

# DECISION-MAKING IN CRISIS DURING MEGAPROJECTS

Dr. Rehab Iftikhar  
Dr. Khadijeh Momeni  
Dr. Tuomas Ahola

TAMPERE UNIVERSITY, FINLAND

**Abstract:** The aim of this paper is to increase the current understanding of decision-making processes by considering the important elements of decision-making in a crisis during a megaproject. For this purpose, the International Islamabad Airport in Pakistan was examined. Data for this study were collected through interviews and archival data. A thematic analysis was used to analyze the data. The analysis represents steps of the decision-making process in crisis, including (i) understanding the crisis, (ii) information gathering and (iii) evaluating alternatives and selecting the best alternative. It was also found that decision-making styles in crisis can be different depending on the nature of the crisis and the level of expertise, which are referred to as consultative decision-making and delegative decision-making.

**Keywords:** crisis, decision-making, megaproject

## 1. INTRODUCTION

Megaprojects are large-scale and complex infrastructure and investment projects with a long duration and a high budget that involve multiple stakeholders [1,2]. They are temporary organizations formed for completing a unique and complex task [3]; defined as a set of organizational actors working together on a complex task over a limited period of time [4,5]. Goodman and Goodman's [4] (p. 494) found four themes for temporary organizations: skills ('a set of diversely skilled people'), interaction ('working together'), task ('on a complex task') and time ('over a limited period of time'). Temporary organizations do have a time limitation because they have a specific beginning and a defined endpoint which is known to all project participants [6] and rely on teamwork – interdependent sets of people working together [7] when the project finishes, the team dissolves, and its members move on to other projects or are reabsorbed into the organization [8]. Context is the linkages between the temporary organization and its external environment, in our case, a temporary organization venture is megaproject where several multiple organizations as involved and impact of environment on the temporary organization [9].

Megaprojects usually play an important role in the sustainable development of public infrastructures [10]. Megaprojects are highly uncertain projects that usually suffer from cost overruns, delays, and reduced functionality of the delivered outcome [11,12]. If not managed properly, the crisis during megaprojects could threaten project viability [13]. A crisis requires a rapid decision, and its importance is increased in megaprojects as it requires interacting with a variety of stakeholders such as clients, consultants, contractors, subcontractors [14,15]. With respect to the critical role of megaprojects in the national economy and social development [16], it is important to study decision-making to resolve crises when diverse actors/stakeholders of megaprojects are involved. Prior research has identified the challenges and unexpected events associated with managing megaprojects [1], mostly focusing on the management of risk [17], project culture [18], contracts [19], technology adoption [20], how organizations deal with unexpected events and deviations [21-23] and identifying different response approaches used to deal with them [24].

However, crises in temporary settings are rarely discussed [23]. A more neutral term, "unexpected event", inspired by risk management, is commonly used [21,25]. "An unexpected event can be predicted and should not happen. When it occurs, it can have a significant impact on the project" [21] (p. 547). Unexpected events have been named and conceptualized in various ways in the literature, including deviations [26], exceptions [27], surprises and emergent events [28]. What is common to all these conceptualizations is the idea that unexpected events are events that were not originally planned or expected to take place as part of a project [24]. Sometimes, the risk is used interchangeably with crisis, but they are different [29]. Risk is "identifiable" [30] (p. 468), involving foreseen and known events, which can be managed, but no one knows when they will occur [25,31]. Risk contains the property of the known-unknown, which means it is identifiable, but it is not possible to determine if it will occur with certainty. Risk is measurable, predictable, and manageable [31]; however, a crisis is an unforeseen, unmeasurable, and unpredictable event [32]. It is a low-probability and high-impact event [33]. Crisis is commonly described as an unanticipated, surprising, and ambiguous event posing a significant threat, leaving only a brief time to make a decision [33-35]. According to Iftikhar and Müller [29], risk is a potential future event characterized by a certain probability of occurrence, and if it occurs, it leads to negative consequences. Contingencies can be planned for risks, whereas a crisis is a threat with a high level of uncertainty with no contingency plan. This difference places emphasis on the element of surprise and on prompt decision-making.

According to Flyvbjerg et al. [1], megaprojects involve unforeseen events (unidentified and "unknown-unknowns"). These events are crises in which potential outcomes and causal forces are not fully understood [36]. Even a well-planned project in terms of design, execution, and operation can face a crisis. In the following, we proceed to discuss the example of Heathrow Terminal 5 (T5) construction project to illustrate the tremendous challenge that relate to management of an uncertain event as well as systems integration in megaprojects. The planning phase of T5, was started in 1986 and ended in 2001. The original project

opening date was March 30, 2008. The design phase was also given full consideration as it began in 1989. The construction phase included two sub-phases: the construction of infrastructure and buildings and integration of systems and retail fit-out of the buildings. The operational readiness phase involved tests and trial to prepare people, processes, systems, and facilities for the public opening. The “start–finish” team worked intensively during six months of systems testing and operational trials prior to opening, including 66 trial openings, each involving 2,500 people. Despite these preparations for the opening; the project experienced difficulties. In the five days after opening, British airways misplaced over 20,000 bags and was forced to cancel 501 flights. Ironically, the troubled opening of T5 costs around \$31 million; causing considerable reputational damage. The terminal achieved the first full schedule of operations 12 days after opening [37,38].

Usually, prior researchers have focused on one specific crisis event, such as the Mann Gulch disaster [39], Chernobyl and the Challenger disaster [40,41]. These are illustrations of industrial (organizational-based crises that cause extensive damage) and widespread destructive crises (cause real damage to human life and/or the environment, for example, death, injuries, etc.) [42]. These industrial and widespread destructive crises lead to major damages; however, not all crises will lead to major damages or life-threatening events. According to Kornberger et al. [15], crisis also includes “normal accidents”, as described by Perrow [43].

Prior research highlights the urgency of decision-making in a crisis [33,44], however its importance is emphasized during megaprojects because (i) multiple stakeholders are involved to accomplish a complex task; and (ii) project temporariness put extra pressure on organizations to finish tasks on-time and make prompt decisions in crisis. A decision is a “cognitive phenomenon and conceptualized as the goal or endpoint for a more or less complex process of deliberation which includes an assessment of consequences and uncertainties” [45] (p. 76). Decision-making is integral to the management of projects, but decisions related to projects are complex and multifaceted. Prior research on decision-making focuses on reasons for deviations, i.e., intra-group

conflicts. There is less focus on the decision and more focus on the process leading to it [46]. In addition, prior research has addressed groupthink [47], decisions as a result of a sensemaking process [48,49] and decision makers' concepts of risk [50]. The literature on project management examines different aspects of decision-making during a project's life cycle, including selecting projects, allocating resources, selecting project managers, selecting suppliers, procurement methods and risk assessment [51-56]. However, little is known about making decisions in crises in the megaproject context when multiple organizations are involved for a certain period.

This study addresses this gap by studying the decision-making process in crises during a megaproject. The focus of this study is not a particular crisis or a type of crisis but on crises in general. Due to their temporariness, complexity and large scale, megaprojects are distinct in their demands for decision-making in crisis compared to organizational decision-making in normal situations. Organizational decision-making in normal situations includes certain steps, such as identifying goals, searching for alternative courses of action, predicting the consequences of each alternative, evaluating each alternative and selecting the best alternative [57]. While the identified steps for organizational decision-making are relevant in the context of megaprojects, due to the aforementioned characteristics of megaprojects and crises (e.g., the need for rapid decision based on the available information and involvement of different actors in crisis and/or decision-making), decision-making in crisis during megaprojects must be explored more deeply to identify the main steps of decision-making in crisis. While decision-making in crisis does not usually occur under rational conditions, the organizations develop certain decision-making styles in crisis based on the previous knowledge and experience [58]. These different decision-making styles have not been in the focus of previous studies in megaprojects. The primary purpose of this study was to investigate and to understand these different steps and styles during the decision-making process in crises when multiple organizations are involved in megaprojects.

For that we posed the following research questions:

- *What are the main steps of decision-making in crises during megaprojects?*

- *What are the different decision-making styles in crises during megaprojects?*

The center of the study is a megaproject. The analysis of the new International Islamabad airport project enabled us to develop an understanding of and insights into the development of timely decisions in a crisis. The study makes two contributions. The first contribution is investigating the decision-making process in crisis during a megaproject, which has been largely overlooked. Second, specifically, a framework has been developed that considers the main elements required for decision-making during megaprojects. The framework explains decision-making steps and styles. Third, it offers an opportunity for diverse temporary organizations to increase their robustness in crises by building capabilities for future projects.

