternate methods or develop more effective solutions to problems.
	Q22	Projects could benefit from establishing a common project diary which all major actors have access and authority to contribute to capture detailed and comprehensive perceptions of what actually happened towards current and future project learning.
	Q23	Please provide comments or suggestions concerning sensitivity to operations and its applicability to managing projects. You may suggest alternative terms or add additional considerations.
Commitment to Resilience	Q24	There is insufficient training provided for all project managers and supervisors to support proper behavioural aspects of recognizing and responding to early warning signs.
	Q25	Project actors are insufficiently tough or empowered to tackle conflict or issues at their roots.
	Q26	'Political' pressure or agenda or other power effects such as social pressure is a major reason why early project warning signs are recognized but not acted on properly.
	Q27	When the unexpected occurs, it should be treated as a learning opportunity for the project and should also be captured and codified as knowledge for future use.
	Q28	Projects could benefit from an in/on-boarding process to include collaboration and culture expectations, a review of knowledge from prior, similar projects, and scenario exercises to identify risks and practice management response to unforeseen problems.

Category		Question
	Q29	Please provide comments or suggestions concerning commitment to resilience and its applicability to managing projects. You may suggest alternative terms or add additional considerations.
Deference to Expertise	Q30	The healthcare owner can have the most influence on the conduct of the project yet probably has the least amount of formal training in the discipline of managing construction projects.
	Q31	If there is insufficient collaboration, then often experts are left out of management discussions of developing a solution or are introduced at the last minute.
	Q32	A project team's culture should value expertise and experience over hierarchical rank.
	Q33	Projects should pre-identify who has what relevant specialized skills and knowledge in order to best respond quickly to unforeseen problems.
	Q34	Projects could benefit from periodic 'reflections' to revise, update, and add to new knowledge that the team possesses, including facts, perceptions, experience, judgment and folklore.
	Q35	Please provide comments or suggestions concerning deference to expertise and its applicability to managing projects. You may suggest alternative terms or add additional considerations.
Mindful Project Management	Q36	I would recommend implementing a voluntary error reporting system on future projects.
	Q37	I would recommend a project charter on future projects.
	Q38	I would recommend a common project diary on future projects.
	Q39	I would recommend an in/on-boarding process on future projects.
	Q40	I would recommend periodic reflection sessions on future projects.
	Q41	How clear is the concept of utilizing HRO mindfulness processes to improve individual and team competence of managing projects to you?
	Q42	How useful is the concept of utilizing HRO mindfulness processes to improve individual and team competence of managing projects to you?
Demographics	Q43	Years working professionally in or supporting the healthcare industry?
	Q44	Years working professionally in a project role or environment?
	Q45	Which of the following best describes your current role?
	Q46	Approximate U.S. dollar value of all projects during career:
	Q47	Approximate U.S. dollar value of single largest project you have been involved?
	Q48	My project experience has primarily been:
	Q49	My familiarity with High Reliability Organizations:

Appendix C Delphi Expert Panel Member information

Panelist ID	Job Title	Organization type	Geographic Location
1	Medical Equipment Planner	Project Management Firm	Middle East
2	Professor / PhD	University	Europe
3	Chief Executive Officer	Architect-Engineering Design Firm	United States
4	Senior Project Director	Healthcare System	United States
5	Facilities Planning & Design Director / Registered Architect	Academic Medical Center	United States
6	Facilities Planning & Design Director / Registered Architect	Academic Medical Center	United States
7	Senior Vice President Facilities and Operations / Professional Engineer	Healthcare System	United States
8	Facilities & Construction Director	Hospital	United States
9	Medical Equipment Planner / Critical Care Nurse	Academic Medical Center	Middle East with European experience
10	Registered Architect	Architect-Engineering Design Firm	United States
11	Facilities Project Manager	Academic Medical Center	Middle East
12	Chief Executive Officer	Contractor	United States
13	IT Senior Project Manager	Academic Medical Center	Middle East with US experience
14	Regional Director Healthcare	Technology Provider	United States
15	Facility Director	Healthcare System	United States
16	Chief Executive Officer	Healthcare System	United States
17	Chief Executive Officer / Registered Nurse	Healthcare Consulting Firm	United States with international experience
18	Senior Operations Director	Healthcare System	Middle East with US experience
19	Chief Executive Officer / Registered Architect	Architect-Engineering Design Firm	Middle East with US experience
20	Chief Executive Officer	Healthcare Real Estate Development Firm	United States with significant international experience

