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Prior and governed stakeholder relationships: The key to resilience of inter-organizational projects

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ABSTRACT

Increasingly, scholars are recognising the importance of resilience in projects. However, there is a lack of research on the resilience of temporary inter-organisational projects while considering the intricate relationship among multiple stakeholder organisations. We conducted an embedded comparative case study to investigate the mechanisms how stakeholder relationships involving prior ties and inter-organisational governance in the project support its resilience. Our results show that few prior ties among stakeholders keep them vigilant, fostering the readiness and preparedness for resilience, while many prior ties keep social solidarity among stakeholders, fostering the response and recovery for resilience. Contractual and relational governance improves resilience by clarifying stakeholders' roles and responsibilities and forming collective cognition, respectively. We believe a plural governance design based on prior ties among stakeholders will improve resilience of the inter-organisational project, by promoting dynamically distributed and centralised stakeholder engagement in preparing, responding and recovering from the unexpected.

1. Introduction

Unexpected crises like pandemics, economic crises, political incidents, and natural disasters inevitably challenge megaprojects (Nachbagauer & Schirl-Boeck, 2019; Wang & Pitsis, 2019; Xin and Pearce, 1996), although there have been massive efforts on risk and crisis management of projects (Thomé et al., 2016). Given the impossibility of anticipating, planning and defending against all the crises that a megaproject might face, the concept of resilience in organisation theory 'the ability of a system to quick return to a stable state after a disruption' (Bhamra et al., 2011) has been given a great amount of attention in the project management realm, especially since the ongoing COVID-19 pandemic (Naderpajouh et al., 2020a). Improving the resilience of projects, which refers to the ability to prepare, respond, and recover from the unexpected is not only a decisive factor for the project's survival, but also related to the interests of all participating stakeholder organisations (Nachbagauer & Schirl-Boeck, 2019; Naderpajouh et al., 2020a, 2020b). Hence, it is necessary to explore how to improve the resilience of a megaproject.

The megaproject as a temporary organisation is typically involved in multiple stakeholder organisations (DeFillippi & Sydow, 2016). Given the inter-organisational intricate interdependencies and the different institutions of these stakeholders (Sydow & Braun, 2018), there is still some doubt whether the insights from organisational resilience such as developing high-reliability organisation (Gilly et al., 2014; Parker & Ameen, 2018; Weick et al., 2008) can be applied into megaprojects (Nachbagauer & Schirl-Boeck, 2019). The introduction of the inter-organisational perspective of projects challenges the intra-organisational focus of single project organisation and highlights the significance of the inter-organisational stakeholder relationship (Sydow & Braun, 2018). Considering the megaproject as an inter-organisational project, its resilience should be subject to the joint effort of multiple stakeholder organisations (Gilly et al., 2014). This infers that the relationship among these stakeholders is the key to the resilience of the inter-organisational project. In view that the temporary organisation is linked to the past and the project context, the relationship among stakeholders is related to their prior ties and project governance (Brahm & Tarziján, 2015; Engwall, 2003). Thus, we argue that it is necessary to explore how their intricate relationships affect stakeholders' efforts to foster resilience of the temporary inter-organisational projects.

Although recognising the prior ties among involved organisations is

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related to the project, the related role has been paid less attention, especially in resilience research (Brahm & Tarziján, 2015). As per extant project governance studies, the goal of governance in the project level is mainly to satisfy stakeholders and improve project performance (Ahola et al., 2014; Derakhshan et al., 2019; Joslin & Müller, 2016). It has never considered the governance on stakeholder relationship in the project with the goal of improving its resilience. Because stakeholders should be the main body that provides resources for project readiness, response and recovery from the unexpected, inappropriate governance on their relationships might reduce their initiative and affect the speed and efficiency of recovery, resulting in the termination or even failure of the project (Thomé et al., 2016). Besides, the existing literature applying stakeholder theory mainly focus on the relationships between internal and external stakeholders and the relationships among internal stakeholders (Biesenthal & Wilden, 2014; Derakhshan et al., 2019; Yang & Shen, 2014). The relationship among external stakeholders has been paid less attention to, but it has been called for (Derakhshan et al., 2019). Especially in inter-organisational projects, external stakeholders should also be engaged in projects and treated as decision makers and value creators (Derakhshan et al., 2019; Lehtinen & Aaltonen, 2020), although we still know little about how stakeholders should engage in adversity-responding activities. Hence, the investigation on the mechanism of the link between external stakeholder relationships and the resilience of inter-organisational projects is of significance but under-studied. In this study, we attempt to explore:

RQ. How do prior ties among stakeholders and governance design in the inter-organisational project support its resilience?

By interpreting the mechanisms behind the influence of stakeholder relationship formed before and governed in the inter-organisational project on its resilience from the perspective of stakeholder management, this study contributes to resilience literature in temporary inter-organisational projects (Naderpajouh et al., 2020a). It also provides a new governance logic on stakeholder relationship for improving the resilience of inter-organisational projects. Plural governance design based on prior ties is recommended to facilitate a dynamically distributed and centralised stakeholder engagement in preparing, responding and recovering from the unexpected (Derakhshan et al., 2019; Lehtinen & Aaltonen, 2020; Thomé et al., 2016). Overall, this study provides an in-depth understanding of how the resilience of temporary inter-organisational projects is achieved through analysing the relationships among stakeholder organisations, which contributes to the larger topic of resilience of general inter-organisational networks.

2. Literature review

In this section, we review the concept of resilience, its project-related research, and inter-organisational project literature, respectively. Since we are concerned about the stakeholder relationship in the inter-organisational project, the related literature on project governance and stakeholders are also included.

2.1. Resilience and project-related research

Resilience refers to the ecological concept of how fast a system returns to the equilibrium state following a perturbation, which complements traditional risk management that employs statistical calculations of probabilities and hindsight (Fiksel et al., 2015; Madni & Jackson; Ponis & Koronis, 2012; Thomé et al., 2016). Resilience has been observed at the individual level and then expanded to higher levels of organisation, industry, supply chain, community, and territory in general management and organisation theory (e.g. Bhamra et al. 2011, Gilly et al. 2014, Kamalahmadi & Mellat 2016, Parker & Ameen 2018, Rao & Greve 2018, Tukamuhabwa et al. 2015, Van Der Vegt et al. 2015). From the capability view, Kamalahmadi and Mellat (2016) provide a comprehensive definition of organisational resilience: 'the dynamic capability of an organisation, which is highly dependent on its individuals, groups, and subsystems to face immediate and unexpected changes in the environment with a proactive attitude and thought, and adapt and respond to these changes by developing flexible and innovative solutions' (p.121). This definition covers multiple important characteristics including dependence on intersubjective interaction, proactive attitude, adaptable and responsive capabilities, and implies the process-based nature of resilience. From the process-based view, organisational resilience can be interpreted 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 preparing resource endowment, detecting weak signals, spotting errors, and anticipating disruptions (Giustiniano et al., 2018). Response and adaption, as an in-crisis organizing capability, involves absorbing shock and reducing loss of function. Recovery or adjustment, as a post-crisis capability, involves remaining flexible and rebuilding primary functions to adapt and recover as early as possible (Tan et al., 2019). This study is aimed to interpret resilience based on the framework of Bhamra et al. (2011).

Projects as vehicles of organising change (Turner & Muller, 2003) face many crises indispensably. Crisis is defined as a low-probability, unanticipated, high-impact events that is unpredictable, surprising, and threaten the viability of the organisation (Williams et al., 2017). There are three essential components to understanding crisis and its subsequent management, namely rarity of the event, significance of the event, and the level of impact on stakeholders (James et al., 2011). Recent development in the project realm have seen a growing trend with regards to exploring crisis management and resilience. The ongoing literature on crisis is parallel and, in some cases, overlapping with the research stream on resilience as the ability of systems to perform under varying conditions and in the face of the unexpected changes and crisis (Giustiniano et al., 2018; Naderpajouh et al., 2018; Weick et al., 2008). Crisis management studies focus on exogenous phenomenon, including antecedents, management, and consequences of crisis (Simard & Laberge, 2018; Wang & Pitsis, 2019). Resilience studies focus on endogenous phenomenon, for example, the capability of systems to absorb, adapt to and transform in response to disruptions (Bhamra et al., 2011; Jobling, 2012; National Research Council, 2012; Unterhitzenberger et al., 2021). They emphasise that resilient actors circumvent major disruption to functioning before, during, and/or after crises or adversity (Alexander, 2013). Hence, when facing the unexpected crises, resilience as 'the ability of an element to return to a stable state after a disruption' (Bhamra et al., 2011) becomes critical (Naderpajouh et al., 2020b).