2. THEORY

2.1. Crises

Seeger et al. [59] (p. 233) defines crisis as a “specific, unexpected, and non-routine event that threatens organization goals”. For Weick [60] (p. 305), a “low probability / high consequence event threatens the most fundamental goals of the organization”. Quarantelli [61] and Hermann [34] add a time dimension to the definition by outlining crises' characteristics of urgency, limited time to respond, and surprise. There are several definitions of crisis, but the most widely cited and well-recognized definition proposed by Pearson and Clair has been selected for this study. According to Pearson and Clair [33], crisis is “a low probability, high impact event that threatens the viability of the organization (in our case a project) and is characterized

by ambiguity of cause, effect, and means of resolution, as well as by a belief that decisions must be made swiftly”. The definition highlights crisis as a) major, unpredictable event that is likely to interfere with normal business operations and has the potential to threaten organizational survival and organizational stakeholders, b) having a low probability of occurrence and including an element of surprise, c) offer little time to respond: being characterized by time pressures and requiring quick decisions and responses to minimize its impact, and d) present a dilemma in need of decision that will result in change for better or worse [34,44,61]. Shirvastava and Mitroff [62] and Mitroff et al. [63,64] proposed a crisis typology, whereby crises are categorized into four types relying on a framework consisting of two dimensions. First, the internal-external dimension determines the source of factors that result in a crisis, which can be a failure of an internal organization system or a failure in the organization's external environment. Second, the technical-social dimension involves the characteristics of factors that cause a crisis. These include technical and/or economic failures or issues associated with human, organizational, or social concerns. Following and Shrivastava and Mitroff's [62] and Mitroff et al.'s [63] typologies of crises, **Table 1** was devised. The examples provided for each cell of **Table 1** are for crises in general, they are not illustrating project-oriented crises.

The internal social crisis represents failures in internal social processes and systems. These crises are most often caused by operator or managerial errors, intentional harm by saboteurs, faulty control systems, unhealthy working conditions, or the failure of decision-making systems. The miscommunication of vital safety information, unsafe

TABLE 1: TYPOLOGY OF CRISES

|          | Social crisis  | Technical and economic crisis  |
|----------|--|--|
| Internal | Organizational breakdown<br>Miscommunication<br>Failure to adapt to change<br>Illegal activities<br>Workplace bullying | Product/ service defect<br>Computer breakdown<br>Bankruptcy<br>Defective/ undisclosed information<br>Plant defects                                       |
| External | Executive kidnapping<br>Terrorism<br>Boycotts<br>Labor strike/ work stoppage<br>Copyright infringements                | Industrial accidents<br>Natural disaster<br>Large-scale systems failure<br>Societal crisis (civil and political)<br>Widespread environmental destruction |

decisions or deliberate harm may result from these failures [62]. In 1986, the space shuttle Challenger exploded 74 seconds after take-off, killing all six crew members and one civilian passenger. This tragedy was a crisis for the National Aeronautics and Space Administration (NASA). The explosion was caused by the failure of the solid rocket booster that powered the shuttle. The launch took place at an extremely low air temperature, which caused the seals of the booster to lose their elasticity and malfunction. The problem was in the design of booster seals [41,42].

The internal technical and economic crisis involves failures in internal organizational systems. These are caused by failures in the core technology of firms. These crises are triggered by major industrial accidents, such as Bhopal, Three Mile Island or Chernobyl. Defects in plant equipment, design or supplies are the primary causes of these crises. For example, a reactor meltdown at a nuclear power plant in Chernobyl caused the deaths of about 30 people. Hundreds of thousands of those living in the vicinity of the plant were severely irradiated [62,65].

The external social crisis represents failures in the social environment of organizations. These crises occur when agents or institutions in the social environment react adversely to the corporation. Incidents of sabotage, terrorism or off-site product tampering or misuse are examples of such failures [62]. For example, in 1982, dozens of Tylenol capsules were found to be contaminated with cyanide. Eight people who ingested these capsules died immediately. This created a nationwide public health scandal and a crisis for Johnson & Johnson, who had manufactured the capsules. The full cost of withdrawing the products from shelves and switching from the production of capsules to other forms of medication exceeded \$500 million [42,64,66].

External crises result primarily from technological and economic failures in the environment, causing crises within organizations. Examples include hostile takeover attempts prompted by the restructuring of industries, drastic currency rate changes and other macroeconomic occurrences or attacks by corporate raiders. In 1985, for instance, cheese contaminated with poisonous bacteria was sold in California, which killed 84 people, creating a major public health crisis that affected the entire state. The victims' relatives sued the manufacturer for billions of dollars, forcing it into a hostile

takeover [62].

*Crises are serious threats to the basic structures or the fundamental values and norms of a social system, which – under time pressure and highly uncertain circumstances – necessitates making critical decisions [67] (p. 10). No serious threat can ever be dealt with in a routine like manner [68]. In addition to threat, a crisis is perceived as an occasion for urgent decision-making.*

2.2. Decision-making in crisis

During a crisis, the decision-making process is critical to make accurate and timely decisions [69] which is pressed by perceived time constraints and colored by cognitive limitations [33]. The consequences of crises are high as they are low-probability, high-impact events; however, their impacts can be reduced by rapid and accurate decisions [70,71]. Decisions must be made quickly despite the uncertainty, time pressure and high stakes associated with crisis [33]. Perceived pressure to make prompt decisions [72] makes adherence to the prescripts of multi-layered and highly differentiated patterns of decision-making non-feasible [73]. Sawle [74] described the importance of making decisions in a crisis as follows: “the worst decision is no decision, and the second-worst decision is a late one”. It is critical to consider the decision-making process in crisis. The objective is to make the right decisions and to execute them effectively. Moreover, the novelty, magnitude, and frequency of decisions demanded by a crisis suggest that no organization will respond in a manner that is completely effective or completely ineffective [33]. Decision-making is complex, and at times of crisis, it is more complicated [75] as crisis is an unexpected, unusual, and abnormal event [76], the subtle quality of decisions can easily get lost in the crisis events [73]. The core elements that define crisis, ambiguity urgency and high stakes, also severely constrain the ability of individuals to make decisions effectively [33].

Hermann [27] define conception of crisis as a decisional situation with three traits: (1) identification of the origin of the event – whether external or internal for the decision-makers; (2) the decision time available for response – whether short, intermediate, or long, and (3) the relative importance of the values at stake to the participants – whether high or low.

Decision-making in crisis is characterized by a high level of uncertainty, the urgency to act, relative promptness, narrowing options and high-stakes implications for organizational survival. At the time of crisis, the challenge for any organization is to make decisions quickly and accurately [44]. During a crisis, one must secure a high-quality decision-making process. Decision quality depends upon three factors: (a) the quality of information (effective information flows, thus preventing overloads and reducing noise in communication channels; noise depends upon the distance between units in the organization), (b) the fidelity of objective articulation and trade-off evaluation (input: cognitive abilities and group think output quality decision) and (c) cognitive abilities of the decision group (the abilities of the decision unit to interpret information, generate options and calculate and make choices between alternative courses of action) [77]. The task of making a decision can be decomposed into five subtasks: (1) identifying the relevant goals; (2) searching for alternative courses of action; (3) predicting the consequences of following each alternative; (4) evaluating each alternative in terms of its consequences for goal achievement; and (5) selecting the best alternative for achieving the goal [57,77].

2.3. Megaprojects

Megaprojects are “large-scale, complex ventures that typically cost [USD one] billion or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational and impact millions of people” [78] (p. 2). The strategic nature and high costs of these undertakings usually imply a strong involvement from public institutions in the project-financing phase [2]. Megaprojects are temporary endeavors (i.e., projects) that have long-lasting impacts on the economy, the environment, technological development, and society [79-81]. Megaprojects often involve the building of physical infrastructures that enable people, resources, and information to move within buildings and between locations, which may be roads, railways, airports, bridges, energy transport and electronic communication [82]. Each megaproject has its internal economy, governance structure and system of production established temporarily [83].

Organizations responsible for carrying out megaprojects face a performance paradox—a significant gap occurs between what is expected from the huge investment of resources and what is obtained from the project investment [17,84]. While reasons for the failure of megaprojects and success factors have been well-studied by previous researchers [85,86], there is a dearth of research on what occurs in a time of crisis and through which tasks and approaches, organizations make decisions to overcome the impacts of crisis and to revive their projects. Adverse circumstances call for quick actions, which is why the crisis management literature places extra emphasis on timely decision-making in crisis [71,87,88]. The current literature suggests that among many other factors, timely decision-making plays an important role in crisis response [57,89,90], and in project-based organizations where timelines are crucial its importance increases multifold. The existing body of knowledge on crisis management is based on the fact that timely decision-making results in timely responses to crises, which helps in reducing the negative outcomes of crises [91]. This is because a crisis has a negative impact that can be reduced by making timely decisions and initiating a timely response [92]. Moreover, according to Hermann [27] there will be many occasions on which one simply cannot make a good decision without some sacrifice to one's own interests or those of some significant others. In other words, crisis decisions in megaprojects are made in light of expectations about the behavior of other organizational actors. Indeed, many crisis events seem to pose dilemmas for choosing between equally defensible courses of action; often represented by different agencies involved in crisis events [67].