Panelist ID	Job Title	Organization type	Geographic Location
21	Facilities and Construction Director / Professional Engineer	Healthcare System	United States
22	Chief Executive Officer / PhD	Project Management Firm	United States
23	Physician / Noted High Reliability expert in healthcare	Healthcare System	United States

Appendix D Sample from Delphi Survey: Open-Ended Comments/Suggestions

NOTE: The number in brackets [] after each comment refers to the particular expert panel member's Participant ID. Details for each participant can be found in Appendix C.

Preoccupation with Failure: Please provide comments or suggestions concerning preoccupation with failure and its applicability to managing projects. You may suggest alternative terms or add additional considerations.

I think that projects can benefit from staff who feel they can speak up, without fear of retribution, when they identify potential problems on a project. [20]

I think this is a great idea and could prove to be very valuable. [8]

I think of the system developing into a learning system. [23]

I think in general that this makes sense. I hope that the term in the case of healthcare would not apply to the over testing and overspending on treatments that are prescribed to prevent lawsuits or poor patient satisfaction scores. [12]

I prefer pre-occupation with success. How do we prevent operating room fires? We build into our process well researched elements that minimize variation and therefore errors. [15]

An example of pre-occupational with failure is that you planned for a menu of services within the hospital and all your planning efforts were focussed on that menu of services, then suddenly the organization decided to change the menu while not giving you enough time to address the changes. I recommend that the services of any project have to be approved and frozen in order to properly plan for the project. Should be any requirement for change, additional time shall be given to the project team to implement these changes. [11]

A key consideration is the need to have an organization wide awareness of "bad news" and be sensitive to the under currents and what is being said around the "water cooler". This requires project managers who are intuitive and well versed with soft skills and experts at people management. They need to pick on the visual cues long before the behaviours they foretell develop into less productive behaviours. [9]

The term preoccupation is almost pejorative. We are really looking at identification of possible points of failure and of means of mitigation and prevention. [5]

A preoccupation with failure means that errors are expected and planned for. Project management skills should include training to anticipate errors and engage in tasks to detect and mitigate them. Additionally, HRO often practice scenarios to reduce errors through the use of checklist, third party review and validation, and accurate data analysis. HRO have learned how to think about failure or if you will how to reason out the possibilities of failure so that it can be accounted for. Project managers need to account for failure in all assignments, all tasks and

milestones. The practice of risk registers does not adequately account for failure. Failure is usually the result of a cascade of errors that have gone undetected until the failure event occurs. Risk registers won't detect the cascade although it might pick up on individual errors. [18]

Using a failure mode analysis during project conception and then throughout the project should provide all team members with a better understanding of how the project fits into an overall scheme. [7]

I simply think it is beneficial to have discussion with an organized team about the elements of a successful project at the very beginning. Ground rules about discovering mistakes and reporting them should be agreed upon. [16]

Preoccupation with failure is an equivalent to anticipation for success. Real time action list with responsible parties and dates of accomplishment that is reviewed weekly with team members should help mitigate preoccupation and anticipate success. [10]

A 'preoccupation with failure' may be better referred to as 'a knowledgeable anticipation of risks and costs. An example might be: Your project depends to a high level on the delivery of a complex system, 'System A'. If you have a moderate level of concern about the delivery on time of System A you might put a delivery date guarantee in the purchase contract with a financial penalty. If you have the next higher level of concern, you might contract your own shipping service from pick up to delivery. The next higher level of concern might warrant several visits to the supplier's shops for design review, assembly review and in shop testing and shipping supervision on site. The next higher level of concern might call for assessment of the supplier's sub-contractors and supply sources and the risks generated by those suppliers. The next higher level of concern might call for relative risk assessment of those sub suppliers and visits to their shops for on-site assessments of capability and risk. Each such step could involve additional information gathering on each entity, their financial and technical health and capabilities and their current business commitments. None of this constitutes a preoccupation with failure if the importance warrants the activities. Such activities would be balanced against risk/cost assessment for the System A failing to arrive on time. [21]