Among the project management literature, Nachbagauer and Schirl-Boeck (2019) offered conceptual clarifications of the unexpected megaprojects on combination with systems theory and resilience and argued that the unexpected crises cannot be planned for as a traditional project management approach; however, managers can prepare for the unexpected through improving resilience. Kutsch et al. (2015) proposed 'project resilience' involving rule-based and mindfulness-based project management in dealing with crisis. Rules are put in place to pre-plan the future-based actions of forecasting, assessing, and scheduling with the express purpose of prevention. Mindfulness emphasises distinctive capabilities to notice, interpret, prepare, contain and bounce back from crisis. However, "project resilience" is not widely applied, probably because there is no clear conceptual definition. Extant studies on resilience in projects also rarely pay attention to the inter-organisational facets of temporary projects which span across the boundaries of multiple stakeholder organisations, while extant literature on crisis management has suggested to measure stakeholder participation in routine and crisis situations (Wang & Pitsis, 2019). Resilience literature have suggested it is necessary to further explore the resilience of inter-organisational networks and hybrid organisations with multiple organisational forms and embedded multiple missions/values (Williams et al., 2017). organisation.

2.2. Stakeholder relationships in temporary inter-organisational projects

When considering projects as temporary organisations, it is imperative to note three pioneering studies: Lundin and Söderholm (1995), Turner and Müller (2003), and Sydow and Braun (2018). Lundin and Söderholm (1995) first defined the features and processes of a temporary organisation. Turner and Müller (2003) further applied organisational theory to explain the nature of the project as a temporary organisation. Sydow and Braun (2018) conceptualised the inter-organisational facets of temporary projects and argued that inter-organisational relations with stakeholders, such as customers, suppliers, service providers, and subcontractors provide a network context for a project temporary organisation. Four features of inter-organisational projects can be illustrated: bridging singularities through latent and activated ties, disordering hierarchies by forming inter-organisational teams, blurring organisational boundaries, and reframing the behaviour of individuals (Sydow & Braun, 2018). These features especially inter-organisational intricate relationships make the project different from the general organisation with a hierarchical structure.

Projects as temporary organisations are affected by the experienced past and expected future of involved organisations (Engwall, 2003). At project commencement, stakeholder organisations are involved in the project. There may be certain relationships among stakeholders due to prior ties established before this project commencement such as long-term repeated ties and cooperative experiences (Brahm & Tarziján, 2015; Gulati, 1995; Vanneste & Puranam, 2010). Prior ties, which signal the continuation of their relationship, breed trust (Gulati, 1995), reduce opportunistic behaviours, improve routines between parties, and promote contractual compliance (Gil & Marion, 2013; Vanneste & Puranam, 2010). After project commencement, inter-organisational governance decisions implemented for project goals also affects the stakeholder relationships (Ahola et al., 2014; Derakhshan et al., 2019). Extant research on inter-organisational projects has discussed the interactions among individuals in different organisations (von Danwitz, 2018), processes of collaboration among multiple organisations (Artto et al., 2016; Oliveira & Lumineau, 2017; Zhang et al., 2018) and governance modes of inter-organisational projects (DeFillippi & Sydow, 2016; Provan & Kenis, 2008). Although the intricate relationship among stakeholder organisations in inter-organisational projects, which involve prior ties and project governance, has been constantly investigated, the ways in which their intricate relationships impact their engagement in the resilience of the inter-organisational project is underexplored. For instance, Wang and Pitsis (2019) suggests measuring stakeholder participation in crisis events.

2.3. Project governance

Project governance literature is divided into studies in the organisational level that view project governance as a process external to any specific project and studies in the project level that treat project governance as a process internal to a specific project (Ahola et al., 2014; Biesenthal & Wilden, 2014). The latter believe a core function of project governance is to align the interests of involved stakeholder organisations to work together towards shared goals (Turner & Simister, 2001). It is aimed to organise stakeholder engagement in projects for project outcomes, stakeholder satisfaction, trust building, etc. (Lehtinen & Aaltonen, 2020), and even treat stakeholders as decision makers and creators and targets of value (Derakhshan et al., 2019; Di Maddaloni & Davis, 2018; Oppong et al., 2017). From an intra-organisational focus on a single project organisation to an inter-oragnizational view on projects, the relationships among internal stakeholders and the relationships between internal and external stakeholders have been researched by applying agency theory, transaction cost theory, resource dependence theory and stakeholder theory (Ahola et al., 2014; Derakhshan et al., 2019). Stakeholder theory brings the main doctrine to the consideration of the external stakeholders and the importance of their positions in the project. However, the relationships among external stakeholder organisations are under-explored (Derakhshan et al., 2019) and there has been limited exploration regarding the link between the governance on their relationships and resilience of inter-organisational projects (Naderpajouh et al., 2020a).

As to the forms of inter-organisational governance, there exist both formal and informal connections (Müller, 2016), such as formal contracts (Arranz & De Arroyabe, 2012), trust (Suprapto et al., 2015), and relational norms (Müller & Martinsuo, 2015). One prominent distinction is made between contractual and relational governance in project settings, originally proposed based on transaction cost theory (Benítez-Ávila et al., 2018). Contractual governance emphasises the significance of contracts and formal rules to prevent inappropriate behaviour by laying down monitoring procedures, detailed duties, rights, contingencies, and outputs to be delivered (Ryall & Sampson, 2009). Relational governance centres on the development of trust, reciprocity, and social norms through mutuality and ongoing information exchange to prevent opportunism and coordination problems (Arranz & De Arroyabe, 2012). The dichotomous view of singular governance has, of late, shifted to a continuous view of plural governance (Benítez-Ávila et al., 2018; Bouncken et al., 2016; Cao & Lumineau, 2015). The contractual and relational governance is adopted as the research basis for this study.

3. Research methodology

3.1. Research design

The exploratory nature of this study calls for a qualitative approach to examine the mechanism how stakeholder relationships involving prior ties and project governance support the resilience of an inter-organisational project based on limited previous research (Eisenhardt, 1989). To answer our research question, two megaprojects case studies with six embedded crises were conducted by following a logic of abductive reasoning. This abductive research approach is particularly suitable for an in-depth understanding of theory development (Eisenhardt, 1989). The generated theoretical framework contributes to an elaboration of relationship among stakeholders towards resilience of interorganisational projects, by reconciling our empirical findings with previous theoretical argument. The study design process followed (Saunders, Lewis, & Thornhill, 2009), where we took a Critical Realist stance, which establishes robustness by combining respondents' observations with existing theory (Bhaskar, 2016). Abductive reasoning was employed for the same reasons (Alvesson & Skoldberg, 2009). Both align especially well with exploratory case study research .

This study aims to systematically investigate how stakeholder relationships in the inter-organisational project support its resilience from the stakeholder management view. The project is a temporary organisation embedded by multiple project stakeholder organisations. Thus, the stakeholder relationships consist of prior ties before the project and the relationship governed in the project. Following the resilience framework including readiness and preparedness, response and adaption, and recovery and adjustment, the research is designed to explore the mechanisms that link stakeholder relationships (prior ties and governed relationship) with resilience of inter-organisational projects. Based on the mechanisms, this study also aims to explore to the optimum design for inter-organisational governance on stakeholder relationships in the project to support its resilience. The theoretical framework is illustrated in Fig. 1.

Two megaprojects in China were chosen to avoid cultural differences (Baxter & Jack, 2008), namely, Project A (a subsea tunnel) and Project B (an intercity high-speed train). These two megaprojects were chosen based on an information-oriented sampling technique to maximise the utility of information from small samples and to identify critical cases to achieve information that permits logical deductions of the type. Cases

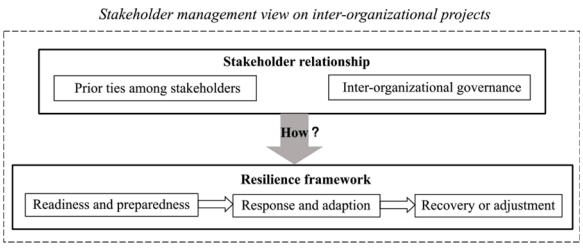

Fig. 1. Research framework overview.

are selected on the basis of expectations about their information content including the following criteria (Flyvbjerg, 2006). Resilience research is particularly suitable with information-oriented sampling since the resilience of projects is manifested during the crisis's events. First, both projects are public-private partnership projects and are extremely large in scale (both around 20 billion USD) with comprehensive governance mechanisms and a variety of stakeholders, including contractors, governments, private sector, financial institutions, and suppliers. Second, both projects are prioritised in their provincial areas and consequently attract both mass media and social media attention. Their resilience is critical not only to their stakeholders but also to the municipal and provincial economic development. Third, both megaprojects entail complicated safety risks and multiple adversities, upon which resilience can be manifested for analysis. The two projects demonstrate different levels of resilience, where anomalies emerge to highlight new or extended preliminary constructs and reveal new relationships (Ridder, 2017). In addition, we have identified and selected three different types of crisis in each project as case events based on the following criteria, (1) to ensure comprehensive information for each critical crisis, (2) to select the most critical crises for projects and project partners, (3) to keep the maximum variance for each crisis,.

