Collective Mindfulness: The Key to Organizational Resilience in Megaprojects

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Abstract

The complexity, internal and external risks, and significant social impact of megaprojects make their organizational resilience particularly important. To survive potential adversities, megaproject organizational resilience depends on collective mindfulness. Drawing on an attention-based view, this study investigates the mechanisms of collective mindfulness for megaproject organizational resilience as a process that functions prior to, during, and after recovery from crises. The results from analyzing six embedded crisis events in two megaprojects indicate that collective mindfulness influences organizational resilience processes through the mechanisms of awareness allocation, emotional detachment, and attention alignment. The study's theoretical and practical implications are discussed.

Keywords

Introduction

Organizational resilience is critical to megaprojects due to their unprecedented risks and uncertainties. These risks and uncertainties include internal dynamics such as incomplete contracts, varied governance structures, long-term contract periods with multiple stakeholders (Wang & Pitsis, 2019); as well as external uncertainties, such as political, economic, legal, social, natural, and project-specific factors (Chan et al., 2011). Defined as the "capacity of a social system to proactively adapt to and recover from disturbances that are perceived within the system to fall outside the range of normal and expected disturbances" (Comfort et al., 2010, p. 9), organizational resilience deals with adversities and crises (Linnenluecke, 2015). Constant mindfulness is required to successfully deal with adversities and crises by detecting risks that threaten megaprojects, deciding quickly on an appropriate response, and following through until the threat is mitigated (Ogliastri & Zúñiga, 2016).

Weick et al. (1999) first introduced the term *mindfulness* in the literature on organizations and crises management. Collective mindfulness refers to organizational processes or practices that help organizations detect, categorize, and respond to unexpected events and errors (Weick et al., 1999). Collective mindfulness is about both the quality of attention and conserving scarce attention (Weick et al., 1999); it suppresses organizational tendencies toward inertia, maintains an organization's commitment to resilience, and improves organizational effectiveness when disruptions occur (Weick et al., 1999). The extant literature in business and organizational behavior has explored the relevance of collective mindfulness for organizational resilience (Oeij

et al., 2018; Ogliastri & Zúñiga, 2016). Most of these studies focus on the mindfulness of members in high-reliability organizations, which operate in unforgiving social and political environments and under very trying conditions (Boin et al., 2010). However, the literature has not addressed the collective cognitive effort of multiple stakeholders for organizational resilience in megaprojects (Thomé et al., 2016). Most of the resilience literature in the project realm addresses the antecedents of resilience at the individual level (Todt et al., 2019) and its relationship with institutions (Naderpajouh et al., 2018). To the authors' best knowledge, little is known about whether and how collective mindfulness facilitates the organizational resilience of megaprojects with multiple stakeholders.

The general management literature explores the relationship between mindfulness and resilience from a cognitive perspective, which describes mindfulness as noticing, feeling, and reaching out to others (Powley, 2009), especially at the individual level. However, megaprojects, as temporary organizations with interorganizational dimensions (Sydow & Braun, 2018), are fundamentally different from permanent organizations; they require resource reconfiguration (Ambulkar et al., 2015) but more importantly, cognitive effort among multiple stakeholders at the collective level. Megaprojects (i.e., projects with costs of more than US$1 billion, affecting one million people or more, and lasting for several years [Flyvbjerg, 2014]), are typically vulnerable to crises due to their strategic importance, dynamic complexity, and extensive impact (Flyvbjerg, 2014; Hällgren et al., 2018). This is often increased through stakeholder behaviors driven by conflicting institutional logics (Zheng et al., 2018). This warrants

an investigation to unpack the collective cognitive effort of project stakeholders' collaborative responses in the face of internal and external adversities. The attention-based view is particularly suitable as a theoretical lens for this study, as it addresses collective cognitive effort (Weick & Sutcliffe, 2006). The attention-based view proposes that the context in which cognition and action are situated influences the attention of managers and with it, the opportunities that are retained in an organization (Ocasio, 1997; Joseph & Wilson, 2017).

In summary, there is no systematic and in-depth understanding from an attention-based view of how collective mindfulness contributes to megaproject organizational resilience. This study seeks to fill this knowledge gap by exploring the mindfulness mechanisms that help megaprojects develop resilience to adversity.

Therefore, the following research question emerges:

RQ: How does collective mindfulness facilitate organizational resilience in the context of megaprojects?

The unit of analysis is a critical crisis event where the organizational resilience of a particular interorganizational megaproject with multiple stakeholders unfolds. The study takes critical realism as its ontological stance, which acknowledges the objectivity of phenomena embedded in the subjectivity the actors experience (Bhaskar, 2016). To achieve these objectives, six events in two megaprojects from the engineering-construction industry in China were chosen for analysis. Data were collected through 16 interviews and analyzed using abductive reasoning (Alvesson & Sköldberg, 2009; Miles et al., 2014) to explore the collective mindfulness mechanisms

that influence the organizational resilience of megaprojects.

Practitioners may benefit from this study through the detailed strategies of collective mindfulness that are identified, allowing them to improve organizational response and recovery from adversities, especially when projects involve multiple stakeholders. Academics may benefit from the study through its contribution to organizational resilience theory and mindfulness theory in megaprojects, where specific mechanisms are explored for an in-depth understanding of their relationship.

The next section reviews the most relevant literature and is followed by the methodology, analysis, and discussion sections. Finally, we conclude the study by answering the research question.

Theoretical Background

In this section, the literature on the attention-based view, crises in megaprojects, collective mindfulness, and organizational resilience are reviewed in order to build the theoretical framework. Due to the attention involved in collective mindfulness, the attention-based view is examined for the cognitive aspects of organizational resilience (Weick & Sutcliffe, 2006).

The Attention-Based View

In the attention-based view, organizations are treated as systems of structurally distributed attention, where decision makers are driven by their perception of the context in which they find themselves (Ocasio, 1997). An important characteristic of this view of the organization is the relationship between individual- and organizational-

level information processing, which emphasizes the distributed nature of organizational decisions, actions, and cognitions. Attention refers to decision makers noticing, encoding, interpreting, and focusing time and effort on the available repertoire of issues (sensemaking of the environment) and their responses (solutions for the issues raised) (Ocasio, 1997).

The attention-based view theorizes the bounded attention of a complex organization with multiple stakeholders in which the focus of attention is not likely to be aligned but scattered with divergent interpretations of signals (Joseph & Wilson, 2017). From an attention-based perspective, organizations are concurrently: (1) cooperative systems with collective action as the common purpose; (2) shifting political coalitions with decision makers holding conflicting interests and goals; and (3) arenas for controversy with participants competing for status, power, and material rewards (Ocasio, 1997; White, 1993).

Research on the attention-based view focuses on organizational performance contingencies in relation to decision makers' attention to monitoring (Tuggle et al., 2010) and innovation (Li et al., 2013), as well as their attention patterns (Tuggle et al., 2010). Emphasis is placed on attention structure and cognition as a mechanism for linking macro-level organizational decision-making with individual-level information processing (Joseph & Wilson, 2017). Related studies have explored the issues of institutional complexities to understand collective cognitive effort (Hung, 2005; Thornton, 1999).