Despite the challenges and failures that have been frequently reported in megaprojects and have been acknowledged in previous research, the literature merely covers the risk management domain [17]. Combining the literature on decision-making in crisis and megaprojects requires exploring crises, and more specifically, decision-making in crises in the context of megaprojects. This case study focuses on this research gap to provide a systematic approach to decision-making in crisis and to identify decision-making styles in crises during megaprojects where multiple organizations can be involved in decision-making.

3. METHODOLOGY

3.1. The case: The new International Islamabad Airport project

The new Islamabad International Airport is located at Pind Ranjha near Fateh Jang, about 25 km from Islamabad and 28 km from Saddar, Rawalpindi. The airport project was conceived in 1984, for which the first feasibility of the new International Islamabad Airport (NIIA) was prepared. The study concluded that the construction of the airport at a new site would be more feasible and economical than the expansion and up-gradation of the International Airport at Chaklala. After a lapse of 22 years, the need for another feasibility study was deemed necessary, and therefore in 2006, the master plan of the new airport was prepared. The new airport with all essential facilities caters to over nine million domestic and international passengers and a cargo handling of more than 150,000 metric tons per annum. The new airport is comprised of passenger and cargo terminal buildings, runways systems, taxiways, aprons, airfield lighting system, air traffic control towers, navigation aids and hangers along with necessary infrastructure/utilities and ancillary facilities, such as roads, car parking facilities, power supply systems, water drainage and sewage treatment plants, etc.

3.2. Research design

A single case study was conducted to understand decision-making in crisis during a megaproject. The case study method is particularly suited to addressing research questions that require a detailed understanding due to the richness of the data that can be collected in a case study context [93]. The focus of this study was the new International Islamabad Airport in Pakistan, which was a megaproject that involved multiple organizations. The selected megaproject in this research has been subject to several crises. The original project was approved at a capital cost of Rs. 36,865 billion (352 million US). The revised capital cost of the project is Rs. 81,171 billion (775 million US), indicating an increase of 120% from the original approved PC-I (archival documents). The construction began in April 2008, and it was expected that the project would be completed in 30 months at the end of 2010; however, the

airport became operational on 3rd May 2018, 11 years after it had been commissioned. These problems make it a perfect opportunity to explore and to understand the decision-making process in crisis during megaprojects. The case offers the possibility to analyze decision-making process by focusing on the following: (i) What are the main steps of decision-making in crisis during megaprojects? (ii) What are the different decision-making styles in crises during megaprojects? These research questions have been addressed through an inductive and in-depth study.

3.3. Data collection

Data were collected using (a) interviews and (b) archival documents. The interviews provided the primary source of data. The archival data served as an important source for triangulating the interview data. We conducted 34 interviews with 28 participants, ranging from 22 minutes to 98 minutes (details provided in **Table 2**). The interviews were conducted with project directors, project managers, general managers, site managers and other team members (contract specialist, construction manager, deputy project manager, resident design coordinator, integration manager, project management officer, commercial manager, and site superintendent). Informants included members of the client, a project management consultant, a design consultant, contractors, and sub-contractors. The interviews were semi-structured, and questions relevant to crisis and decision-making were asked. The interviews were recorded and transcribed.

Furthermore, archival sources of data acquired through searching the internet and provided by informants were used. Archival data consist of internal and publicly available data. First, the client website was searched for the terms “new Islamabad airport” or “new International Islamabad airport”. Second, Google was used to search for “new Islamabad airport” or “new International Islamabad airport”. Third, the client, contractors and project management consultant were asked to provide necessary documents. Archival data helped to develop a better understanding and background of the project.

| Role of the organization | Designations                  | Experience (years) | Nationalities | Interview duration (minutes) | Date of conducting interview |
|--------------------------|-------------------------------|--------------------|---------------|------------------------------|------------------------------|
| Client                   | Project director              | 30                 | Pakistan      | 91                           | 18-02-2016                   |
|                          | Contract specialist           | 33                 | Pakistan      | 36                           | 13-01-2016                   |
| Designer                 | Resident design engineer      | -                  | Pakistan      | 31                           | 11-01-2016                   |
| Consultant               | Project director              | -                  | UK            | 40                           | 12-01-2016                   |
|                          | Project manager               | -                  | Australia     | 73                           | 12-01-2016                   |
| Contactor 1              | System integration specialist | 25                 | UK            | 52                           | 13-01-2016                   |
|                          | Project manager               | 27                 | Pakistan      | 98                           | 05-02-2016                   |
|                          | Deputy project manager        | 12                 | Pakistan      | 32                           | 23-01-2016                   |
| Contractor 2             | Project director              | 27                 | China         | 66                           | 18-01-2016                   |
|                          | Site superintendent           | 7                  | China         | 36                           | 18-01-2016                   |
| Contractor 3             | Project director              | 50                 | Pakistan      | 87                           | 26-01-2016                   |
|                          | General manager               | -                  | Pakistan      | 25                           | 21-01-2016                   |
|                          | Construction manager          | 40                 | Pakistan      | 35                           | 22-01-2016                   |
| Contractor 4             | Project manager               | 41                 | Pakistan      | 66                           | 28-01-2016                   |
| Contractor 5             | Project manager               | 20                 | Pakistan      | 55                           | 15-01-2016                   |
|                          | Head of project               | -                  | South Africa  | 88                           | 02-02-2016                   |
| Contractor 6             | Project manager               | -                  | Pakistan      | 30                           | 13-01-2016                   |
|                          | Site manager                  | -                  | Pakistan      | 42                           | 02-02-2016                   |
|                          | Project manager               | 28                 | Italy         | 56                           | 05-02-2016                   |
| Contractor 7             | Project management officer    | 20                 | Pakistan      | 43                           | 08-02-2016                   |
|                          | Integration manager           | 15                 | Pakistan      | 44                           | 11-02-2016                   |
| Contractor 8             | Head of project               | -                  | South Africa  | 88                           | 09-02-2016                   |
|                          | Project manager               | 25                 | Pakistan      | 26                           | 09-02-2016                   |
|                          | Site manager                  | 30                 | Pakistan      | 35                           | 21-01-2016                   |
| Contractor 9             | Project director              | 27                 | Pakistan      | 54                           | 15-02-2016                   |
|                          | Project manager               | 25                 | Pakistan      | 52                           | 15-02-2016                   |
|                          | General manager               | 31                 | Pakistan      | 39                           | 17-02-2016                   |
|                          | -                             | -                  | -             | -                            | -                            |
| Sub-contractor 1         | Project manager               | -                  | Poland        | 22                           | 18-02-2016                   |
|                          | Site manager                  | 5                  | Pakistan      | 43                           | 15-01-2016                   |

TABLE 2: INTERVIEW PARTICIPANTS' DETAILS

3.4. Data analysis

For the data analysis, a thematic analysis was used, which was highly inductive [94,95], and themes emerging from the content of the data were identified [96,97]. Braun and Clarke's [97] practical guide was followed to apply the thematic analysis. First, the transcriptions were read and explored inductively to identify different activities that were done during the decision-making process in crisis. Second, by labeling the tentative topics, sub-themes were developed for coding different activities of the decision-making process and different styles of decision-making. Third, by going back and forth between the sub-themes, the main themes were defined. For the decision-making process, the data were categorized into understanding the crisis, information gathering and evaluating alternatives and selecting the best alternative. These themes illustrate the main steps of the decision-making process. For decision-making styles, the data were categorized as consultative decision-making and delegative decision-making inductively as the interviews differentiated between decision-making through consultants with other organizations and decision-making delegated to

another organization. **Table 3** illustrates how the sub-themes were derived from the interview transcriptions and how the sub-themes then led to themes.

4. FINDINGS

Two major themes emerged as elements of decision-making that significantly affect the decision-making process in crisis in the studied megaproject: steps in decision-making and decision-making styles.

4.1. Steps of decision-making

The main steps of decision-making consist of three sub-themes: understanding the crisis, information gathering, evaluating alternatives and selecting the best alternative.