Not sure if preoccupation describes the awareness needed. Awareness is needed, but preoccupation may preclude other necessary activities. [6]

Preoccupation with Failure seems a little strong. I think that this concept is essentially articulating a need for a more comprehensive list of potential risks, which should be identified and mitigated, such as resource behavioural skills, cultures, beliefs, personality, etc. [13]

Preoccupation is too strong a word to describe a healthy concern for failure in most project management. Preoccupation suggests to me that there is an obsession with no balance of risk and reward. While some industries should eliminate all doubt about results, this application to all

project management does not seem appropriate. "Apprehension" to Failure could be a better fit under normal hospital project management. [3]

Not sure I like the term preoccupation with failure. More critical to focus on a grand vision, create excitement, which engages the right highly motivated team. [4]

Formal teamwork training has proven to reduce errors in high-stress environments such as military aviation, combat casualty units and emergency departments. Findings point to the effectiveness of formal teamwork training for improving team behaviours, reducing errors, and improving staff attitudes among the trained hospitals that I have been affiliated with. Attitudes, mind-set, intimidation, fear and many other issues present a focus that leads away from excellence. [17]

Reluctance to Simplify: Please provide comments or suggestions concerning a reluctance to simplify and its applicability to managing projects. You may suggest alternative terms or add additional considerations.

The reluctance to simplify is mainly due to the management wishes to prove the complicity of the project thus justifying their existence. [1]

I revisited the statements/questions above and most do not pertain to "simplification" as I understand it. Skeptics, integration and collaboration all additive not subtractive. [14]

A reluctance to simplify is a symptom of a reluctance to create less complexity and relax control. This can be symptomatic of the personality of the project manager to the competence of the team, both of which would need addressing. [9]

It needs to be understood and recognized that all parties to the project, no matter how small the role, should be integrated and included in communication and should be valued as members of the team. [5]

Simplification is helpful as organizations are buried in procedures or requirements that stifle creativity and leave us with a product similar to the one we just tried to get away from. Having a challenge document to Owner related procedures or products that get reviewed with cost alignment, benefits to the project and/or anticipated improvement of schedule may be beneficial. [10]

A reluctance to simplify might better be described as a process to identify and manage the required level of detail for each and all activities. The identification and legitimization of this process very early in the project team development is important and will be helpful. It is important that no team member be surprised by a need to examine and validate what they are doing. [21]

I believe this is a very important attitude, but a leader must be able to communicate to stakeholders at many levels of complexity. This gets back to the earlier question about communications about data with the project team. Complexity should not be ignored, but if you cannot entertain the team with your love of the complexity, YOU will be ignored. [3]

Sensitivity to Operations: Please provide comments or suggestions concerning sensitivity to operations and its applicability to managing projects. You may suggest alternative terms or add additional considerations.

I strongly recommend open communication and sharing information with project team, as I believe the proper communication is the main key for project success. [11]

This really felt like it was more about course correction than operational sensitivity. [14]

A share point function where each team member can contribute would facilitate communication, but this should have a moderator or manager to channel and manage the communications. [9]

This reinforces the need for open communication and establishment of an atmosphere of trust. [5]

I have to challenge the premise to operational sensitivity. While I agree that HROs are interested in daily situational awareness, I don't think that everyone's focus is on it. Where an HRO depends on strategic development to achieve its mission, then strategic roles will be aligned and integrated with situational awareness activities and data to build project capabilities and predict resources, risks and errors. [18]

Starting a collaborative, very diverse and integrated process early in the project is helpful for success. Using tools such as A3 and Choosing by Advantages made popular by the Lean movement are very helpful. [10]

Most needs should be identified and addressed as a part of team development prior to project launch. Assume this refers to operations within the environment where the project is taking place. These processes must be carefully defined very early in the process so that contract entities can plan and estimate appropriately. [21]

Operations and people are constantly changing. In a state of constant change, experience, open communication and leadership is very important to understanding and clearly articulating the desired future condition. [3]

Commitment to Resilience: Please provide comments or suggestions concerning commitment to resilience and its applicability to managing projects. You may suggest alternative terms or add additional considerations.