In the context of megaprojects that fail, the attention-based view explains how

competing institutional logics disconnect institutional and evolutionary strategizing from attention to rational strategizing (Vit, 2011). For megaprojects that face internal and external adversities, it is important to improve the quality of attention and remain mindful of multiple stakeholders (Weick & Sutcliffe, 2006). Therefore, the attention-based view is particularly suitable for explaining collective cognitive efforts in megaprojects. However, previous studies using the attention-based view rarely explain how megaprojects sustain resilience as systems of attention to risks and crises (Ocasio, 2011). The present study aims to explain this concept to improve managing and handling risk in megaprojects.

Crises in Megaprojects

A crisis is defined as a process of weakening or degeneration that can culminate in a disruption event to the actor's normal functioning (Williams et al., 2017, p. 739). It is "a low-probability, high impact event that threatens the viability of the organization and is characterized by ambiguity of cause, effect, and means of resolution, as well as by a belief that decisions must be made swiftly" (Pearson & Clair, 1998, p. 60). Crises differ in both risks (i.e., identifiable events with negative consequences) and disasters (i.e., events that pose serious threats to society, including human loss and material damage that potentially lead to the collapse of social structures and/or functions) (Iftikhar & Müller, 2019).

Crises in megaprojects manifest themselves as an accumulation of defects and weaknesses perceived to threaten the objectives of both the megaproject and its stakeholders (Wang & Pitsis, 2019). Crises can be internal or external and social or

technical/economic (Mitroff et al., 1987) and may be differently perceived, understood, and responded to by different stakeholders (Cuppen et al., 2016).

Embedded in political systems, government, and private business sectors (Giezen, 2012; Zheng et al., 2018), megaprojects involve multiple stakeholders and complicate collective responses to crises. Stakeholders can include any group or individual who can affect or is affected by the achievement of the megaproject's objectives (Freeman, 1984; Yang & Shen, 2015). Adequate stakeholder engagement is critical to megaprojects (Loosemore, 1998) when a crisis occurs due to the importance of the unified efforts of multiple stakeholders. However, stakeholders' distributed attention structures and divergent institutional demands (Matinheikki et al., 2019) have not been fully considered in earlier studies of megaprojects.

Instead, research has primarily explored organizational behaviors in megaprojects under different adversities (Li et al., 2019; Zheng et al., 2018). Xavier et al. (2014) claim that the organizational response to crises in megaprojects is significantly affected by the collective level of cognitive and affective capabilities and their institutional environment. Megaprojects managed by construction companies often result in crisis-prone organizations (Loosemore & Teo, 2000), and the complicated relationships among stakeholders erode organizational resilience to adversities. The existence of institutional misfits (e.g., public and private sectors) among stakeholders prior to adversity and the presence of diverging institutional logics during organizational recovery and response may lead to disasters (Naderpajouh et al., 2018). Hence, crises in megaprojects require the collective cognitive efforts of stakeholders, a topic that has

not yet been adequately addressed.

Collective Mindfulness

Mindfulness addresses the quality of attention (Weick & Sutcliffe, 2006) and describes an enhanced and receptive attention to and awareness of the current experience or present reality (Brown & Ryan, 2003) from the individual to a collective level (Yu & Ni, 2018). Collective mindfulness is not an aggregate of individual mindfulness but an emergent, shared state of mind (Marks et al., 2001). Collective mindfulness in projects is defined here as a shared belief among project stakeholders where project interactions are characterized by awareness and attention to present events and by experiential, nonjudgmental processing of within-project experiences (Yu & Zellmer-Bruhn, 2017). Collective mindfulness consists of two elemental dimensions: (1) attention to and awareness of the present; and (2) receptive, open, and nonjudgmental experiential processing (Davidson & Kaszniak, 2015; Good et al., 2016; Yu & Zellmer-Bruhn, 2017).

The attention dimension centers on the present in a sustained and concentrated manner (Brown & Ryan, 2003), which originates from classic Buddhist accounts of mindfulness (Quaglia et al., 2015). Integrating the terms *attention* and *awareness* is critical for describing mindfulness, since attention by itself only describes a focused manner without meta-awareness—an apprehension of the current state of the mind that monitors focused attentiveness (Dreyfus & Georges, 2011). The present moment refers to ongoing events: present issues that do not belong to the future or past (Smallwood & Schooler, 2015). Sustained and concentrated attention explains the deliberate and

purposeful manner of attention (Yu & Zellmer-Bruhn, 2017).

The processing dimension emphasizes receptive, open, and nonjudgmental information processing (Weick & Sutcliffe, 2006) where conceptual and discriminatory awareness is reduced. Receptiveness reveals the nonreactive nature of perception (Good et al., 2016), whereas openness reflects the Buddhist origins of mindfulness as an open-minded curiosity and compassionate intent (Weick & Putnam, 2006). Nonjudgmental processing is also experiential processing and treats the facts as observed rather than with immediate judgment (Good et al., 2016). A nonjudgmental process does not compare, categorize, or evaluate events or experiences based on memory (Brown & Ryan, 2003). Collective mindfulness facilitates members staying focused and discussing only phenomena, facts, ideas, and opinions (Marks et al., 2001).

Research on mindfulness in projects has emerged in the past decade, focusing on project reliability (Turner et al., 2016) and managing conflicts (Pitagorsky, 2012). Mindfulness enhances the resilience of HROs and hybrid organizations, because mindful organizing facilitates organizations detecting, categorizing, and responding to uncertainties and unexpected events (Ogliastri & Zúñiga, 2016; Weick et al., 1999). Project reliability, especially for complex projects, is enhanced by mindfulness-based managerial modes of action (Turner et al., 2016). Apart from risks and uncertainties, conflicts can also be resolved through collective mindfulness (Pitagorsky, 2012) to prevent organizational weakening during crises. Being mindful indicates concern for the social dynamics in organizations and cognitive approaches to empathy, such that a collective sensitivity for surroundings and a robust relational structure among

stakeholders enables them to collaborate in the face of crises (Powley, 2009). Collectively concentrating on the present moment involves interpretive work directed at weak and small signals and is often omitted in conceptual information processing (Weick et al., 1999), which is critical for responses in megaproject crises (Wang & Pitsis, 2019). Nonjudgmental information processing stabilizes and controls the internal and interactive emotional tones among stakeholders when crises are encountered (Smallwood & Schooler, 2015) and provides an attentional focus on the task rather than triggering relational conflict, resulting in improved megaproject resilience (Yu & Zellmer-Bruhn, 2017). The importance of mindfulness in organizational resilience is acknowledged, but few studies have explored collective mindfulness for multiple stakeholders in achieving organizational resilience.