4.1.1. Understanding the crisis

Project actors often face crises in complex projects. The elements of a crisis are numerous, and the interrelationships among the elements are extremely complicated. Understanding the crisis is the foremost step of decision-making because this understanding is crucial. Generally, an

TABLE 3: EXAMPLES OF THE CODING PROCEDURE

| Research questions        | Themes  | Sub-themes   | Illustrative quotes   |
|---------------------------|---|--|---|
| Steps for decision-making | <i>Understanding the crisis</i>                                   | Understand crisis background   | <i>You are required to be more incisive to go into detail to find out where the crisis lies... I think if any situation happens, so first you have to understand it, which is called the evaluation process in which some help is taken from consultations and documents, and then you look at the issue's background.</i> (Project director, Client)   |
|                           |   | Stakeholder identification   | <i>If we ever encounter something abnormal, we report it to the consultant and consultant reports to the relevant package... We get clarifications from the client. Different stakeholders are involved specifically client, consultant, and designer.</i> (Project manager, Contractor 7)  |
|                           |   | Identify source of crisis  | <i>You cannot land planes without systems operating, tested, commissioned, and seems to be functioning properly... We call them “mission critical systems” ... Without these systems, you cannot perform anything. You just have several assets out there that look like an airport, but they do not do anything. System integration is really what drives this airport, what will make it work. Everything is related, you cannot check-in without some system... The bag needs to check-in and passenger cannot go through a door unless you have a security clearance. Everything is system related.</i> (Project Manager, Consultant) |
|                           | <i>Information gathering</i>                                      | Information from different sources   | <i>We collect information from consultants. Every activity is done with the approval of consultants. Basically, a consultant is a third party who works on the behalf of client. We got information from there.</i> (Deputy project manager, Contractor 1)  |
|                           |   | Communication mediums  | <i>Information comes from staff members. This is the era of communication. We have provided our employees with phones. They show us the issue, and snaps are transferred to WhatsApp simultaneously.</i> (Integration manager, Contractor 7)  |
|                           |   | Information accuracy and completeness  | <i>Without information we cannot make decision. You must have some information. Sometimes information is not so complete, 70-80% of information is required to make a decision.</i> (Site superintendent, Contractor 2)   |
|                           | <i>Evaluating alternatives and selecting the best alternative</i> | Think of 2-3 alternatives  | <i>The most important step is to develop some options—2-3 at least. It is better to have less options. You can have more options, but then it is difficult to make decisions.</i> (Project director, Client)  |
|                           |   | Evaluate alternatives (pros and cons)  | <i>Options are then evaluated on the basis of advantages and disadvantages. In advantages, the first thing we consider is that a project should not stop, the government should not suffer any loss, it must be legal, it must be viable. We keep in mind the option that gives the maximum benefit to a project.</i> (Project director, Client)  |
|                           |   | Choose an alternative, i.e. (i) Follow the contract (ii) Desirable time and cost implications (iii) Favorable for company and project interest | <i>Then after the analysis, we adopt the best option. It must be in the interest of the project, not a loss of revenue or anything, human safety, no audit objection, no irregularities, no wasteful expenditures, and projects should not suffer.</i> (Project director, Client)   |
| Decision-making style     | <i>Consultative decision-making</i>                               | Consult with internal staff (head office, board of directors and senior management)  | <i>If the situation was that we cannot make decision then we escalate to higher authority... you need to consult people... Consult with your head office or with senior, you consult with them and then took any decision.</i> (Project manager, Contractor 5)  |
|                           |   | Decision is taken by consulting staff and project managers etc.  | <i>The site managers are the one who make the decisions because they are involved in the execution of the project. If they feel that in a certain matter, they require my decision as a project manager, then I make the decision. Things they cannot control they ask from project managers... Sometimes, I do not have authority to make decisions. Then, I will escalate to a higher authority to get advice and support.</i> (Project manager, Contractor 6)  |
|                           | <i>Delegative decision-making</i>                                 | External organizations (client, consultant etc.) make decision   | <i>We make decisions by coordinating with project management consultant and client. like decision of sand filling was taken by client... In a project, you have to make decisions with coordination.</i> (Project manager, Contractor 4)  |
|                           |   | Discussion and consultation with specialized people from other organizations   | <i>There are some issues that need some guidance from the specialized organization... third party is involved, and they call their expert and finalize the decision.</i> (Resident design engineer, Designer)   |

understanding of the crisis defines where the crisis lies and what the sources and characteristics of the crisis are, meaning whether the crisis lies internally or externally, such as within an organization or other organizations (the client, contractor, consultant, and designer involved in the project), the reason for the crisis and whether the crisis is technical, economic, or social in nature:

*This project has different project directors from the client side. There is a new director; it does not necessarily need to be for this project, such as a new director of a car factory. If the director is changed after every few months, you come to the position where you do not know what is going on. You need to know your contractors, suppliers, and your staff, which is a time-consuming exercise. Changing staff every few months is not good for such a project.* (Project manager, Sub-contractor 1)

The aforementioned quote illustrates an internal social crisis, a crisis within the organizational environment—the client of the project. The next quote discusses an external social crisis, which is in the external environment of project, including water management and electricity etc., in the domain of external stakeholders.

*The land was purchased during the period of 1986-2008. The average cost was 22 times higher than the cost estimated in the feasibility study in 1984. The process for purchase of land was continued for 22 years... Both client and consultant were not sure about the actual requirement of land... Moreover, there is no groundwater... If you do not have water... if you do not have electricity, how would you run this airport?* (Director, Contractor 3)

The following quote explains an internal technical and economic crisis. The airport cannot be operational without systems.

*Systems integration will drive the success or failure of this airport. There are up to 250 different systems. Normally, you plan to build the terminal building; you plan for the baggage handling system, and you plan for the systems to be operated. In this case, they did not do that. They were*

*thinking of assets only—facilities only: air traffic control tower, passenger terminal building, utilities, roads, car parks, and runways, etc. The hard assets. There was not very much focus on these hidden aspects, which really drive an airport.... The first thing is that we really need to think about systems as they really are the driver of this airport. All the rest is the hard assets on which the systems are located.* (Project manager, Consultant)

The airport project began in 2008, but due to the prolongation of the project, technology has changed, which led to an external technical and economic crisis.

*From 2008, design has changed since then, and technology has moved on. If you realize you have florescent lights, they are outdated technology-wise. Right now, we are using LED lights, which consume less power. They are more efficient, but they cost more, even the holder, the basic unit is different, so procurement changes.... It is an old airport planning to be in good shape. It does not have very modern systems. It has all kinds of systems, but they are at a very low level.* (Project manager, Consultant)

After identifying different sources, i.e., internal, external, social, and technical crises, it is important to identify the stakeholders, who are not affected by the crisis but are the main source of the crisis.

*The most important thing in decision-making is to identify the crisis. Once the crisis is identified, then you have to coordinate with the stakeholders. If the crisis is because of you or due to the client, the stakeholders or any third party, you just have to identify the source of the crisis... The first thing is the identification of the crisis, and then the identification of the stakeholders is a very important thing.* (Project management officer, Contractor 7)

The more the understanding of the crisis is developed, the more likely the understanding of the root cause to create countermeasures so the crisis will not recur, and better project actors can consider crisis management. Understanding the crisis is the first step of decision-making.

4.1.2. Information gathering

Information gathering is the process of monitoring the environment and providing data to managers. The data collected indicate that different internal and external sources were used for information gathering. Internal sources refer to information collected from the project team members and the staff of the respective organization, whereas external sources include other organizations, such as the client, contractor, consultant, designer, and suppliers.

*During the project, one has to gather the information. There is a system. We have the team, which is responsible for gathering the information. Most of the time, we obtained information from designers and suppliers and sometimes require internal information as well. We communicate with other contractors. Then, we bring the issue to [Consultant's name] knowledge so we communicate with the client via the engineer. We have to tell them we have to look into the contract. We gather the information from every possible way. (Project manager, Contractor 8)*

The next step is to identify the communication medium through which the information is gathered. In the communication medium, formal (meetings, documents, and contracts) and informal (email, WhatsApp, SMS, etc.) means were used by the informants for information gathering.

*The information is reached by telephone, WhatsApp, SMS, email, meetings, etc. I also visit the site. I see what is going on at the site, and I see what is going on with the documents and submittals (Project Manager, Sub-contractor 1). The priority is to get the full facts behind the full information, what specifications say, what drawings say, and review that to make the qualified decisions based upon the facts. (Project manager, Consultant)*

*The gathered information should be accurate and complete by all means. The quality of information is measured by accuracy, timeliness, completeness, and relevance. Accuracy and completeness are important to the quality of information. To make information useful, it must be complete. If parts of the information are missing, the project*

*actor will not make use of it. As far as the accuracy and completeness of the information are concerned, project actors attempt to obtain as much information as possible. If there is incomplete information, they use their judgment and experience. Accuracy involves ensuring that the information is correct and without any discrepancy. If the project team members have any doubt, they do site visits.*

*The information has to be qualitatively correct; accuracy depends upon the quality of the information. It has to come on time. It should be complete in itself—all this information. You can come to know within minutes that the information is complete or not. Since you get information from the right kind of people, you cannot expect any electrical drawing from civil engineers or civil designs from the electrical engineers, so they are managing their respective fields. (Project director, Client)*

4.1.3. Evaluating alternatives and selecting the best alternative

Based on the informants' responses, the most important step is to determine the number of alternative options, two to three at least. It is better to have fewer options. More options make it difficult to make a decision, so it is better to have options that are viable and implementable. The next step is to evaluate these options and to choose the most appropriate one. The evaluation of the alternatives is based on which option has more advantages and which option has more disadvantages. Usually, the alternative selection is made by considering a few criteria, but both quantitative and qualitative criteria, i.e., time and financial implications, resource availability, favorability for the company and the project and specifications, i.e., project and contract specification and legality, were incorporated, as illustrated by the project manager of Contractor 1:

*You should always have an alternate option. Alternate, or we called it reserve option... I will not rely on a single back up. I will minimum consider two backups. Cost is always number one, and availability is number two when considering the backups.*

This quotation illustrates the importance of cost and availability; however, alternatives are evaluated on a need basis as well. It is important to understand the situation at the time and what is important: time is important, money is important, etc. The objective and its importance at a given time are based on alternative evaluations and selections.