Many questions focus on behaviour. Behaviour is too variable. We must think about manufacturing. Successful manufacturing eliminates variability through process. [15]

Any initiative that improves collaboration and cultural expectations and includes contributions from previous projects has to be good. This collective wisdom can only contribute positively to outcomes. [9]

Recognition of inevitable change and a commitment to resiliency is essential to successful project management especially in healthcare renovation projects. [5]

I believe commitment to resilience should be studied as a major reason while some project teams succeed in highly stressed environments. Project delays and cutbacks, along with unexpected poor outcomes will not deter a resilient team. It might explain how some team overcome catastrophic events on projects. [18]

On-boarding tools are a huge benefit to a project. [10]

Resilience would seem to be important to the extent it represented return to and consistency with the goals and vision of this specific project. [21]

Resilience is a great word for this requirement. It speaks to experience, learning, trust, leadership and commitment. [3]

Deference to Expertise: Please provide comments or suggestions concerning deference to expertise and its applicability to managing projects. You may suggest alternative terms or add additional considerations.

Less reliance on hierarchical structures and more openness and access to expertise from members ranked lower on the org structure would be beneficial. [9]

The caveat is that those with requisite expertise must be willing to be flexible and creative. [5]

Expertise is most valuable when timely applied. The project team management process should be focused on finding and incorporating the needed expertise when needed. The process must also provide for how to deal with 'Expertise' that is not timely, how to manage its impact and how to protect the project and process from adverse impact. [21]

Also, a general assumption is that hierarchical positions are assumed to have the experience required to manage the project to success. [13]

The expert is often suspect because the solution is not novel. It is not innovative. It is not Out of the Box Thinking. It is off the shelf. Deference to experience may eventually occur, but it takes patience and close inspection to be sure that the solution is customized to the future condition and operation. Deference is a term that suggests that others should withdraw. Often, an expert

has more data, more examples, and more knowledge of outcomes, which need to be "considered and judged". [3]

Mindful Project Management: How clear is the concept of utilizing HRO mindfulness processes to improve individual and team competence of managing projects to you?

Not Clear

Somewhat Clear

The concept of utilizing HRO is clear in that I know why it should be used. I'm not sure how this kind of thinking can be transferred to other organizations in the short-term. It might take longer than the length of the project before teams are dispersed. It would be a major culture shift. [18]

My understanding of the process is that an important reason that it is successful is because it is anonymous. This is not possible with hospital project management and the nature of construction projects. Leadership must find a way to open communications, welcome input, and respect and take advantage of experience and minimize risk with real data. [3]

Very Clear

I understand the process. [12]

Unless the HRO is practiced and skilled in project management, it needs to employ professional process (as opposed to Project) management to oversee the team building and process. A question might be: Is there justification for the HRO to have a program to develop the HRO skills it needs to be able to participate in, manage and communicate with a project ongoing within its business, site or activities. These are definable, and therefore plannable and trainable skills. [21]

I have always simply called this good and appropriate project management. [5]

I would emphasize again, this can only occur with the leader's support. It also requires discipline from all members. [16]

Mindful Project Management: How useful is the concept of utilizing HRO mindfulness processes to improve individual and team competence of managing projects to you?

Not Useful

Somewhat Useful

Many useful and a few would be marginally beneficial I think. [12]

Very Useful

Requires individual and team buy-in. [18]

The focuses of the HRO are directly applicable to team competence for managing projects. The HRO mindfulness must also apply to the HRO organization as it relates to the project team and the project. Being an HRO does not suggest that an organization expect they will have to spend less time and effort in bring a project to a successful conclusion; it implies that they will have to invest more time than a less competent organization. [21]

The process puts a clinical structure around good project management. [3]