3.2. Case contexts

Project A was a subsea tunnel project, one of the largest infrastructure megaprojects in City A and the second-largest sea-crossing megaproject in China. It was characterised by technical complexity, high level of environmental hazards, and extreme building conditions. It required cutting-edge techniques and equipment for implementation. It was about 12.1km in length, of which 5.1km was undersea. It was designed to last for 100 years and costs 23.7 billion USD. Firm AA was the general contractor of the project and City A's Urban Construction Bureau was the main sponsor (the city and firm have been anonymised). It was a public-private partnership among City A's local government, China Railway Investment Group, City A Metro, and other major stakeholders.

Project A underwent three major crises (of the several) during its construction phase, which were not only detrimental to the project progress but also significantly increased project costs as Table 1 shows. The pollution crisis (A1) occurred when it was discovered that the contaminated soil had an uninspected composition and that the standard of International Standard Organisation for the treatment of Class II solid waste changed. The housing demolition crisis (A2) occurred because it was difficult to conduct the demolition and relocate all the houses as the property rights of many old houses were unknown and each family had different requirements. The technical crisis (A3) occurred when the technical staff discovered that the actual geological conditions at the site were far more complicated than what the drawings showed and that the original levelling plan was a major safety risk.

Project B was an intercity high-speed train project linking coastal cities, which was the largest urbanisation transportation megaproject in China. It was characterised by unknown and harsh geological conditions, the involvement of many stakeholders, a demanding building environment, and new technologies. It was approximately 46.301km long, with an expected speed of 220km/h. The project was designed to last for 100 years and cost 19.8 billion USD. Firm BB was the general contractor in the project and City B and C's local government were the main sponsors (the cities and firm have been anonymised). They were quite familiar with each other since they have had previous collaboration experience.

Project B also suffered several major crises during its construction phase, among which three were the most severe, as shown in Table 1. The financing crisis (B1) occurred when Bank C found procedural lapses with the loan issue at the review stage, although it had clearly been stated that the bank would provide loans during the bidding process. The payment crisis (B2) occurred when workers went on strike to protest against a subcontractor that failed to pay their wages on time. The weather crisis (B3) occurred when there were typhoons and storms in the summer while construction work was ongoing.

3.3. Data collection and analysis

The data were collected from multiple resources (Eisenhardt, 1989; Yin & Thousand, 2009). First, we gathered public and project-specific available electronic documents; second, we conducted semi structured interviews. These two data collection methods are typical and appropriate for qualitative case-based research (Table 2) (Yin & Thousand, 2009).

To acquire sufficient info for background understanding of projects and crises events, we have comprehensively searched and gathered the available data from both public websites and corporate profiles, which include internal reports on project crises management, emails between key stakeholders, the project plan and project log for both projects, news report on crises events, research paper on projects, and local government reports. After excluding the irrelevant files and documents, 39 documents were adopted for further analysis and data triangulation. For example, the related information on prior ties among stakeholders are mainly from the contracts, emails, and news.

Eighteen interviews were conducted with project managers, project team members, engineers, and government officials who performed tasks in relationship with multiple stakeholders in projects. The different project participants' work differed; thus, they interacted at different intensities with involved stakeholders during crises. Selecting informants from different positions allowed us to gain richer insights into the studied phenomena. Theoretical saturation was achieved by following the informational redundancy approach at an early stage in the process. Decisions about when further data collection was unnecessary are based on the researcher's sense of no additional data being found whereby the researchers could develop properties of the category. The interviews were carried out by a team of 2–6 researchers, with one leading the conversation, while the rest of the team took notes. The interviews ranged from 45–120 min and were audio-recorded with the interviewees' approval.

All interviews used the same sets of questions developed and piloted

Table 1
Six crisis events of the two projects.

Project	Subsea tunnel A			Intercity high-speed train B		
Total investment	23.7 billion USD			19.8 billion USD		
Project duration	50 months			40 months		
Project initiation	Apr 2017			Dec 2016		
Crisis event	A1: Pollution	A2: Demolition	A3: Technique	B1: Financing	B2: Payment	B3: Weather

Table 2
Overview of data sources.

Projects	Interviews (N=18) Interviewee title	Interview date	Documents (N=39)
A: Subsea tunnel	Project manager (Firm AA)Associate project managerSafety managerProject engineerGovernment officer (Urban Construction Bureau) Government officer (Environment Protection Department) Professor (D University)	2019.04.032019.05.122019.04.052021.04.252019.04.162019.04.292019.05.202021.04.282021.05.052021.04.24	Contracts (8)Internal reports (2)Emails (5)Project plan (1)Project Log (2) News reports (2)Research paper (2)Government reports (2)
B: Intercity highway	Project manager (Firm BB)Assistant project managerSafety managerProject engineerGovernment officer (Urban Construction Bureau) Construction subcontractor	2019.09.232019.10.102021.05.152019.09.242019.09.272019.12.022021.04.272021.05.10	Contracts (6)Internal reports (1)Project plan (1)News reports (6) Government reports (1)

upfront by the researchers. These questions covered: (1) basic information about the projects, the relationships among project stakeholders, the major crises that occurred over the project lifecycle; (2) questions on prior ties of stakeholders and inter-organisational governance in the project, and how they were organised in face of the crises; and (3) stakeholders' anticipation, response, and ways of recovery from the crises.

Validity and reliability were ensured by following Miles et al. (2014). All constructs were derived from the literature on resilience, stakeholder and governance. The data collection continued until clear patterns showed and no new patterns emerged (i.e., theoretical saturation was reached). Cross-validation of interview statements was conducted to establish reliability, which involved a comparison of data across all available data.

For a holistic and in-depth understanding of the data, they were analysed through: (1) within-case analysis and (2) cross-case comparison (Eisenhardt, 1989). First, for within-case analysis, researchers individually investigated each case as a stand-alone entity and familiarised themselves with the interview transcripts and documentation of the crisis event. The researchers generated thick case descriptions by taking each crisis in projects as the unit of analysis and manually summarising each crisis in terms of activities, involved stakeholders, and resilience (as is displayed in Appendix). The coding was conducted through coding the amount of prior ties, the contractual and relational governance, the resilience of each embedded crises and the underlying mechanisms in all case data. Coding for the underlying mechanisms was conducted deductively by looking for support of existing theories on prior ties, inter-organisational governance and resilience, and then gradually expanded into inductive interpretation in light of the additional information given through the interview data and the display of the findings. By following the abductive approach, we formed categories for all the information we received from the interviews, got insights from the theory, and reflected back to the empirical findings. More specifically, we organised the data into first- and second-order codes and then into aggregated and theoretical dimensions (Gioia et al., 2013). Therefore, the roles of prior ties among stakeholders and governance in inter-organisational project resilience were deductively looked for in the crisis events. We read through the interview transcriptions and gave first-order labels to sections of the interviews that described the impacts of prior ties among stakeholders and inter-organisational governance on resilience. The codes and connections among the different categories lead to the identification of variables, such as social solidarity. Consistency of patterns was validated by constantly comparing new insights and searching for deviations (Bowen, 2008). The results were then utilised for cross-case analysis, where common patterns were found. Second, for cross-case analysis, we compared the initial findings from both cases and made comparisons accordingly. The unique traits of each case were discovered to facilitate cross-case analysis and comparison of in-case findings. Cross-case patterns and new findings were found through comparisons (Eisenhardt, 1989). During the second step, iterative tabulation of evidence and replication of logic across cases prevented false or premature conclusions (Eisenhardt, 1989).

An example of coding procedure is displayed as follows. The interviewee's detailed description '*We required all stakeholders to participate and frequently brainstorm each detail in the project, and encouraged everyone to put forward potential risks and requirements'* is coded into the 1st-order code of *'All stakeholders participate brainstorm about risks prior to tasks'*, which is then coded into the 2nd-order themes of *'speaking out freely'*. Similarly, the 1st-order code of *'Freely point out the different ideas anytime'* is coded as the 2nd-order themes of *'appreciate different perspectives'*. By following similar steps, the other 1st-order codes and 2nd-order themes for roles of prior ties among stakeholders in resilience of inter-organisational projects were produced. By comparing the differences between 2nd-order themes identified previously, aggregated dimensions of *'freedom to be vigilant* and *social solidarity'* were generated. Then all cases were cross analysed to compare the differences and

commonalities of these codes, themes, and dimensions. Data were then cross-analysed to facilitate purification and confirmation of findings to establish cross-validation.

4. Data analysis and results

After summarising the characteristics of six crisis events of the two case projects, in terms of prior ties among stakeholders, inter-organisational governance and resilience, the roles of prior ties among stakeholders (few or many) and inter-organisational governance (contractual or relational) in resilience of inter-organisational projects were identified respectively in the analysis of all the interview data. Then, a model of the relationship among stakeholders and the resilience of inter-organisational projects was developed through a cross-case analysis from the stakeholder management view. We first provide analytical evidence in terms of the cases and then describe the findings.