Organizational Resilience

Resilience is widely used in various fields, including ecology (Walker et al., 2004), strategic management (Hamel & Likangas, 2003), safety engineering (Hamel & Likangas, 2003) and, more recently, projects (Naderpajouh et al., 2018; Thomé et al., 2016). The resilience elements in these fields share a common meaning of "the capacity and the ability of an element to return to a stable state after a disruption" (Bhamra et al., 2011, p. 5376). Organizational resilience is conceptualized by Williams et al. (2017) as the process by which an organization builds and uses its capability endowments to interact with internal and external dynamics in a way that positively adjusts and maintains functioning prior to, during, and following adversity. Organizational resilience in megaprojects focuses on a collective response to adversities and recovery

from crises through the temporary collaboration of project stakeholders.

The process-based view of organizational resilience is classified as (1) readiness and preparedness, (2) response and adaption, and (3) recovery or adjustment (Bhamra et al., 2011). Readiness and preparedness as a pre-adversity capability involves detecting weak signals, spotting errors, and anticipating dangers; it is a proactive dimension (Giustiniano et al., 2018). This proactive dimension of resilience reveals the preparation and restoration of resource endowment toward responses that have short- and long-term social impacts on people's lives and businesses (van der Vegt et al., 2015). Response and adaption, as the dimension of in-crisis organizing capability, involves absorbing shock, reducing loss of function, and improvising and remaining flexible (Vit, 2011). Recovery or adjustment as the post-crisis capability involves adjusting to the circumstances and rebuilding primary functions as early as possible. The response and adaption and recovery or adjustment dimensions are adaptive dimensions (Giustiniano et al., 2018) that allow organizations to strengthen and become more resourceful (Sutcliffe & Vogus, 2003).

Organizational resilience in megaprojects somewhat overlaps with project risk and change management, but they are inherently different from each other. Risk management focuses on identifying, analyzing, and managing project-related risks (West et al., 2019), whereas organizational resilience is a process with a specific focus on adjustment and function prior to, during, and following adversity (Williams et al., 2017). Due to the impossibility of defending against all possible risks, organizational resilience becomes a critical goal in megaprojects (Naderpajouh et al., 2018).

Megaproject organizational resilience is threatened by a variety of stressors, conflicts, and disturbances that occur throughout the project life cycle (Lengnick-Hall & Beck, 2005). The real challenge for organizational resilience in megaprojects is recognizing them as dynamic complex systems that are constantly threatened by acute and growing adversities, whose dynamic stability perhaps changes into a state of instability (Hollnagel et al., 2006).

Megaproject organizational resilience is also challenged by long periods of gestation, implementation, and operation (Ansar et al., 2016). These are amplified by the scale and complexities of megaprojects (Flyvbjerg, 2014), which, due to their fragility as systems, are easily harmed by randomness (Taleb, 2011). Multiple institutional logics force project stakeholders to deal with crises collectively (Biesenthal et al., 2018). Therefore, the resilience of megaprojects, as interorganizational projects (Sydow & Braun, 2018), can be threatened by institutional complexities in the face of adversity (Qiu et al., 2019). Institutional complexities and adversities challenge the collective cognitive effort of different stakeholder groups, which complicates megaproject organizational resilience.

This review of the literature indicates that a knowledge gap exists regarding how collective mindfulness impacts organizational resilience in megaprojects. This knowledge gap hinders a holistic understanding of organizational resilience in projects from a collective cognitive perspective. To the best of the authors' knowledge, the research question has not been answered by the existing literature and thus requires further investigation.

Theoretical Framework

Based on the literature on the attention-based view, collective mindfulness, and organizational resilience, we propose a theoretical framework that reflects our current understanding of organizational resilience in megaprojects in the presence of institutional complexities.
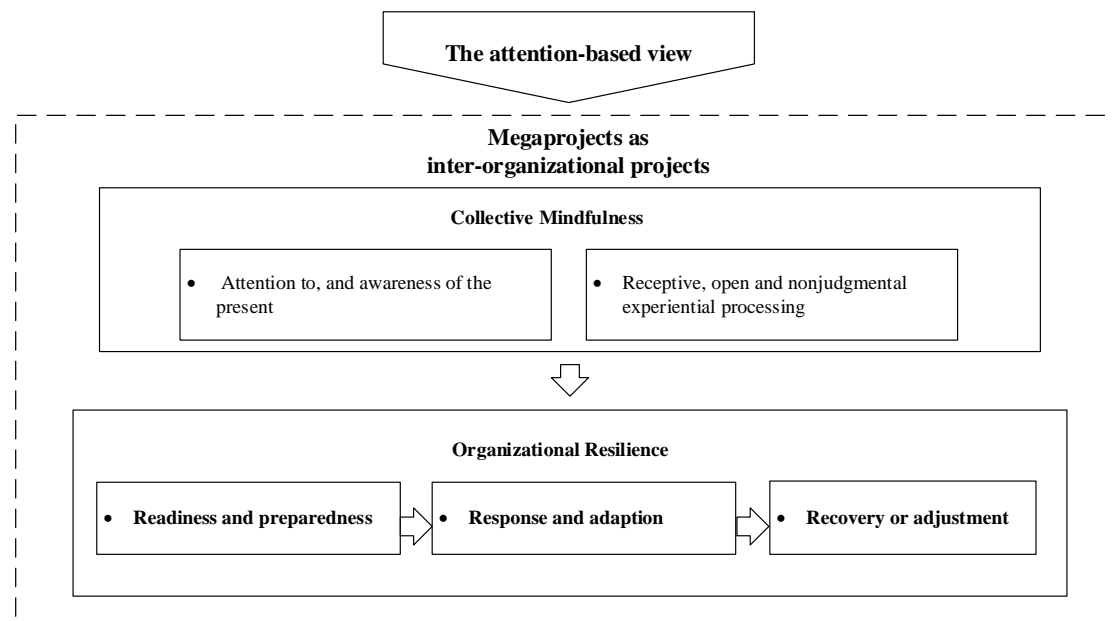
Figure 1. Theoretical framework for organizational resilience and collective mindfulness.

Research Methodology

Research Design

The study's exploratory nature calls for a qualitative approach to unpack how collective mindfulness impacts organizational resilience in megaprojects. Following Saunders et al. (2007), we sequentially chose the underlying philosophy, research approach, strategy, methodological choice, time horizon, techniques, and procedures. The philosophical stance chosen was critical realism. This stance acknowledges the existence of a

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particular phenomenon and seeks to explain it, while knowing that other possible explanations are subject to the actors' situational experiences. We chose abductive reasoning as our research approach, which combines the credibility of deductive reasoning with the creativity of inductive reasoning (Alvesson & Sköldberg, 2009) to develop new or extend existing theory. Two comparative case studies were conducted to answer the research question. Given that organizational resilience is only observed when adversities and crises are confronted (Williams et al., 2017), crises are adopted as the embedded unit of analysis for each case (Yin, 2009). Data analysis follows the framework provided by Miles et al. (2014).