*Leading criteria should dictate the option that you want to exercise. Leading criteria could be short of money, could be short of time, could be short of expertise, could be the accessibility to the site, the importance of the project, its availability to the people and to the users. That should govern you in decision-making. (Project director, Contractor 3)*

4.2. Decision-making styles

*Decision-making in crisis is crucial. There are several different decision-making styles, and it is important to know when to use the different styles of decision-making. For decision-making style, the sub-themes are consultative decision-making style and delegative decision-making style. The findings show that consultative and delegative decision-making styles are evident throughout the data.*

4.2.1 Consultative decision-making

Consultative decision-making involves a process in which one person makes the decision with input from other members. For consultative decision-making, a project manager asks his/her team for information that would be helpful for decision-making, but the final decision is made by the manager. Therefore, the purpose is to consult and to gather as much information as possible from a team before making a decision.

*On execution side decision is taken by project manager, he takes the decision until and unless there is financial limit present, if it is beyond that limit, you need signature mandate and you have to escalate... A financial decision is always made by the financial authority, i.e., project director. We inform him, and he gives us the decision related to finance. There are levels for it. Some of the decisions are made by the project director, and if finances go up, then the director-general makes the financial decisions. For administrative*

*decisions, we have a field staff in which we have in-charge, including site in-charge, engineers, managers, and assistant managers. If the site in-charge wants to make any decision, then he is authorized, so if there is a need for technical input to make the administration decision, then he asks engineers. (General manager, Contractor 9)*

4.2.2. Delegative decision-making style

To make the right decisions, sometimes the responsibility of making a decision is transferred to other organizations, i.e., client, consultant, designer and the third party. The reasons to transfer the decision-making responsibility are (a) the organization does not have expertise and enough knowledge and (b) the crisis source is external, produced by a contractor, client or consultant, but affects an organization, which is incapable of decision-making, so the power of decision-making lies with some other organization. This is known as a delegative decision-making style in which managers are not making decisions, but they receive the decisions.

*We just follow the decision of [consultant's name] and [client's name] because the contractor is a follower. We as a contractor just inform about the problem. If we do not have control over the situation, then the client makes a decision. (Construction manager, Contractor 3)*

The above quote explained that contractors do not have capacity to do something about crisis. Usually, external crises are either uncontrollable or controllable by others such as client, consultant etc., and sometimes specialized decision-making is required. As illustrated below:

*Sometimes, you might get a more informed decision and refer the case to some specialist, whether they are on board or in the market. That procedure we call a third-party validation... We find people who are more qualified and more experienced and get their opinion, so it was the outsourcing of the problem, which is also one of the solutions. If you do not have a solution for technical things, then you can ask from others. You pay them extra, and you get solutions from them. (Project director, Client)*



5. DISCUSSION

Research on managing megaprojects has gradually evolved in terms of challenges, risks, and failures [11,98-100], complexity of stakeholder management [101], joint value creation [102,103] and governance [98]. The common view throughout the literature is that megaprojects are highly risky and that there is a need for a systematic process for risk management in megaprojects [2,10,13]. Therefore, the ability to make sound decisions is crucial to the success of a project [104]; however, the literature has solely focused on risks [13,98] and has not addressed crises as high-impact, unknown events. The findings of this study suggest specific decision-making steps and styles that are based on the characteristics of a crisis (high-impact, unknown event) and the inter-organizational aspects of the megaproject.

5.1. Decision-making steps

The study confirms the process model of previous research for the organizational decision-making process [105]. The findings show that decision-making in crisis during megaprojects demands specific steps to ensure the suitability of input for decision-making. **Figure 1** illustrates the main steps in decision-making in crisis and their relationship with decision-making styles based on the empirical findings of a megaproject.

Due to the high number of actors and activities involved in megaprojects [13], it is important to have an understanding of the crisis. Here, understanding of the crisis is defined as a separate step of decision-making to shed light on the process by which multiple organizations are involved and negotiate and interpret information. Understanding the crisis requires gathering various types of information about the background of the crisis [106]. This information helps decision-makers identify what the sources of the crisis are, and which organizations and stakeholders are involved with what impacts and through which actions. By interpreting the information, decision makers obtain an understanding (meaning) of the crisis [100].

Previous studies have shown that information management plays a critical role in complex and multi-environment projects [107,108]. Decision-making in a crisis requires accurate and complete information. The quality of decisions largely depends on the quality of information that decision-makers have [109] which depends on the ability of the system to effectively absorb information flows, thus preventing overloads and to reduce noise in communication channels [77]. To gather quality information, decision-makers try to define what type of information they need, where the information is and how to get the information. The findings show that in a time of crisis, decision-makers may receive

*several pieces of information from different sources either formally or informally. The inter-organizational aspects of megaprojects force decision-makers to seek information from internal and external individuals, teams of different organizations, such as clients, designers, contractors, etc. [110]. This interactions with key stakeholders in a crisis are thought to enhance their ability to minimize the crisis, to resume business, and to learn from the crisis [33]. However, not all information can be used as input for decision-making, and information overload can have a negative effect on the quality of decision-making [107]. The findings of this study confirm the identified dimensions of the quality of information, including the availability, topicality, and validity of information [109]; however, the study has revealed that in some cases, correct and early information is not available [106]. Thus, decision-making in crisis also depends on the judgment and experience of decision-makers in evaluating the quality of information to be utilized for decision-making [102]. The findings reveal that understanding the crisis and information gathering steps have a bidirectional relationship. In one direction, gathered information from different sources helps to obtain a better understanding of the crisis. In the other direction, by understanding the crisis, decision-makers can identify whether the crisis has internal or external sources or the crisis has technical, economic, or social causes. In turn, this understanding leads to deeper information gathering from relevant sources.*

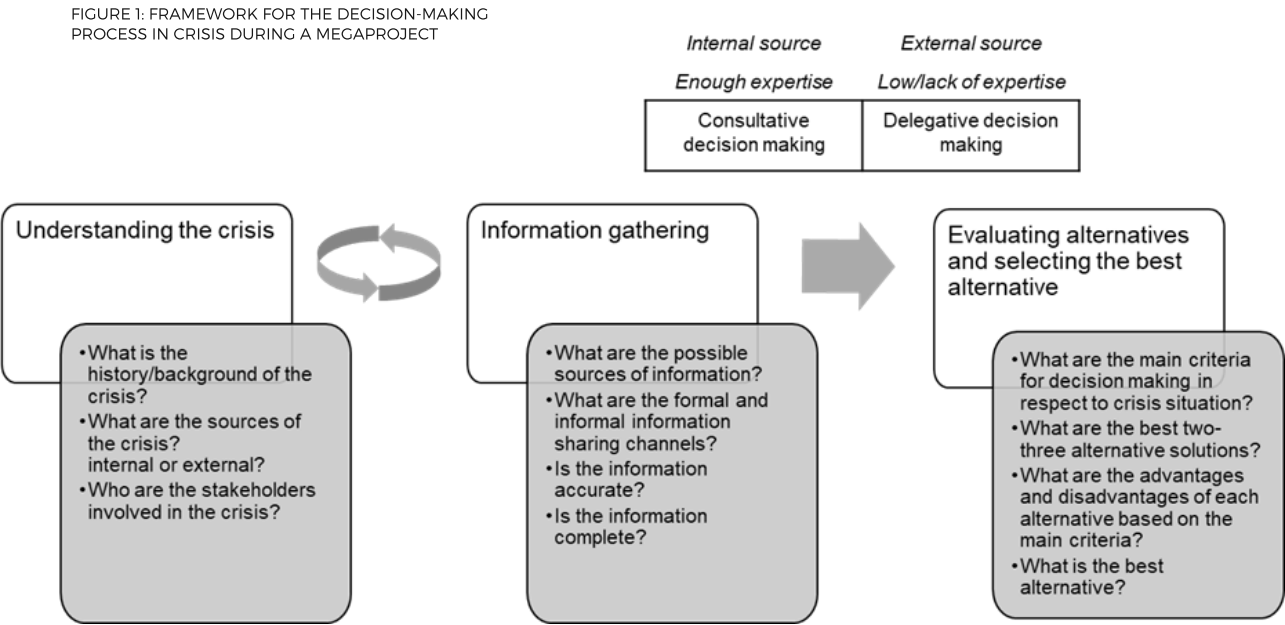
*The conventional risk-management frameworks that are also used in megaprojects are rooted in the planning and proactive management of the risks [13], while a crisis requires a fast decision [33] with no contingency plan. The findings show that decision-making is not about finding and applying the first solution that may emerge. Due to the unfavorable high impacts of a crisis on a project, decision-makers try to develop multiple alternatives to ensure that they can manage the impacts of a crisis; however, the number of alternatives is usually limited to create a balance between making an accurate decision and minimizing the efforts of decision-making [45]. The findings also show that the decision-makers have certain criteria to evaluate different alternatives to make sure that pros and cons of actions are well-understood [108]. Using the iron triangle (cost, time, quality) does not always provide sufficient criteria [111,112].*

This study identified several criteria, including time, financial implications, resource availability, favorability for the company and the project, project and control specification and legality, needed to select the best alternative.