4.1. Role of prior ties of stakeholders in resilience of inter-organisational projects

In Project A, other than City A's Urban Construction Bureau as the main sponsor, Firm AA, as the general contractor, also hired a supervision company to jointly sign the project contract and formulate more detailed contract terms. All of them were collaborating for the first time, especially in a subsea tunnel-related project. Since the parent company of Firm AA was not located in the city, it also had to find some new subcontractors instead of collaborating with their partners. Local stakeholders and subcontractors were also new to each other. Thus, most the stakeholders did not know each other well in Project A. We found that there were only a few prior ties among the stakeholders of Project A. They were not connected, so they could boldly raise threats and risks based on their own interests without interference from others and put forward different views and suggest novel solutions. Before the crisis event A Pollution, Project A demonstrated a presence of anticipation, which included detecting weak signals.

> *'We did a lot of work in the early stage of the project. We required all stakeholders to participate and frequently brainstorm each detail in the project, and encouraged everyone to put forward potential risks and requirements. Regardless of the magnitude of the risk, we discussed all the solutions. As all stakeholders were not familiar with each other, they strived to point out in advance the threats and risks, to prevent sabotaging their interests. They also put forward diverse requirements and solutions.'*

We coded the role of few prior ties of stakeholders in resilience as 'speaking out freely', 'immediate report' and 'appreciating different perspectives', as shown in Fig. 2. Less prior connections among stakeholders enable each stakeholder to be independent and vigilant. They have no interdependent objects, and they have no previous cooperation experience to refer to. That is why everyone is more likely to actively express their own view and indicate risks for their own interests. We found the data on the role of few prior ties mainly describes how to prevent the crisis from occurring and developing. That is to say, few prior ties allow stakeholders to have adequate anticipation and advance preparation, which promotes readiness and preparedness of resilience of the inter-organisational project. Hence, we summarised three codes as freedom to be vigilant, which involves in a process during which people are willing to claim their concerns from their varied perspectives, to describe the role of few prior ties of stakeholders in resilience of inter-organisational projects, especially during the readiness and preparedness. Hence, we put forward that:

Proposition 1. *In the face of a crisis, few prior ties among stakeholders can keep stakeholders vigilant, which is conducive to resilience of the inter-organisational project during the readiness and preparedness.*

Project B involved the local governments of both City B and C. Firm BB, being the general contractor, had hired a local supervision company, and they had signed a project contract together. They had collaborated many times earlier. All the subcontractors were also long-term partners of Firm BB. There was already a tacit understanding of the work connection between the subcontractors. We found there have been multiple ties among the stakeholders in project B due to their previous experiences, which is conductive to collaboration with each other facing the crisis.

> *'As we have collaborated before, we understand and trust each other. When we encountered the financing crisis, the government immediately helped us coordinate with Bank C. After analysing our situation, the government also helped us obtain loans from Bank E as a guarantee. When our subcontractor had an employee payment crisis, our firm, several government departments, and Bank E communicated in many ways, and all worked together to deal with it, without causing construction delays and loss of workers. Before the typhoon hit, the government department sent out early warnings, so that we could take precautions against floods on the construction site. The concerted efforts of all the stakeholders ensured that there was no serious delay in the project.'*

We coded the role of many prior ties among stakeholders in resilience as 'accumulated trust', 'tacit understanding', and 'common cognition', as shown in Fig. 2. In this project, there was accumulated trust and tacit understanding among stakeholders due to their previous cooperative experiences. Common cognition among different

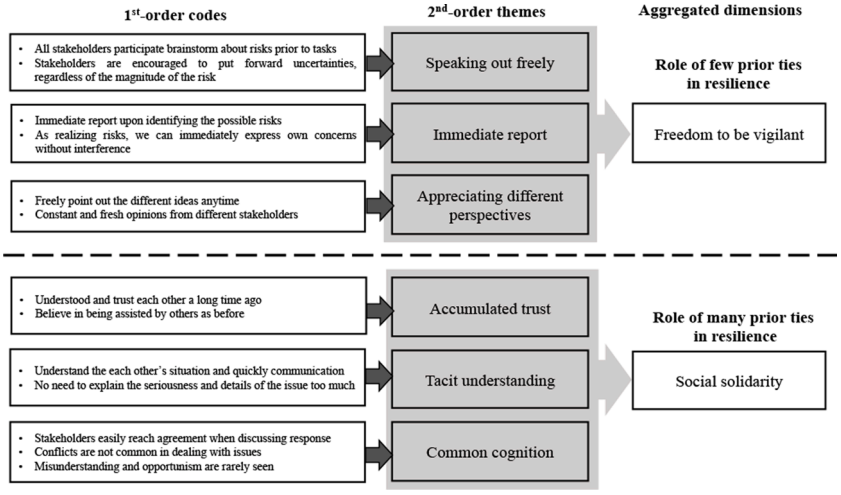

Fig. 2. Role of prior ties among stakeholders in resilience of inter-organisational projects.

organisations was also easier to develop through their mutual ties in this project. When faced with an unexpected crisis, they could rapidly communicate with each other due to accumulated trust. Through frequent and timely information sharing among stakeholders, tacit understanding and common cognition ensured effective collaboration for immediate coping and swift healing, which facilitated an immediate respond and rapid recovery for resilience of inter-organisational projects. We found the data on the role of many prior ties in this project mainly describe how to jointly respond to and follow-up functional recovery. Thus, we summarised three codes as social solidarity to describe the role of many prior ties among stakeholders in resilience of inter-organisational projects, especially in the response and recovery stages. Hence, we put forward that:

Proposition 2. *In the face of a crisis, many prior ties among stakeholders can keep stakeholders in social solidarity, which is conductive to resilience of the inter-organisational project in the response and recovery stages.*

4.2. Role of inter-organisational governance in resilience of inter-organisational projects

In Project A, Firm AA was an experienced engineering project company. Although this was the first time that it was involved in a subsea tunnel project, they had consulted a lot of experts and referenced a lot of previous experience in large-scale construction projects, and formulated many rules and regulations and contract clauses. At the same time, because they were not familiar with each other, Firm AA tried to provide opportunities, such as party, for stakeholders to communicate privately after meetings. The importance of both contract formulation and relational governance among stakeholders was recognised and emphasised.

> *'We convened discussions on every item with reference to other engineering project contracts. For every request made by the other stakeholders, we considered them to be a part of the contract. However, many clauses are still being explored. Because we were working with many organisations for the first time, we tried to specify each role, requirement, and responsibility in the contract and included government assistance as an obligation into the terms. We tried to help the other stakeholders communicate more and establish an environment of mutual trust, but it is very difficult to promote mutual understanding and trust among previously unknown stakeholders especially in the early stages.'*

In Project B, Firm BB communicated with the governments on the importance of the project, responsibilities, and obligations that required assistance. They also conducted in-depth and frequent communication with all the parties and clearly stated the requirements of cooperation with each other in dealing with the risks in the contract. Metro Co. Ltd. of City B had previously worked with Firm BB and had extensive experience in drawing up contracts for subways. The comprehensive understanding made the contracts more detailed.

> *'We formulated detailed contract clauses and stipulated mutual cooperation obligations. We also regularly organised discussions with the representatives of all parties on the progress of the project and the problems encountered during the operation of the project. As most organisations were familiar with each other, private gatherings and communication after the meeting were indispensable. We did not need to spend too much money on their relational governance.'*

It can be seen that both Projects A and B adopted contractual and relational governance. A plural governance mechanism was employed. To investigate the role of inter-organisational governance, we coded all the data on the roles of contractual and relational governance in resilience of inter-organisational projects, as shown in Fig. 3.

We identified role clarification and task assignment in contractual governance. Inter-organisational contractual governance can legally clarify the respective responsibilities and roles. To protect their interests during crisis events, each stakeholder examines itself, flags the possible risks early, formulates solutions, and, in turn, avoids taking responsibility after the crisis. Clearly divided responsibilities and tasks make it impossible for each stakeholder to evade responsibility, require examining their own work and actively detect problems at their end in advance, and as a result, reduce the probability of a crisis. It is conductive to resilience under inter-organisational contractual governance mechanisms. Hence, we summarised two codes as role and responsibility clarification to describe the role of contractual governance in resilience of inter-organisational projects. We have also identified the role of contractual governance throughout the entire process of resilience. That is to say that contractual governance clarifies the role and responsibilities during the readiness, response, and recovery stage of resilience of interorganisational projects. The role and responsibility clarification promotes readiness of resilience, as is mentioned by a project manager of Project A, *'I have to make efforts on identifying risks related to me because I do not take responsibility afterwards as contracts'*. Contractual governance also enhances the ability of responding, for example, the engineer of Project B states, *'Contracts clarify what assignments needs to be done. When the unexpected crises occur, each one knows their own tasks. It is written in rules and regulations, and one has to follow'*. Contractual governance promotes the recovery during resilience, for example, *'As is written in our agreement, our obligations and responsibilities are clearly listed, for example, the excavator suppliers have to repair or provide backup for unexpected technical failure'*.