Sampling

Two megaprojects in China were chosen for the study: *Subsea Tunnel A* and *Intercity High-Speed Train B*. A longitudinal comparative study was conducted to gain a more holistic understanding of the phenomenon through an in-depth investigation of two different project settings (Baxter & Jack, 2008). The cases were not chosen randomly but were chosen based on an information-oriented sampling technique (Flyvbjerg, 2006) and to avoid the influence of cultural differences. The project selection criteria included the following. First, the projects were required to be extremely large in scale (both around US$20 billion) with a wide range of stakeholders, including governments, private sectors, financial institutions, and suppliers, and involve significant institutional complexities throughout the project life cycle. Second, the projects were required to be highly prioritized in their provinces, making their resilience critical for the stakeholders as well as for regional development. Both projects attracted wide attention at the local

and national governmental and societal levels. Third, they were required to be ongoing megaprojects, due to the preference for on-site observations and immediate investigation. For the two cases, the crises were the embedded unit of analysis, and data were collected using maximum variation techniques to identify the key characteristics of the phenomena (Teddlie & Yu, 2007).

Subsea Tunnel A

Subsea Tunnel A is one of the largest infrastructure megaprojects in China's Northeast region. It is the second largest sea-crossing megaproject in China and is characterized by technical complexity, high environmental requirements, and extreme building conditions. The tunnel is about 12.1 kilometers long in total, with 5.1 kilometers under the sea, and was designed to last for 100 years at a cost of US$23.7 billion. The project involves Company A as the general contractor and City A's local government as the main sponsor (the name of the city is anonymized here). The resilience of the Subsea Tunnel A project is critical not only to the general contractor as a monumental project, but also to City A's regional development.

During the construction period, three major crises occurred that were detrimental to the project's progress and increased project costs: pollution crisis a1 (an external crisis), housing demolition and relocation crisis a2 (an external crisis), and technical crisis a3 (an internal crisis). The impact of these crises can be regarded as significant. Crisis a1 demonstrated low resilience in Subsea Tunnel A, whereas crises a2 and a3 demonstrated a medium level of project resilience (Table 1).

Intercity High-Speed Train B

Intercity High-Speed Train B is one of the largest infrastructure megaprojects in China's eastern region. It is the largest urbanization transportation megaproject in China, characterized by unknown and harsh geological conditions, numerous stakeholders, and the demand for building an environment and new technologies. Intercity High-Speed Train B stretches over 46.38 kilometers in total and has an expected speed of 220 km/h. The project was designed to last for 100 years and cost U$19.8 billion. The project involves Company B as the general contractor and the local governments of Cities B and C as the main sponsors (the names of the cities are anonymized here). The project's resilience is important because of its potential environmental and societal impacts on both of the cities and even the entire region.

During the construction period, the project suffered several major crises, three of which were significant; however, these crises were dealt with in a quite resilient manner. The three major crises included weather hazard b1 (an external crisis), housing demolition and relocation crisis b2 (an external crisis), and construction crisis b3 (an internal crisis). All three crises demonstrated the high resilience of the Intercity High-Speed Train B project (Table 1).

Table 1. Six Crisis Events of Two Cases of PPP Projects

PPP Project	Subsea Tunnel A	Intercity High-Speed Train B
Total investment	US$23.7 billion	US$19.8 billion
Project duration	50 months	40 months
Project initiation	April 2017	December 2016

Crisis events	Pollution Crisis a1	Housing demolition and relocation crisis a2	Technical crisis a3	Weather hazard b1	Housing demolition and relocation crisis b2	Construction Crisis b3
Crisis type	External Tech/Eco*	External Social	Internal Tech/Eco	External Tech/Eco	External Social	Internal Social
Resilience	Low	Medium	Medium	High	High	High

*Tech/Eco: Technological and/or Economic

Data Collection and Analysis

Sixteen interviews were conducted with stakeholders of the interorganizational megaprojects. Project files and company documents, news reports, and government reports were also collected to substantiate the findings (Eisenhardt, 1989). For example, the project brochures of both projects were collected, which included project information, management skills, key concerns, and new technologies. The interviews were conducted with project managers, design engineers, construction managers, and government officials (Table 2) who were involved in the multiple crises of the megaprojects. Among 16 interviewees there was only one female and the other 15 interviewees were male. The ages of the interviewees ranged from 28 to 52 (mean = 36.8) years, with tenure from 2 to 10 (mean = 4.5) years in their current positions. The interviews were carried out by a team of two to six researchers, with one leading the conversation while the rest of the team took notes. The interviews ranged from 45 to 120 minutes and were audio recorded with the interviewees' approval. A summary of the interviewees and the covered crises is presented in Table 2.

All interviews followed the same set of questions, which were developed and piloted by the authors upfront. These questions covered: (1) basic information about the project, the relationships among project stakeholders, and the major crises that occurred over the project life cycle; (2) questions about collective mindfulness prior to, during, and after the crises; and (3) stakeholders' anticipation of, response to, and means of recovery from the crises. The questions were adapted from Yu and Zellmer-Bruhn (2017); an example is: *How would you describe the attention of stakeholders throughout the project life cycle and prior to the adversities? How did their mindfulness contribute to the megaproject's readiness and preparedness in the face of adversities?*

Validity and reliability were ensured by following Miles et al. (2014). All constructs were derived from extant publications pertaining to resilience and mindfulness (Bhamra et al., 2011; Yu & Zellmer-Bruhn, 2017). Data collection continued until clear patterns occurred and no new patterns emerged (i.e., theoretical saturation was reached). The interview statements were cross-validated to pursue reliability and involved comparisons of data across all available data.

The data analysis follows Miles et al. (2014): (1) data condensation, (2) data display, and (3) conclusion drawing/verification. In light of the mindfulness and resilience literature, interviewee data were interpreted to form the initial coding. Categories were then derived by linking the coded text to previously created codes. The codes and connections among different categories were formed into categories. The interpretation of the interviewee data demonstrated the connections among constructs. Pattern consistency was validated by constantly comparing new insights and searching for

deviant cases (Bowen, 2008), and the patterns were interpreted in the context to build theory.

Existing theories of mindfulness were used to initiate the coding, which was expanded by interpretating the contextual information taken from the interview data. For example, the attention of megaproject stakeholders to the issues and adversities was deductively sought in the displays of findings, whereas the theory of collective mindfulness was used to generalize stakeholders' mindfulness mechanisms. The nature of collective mindfulness mechanisms and how they unfold during organizational processes prior to, during, and following adversities were identified. The Appendix at the end of this article demonstrates the coding structure. The iterative process of analyzing between theory and data form our findings about collective mindfulness mechanisms. The process continued until no emergent ideas or insights were discovered from additional data and analysis, at which point theoretical saturation was achieved (Bowen, 2008). The final model was compared with each interview for validation (Miles et al., 2014).