5.2. Decision-making styles

Like previous studies on project management, this case study shows that decisions during a project are made at different hierarchical levels and that certain actors are responsible for certain decision types [113]. In addition to a formal decision-making process, actual decision-making in an organization may include informal or invisible processes [109]. To better understand the actual process of decision-making in crisis, the styles used to make decisions were also analyzed. The findings show that the project director and managers usually decide upon a suitable decision-making style and subsequently on the right decision-makers. The findings reveal two styles of decision-making: consultative and delegative. This finding contributes to previous studies on decision-making styles in project management. While previous studies have mainly focused on the impact of cultural differences on decision-making styles [45], this study highlights the importance of the characteristics of the crisis (which are defined by “understanding the crisis” and “information gathering”) in selecting the suitable decision-making style. Moreover, the findings of this study show that once the organization identifies the sources of crisis (internal vs. external sources) and the level of internal expertise, the organization can determine the suitable decision-making style for a crisis and can continue evaluating alternatives accordingly.

The findings of this study highlight the inter-organizational aspect of decision-making in megaprojects [101]. Because organizations do not always have the necessary information, resources, and know-how, they follow a collaborative approach to engage relevant actors in decision-making [114]. Moreover, the involvement of other actors in decision-making can increase their satisfaction with the outcome [115]. This case study has presented situations in which making a decision involves multiple information sources from different organizations. For example, the project manager at a contractor organization did not access or was not able to



process all information. A previous study has shown the importance of continuous consultation among different actors in the process of decision-making for megaprojects [116]. The findings of this study reveal a consultative style, where different actors provide input for decision-making. The consultative process allows everyone’s perspective to be presented and the process to be finalized by one individual to make decisions [117]; however, the findings show that when the source of the crisis is external to the organization and there is a need for specific knowledge and skills, decision-making could be delegated to another organization with suitable expertise. The delegative decision-making style is the extent to which the manager attains desired objectives by allowing organizations to make collective decisions [118]. The case study shows that delegation is not necessarily limited to the organizations involved in the projects; decision-making can also be outsourced to specialist third parties.

6. CONCLUSION

This paper sought to answer the research questions: What are the main steps of decision-making in crises during megaprojects? And What are the different decision-making styles in crises during megaprojects? In doing so, this research began to capture a more comprehensive view of decision-making of crisis in megaproject settings. In this study, we present the main elements of decision-making i.e., decision-making steps and decision-making styles. Decision-making steps, i.e., understanding the crisis, information gathering and evaluating alternatives and selecting the best alternative, are the means through which decisions are made in crisis. Meanwhile, different decision-making styles, i.e., consultative and delegative decision-making styles, also play an important role in making decision in crisis during megaproject. These decision-making styles show the difference between megaprojects as temporary organizations and other contexts; the set of diversely skilled people from multiple organizations and the interactions between them to accomplish the megaproject would demand more collaborative approach in decision-making. Moreover, the limited period of time combined with high criticality of accomplishing a complex task which includes lots of contractual arrangements would require a deep but at the

same time rapid decision-making approach in megaprojects. The identified decision-making styles were a way of balancing this trade-off in this case study.

This paper contributes to the literature on megaprojects through an increased understanding of decision-making processes during crises in megaprojects. First, it extends the dimensions of decision-making in crises during a megaproject, to include decision-making steps and styles. Second, the key findings are related to the relationship between decision-making steps and styles. Although decision-making steps are valuable for all types of crises, but decision-making styles may vary; for instance, if crisis is internal and controllable then consultative decision-making style would be applicable whereas if crisis is external and uncontrollable then delegative decision-making style would be followed. Third and central contribution of the paper is the presentation of a framework (Figure 1) that considers the requirements of crisis and multi-actor projects. It considers the multiple sources of crisis and information in megaprojects– – a bi-directional relationship, and the need for evaluating the suitability of the information and for the adoption of different decision-making styles depending on the nature of the crisis, authority and capabilities of the multiple actors involved the project. Finally, we argue that our framework (Figure 1) can serve as a refined basis for further research concerning some of the distinctive features of decision-making in crises during megaprojects.

The implications of this study are for practitioners concerning the proposed framework of decision-making in crises during megaprojects. The derived decision-making framework will assist with and engage project participants in the decision-making process in a holistic manner. Different decision-making steps would guide managers and teams to apply different decision-making styles efficiently, which can affect the way organizations make decisions. The application of the decision-making process could lead to more successful management of crisis during megaprojects. The crises identified are pertinent for both single and multiple organizational settings. The decision-making framework will be helpful for managers to enhance their likelihood of successfully managing a project as it provides a roadmap for

REFERENCE

1. Flyvbjerg et al., op. cit.; Miller, R., & Lessard, D.R. (2000). *The Strategic Management of Large Engineering Projects: Shaping Institutions, Risks, and Governance*. Cambridge: MIT Press.

2. Locatelli, G., & Mancini, M. (2010). Risk management in a mega-project: The universal EXPO 2015 Case. *International Journal of Project Organisation Management*, 2(3): 236-253.

3. Turner, J.R. (2006). Towards a theory of project management: The nature of the functions of project management. *International Journal of Project Management*, 24(4): 277-279.

4. Goodman, R.A., & Goodman, L.P. (1976). Some management issues in temporary systems: A study of professional development and manpower-the theatre case. *Administrative Science Quarterly*, 21(3): 494-501.

5. Grabher, G. (2002). Cool projects, boring institutions: Temporary collaboration in social context. *Regional Studies*, 36(3): 205-214.

6. Lundin, R.A., & Söderholm, A. (1995). A theory of the temporary organization. *Scandinavian Journal of Management*, 11(4): 437-455.

7. Cummings, J., & Pletcher, C. (2011). Why project networks beat project teams. *MIT Sloan Management Review*, 52(3): 75-80.

8. Brady, T., & Davies, A. (2004). Building project capabilities: From exploratory to exploitative learning. *Organization Studies*, 25(9): 1601-1621.

9. Bakker, R.M. (2010). Taking stock of temporary organizational forms: A systematic review and research agenda. *International Journal of Management Reviews*, 12(4): 466-486.

10. Wang, Y., Wang, Y., Wu, X., & Li, J. (2020). Exploring the risk factors of infrastructure PPP projects for sustainable delivery: A social network perspective. *Sustainability*, 12(10): 4152.

11. Flyvbjerg, B. (2014). What you should know about megaprojects and why: An overview. *Project Management Journal*, 45(2): 6-19.

12. Görecki, J., & Díaz-Madroñero, M. (2020). Who risks and wins?—Simulated cost variance in sustainable construction projects. *Sustainability*, 12(8): 3370.

13. Kardes, I., Ozturk, A., Cavusgil, S.T., & Cavusgil, E. (2013). Managing global megaprojects: Complexity and risk management. *International Business Review*, 22(6): 905-917.

14. Antillon, E.I., Garvin, M.J., Keith R., Molenaar, K.R., & Javernick-Will, A. (2018). Influence of interorganizational coordination on lifecycle design decision making: Comparative case study of public–private partnership highway projects. *Journal of Management Engineering*, 34(5): 05018007.

15. Kornberger, M., Leixnering, S., & Meyer, R.E. (2019). The logic of tact: How decisions happen in situations of crisis. *Organization Studies*, 40(2): 239-266.

16. Wu, G., Zhao, X., Zuo, J., & Zillante, G. (2017). Effects of contractual flexibility on conflict and project success in megaprojects. *International Journal of Conflict Management*, 29(2): 253-278.

17. Flyvbjerg, B., Bruzelius, N., & Rothengatter W. (2003). *Megaprojects and Risk: An Anatomy of Ambition*. Cambridge: Cambridge University Press.

18. Van Marrewijk, A. (2007). Managing project culture: The case of Environ megaproject. *International Journal Project Management*, 25(3): 290-299.

19. Gil, N. (2009). Developing project client supplier cooperative relationships: How much to expect from relational contracts? *California Management Review*, 36(7): 1434-1169.

20. Gil, N., Miozzo, M., & Massini, S. (2012). The innovation potential of new infrastructure development: An empirical study of Heathrow Airport’s T5 project. *Research Policy*, 41(2): 452-466.