We identified coordination and mutual understanding in relational governance. Inter-organisational relational governance promotes relational exchange and willingness to cooperate. Frequent communication enhances mutual coordination. It also enables mutual understanding among stakeholders. When faced with difficulties, stakeholders do not complain to each other, but understand, coordinate, and tolerate each other more. They are willing to help the hard-pressed party solve its problems and work together to overcome difficulties. The teamwork with relational ties facilitates immediate coping and recovery. It is conductive to resilience under inter-organisational relational

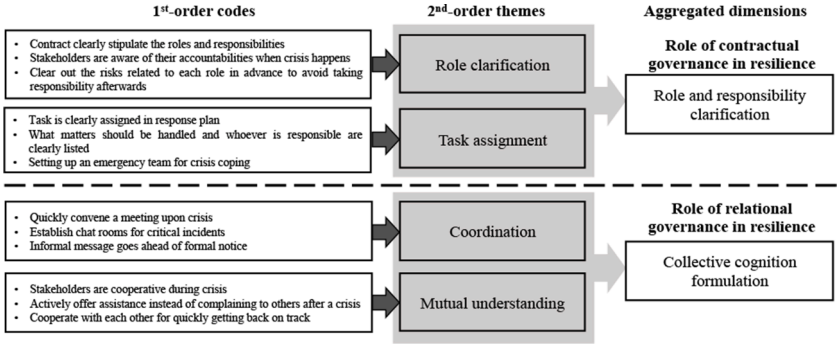

Fig. 3. Role of governance mechanisms in resilience of inter-organisational projects.

governance mechanisms. Hence, we summarised two codes as collective cognition formulation to describe the role of relational governance in resilience of inter-organisational projects. Moreover, we have also identified that relational governance facilitate collective cognition formation throughout the entire resilience process. That is to say relational governance affects the readiness, response, and recovery of inter-organisational projects in face of the unexpected. Relational governance promotes the ability of readiness, for example, a safety manager of Project B said that, *'The risk identification is key to the project life circle. The smooth communication among us provides a perfect channel for us to point out our concerns, which would benefit us all'*. Relational governance also promotes the ability of in-crises responding, for example, a government officer said, *'We should be cooperative with one another during turbulent days. People are aware of that we are in the same boat. If someone is down, it would affect us all'*. Relational governance enhances the ability of post-crises recovery, for example, a project manager of Project B said, *'The work resumption after the crises is critical and dependents on our friendship with suppliers. A friend in need is a friend indeed; otherwise, the damage caused last for quite long'*. Thus, we propose that:

Proposition 3. *Contractual governance in an inter-organisational project can improve its resilience by clarifying roles and responsibilities of stakeholders throughout the entire process of pre-crises preparation, in-crises response and post-crises recovery.*

Proposition 4. *Relational governance in an inter-organisational project can improve its resilience by forming collective cognition among stakeholders throughout the entire process of pre-crises preparation, in-crises response and post-crises recovery.*

4.3. A model of stakeholder relationships and resilience of inter-organisational projects

By comparing the results of each case analysis, we can merge the mechanisms of prior ties of stakeholders and inter-organisational governance on resilience into a model (Fig. 4). Although either many or few prior ties among stakeholders can promote the development of project resilience to varying degrees, they cannot fully improve resilience. Contractual and relational governance in the project can promote the entire resilience process by different mechanisms. Hence, many ties, few ties, contractual governance and relational governance function differently for stakeholder engagement. Building on findings in the above sections, we take a step further and group four mechanisms into two sets of stakeholder engagement strategies to facilitate our understanding of how stakeholders are mobilised prior to, during and after the crises. Theses are distributed engagement and centralised engagement.

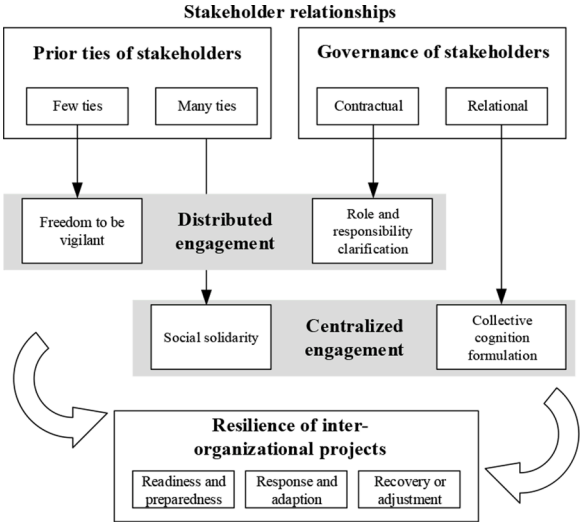

Fig. 4. Model of stakeholder relationships and resilience of inter-organisational projects.

The resilience of interorganisational projects calls for an agile mobility and involvement of external stakeholders, which is provided by dynamically distributed and centralised engagement of external stakeholders. ***Distributed engagement*** refers to a decentralised stakeholder organising strategy that project stakeholders are configured and scattered to gain attention diversification and risk spreading. Distributed engagement includes freedom to be vigilant and roles and responsibility clarification. Distributed engagement provides width and agility for resilience of inter-organisational projects. Distributed engagement allows project stakeholders to have contextualised and localised knowledge to be able to optimally manage and respond to a spectrum of threats. For example, a typical distributed engagement of stakeholders in Project A was found. The project manager said that, *'What matters should be handled and whoever is responsible is clearly listed. As something happens, as long as each stakeholder can perform their own duties, it would be a great thing for the project'*. In this case, distributed engagement of stakeholders in Project A implies an organised but orderly scattered deployment of external stakeholders. ***Centralised engagement*** refers to an ordered and concentrated stakeholder organising strategy that allows project stakeholders to reach solidarity and alignment of goals and means. It includes social solidarity and collective cognition formulation and offers depth and unity for resilience of inter-organisational projects. It also allows stakeholders to create predictability and reduce errors during turbulence by eliminating chaos. For example, a typical centralised engagement of stakeholders in Project B was found. Engineers of Project B said that, *'We actively find the one who has trouble and convene to discuss how to offer assistance instead of complaining about him after an occurrence of crises'*. In this case, centralised engagement of stakeholders in Project B shapes and aligns the mind-sets and values of external stakeholders.

Distributed engagement and centralised engagement are not independent in each crisis event. They form a dynamic stakeholder engagement strategy that facilitate a resilience approach towards responding to the unexpected crises. The dynamism of stakeholder engagement is an ambidexterity of shifting between distributed engagement and centralised engagement of multiple stakeholder organisations. The flexibility and unity, required by resilience (Giustiniano et al., 2018), are simultaneously achieved when stakeholders are organised in such a dynamic manner. Either centralised engagement or distributed engagement cannot provide a whole picture of how stakeholders should be organised in resilience processes. To sum up, the relationship of stakeholders needs to be properly governed in the current project according to prior ties among stakeholders for comprehensively improving resilience of inter-organisational projects.

Proposition 5. *Plural governance design based on prior ties among stakeholders can dynamically promote distributed and centralised stakeholder engagement in preparing, responding and recovering from the unexpected to improve resilience of the inter-organisational project.*

5. Discussion and conclusion

This study explores the mechanisms behind the process which the stakeholder relationships support the resilience of inter-organisational project to address the research question. We focus on the inter-organisational relationship formed in the past and governed in the temporary project. Regarding the research question, few prior ties among stakeholders fosters the preparedness phase in resilience framework through keeping stakeholders vigilant, while many prior ties foster the response and recovery phases in resilience framework through keeping social solidarity among stakeholders. Contractual governance in an inter-organisational project improves the whole framework of its resilience by clarifying roles and responsibilities of stakeholders, while

relational governance fosters the whole framework of its resilience by forming collective cognition among stakeholders. Overall, the stakeholder relationships should be appropriately developed by plural governance design based on their prior ties, enabling stakeholders to be dynamically distributed, as well as centralised engagement in the preparation, response and recovery from the unexpected for enhancing the resilience of inter-organisational projects.

As to the role of prior ties among stakeholders, stakeholder organisations under few prior ties can speak out freely, report immediately upon realising something, and provide different perspectives without being disturbed by others, so as to have freedom to be vigilant, which is conducive to the preparedness phase in resilience framework. It is similar with the role of low-density network in social network theory (Burt, 2000) where diversified information flow from multiple perspective of organisations facilitates the flexibility and readiness (Ahuja, 2000; Gilsing & Duysters, 2008). Conversely, stakeholders with many prior ties tend to have accumulated trust, tacit understanding, and common cognition, which promotes social solidarity. They seem to form a dense network which facilitates trust-building (Dyer & Nobeoka, 2000; Phelps, 2010). It contributes to the response to the unexpected and recovery from damage in resilience framework (Giustiniano et al., 2018).