Table 2. Profiles of Interviewees

Interviewee	Interviewee Position	Project Stakeholder	Crisis Involved
1	Project manager A	A—General contractor	a1; a2; a3
2	Design engineer A	A—Design institute	a1; a3
3	Construction manager A	A—Construction team	a1; a2; a3
4	Project deputy manager A	A—General contractor	a1; a2; a3
5	Government official A	A—Government	a1; a2; a3
6	Supplier A	A—Equipment supplier	a1; a2; a3
7	Safety manager A	A—General contractor	a1; a2; a3
8	Technical staff A	A—Consultant company	a2; a3
9	Construction manager B	B—Construction team	b1; b2; b3
10	Project manager B	B—General contractor	b1; b2; b3
11	Safety manager B	B—General contractor	b1; b3

12	Design engineer B	B—Design institute	b1; b3
13	Government official B	B—Government	b1; b2; b3
14	Supplier B	B—Supplier	b1; b2; b3
15	Government official B2	B—Government	b1; b2
16	Construction team lead B	B—Construction team	b2; b3

Data Analysis

The authors identified and analyzed six crisis events during the megaproject life cycle (three crises for each case; see Table 1) using interviews with 16 project members (see Table 2: more than four interviewees for each crisis). The interview data analysis indicated that collective mindfulness is deeply embedded in megaprojects. During the process of organizational resilience prior to, during, and post adversity, three different mindfulness mechanisms were observed: awareness allocation, emotional detachment, and attention alignment. These are discussed in the following subsection.

Awareness Allocation Mechanism for Readiness and Preparedness

Awareness allocation is a mechanism adopted throughout a project life cycle, but it only manifests itself and functions prior to or in the early stages of a crisis. Awareness allocation refers to purposefully deploying collective awareness or attention to the present moment in an organized manner. Awareness allocation involves systematically and efficiently assigning different attention tasks to stakeholders; these tasks are often complementary, repetitive, and sequential. The stakeholders are required to pay attention to the risky spots, including those that are error prone, overlooked, and linked. Prior to a crisis, the general contractors in both megaprojects adopted awareness allocation mechanisms that involved multiple stakeholders. Awareness allocation is

done to enhance the quality of attention from a distributed structural perspective (Weick & Sutcliffe, 2006). The leaders of megaprojects make decisions based on channels of attention (Ocasio, 1997), and their projects are often subject to risks, uncertainties, and complexities (Khallaf et al., 2018). Precise and efficient allocation of awareness can lead to enhanced observation of early signals and accurate interpretations (Williams et al., 2012). Both Subsea Tunnel A and Intercity High-Speed Train B adopted awareness allocation mechanisms during the pre-adversity stage of organizational resilience. Some related examples are described in the following sections.

Subsea Tunnel A

Subsea Tunnel A was not fully prepared before pollution crisis a1 unfolded. Pollution crisis a1 was regarded as a minor issue by the project team at project initiation. The project required two specialists to implement pollutant removal. Due to a misinterpretation of government regulations and an inaccurate estimation of pollutant ingredients, the two specialists failed to discover the issues early and had to find new land for pollutant disposal and storage; this search for alternative disposal solutions added three extra months to the project time. The failure to estimate and verify a pollutant's potential influence was regarded as a major mistake. Subsea Tunnel Project Manager A described it as, "*the PMO (project management office) should have arranged additional personnel with environmental and political backgrounds to investigate this issue [pollution crisis] in advance. Then we wouldn't have been caught unprepared.*" The construction managers confirmed that "*we were not fully prepared*

for the pollution. Special personnel or even a specific team should be assigned to keep an eye on this issue."

Intercity High-Speed Train B

Intercity High-Speed Train B was shocked by the sudden, but not entirely unprepared for, the weather change of weather hazard b1. Located in a rainy region, Intercity High-Speed Train B listed the probability of heavy rainstorms as one of the project's main concerns and deployed a series of preparatory work that included pressure sensing, on-site inspection, and weather forecasting. These tasks were conducted by project team members, including on-site construction managers (observing pit cracks), safety engineers equipped with measuring devices (for pit pressure), and government coordinator assistants (for retrieving weather information). These specialists shared a complete attention structure with some verification and integration methods. Even the construction workers were told to keep clear of the pit walls at all times. A sudden change in weather badly affected the Intercity High-Speed Train B, with one side of a wall falling and breaking sets of scaffolds. Safety manager B said that: *"Thanks to our previous allocation of tasks, we have 'eyes' on those risky spots. The weather hazard was bad, but we are fully prepared... there were not any unanticipated things, I was sure that things were under control."*

In summary, an awareness allocation mechanism is critical for organizational resilience. Awareness allocation requires systematically deploying channels of attention and keeping the information and signals in an interpretable order. Based on that, we draw the first proposition:

Proposition 1: The awareness allocation mechanism of collective mindfulness improves organizational resilience in megaprojects by identifying early signals that are hidden and scattered among different organizational processes. The awareness allocation mechanism can be established by sharing previous experiences, collectively identifying the critical events and risky spots, assigning attention tasks to involved stakeholders, and forming a comprehensive attention structure for issues and adversities in megaprojects.

Emotional Detachment for Response and Adaption

Emotional detachment is a mechanism applied in the response and adaption stage of organizational resilience and refers to stakeholders detaching from an emotional reaction to remain calm during a crisis. Emotional detachment is the collective emotional control of negative impulses and reactions, collectively minimizing or overcoming stakeholders' negative emotions. Megaproject stakeholders are prone to looking for solutions rather than someone to blame. The stakeholders also try to stay rational rather than emotional while also fighting against apathy and inertia (Matinheikki et al., 2019). Extant research illustrates how collective mindfulness reduces team conflict due to detachment from negative emotionality (Yu & Zellmer-Bruhn, 2017). The key to keeping projects well organized is to utilize the affective functions of experiential information processing (Good et al., 2016) to restrain negative or conflicting emotions. Emotional detachment builds on receptive, open, and nonjudgmental experiential processing to maintain the clarity of awareness (Brown et al., 2007). Collective awareness and attention are vulnerable when interpersonal

conflicts or team-level emotional disorders are encountered.

Subsea Tunnel A

Getting a bit too emotional was a problem among the stakeholders of Subsea Tunnel A. When the PMO of the Subsea Tunnel discovered the potential delays and additional project costs caused by unresolved housing relocation crisis a2, accountability overwhelmed other issues and became the center of conflicts. The Subsea Tunnel A stakeholders had different institutional logics—the government representative pursued hierarchical logic by strictly following government rules and regulations, which conflicted with the general contractor's marketing logic of minimizing housing relocation cost through flexibility. Neither side compromised. The parties involved were not able to concentrate on developing and carrying out an alternative plan. All stakeholders were judgmental and emotional toward one another, constantly blaming the opponent party's attitudes and behaviors rather than trying to compromise and jointly solve the issue. The project deputy manager recalled: "*We really should have worked together as a team and focused on solving the issues first, rather than bringing in negative emotions and feelings. We could have saved a lot of time spent on endless quarrels and arguing; finding the way out should have been the goal.*"