21. Geraldi, J.G., Lee-Kelley, L., & Kutsch, E. (2010). The Titanic sunk, so what? Project manager response to unexpected events. *International Journal Project Management*, 28(6): 547-558.

22. Hällgren, M., & Wilson, T.L. (2008). The nature and management of crises in construction projects: Projects as practice observations. *International Journal Project Management*, 26(8): 830-838.

23. Hällgren, M., & Wilson, T.L. (2011). Opportunities for learning from crises in projects. *International Journal of Managing Project in Business*, 4(2): 196-217.

24. Tukiainen, S., Aaltonen, K., & Murtonen, M. (2010). Coping with an unexpected event: project managers’ contrasting sensemaking in a stakeholder conflict in China. *International Journal of Managing Project in Business*, 3(3): 526-543.

25. Meyer, D.A., Loch, H.C., & Pich, T.M. (2002). Managing project uncertainty: From variation to chaos. *MIT Sloan Management Review*, 43(2): 60-67.

26. Hällgren, M. (2007). Beyond the point of no return: On the management of deviations. *International Journal of Project Management*, 25(8): 773-780.

27. Orr, R.J., & Scott, R.W. (2008). Institutional exceptions on global projects: A process model. *Journal of International Business Studies*, 39(4): 562-588.

28. Sommer, S.C., & Loch, C.H. (2004). Selectionism and learning in projects with complexity and unforeseeable uncertainty. *Management Science*, 50(10): 1334-1347.

29. Iftikhar R., & Müller, R. (2019). Taxonomy among triplets: Opening the black box. *International Journal of Management*, 10(2): 63-85.

30. Scotte, H., & Bourgault, M. (2008). Dimensions of uncertainty and their moderating effect on new product development project performance. *R&D Management*, 38(5): 468-479.

31. Knight, F.H. (1921). *Risk, Uncertainty and Profit*. Boston, MA: Hart, Schaffner & Marx; Houghton Mifflin Co.

32. Seeger, M.W. (2002). Chaos and crisis: Proposition for general theory of crisis communication. *Public Relations Review*, 28(4): 329-337.

33. Pearson, C.M., & Clair J.A. (1998). Reframing crisis management. *Academy Management Review*, 23(1): 59-76.

34. Hermann, C.F. (1963). Some consequences of crisis which limit the viability of organizations. *Administrative Science Quarterly*, 8(1): 61-82.

35. Dutton, J.E. (1986). The processing of crisis and non-crisis strategic issues. *Journal of Management Studies*, 23(5): 501-517.

36. Miller, R., & Lessard, D. (2007). Evolving strategy: Risk management and the shaping of large engineering projects. *MIT Sloan Working Paper*, 4639(7): 1-37.

37. Davies, A., Dodgson, M., & Gann, D. (2016). Dynamic capabilities in complex projects: The case of London Heathrow Terminal 5. *Project Management Journal*, 47(2): 26-46.

38. Davies, A., Gann, D., & Douglas, T. (2009). Innovation in megaprojects: Systems integration at London Heathrow Terminal 5. *California Management Review*, 51(2): 101-125.

39. Weick, K.E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly*, 38(4): 628-652.

40. Weick, K.E. (1988). Enacted sensemaking in crisis situations. *Journal of Management Studies*, 25(4): 305-317.

41. Vaughan, D. (1996). *The Challenger Launch Decision*. Chicago: University of Chicago Press.

42. Shrivastava, P., Mitroff, I.I., Miller, D., & Miglani, A. (1988). Understanding industrial crises. *Journal of Management Studies*, 24(4): 285-303.

43. Perrow, C. (1984). *Normal Accidents: Living with High Risk Technologies*. New York: Basic Books.

44. Bonn, I., & Rundle-Thiele, S. (2007). Do or die- Strategic decision-making following a shock event. *Tourism Management*, 28(2): 615-620.

45. Müller, R., Spang, K., & Ozcan, S. (2009). Cultural differences in decision making in project teams. *International Journal of Managing Project in Business*, 2(1): 70-93.

46. Stingl, V., & Geraldi, J. (2017). Errors, lies and misunderstandings: Systematic review on behavioural decision making in projects. *International Journal of Project Management*, 35(2): 121-135.

47. Hällgren, M. (2010). Groupthink in temporary organizations. *International Journal of Managing Project in Business*, 3(1): 94-110.

48. Weick, K.E. (1995). *Sensemaking in Organizations*. Thousand Oaks: Sage Publications.

49. Musca, G.N., Mellet, C., Simoni, G., Sitri, F., & de Vogüé, S. (2014). Drop your boat!: The discursive co-construction of project renewal. The case of the Darwin mountaineering expedition in Patagonia. *International Journal of Project Management*, 32(7): 1157-1169.



50. Zhang, H., Herazo, B., & Lizarralde, G. (2011). Paquin, R., Two schools of risk analysis: A review of past research on project risk. *Project Management Journal*, 42(4): 5-18.

51. Love, P.E., Skitmore, M., & Earl, G. (1998). Selecting a suitable procurement method for a building project. *Construction Management Economics*, 16(2): 221-233.

52. Mian, S.A., & Dai, C.X. (1999). Decision-making over the project life cycle: An analytical hierarchy approach. *Project Management Journal*, 30(1): 40-52.

53. Turner, J.R., & Simister, S.J. (2001). Project contract management and a theory of organization. *International Journal of Project Management*, 19(8): 457-464.

54. Zeng, J., An, M., & Smith, N.J. (2007). Application of a fuzzy based decision-making methodology to construction project risk assessment. *International Journal of Project Management*, 25(6): 589-600.

55. Martinsuo, M. (2013). Project portfolio management in practice and in context. *International Journal of Project Management*, 31(6): 794-803.

56. Costantino, F., Di Gravio, G., & Nonino, F. (2015). Project selection in project portfolio management: An artificial neural network model based on critical success factors. *International Journal of Project Management*, 33(8): 1744-1754.

57. Anderson, P.A. (1983). Decision making by objection and the Cuban missile crisis. *Administrative Science Quarterly*, 28(2): 201-222.

58. Sayegh, L., Anthony, W.P., & Perrewé, P.L. (2004). Managerial decision-making under crisis: The role of emotion in an intuitive decision process. *Human Resource Management Review*, 14(2): 179-199.

59. Seeger, M.W., Sellnow, T.L., & Ulmer, R.R. (1998). *Communication, Organization and Crisis*. Thousand Oaks: Sage Publication.

60. Weick, K.E. (1988). Enacted sense making in crisis situation. *Journal of Management Studies*, 25(4): 305-317.

61. Quarantelli, E.L. (1988). Disaster crisis management: A summary of research findings. *Journal of Management Studies*, 25(4): 373-385.

62. Shrivastava, P., & Mitroff, I.I. (1987). Strategic management of corporate crises. *Columbia Journal of World Business*, 22(1): 5-11.

63. Mitroff, I.I., Shrivastava, P., & Udwadia, F.E. (1987). Effective crisis management. *Academy Management Executive*, 1(4): 283-292.

64. Mitroff, I.I., Pauchant, T.C., & Shrivastava, P. (1988). The structure of man-made organizational crises: Conceptual and empirical issues in the development of a general theory of crisis management. *Technological Forecasting and Social Change*, 33(2): 83-107.

65. Liberatore, A. (2013). *The Management of Uncertainty: Learning from Chernobyl*. London: Routledge, Taylor & Francis Group.

66. Olaniran, B.A., Scholl, J.C., Williams, D.E., & Boyer, L. (2012). Johnson and Johnson phantom recall: A fall from grace or a re-visit of the ghost of the past. *Public Relations Review*, 38(1): 153-155.

67. Rosenthal, U., Charles, M. T., & Hart, P. (1989). (Eds.), *Coping with Crises: The Management of Disaster, Riots and Terrorism*. Spring field, IL: Charles C. Thomas.

68. Inbar, M. (1979). *Routine Decision Making: The Future of Bureaucracy*. London: Sage.

69. Loosemore, M. (1998). The three ironies of crisis management in construction projects. *International Journal of Project Management*, 16(3): 139-144.

70. Mallak, L.A., & Kurstedt Jr. H.S. (1997). Planning for crises in project management. *Project Management Journal*, 28(2): 14-24.

71. Kahn, W.A., Barton, M.A., & Fellows, S. (2013). Organizational crises and the disturbance of relational systems. *Academy Management Review*, 38(3): 377-396.

72. Haas, J., Kates, E.R.W., & Bowden, M.J. (1977). (Eds.), *Reconstruction Following Disaster*. Cambridge: MIT Press.

73. Hart, P., Rosenthal, U., & Kouzmin, A. (1993). Crisis decision making: The centralization thesis revisited. *Administration & Society*, 25(1): 12-44.

74. Sawle, C. (1991). Concerns of project managers: Crisis project management. *PM Network*, 5(1): 25-29.

75. Wilson, T.C. (2013). Risk management lessons learned from the financial crisis: One CRO's view. *Journal of Risk Management in Financial Institutes*, 6(2): 167-177.