As to inter-organisational governance in the project, the contractual governance clarifies each stakeholder's role and assigns their tasks, which forces everyone to perform their own responsibilities in preparing, responding, and recovering from the unexpected, thereby enhancing the resilience of the project. Conversely, relational governance foster coordination and mutual understanding among stakeholders, which reflects the formation of collective cognition on the community of shared interests. This collective cognition enables stakeholders to actively cooperate with others in preparation, response, and the after-crisis recovery, instead of causing internal conflicts or friction. The evidence of this study also suggests the plural governance design, responding to the ongoing discussion on the interplay of contractual and relational governance mechanisms (Benítez-Ávila et al., 2018; Lu et al., 2015). It is similar to project governance literature, which calls for a balance between control and trust in dealing with risks (Zwikael & Smyrk, 2015).

With regards to stakeholder relationship, the plural governance design based on prior ties is useful for enhancing resilience of inter-organisational projects by enabling stakeholders to be dynamically distributed and centralised engagement in preparing, responding and recovering from the unexpected. The mechanism responses to the stakeholder engagement highlighted in stakeholder management literature (Lehtinen & Aaltonen, 2020; Spitzeck & Hansen, 2010) and the suggestion that is treating stakeholder as decision makers and creator of value in project governance literature (Derakhshan et al., 2019). However, the goals of these studies are project performance instead of developing resilience of the temporary inter-organisational project. This study also explains the detailed form of stakeholder engagement in the project activities for developing resilience, which should be dynamically distributed and have centralised engagement.

5.1. Theoretical implications

This study primarily contributes towards resilience literature by providing a theoretical understanding of resilience of temporary inter-organisational projects. To manage the unexpected, scholars have called for project management studies on resilience (Naderpajouh et al., 2020b). This research is motivated by the view of inter-organisational projects and the responses to their features in resilience designs (Sydow & Braun, 2018). Along this line, we have demonstrated how resilience of projects is achieved with the help of multiple stakeholders. Our results conform with previous findings in resilience studies that its development is due to the joint efforts of multiple organisations (Thomé et al., 2016). Following the literature treating projects as temporary organisations where involved stakeholders are affected by the experienced past and governed by the project (Ahola et al., 2014; Engwall, 2003), we went a step further to explain how the intricate inter-organisational relationships involving prior ties and project governance influence the resilience of the temporary inter-organisational project.

Second, this study contributes to the project governance literature. Extant project governance studies focusing on the project level take project performance and stakeholder satisfaction as governance goals (Ahola et al., 2014; Benítez-Ávila et al., 2016; Biesenthal & Wilden, 2014; Derakhshan et al., 2019; Haq et al., 2019). Traditional contractual and relational governance is proposed based on transaction cost theory, which is aimed to reduce transaction costs and opportunism and optimise resource configuration and coordination. This study paves a new way for governance design suggesting that plural governance design based on prior ties is required for the resilience of inter-organisational projects. Our research findings provides new insights on the contingent governance design according to prior ties.

Third, this study contributes to stakeholder theory in project management studies. Extant literature mainly study relationships among internal stakeholders and relationships between internal and external stakeholders (Derakhshan et al., 2019). Although the importance of external stakeholders in inter-organisational projects has been recognised which is the essential difference from general organisation (Sydow & Braun, 2018), relationships among external stakeholders is under-explored. This study is focused on the relationship among external stakeholder organisations formed before and governed in the inter-organisational project. Our research findings explored the stakeholder engagement in project activities especially in face of the unexpected, in response to highlighting the importance of organising external stakeholder engagement in inter-organisational projects (Lehtinen & Aaltonen, 2020). This study provides the detailed forms of stakeholder engagement that are dynamically distributed and have centralised engagement in the preparation, response and recovery phases of activities for resilience of inter-organisational projects.

5.2. Managerial implications

The first managerial implication of this study is that partners in inter-organisational projects should pay attention to the prior and governed relationships among themselves. The stakeholders should be organised to contribute to responding to adversities and crises. Both prior ties and governance mechanisms of stakeholders are of importance in building resilient inter-organisational projects with differing mechanisms and impacts. The general contractor of megaprojects should pay attention to the selection of subcontractors and other stakeholders before the project initiation to investigate their prior ties. Second, project partners should be governed with plural mechanisms, but with a contingent focus according to their prior ties. For example, for project partners who know each other well, contract-dominant approaches should be adopted to allow partners to clarify their roles and responsibilities and to identify potential risks related to themselves. For those partners who are not familiar with each other, relational norms and trust should be adopted to reduce potential opportunistic behaviours and to achieve the collective response in a crisis and quick after-crisis recovery. Third, the goal of the plural governance design based on prior ties is to allow stakeholders to be dynamically distributed and have central involvement in the preparing, responding and recovering activities. Dynamic distribution and centralised engagement are recommended for project stakeholders to achieve flexibility and solidarity simultaneously. This is particularly relevant when partners are required to invest collaborative efforts to handle technological, ecological, financial, and social disruptions.

5.3. Limitations and future research

The interview data of this study only include inter-organisational projects in China and, hence, cannot be generalised to other countries

with different cultural and institutional backgrounds. In this regard, the inter-organisational relationships, especially in large-scale projects, may involve the *guanxi* system as a substitute for formal inter-organisational relationships (Xin & Pearce, 1996). Another limitation of this study is the qualitative analysis on the link between stakeholder relationships and the resilience of inter-organisational projects by six embedded cases of two case projects based on 18 interviews. Future studies could look into a quantitative measurement and validation of the propositions derived in this study for generalisability purposes. In addition, the project system is not stable but a constantly evolving system from the project phase to the operations phase in system lifecycles (Artto et al., 2016). The study collects the data that reflects the crises processes but not in a specific longitudinal manner. Hence, the dynamic view and longitudinal approach are expected to be applied in a future study on resilience of inter-organisational projects. The fourth limitation is the simplified measurement of relationships in inter-organizaitonal projects. Future research may take a comprehensive measurement of properties of such ties, including strength, length, depth, and quality, for improved understanding of the issues.

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Appendix. Selected interview transcriptions for each case in terms of resilience

Projects	Crises	Evidence of resilience
Project A: Subsea tunnel	**A1: Pollution**	Pollution is a common issue in the engineering industry. We took notice of it and of the overwhelming requirements on pollution through an incident analysis.We checked many ISO standards and asked the government for detailed rules, especially for water and soil pollution directly related to the subsea tunnel. We tried to develop many solutions for pollution based on inspection results.Uninspected composition of the contaminated soil and changing standards on the treatment of Class II solid waste resulted in continuous negotiation among government departments without necessary actions and in turn, caused project delay.The solutions were provided after months. Project progress had been affected significantly, causing cost overruns and delay in project delivery.
	A2: Demolition	We were aware of house demolition issues and the complaints from residents. The project contract clearly stated that demolition issues had to be coordinated and promoted mainly by the government departments.Actively communicating with affected residents while searching for alternative solutions.We conducted collective brainstorming for an alternative solution that would bypass the demolition issue.Due to the lack of joint effort and coordination among different government departments, an alternative solution for demolition was not immediately found.Due to the influence of public opinion, the government was very cautious in tackling such issues and spent a long time negotiating with the public without achieving any result.
	A3: Technique	After identifying the possible risks, the technical engineer quickly reported to the project managers. They learned about the situation 5 months before the levelling boat started.*We* asked D University for technical support as this was being implemented for the first time.We asked D University to find an innovative plan as a backup.Coordinated for alternative solutions and took action according to the immediate situation.The research institutions and external technical supports were reallocated and reconfigured to use the new alternative solution.Backup equipment was delivered to the site by suppliers immediately after the crises.
Project B: Intercity highway	**B1: Financing**	We did not discover the underlying risks of financing since Bank C had clearly stated that it would provide loans during the bidding process. We did not anticipate any problems in the approval process.We quickly communicated with the government department of City B and established contact with Bank E through their connections. With the coordination of multiple parties, project loan funds were issued by Bank E.Although the interest rate on the funds was higher, the timely availability of project funds ensured the timely implementation.
	B2: Payment	After the project fund loan fiasco, we reminded all the subcontractors to review and manage their own funds.We noticed that each subcontractor needs to ensure proper treatment of their employees. If there is a serious problem, it should be punished. The hidden dangers and risks need to be reported in time to maintain the stable and safe operation of the project and prevent a public opinion crisis. The project manager understood the situation and quickly communicated with the government department. I also communicated with the employee representatives and expressed my concern and an attitude favouring resolution. Firm BB also quickly communicated with the subcontractors involved to understand the specific financial difficulties.BB responded proactively and agreed to propose solutions to help the subcontracting companies improve funding pressure, stabilise employee sentiment, avoid potential public backlash, social risks, and adverse effect on the project.Reallocated employees to other sites for temporary jobs and reduced the number of unoccupied labour due to construction being suspended.
	B3: Weather	The severe rain and typhoons in coastal areas are risks that must be considered.We had safety regulations to direct a solution in severe weather.We trained all the workers on safely dealing with severe weather and conducted emergency drills.Before the typhoon, we had received a notice from government departments and we were fully prepared for flood control and stopped construction to do site inspection.We purchased engineering insurance to prevent accidental losses.The rain was very heavy and we detected water in the equipment room. The construction team arrived at the site immediately on receiving the alarm notification and carried out site inspection and related work to facilitate drainage.There was no serious loss of personnel, or impact on the work schedule. After the weather cleared, we quickly resumed work.