Intercity High-Speed Train B

The parties of Intercity High-Speed Train B were very calm during their process of dealing with the same type of crisis. Intercity High-Speed Train B suffered from housing relocation crisis b2 in which a group of local residents refused to reconcile,

pushing for higher housing compensation. The additional housing compensation exceeded the predetermined budget, which caused disagreement between the government representatives and general contractors due to their different institutional logics. However, the PMO agreed to suspend disputes and jointly work on the issue calmly and objectively with an open-minded attitude. The stakeholders acknowledged that the urgent need was to come up with alternative plans because project success was their ultimate goal. Although housing compensation was a primary burden for the government, it only indirectly affected other stakeholders. The stakeholders were willing to assume extra responsibility for the benefit of the megaproject. With the assistance of other stakeholders, the design managers proposed changing the location of a station to avoid these difficult local residents. The new location and feasibility plans were tested, resulting in an immediate redesign. The design managers acknowledged: "*We all know that if we stick to our original plan, it might work out but it might also turn into a disaster, so everybody was open to suggestions. The new plan of relocating the station went smoothly.*"

In summary, emotional detachment is especially critical in the response and adaption stage of megaproject organizational resilience. During crises, megaproject stakeholders cannot afford extra emotional and relational damage caused by mishandling emotions and relational conflicts. An emotional detachment mechanism stems from controlling negative emotions, fighting against apathy and inertia, and looking for solutions rather than blaming others. From this, we pose proposition 2:

Proposition 2: Emotional detachment mechanisms for collective mindfulness enhance

megaproject organizational resilience by inhibiting negative emotional or conceptual reactions to crises or other members. Emotional detachment can be formed by focusing on the issues and problems, setting aside personal attitudes, avoiding immediate judgment of the situation or criticizing others, and maintaining a harmonious atmosphere even in the face of adversity.

Attention Alignment Mechanism for Recovery and Adjustment

The attention alignment mechanism is adopted during the recovery and adjustment period of organizational resilience. Attention alignment refers to unifying and concentrating the attention of project stakeholders to focus organizational awareness in the intended direction. Attention alignment involves emphasizing the prioritized common values and goals while ignoring those that are currently unimportant, unifying the command of available tangible and intangible resources, and keeping the stakeholders updated to eliminate anxiety. The attention alignment mechanism's purpose is to promote the quality of a recovery or rebuild an organization's function. Stability or continuity of attention and awareness is achieved (Brown et al., 2007) by aligning the attention of multiple stakeholders with diversified institutional logics.

Subsea Tunnel A

Attention alignment was the mechanism adopted by Subsea Tunnel A when technical crisis a3 was encountered. When technical personnel identified operational difficulties with the rubble leveling barge, the stakeholders tried to work on alternative technical solutions. Subsea Tunnel A organized both internal and external stakeholders, including technical institutes, general contractors, and suppliers to work jointly on the issue. The

stakeholders were coordinated to devote their best energy to the alternative plan. Their efforts and attention were aligned and coordinated by a special emergency management team. With the help of this team, project resources were organized to experiment and pilot innovative solutions. Therefore, solving the operational difficulties of the rubble leveling barge became their collective focus. The construction manager said: "*We have tested our 'legs (for the rubble leveling barge)' as a new solution for a tilted work plane. It (the solution) was developed sooner than we had expected since all the available resources were gathered for this issue. We, the special emergency management team, were unbelievably efficient.*" The deputy project manager confirms: "*The special emergency management team really shows solidarity. Stakeholders were following unified instructions.*"

Intercity High-Speed Train B

Intercity High-Speed Train B has a special rule in the project charter that regulates stakeholders' behaviors and performance during a crisis. During construction crisis b3, the special rule allowed for five emergency management teams and reserve leaders with different specialized backgrounds. Emergency teams consist of specialized personnel who are experts in dealing with particular issues and are activated whenever a particular type of crisis occurs. In a crisis, the emergency team members focus their attention on the crisis to reduce wasted effort and manage time. The stakeholders of Intercity High-Speed Train B had different concerns due to different institutional logics but remained dedicated to collectively contributing to the common goal of rebuilding the foundation pit. The project processes and resources were synergized and maximized to achieve

sufficient recovery. Aligning their attention toward a crisis ensures the megaproject's organizational resilience. Supplier B explained: "*We followed Liu's (emergency team lead) order that we only do what he asked us to do and do our best to achieve that. I know they need us to concentrate on the technical parts—that is why we are here.*"

In summary, attention alignment is important for the recovery and adjustment process of megaproject organizational resilience. Megaproject stakeholders cooperate more efficiently and effectively to strategically rebuild functions when their attention is aligned. Attention alignment requires multiple parties to collaborate and concentrate on particular issues and problems, especially after adversities occur. Based on this, we pose proposition 3:

Proposition 3: Attention alignment mechanisms for collective mindfulness lead to improved organizational resilience in megaprojects due to concentrated efforts and attention to particular issues. Attention alignment can be formed by emphasizing the prioritized values and unifying the command of available resources, as well as keeping involved stakeholders updated to eliminate their anxiety.

Discussion

This study explored three collective mindfulness mechanisms that can enhance the organizational resilience process in megaprojects. Three mechanisms were identified to improve our understanding of megaproject organizational resilience: awareness allocation, emotional detachment, and attention alignment.

The three mindfulness mechanisms identified describe how megaproject

stakeholders interact mindfully, which resonates with the previous findings of how team member interaction contributes to moving from individual mindfulness to collective mindfulness (Yu & Ni, 2018). The awareness allocation mechanism explains the mindful organizing mechanism prior to adversities, since the attention of decision makers is often limited (Ocasio, 1997). Systematically allocating awareness and rationally assigning attention tasks to situational and procedural abnormalities lead to a collectively experienced and acute onset, as well as a time-delineated understanding of the crisis phenomenon. Therefore, awareness allocation enables quick identification and an accurate interpretation of early crisis signals, which facilitates swift decision-making to avoid additional losses in highly ambiguous contexts (Mcfarlane & Norris, 2006).

Emotional detachment mechanisms reveal the affective aspects of collective mindfulness. Compared to the mindfulness processes in the general management literature, the emotional detachment in collective mindfulness not only stems from an event-oriented need, but also from institutional complexity. Emotional detachment mechanisms inhibit the tendency for organizational breakup or paralysis due to institutional conflicts (Pache & Santos, 2013). This affective-based mechanism of mindful organizing explains the strategies adopted for temporal institutional requirements (Dille & Söderlund, 2013). Emotional detachment mechanisms also reveal collective group-level emotional intelligence for managing intraorganizational conflicts (Sunindijo & Hadikusumo, 2014), demonstrating how nonjudgmental experiential processing functions when a crisis unfolds. The emotional detachment

mechanisms resonate with a stream of research that mentions citizenship behaviors in the Chinese context (Yang et al., 2018), where facilitating and preserving harmonious relationships in the workplace is encouraged by the national culture (Farh et al., 2004).

Attention alignment mechanisms explain how megaproject stakeholders are directed toward a unified goal for recovery or adjustment. Attention alignment usually involves a special emergency management team that establishes and legitimizes collective effort in recovery and adjustment. A leader acts as a conflict buffer in institutional contradictions (Qiu et al., 2019), whereas attention alignment prevents stakeholders from delaying corrective actions in organizational routines. Consequently, the organizational capability for adjustment and flexibility resists erosion (Rahmandad & Repenning, 2016), which preserves resilience against crisis.