76. Lacombe, P. (2002). Agronomic research and research into crisis situation. *Journal of Contingencies and Crisis Management*, 10(4): 205-206.

77. Smart, C., & Vertinsky, I. (1977). Designs for crisis decision units. *Administrative Science Quarterly*, 22(4): 640-657.

78. Flyvbjerg, B. (2017). Introduction: The iron law of megaproject management. In Flyvbjerg, B. (Eds.). *The Oxford Handbook of Megaproject Management*, (pp. 1-18). Oxford, UK: Oxford University Press.

79. Bruzelius, N., Flyvbjerg, B., & Rothengatter, W. (2002). Big decisions, big risks: Improving accountability in megaprojects. *Transport Policy*, 9(2): 143-154.

80. Zhai, L., Xin, Y., & Cheng, C. (2009). Understanding the value of project management from a stakeholder's perspective: Case study of megaproject management. *Project Management Journal*, 40(1): 99-109.

81. Brookes, N.J., & Locatelli, G. (2015). Power plants as megaprojects: Using empirics to shape policy, planning, and construction management. *Utilities Policy*, 36: 57-66.

82. Priemus, H. (2010). Decision-making on mega-projects: Drifting on political discontinuity and market dynamics. *European Journal of Transport and Infrastructure Research*, 10(1): 19-29.

83. Miller, R., & Hobbs, B. (2005). Governance regimes for large projects. *Project Management Journal*, 36(3): 42-51.

84. Flyvbjerg, B., Holm, M.K.S., & Buhl, S. (2004). What causes cost overrun in transport infrastructure projects? *Transport Review*, 24(1): 3-18.

85. Smits, K., & Van Marrewijk, A. (2012). Chaperoning: Practices of collaboration in the Panama Canal expansion program. *International Journal of Managing Project in Business*, 5(3): 440-456.

86. Shenhar, A., & Holzmann, V. (2017). The three secrets of megaproject success: Clear strategic vision, total alignment, and adapting to complexity. *Project Management Journal*, 48(6): 29-46.

87. Maitlis, S., & Sonenshein, S. (2010). Sensemaking in crisis and change: Inspiration and insights from Weick (1988). *Journal of Management Studies*, 47(3): 551-580.

88. Bechky, B.A., & Okhuysen, G.A. (2011). Expecting the unexpected? How swat officers and film crew handle surprises. *Academy of Management Journal*, 54(2): 239-261.

89. Tjosvold, D. (1984). Effects of crisis orientation on managers' approach to controversy in decision making. *Academy of Management Journal*, 27(1): 130-138.

90. Roberts, K.H. (1990). Some characteristics of one type of high reliability organization. *Organization Science*, 1(2): 160-176.

91. Claeys, A.S., & Caubergh, V. (2012). Crisis response and crisis timing strategies: Two sides of the same coin. *Public Relation Review*, 38(1): 83-88.

92. Graffin, S.D., Haleblan, J., & Kiley, J.T. (2016). Ready, aim, acquire: Impression offsetting and acquisitions. *Academy of Management Journal*, 59(1): 232-252.

93. Hartley, J. (2004). Case study research. In Cassell, C., Symon, G. (Eds.). *Essential Guide to Qualitative Methods in Organizational Research*, (pp. 323-333). London: Sage.

94. Boyatzis, R.E. (1998). *Transforming Qualitative Information: Thematic Analysis and Code Development*. Thousand Oaks, CA: Sage Publication.

95. Howitt, D., & Cramer, D (2007). *Introduction to Research Methods in Psychology*, Pearson Education.

96. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2): 77-101.

97. Braun, V., & Clarke, V (2012). Thematic analysis. In Cooper et al. (Eds.). *APA Handbook of Research Methods in Psychology*, Vol. 2: Research Designs: Quantitative, Qualitative, Neuropsychological, and Biological, (pp. 57-71). Washington, DC: American Psychological Association.

98. Sanderson, J. (2012). Risk, uncertainty and governance in megaprojects: A critical discussion of alternative explanations. *International Journal of Project Management*, 30(4): 432-443.

99. Sanchez-Cazorla, A., Alfalla-Luque, R., & Irimia-Dieguez, A.I. (2016). Risk identification in megaprojects as a crucial phase of risk management: A literature review. *Project Management Journal*, 47(6): 75-93.

100. Saunders, F.C., & Townsend, E.A. (2019). *Delivering new nuclear projects: A megaprojects perspective*. *International Journal of Managing Project in Business*, 12(1): 144-160.

101. Daniel, E., & Daniel, P.A. (2019). *Megaprojects as complex adaptive systems: The Hinkley point C case*. *International Journal of Project Management*, 37(8): 1017-1033.

102. Eweje, J., Turner, R., & Müller, R. (2012). Maximizing strategic value from megaprojects: the influence of information-feed on decision-making by the project manager. *International Journal of Project Management*, 30(6): 639-651.

103. Lehtinen, J., Peltokorpi, A., & Arto, K. (2019). Megaprojects as organizational platforms and technology platforms for value creation. *International Journal of Project Management*, 37(1): 43-58.

104. Al-Harbi, & Al-S K.M. (2001). Application of the AHP in project management. *International Journal of Project Management*, 19(1): 19-27.

105. Thomas, J.B., Shawn, M., Clark, D., & Gioia, A. (1993). Strategic sensemaking and organizational performance: Linkages among scanning, interpretation, action and outcomes. *Academy of Management Journal*, 36(2): 239-270.

106. De Bruijn, H., & Leijten, M. (2007). Megaprojects and contested information. *Transportation Planning and Technology*, 30(1): 49-69.

107. Caniels, M.C., & Bakens, R.J. (2012). The effects of project management information systems on decision making in a multi-project environment. *International Journal of Project Management*, 30(2): 162-175.

108. Chapman, R.J. (2016). A framework for examining the dimensions and characteristics of complexity inherent within rail megaprojects. *International Journal of Project Management*, 34(6): 937-956.

109. Dietrich, P., & Lehtonen, P. (2005). Successful management of strategic intentions through multiple projects–Reflections from empirical study. *International Journal of Project Management*, 23(5): 386-391.

110. Turner, B. (1976). The organizational and interorganizational development of disasters. *Administrative Science Quarterly*, 21(3): 378-397.

111. Dweiri, F.T., & Kablan, M.M. (2006). Using fuzzy decision-making for the evaluation of the project management internal efficiency. *Decision Support Systems*, 42(2): 712-726.

112. Marques, G., Gourc, D., & Luras, M. (2011). Multi-criteria performance analysis for decision making in project management. *International Journal of Project Management*, 29(8): 1057-1069.

113. Drouin, N., Müller, R., Sankaran, S., & Vaagaasar, A.L. (2018). Balancing vertical and horizontal leadership in projects: Empirical studies from Australia, Canada, Norway, and Sweden. *International Journal of Managing Project in Business*, 11(4): 986-1006.

114. Nunes, M., & Abreu, A. (2020). Managing open innovation project risks based on a social network analysis perspective. *Sustainability*, 12(8): 3132.

115. Bourgault, M., Drouin, N., & Hamel, É. (2008). Decision making within distributed project teams: An exploration of formalization and autonomy as determinants of success. *Project Management Journal*, 39(S1): S97-S110.

116. Warrack, A.A. (1993). *Megaproject Decision Making: Lessons and Strategies*. Canada: University of Alberta.

117. Akdere, M. (2011). An analysis of the decision-making process in organizations: Implications for quality management and systematic practice. *Total Quality Management*, 22(12): 1317-1330.

118. Oshagbem, T. (2008). The impact of personal and organisational variables on the leadership styles of managers. *The International Journal of Human Resource Management*, 19(19): 1896-1910.

ABOUT AUTHORS



**Dr. Rehab Iftikhar** is a Postdoc researcher at Tampere University, Finland. She earned her Ph.D. degree in Management from Luiss Guido Carli University, Italy in 2017. Her research focuses on the investigation of crisis and its management, accentuate performance, sense-making, and learning in interorganizational projects. She is particularly interested in collaboration (relationship/ network), resilience and knowledge management, empirically concentrated on interorganizational projects.



**Dr. Khadijeh Momeni** is a postdoctoral research fellow at the Department of Industrial Engineering and Management, Tampere University. Her research focuses on managing and developing industrial solutions, digital servitization, and resource integration in industrial networks. She has published in number of journals, including *International Journal of Project Management* and *International Journal of Managing Projects in Business*.



**Dr. Tuomas Ahola** is an Associate Professor at the Tampere University, Finland. He's research in the domain of project business concentrates on diverse themes including the management of complex interorganizational projects, project governance, and sustainability in context of project deliveries. Ahola has published his research in academic journals such as *International Journal of Project Management*, *Project Management Journal*, *Research Policy*, *Industrial Marketing Management*, and *International Journal Production & Operations Management*.