References

Ahola, T., Ruuska, I., Artto, K., & Kujala, J. (2014). What is project governance and what are its origins? *International Journal of Project Management, 32*, 1321–1332. https://doi.org/10.1016/j.ijproman.2013.09.005

Ahuja, G. (2000). Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly, 45*, 425. https://doi.org/10.2307/2667105

Alexander, D. E. (2013). Resilience and disaster risk reduction: An etymological journey. *Natural Hazards and Earth System Sciences, 13*, 2707–2716. https://doi.org/10.5194/nhess-13-2707-2013

Alvesson, M., Skoldberg, K., et al. (2009). Reflexive Methodology: New Vistas for Qualitative Research. *Reflexive Methodology* (2nd). UK: London sage.

Arranz, N., & De Arroyabe, J. F. (2012). Effect of formal contracts, relational norms and trust on performance of joint research and development projects. *British Journal of Management,, 23*, 575–588. https://doi.org/10.1111/j.1467-8551.2011.00791.x

Artto, K., Ahola, T., & Vartiainen, V. (2016). From the front end of projects to the back end of operations: Managing projects for value creation throughout the system lifecycle. *International Journal of Project Management, 34*, 258–270. https://doi.org/10.1016/j.ijproman.2015.05.003

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report, 13*, 544–559.

Benítez-Ávila, C., Hartmann, A., Dewulf, G., & Henseler, J. (2018). Interplay of relational and contractual governance in public-private partnerships: The mediating role of relational norms, trust and partners' contribution. *International Journal of Project Management, 36*, 429–443. https://doi.org/10.1016/j.ijproman.2017.12.005

Benítez-Ávila, C., Hartmann, A., Dewulf, G., Henseler, J., Joslin, R., Müller, R., Lu, P., Cai, X., Wei, Z., Song, Y., & Wu, J. (2016). The relationship between project

governance and project success. *International Journal of Project Management, 34*, 613–626. https://doi.org/10.1016/j.ijproman.2016.01.008

Bhamra, R., Dani, S., & Burnard, K. (2011). Resilience : the concept, a literature review and future directions. *International Journal of Production Research, 49*, 5375–5393. https://doi.org/10.1080/00207543.2011.563826

Bhaskar, R. (2016). Enlightened Common Sense: The Philosophy of Critical RealismAbingdon. *Enlightened Common Sense*. UK: Oxon, UK, Routledge.

Biesenthal, C., & Wilden, R. (2014). Multi-level project governance: Trends and opportunities. *International Journal of Project Management, 32*, 1291–1308. https://doi.org/10.1016/j.ijproman.2014.06.005

Bouncken, R. B., Clauß, T., & Fredrich, V. (2016). Product innovation through coopetition in alliances: Singular or plural governance? *Industrial Marketing Management, 53*, 77–90. https://doi.org/10.1016/j.indmarman.2015.11.011

Bowen, G. A. (2008). Naturalistic inquiry and the saturation concept: A research note. *The Qualitative Report, 8*, 137–152. https://doi.org/10.1177/1468794107085301

Brahm, F., & Tarziján, J. (2015). Does complexity and prior interactions affect project procurement? Evidence from mining mega-projects. *International Journal of Project Management, 33*, 1851–1862. https://doi.org/10.1016/j.ijproman.2015.08.005

Burt, R. S. (2000). The network structure of social capital. *Research in Organizational Behavior, 22*, 345–423. https://doi.org/10.1016/S0191-3085(00)22009-1

Cao, Z., & Lumineau, F. (2015). Revisiting the interplay between contractual and relational governance: A qualitative and meta-analytic investigation. *Journal of Operations Management, 33*, 15–42. https://doi.org/10.1016/j.jom.2014.09.009

DeFillippi, R., & Sydow, J. (2016). Project networks: Governance choices and paradoxical tensions. *Project Management Journal, 47*, 6–17. https://doi.org/10.1177/875697281604700502

Derakhshan, R., Turner, R., & Mancini, M. (2019). Project governance and stakeholders: A literature review. *International Journal of Project Management, 37*, 98–116. https://doi.org/10.1016/j.ijproman.2018.10.007

Di Maddaloni, F., & Davis, K. (2018). Project manager's perception of the local communities' stakeholder in megaprojects. An empirical investigation in the UK. *International Journal of Project Management, 36*, 542–565. https://doi.org/10.1016/j.ijproman.2017.11.003

Dyer, J. H., & Nobeoka, K. (2000). Creating and managing a high-performance knowledge-sharing network: The Toyota case. *Strategic Management Journal, 21*, 345–367. https://doi.org/10.1002/(SICI)1097-0266(200003)21:3<345::AID-SMJ96>3.0.CO;2-N

Eisenhardt, K. M. (1989). Building theories from case study research. *The Academy of Management Review, 14*, 532–550. https://doi.org/10.5465/amr.1989.4308385

Engwall, M. (2003). No project is an island: linking projects to history and context. *Research Policy, 32*, 789–808. https://doi.org/10.1016/S0048-7333(02)00088-4

Fiksel, J., Polyviou, M., Croxton, K. L., & Pettit, T. J. (2015). From risk to resilience: Learning to deal with disruption. *MIT Sloan Management Review, 56*, 79. https://doi.org/10.5822/978-1-61091-588-5_2

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry, 12*, 219–245. https://doi.org/10.1177/1077800405284363

Gil, R., & Marion, J. (2013). Self-enforcing agreements and relational contracting: Evidence from California highway procurement. *The Journal of Law, Economics, and Organization, 29*, 239–277. https://doi.org/10.1093/jleo/ewr026

Gilly, J., Kechidi, M., & Talbot, D. (2014). Resilience of organizations and territories : The role of pivot firms. *European Management Journal, 32*, 596–602. https://doi.org/10.1016/j.emj.2013.09.004

Gilsing, V. A., & Duysters, G. M. (2008). Understanding novelty creation in exploration networks-structural and relational embeddedness jointly considered. *Technovation, 28*, 693–708. https://doi.org/10.1016/j.technovation.2008.03.004

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the gioia methodology. *Organizational Research Methods, 16*, 15–31. https://doi.org/10.1177/1094428112452151

Giustiniano, L., Clegg, S. R., e Cunha, M. P., & Rego, A. (2018). *Elgar introduction to theories of organizational resilience* (p. A). Edward Elgar Publishing.

Gulati, R. (1995). The Implications of repeated ties for contractual choice in Alliances. *Academy of Management Journal, 38*, 85–112. https://doi.org/10.5465/256729

Haq, S. U., Gu, D., Liang, C., & Abdullah, I. (2019). Project governance mechanisms and the performance of software development projects: Moderating role of requirements risk. *International Journal of Project Management, 37*, 533–548. https://doi.org/10.1016/j.ijproman.2019.02.008

James, E. H., Wooten, L. P., & Dushek, K. (2011). Crisis management: Informing a new leadership research agenda. *The Academy of Management Annals, 5*, 455–493. https://doi.org/10.5465/19416520.2011.589594

Jobling, M. (2012). National Research Council (NRC): Nutrient requirements of fish and shrimp. *Aquaculture International, 20*, 601–602. https://doi.org/10.1007/s10499-011-9480-6

Joslin, R., & Müller, R. (2016). The relationship between project governance and project success. *International Journal of Project Management, 34*, 613–626. https://doi.org/10.1016/j.ijproman.2016.01.008

Kamalahmadi, M., & Mellat, M. (2016). A review of the literature on the principles of enterprise and supply chain resilience : Major findings and directions for future research. *International Journal of Production Economics, 171*, 116–133. https://doi.org/10.1016/j.ijpe.2015.10.023

Kutsch, M. E., Hall, M., & Turner, N. (2015). *Project resilience: The Art of noticing, interpreting, preparing, containing and recovering*. Ltd: Ashgate Publishing.

Lehtinen, J., & Aaltonen, K. (2020). Organizing external stakeholder engagement in inter-organizational projects: Opening the black box. *International Journal of Project Management, 38*, 85–98. https://doi.org/10.1016/j.ijproman.2019.12.001

Lu, P., Guo, S., Qian, L., He, P., & Xu, X. (2015). The effectiveness of contractual and relational governances in construction projects in China. *International Journal of Project Management, 33*, 212–222. https://doi.org/10.1016/j.ijproman.2014.03.004

Lundin, R. A., & Söderholm, A. (1995). A theory of the temporary organization. *Scandinavian Journal of Management*. https://doi.org/10.1016/0956-5221(95)00036-U

Madni, A. M., & Jackson, S. (June 2009). Towards a Conceptual Framework for Resilience Engineering," in. *IEEE Systems Journal, 3*(2), 181–191. https://doi.org/10.1109/JSYST.2009.2017397

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). London: Sage Publications Ltd.