Conclusion

This study adopted collective mindfulness theory from an attention-based view to explore how organizational resilience is achieved in megaprojects. A qualitative approach was chosen, using data collected through 16 interviews of six crises events in two influential megaprojects. The readiness and preparedness, response and adaption, and recovery and adjustment processes were investigated as sequential processes of organizational resilience from an attention-based view. Applying abductive reasoning led to identifying three mechanisms of collective mindfulness in organizational resilience, allowing us to answer the research question.

The research question asked how collective mindfulness facilitates organizational

resilience in the context of megaprojects. Three mechanisms through which collective mindfulness impacts organizational resilience were identified: (1) awareness allocation, (2) emotional detachment, and (3) attention alignment. The awareness allocation mechanism of collective mindfulness is enacted during the pre-crisis period, where readiness and preparedness for organizational resilience are applied. The emotional detachment mechanism of collective mindfulness is enacted during the in-crisis period, when response and adaption of organizational resilience occur. The attention alignment mechanism appears during the post-crisis period, when recovery and adjustment of organizational resilience are performed.

The summary of mindfulness mechanisms and organizational resilience (Figure 2) in megaprojects is built on the organizational resilience processes performed prior to, during, and after crises. Our research findings unpack the mindfulness mechanisms as cognitive and emotional endowments that contribute to the process of organizational resilience. In megaprojects, adversities that include routine hardships and surprisingly discontinuous events (Kahn et al., 2018) are extenuated by conflicting institutional logics. The conflicting and competing institutional logics of diversified project stakeholders may worsen, intensify, or blur how adversities influence megaprojects (Qiu et al., 2019). Collective mindfulness offers a cognitive and emotional response to adversities, which further influences the readiness and preparedness, response and adaption, and recovery and adjustment stages of organizational resilience. The mechanisms through which collective mindfulness affects organizational resilience as a process are awareness allocation, emotional detachment, and attention alignment.

These mechanisms enhance the quality of the project stakeholders' attention in the face of crises. The cognitive and emotional levels of mindful organizing alleviate the negative impacts of institutional complexities, including endogenous factors that drive relationship conflicts, such as ambiguous contracts and opportunistic behaviors (Zheng et al., 2019), enabling behavioral and relational responses to adversities and organizational resilience in megaprojects.
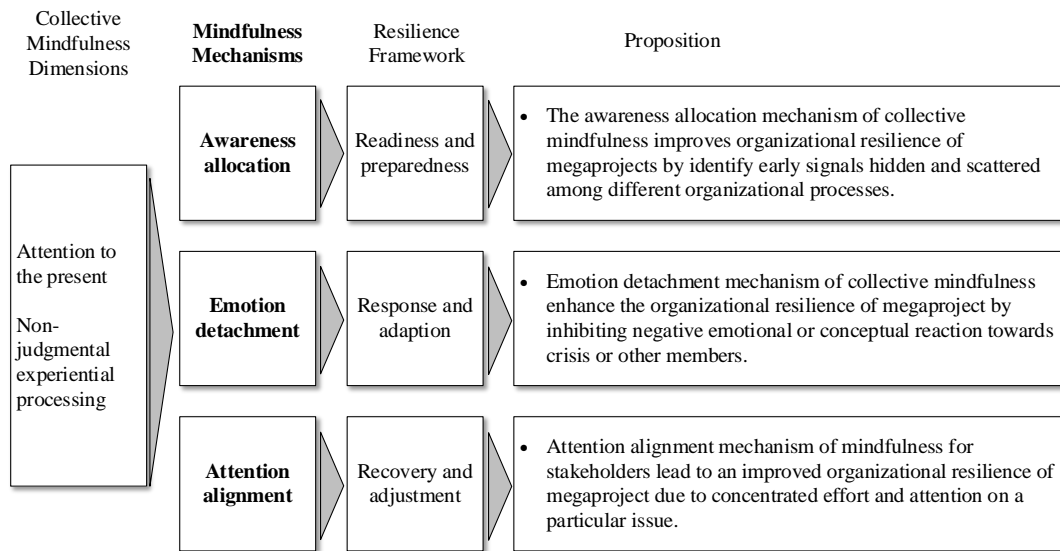

Collective Mindfulness Dimensions	**Mindfulness Mechanisms**	Resilience Framework	Proposition
Attention to the present Non-judgmental experiential processing	**Awareness allocation**	Readiness and preparedness	• The awareness allocation mechanism of collective mindfulness improves organizational resilience of megaprojects by identify early signals hidden and scattered among different organizational processes.
	Emotion detachment	Response and adaption	• Emotion detachment mechanism of collective mindfulness enhance the organizational resilience of megaproject by inhibiting negative emotional or conceptual reaction towards crisis or other members.
	Attention alignment	Recovery and adjustment	• Attention alignment mechanism of mindfulness for stakeholders lead to an improved organizational resilience of megaproject due to concentrated effort and attention on a particular issue.

Figure 2. The summarized collective mindfulness mechanisms in organizational resilience.

Theoretical and Practical Implications

This study's theoretical implications include, foremost, empirical validation of the positive impact of collective mindfulness on organizational resilience in megaprojects (Oeij et al., 2018). The research findings contribute to the larger theory of organizational resilience by exploring the mechanisms through which collective mindfulness impacts organizational resilience in megaprojects. This theory proposes

that collective mindfulness promotes resilience through different mechanisms at different stages of resilience processes (Bhamra et al., 2011). For megaprojects with institutional complexities (Biesenthal et al., 2018), collective mindfulness mechanisms can cognitively and emotionally mitigate conflicting and competing logics in the face of crises. Our findings bring cognitive solutions for stakeholder engagement in megaprojects, especially when there are differing institutional logics. Stakeholders' institutional complexities need to be resolved by being attentive to the present and reducing the influence of emotion during the resilience process (Biesenthal et al., 2018). Collective mindfulness alleviates how conflicting institutional demands and distractions impact megaproject resilience (Qiu et al., 2019). Our study also provides an explanation of how a shared view of the *vision* occurs through understanding different stakeholders' institutional logics (Christenson & Walker, 2004) and how to enhance the quality of collective attention (Weick & Sutcliffe, 2006) through collective mindfulness mechanisms. Resilient organizations have systematically distributed and organized attention to their internal and external environments (D'Aveni & MacMillan, 1990).

Our findings have several implications for practicing managers. Collective mindfulness as explored in this research can be applied to megaproject stakeholders for improved resilience. The research outlined the cognitive and emotional strategies that megaproject managers can utilize to coordinate stakeholders' pre-, during, and post-adversity capabilities. Megaproject stakeholders—including not only those directly affected but also peripheral stakeholders—are advised to pay distributed attention to

critical events. Both core and peripheral stakeholders, including the main contractor, subcontractors, government, and suppliers, should be coordinated and organized for collective effort in the face of internal and external adversities. Assigning mindful attention using complementary, sequential, or repetitive methods can increase the ability to discern early warning signs (Williams et al., 2012). Stakeholders can collectively identify and interpret procedural, factual, and contextual abnormalities to minimize the development of adversities by, for example, highlighting risks that are identified collectively by different stakeholders. Keeping stakeholders emotionally detached at the collective level can also be actively used to organize collective responses and adaption as growing strains and crises unfold. This strategy should be adopted especially when the crises involve both the public and private sectors by, for example, avoiding immediate blaming and conflicts during crises. Separating negative personal and relational emotions from the collective response to adversities facilitates surviving from risks and uncertainties. The efficiency and effectiveness of recovery from crises are subject to the aligned attention of stakeholders. Under extenuating circumstances, megaprojects must keep stakeholders mindful and proactively assign an emergency team for crises. Project managers should emphasize their collective priorities, unify the command of tangible and intangible resources, and keep stakeholders informed to improve mindful organizing.

Limitations and Future Research Directions

This research has several limitations. First, the study focuses on infrastructure

megaprojects. The mechanisms through which collective mindfulness affects organizational resilience may change according to the characteristics of other industries. Future research may empirically validate the research findings in other project-based industries and improve the generalizability of our findings to other diverse businesses. The proposed conceptual framework and propositions can be empirically tested with quantitative and qualitative data or a mix of both. A second limitation is the geographical spread. Both megaprojects examined are characterized by a Chinese culture background, where culture-based institutional logics dominate megaproject life cycles. Eastern and western understanding of collective mindfulness may be interpreted differently (Weick & Putnam, 2006). Future research could compare the cultural differences of the western and eastern perspectives of mindful organizing. This line of work can also be extended to include other institutional and organizational variables, such as contractual and relational governance among stakeholders. A third limitation is that there might be some other influencing factors for development and application of collective mindfulness, including previous ties, trust level, cultural influences. These influencing factors can be investigated in future research on the resilience of megaprojects.

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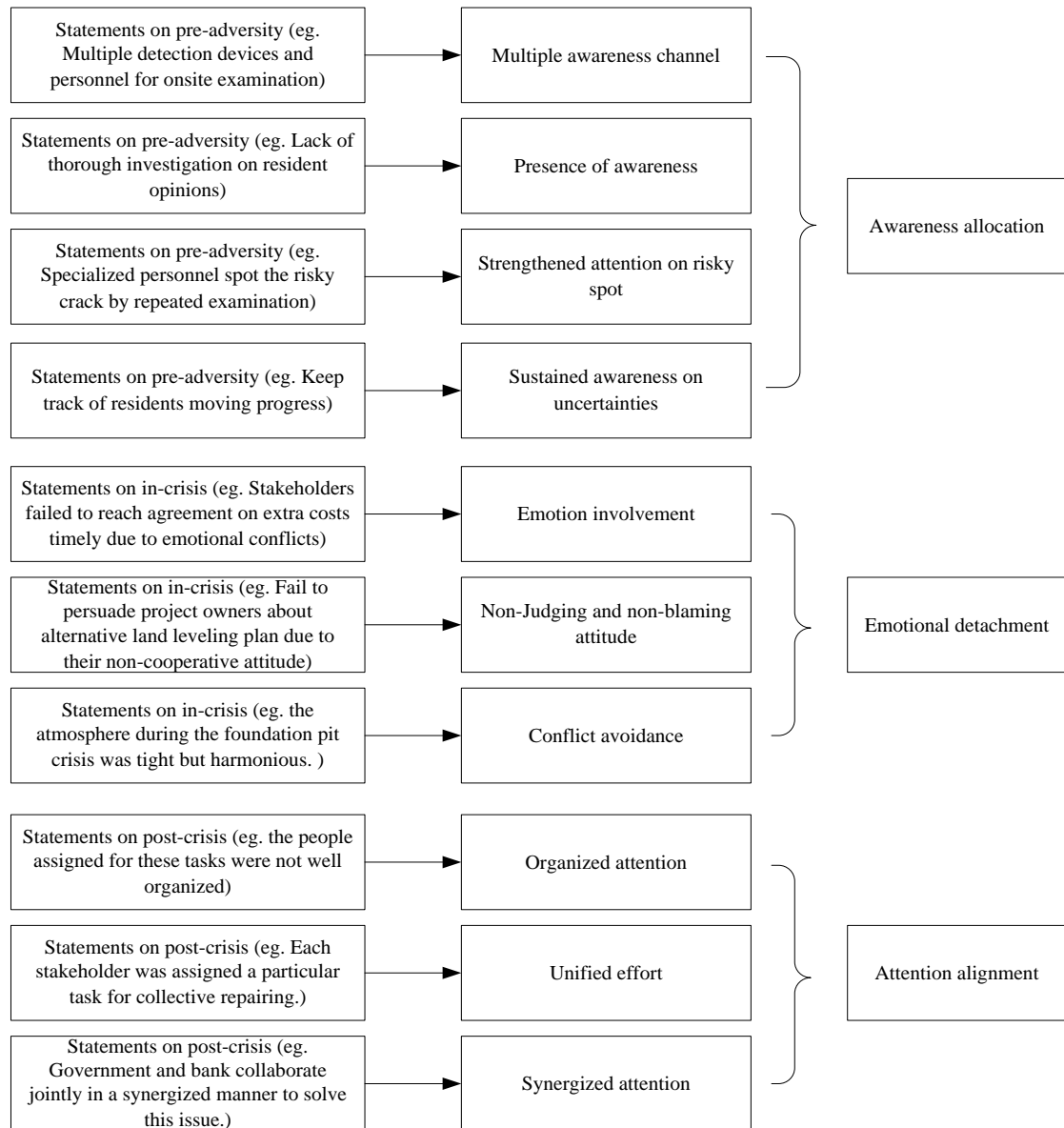
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Appendix. Examples of Coding Structure

Statements on pre-adversity (eg. Multiple detection devices and personnel for onsite examination) →	Multiple awareness channel	
Statements on pre-adversity (eg. Lack of thorough investigation on resident opinions) →	Presence of awareness	Awareness allocation
Statements on pre-adversity (eg. Specialized personnel spot the risky crack by repeated examination) →	Strengthened attention on risky spot	
Statements on pre-adversity (eg. Keep track of residents moving progress) →	Sustained awareness on uncertainties	

Statements on in-crisis (eg. Stakeholders failed to reach agreement on extra costs timely due to emotional conflicts) →	Emotion involvement	
Statements on in-crisis (eg. Fail to persuade project owners about alternative land leveling plan due to their non-cooperative attitude) →	Non-Judging and non-blaming attitude	Emotional detachment
Statements on in-crisis (eg. the atmosphere during the foundation pit crisis was tight but harmonious.) →	Conflict avoidance	

Statements on post-crisis (eg. the people assigned for these tasks were not well organized) →	Organized attention	
Statements on post-crisis (eg. Each stakeholder was assigned a particular task for collective repairing.) →	Unified effort	Attention alignment
Statements on post-crisis (eg. Government and bank collaborate jointly in a synergized manner to solve this issue.) →	Synergized attention	

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