Muller, R. (2016). *Governance and governmentality for projects: Enablers, practices, and consequences*. New York: Taylor & Francis.

Müller, R., & Martinsuo, M. (2015). The impact of relational norms on information technology project success and its moderation through project governance. *International Journal of Managing Projects in Business, 8*, 154–176. https://doi.org/10.1108/IJMPB-04-2014-0036

Nachbagauer, A. G. M., & Schirl-Boeck, I. (2019). Managing the unexpected in megaprojects: Riding the waves of resilience. *International Journal of Managing Projects in Business, 12*, 694–715. https://doi.org/10.1108/IJMPB-08-2018-0169

Naderpajouh, N., Matinheikki, J., Keeys, L., Aldrich, D., & Linkov, I. (2020a). Call for papers: Resilience in project studies: An interdisciplinary discourse. *International Journal of Project Management, 38*, 307–309. https://doi.org/10.1016/j.ijproman.2020.06.003

Naderpajouh, N., Matinheikki, J., Keeys, L. A., Aldrich, D. P., & Linkov, I. (2020b). Resilience and projects: An interdisciplinary crossroad. *Project Leadership and Society, 1*, Article 100001. https://doi.org/10.1016/j.plas.2020.100001

Naderpajouh, N., Yu, D. J., Aldrich, D. P., Linkov, I., & Matinheikki, J. (2018). Engineering meets institutions: An interdisciplinary approach to the management of resilience. *Environment Systems and Decisions, 38*, 306–317. https://doi.org/10.1007/s10669-018-9704-7

National Research Council. (2012). *Disaster resilience: A national imperative*. Washington, DC: The National Academies Press.

Oliveira, N., & Lumineau, F. (2017). How coordination trajectories influence the performance of interorganizational project networks. *Organization Science, 28*, 1029–1060. https://doi.org/10.1287/orsc.2017.1151

Oppong, G. D., Chan, A. P. C., & Dansoh, A. (2017). A review of stakeholder management performance attributes in construction projects. *International Journal of Project Management, 35*, 1037–1051. https://doi.org/10.1016/j.ijproman.2017.04.015

Parker, Hamieda, & Ameen, K. (2018). The role of resilience capabilities in shaping how firms respond to disruptions. *Journal of Business Research, 88*, 535–541. https://doi.org/10.1016/j.jbusres.2017.12.022

Parker, H., & Ameen, K. (2018). The role of resilience capabilities in shaping how firms respond to disruptions. *Journal of Business Research, 88*, 535–541. https://doi.org/10.1016/j.jbusres.2017.12.022

Phelps, C. C. (2010). A longitudinal study of the influence of alliance network structure and composition on firm exploratory innovation. *Academy of Management Journal, 53*, 890–913. https://doi.org/10.5465/AMJ.2010.52814627

Ponis, S. T., & Koronis, E. (2012). Supply chain resilience: Definition of concept and its formative elements. *Journal of Applied Business Research, 28*, 921–930. https://doi.org/10.19030/jabr.v28i5.7234

Provan, K. G., & Kenis, P. (2008). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration Research and Theory, 18*, 229–252. https://doi.org/10.1093/jopart/mum015

Rao, H., & Greve, H. R. (2018). Disasters and community resilience: Spanish flu and the formation of retail cooperatives in Norway. *Academy of Management Journal, 61*, 5–25. https://doi.org/10.5465/amj.2016.0054

Ridder, H. G. (2017). The theory contribution of case study research designs. *Business Research, 10*, 281–305. https://doi.org/10.1007/s40685-017-0045-z

Ryall, M. D., & Sampson, R. C. (2009). Formal contracts in the presence of relational enforcement mechanisms: Evidence from technology development projects. *Management Science, 55*, 906–925. https://doi.org/10.1287/mnsc.1090.0995

Saunders, M., Lewis, P., Thornhill, A., et al. (2009). Research Methods for Business Students. *Pearson*.

Simard, M., & Laberge, D. (2018). Development of a crisis in a project: A process perspective. *International Journal of Managing Projects in Business, 11*, 806–826. https://doi.org/10.1108/IJMPB-08-2017-0093

Spitzeck, H., & Hansen, E. G. (2010). Stakeholder governance: How stakeholders influence corporate decision making. *Corporate Governance International Journal of Business in Society, 10*, 378–391. https://doi.org/10.1108/14720701011069623

Suprapto, M., Bakker, H. L. M., & Mooi, H. G. (2015). Relational factors in owner-contractor collaboration: The mediating role of teamworking. *International Journal of Project Management, 33*, 1347–1363. https://doi.org/10.1016/j.ijproman.2015.03.015

Sydow, J., & Braun, T. (2018). Projects as temporary organizations : An agenda for further theorizing the interorganizational dimension. *International Journal of Project Management, 36*, 4–11. https://doi.org/10.1016/j.ijproman.2017.04.012

Tan, W. J., Zhang, A. N., Cai, W., & Tan, W. J. (2019). A graph-based model to measure structural redundancy for supply chain resilience a graph-based model to measure structural redundancy for supply chain resilience. *International Journal of Production Research, 0*, 1–20. https://doi.org/10.1080/00207543.2019.1566666

Thomé, A. M. T., Scavarda, L. F., Scavarda, A., Thomé, F. E. S., & de, S. (2016). Similarities and contrasts of complexity, uncertainty, risks, and resilience in supply chains and temporary multi-organization projects. *International Journal of Project Management, 34*, 1328–1346. https://doi.org/10.1016/j.ijproman.2015.10.012

Tukamuhabwa, B. R., Stevenson, M., Busby, J., & Zorzini, M. (2015). Supply chain resilience : Definition, review and theoretical foundations for further study. *International Journal of Production Research, 53*, 5592–5623. https://doi.org/10.1080/00207543.2015.1037934

Turner, J. R., & Müller, R. (2003). On the nature of the project as a temporary organization. *International Journal of Project Management, 21*, 1–8. https://doi.org/10.1016/S0263-7863(02)00020-0

Turner, J. R., & Simister, S. J. (2001). Project contract management and a theory of organization. *International Journal of Project Management, 19*, 457–464. https://doi.org/10.1016/S0263-7863(01)00051-5

Unterhitzenberger, C., Naderpajouh, N., Hällgren, M., & Huemann, M. (2021). Call for papers: Temporary organising and crisis. *International Journal of Project Management, 39*, 209–212. https://doi.org/10.1016/j.ijproman.2021.01.002

Van Der Vegt, G. S., Essens, P., Wahlström, M., & George, G. (2015). Managing risk and resilience: From the editors. *Academy of Management Journal, 58*, 971–980. https://doi.org/10.5465/amj.2015.4004

Vanneste, B. S., & Puranam, P. (2010). Repeated interactions and contractual detail: Identifying the learning effect. *Organization Science, 21*, 186–201. https://doi.org/10.1287/orsc.1080.0402

von Danwitz, S. (2018). Managing inter-firm projects: A systematic review and directions for future research. *International Journal of Project Management, 36*, 525–541. https://doi.org/10.1016/j.ijproman.2017.11.004

Wang, A., & Pitsis, T. S. (2019). Identifying the antecedents of megaproject crises in China. *International Journal of Project Management*. https://doi.org/10.1016/j.ijproman.2019.05.003

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (2008). Organizing for high reliability: Processes of collective mindfulness. *Crisis Management, 3*, 81–123.

Williams, T. A, Gruber, D. A., Sutcliffe, K. M., & Shepherd, D. A. (2017). Organizational response to adversity: Fusing crisis management and resilience research streams. *The Academy of Management Annals, 11*, 733–769. https://doi.org/10.5465/annals.2015.0134

Xin, K. K., & Pearce, J. L. (1996). Guanxi: Connections as substitutes for formal institutional support. *Academy of Management Journal, 39*, 1641–1658. https://doi.org/10.5465/257072

Yang, R. J., & Shen, G. Q. P. (2014). Framework for stakeholder management in construction projects. *Journal of Management in Engineering, 31*, Article 04014064. https://doi.org/10.1061/(asce)me.1943-5479.0000285

Yin, R., & Thousand, S. (2009). *Case study research: Design and methods* (4th ed.). Blackwell Science Ltd.

Zhang, Y., Sun, J., Yang, Z., & Wang, Y. (2018). Mobile social media in inter-organizational projects: Aligning tool, task and team for virtual collaboration effectiveness. *International Journal of Project Management, 36*, 1096–1108. https://doi.org/10.1016/j.ijproman.2018.09.003

Zwikael, O., & Smyrk, J. (2015). Project governance: Balancing control and trust in dealing with risk. *International Journal of Project Management, 33*, 852–862. https://doi.org/10.1016/j.ijproman.2014.10.012