Improvisation in turbulent environments: An exploratory case study of a Rescue Projects Organization

Abstract

This study explores the antecedents of knowledge utilization, specifically tacit knowledge, leading to improvisation in rescue projects confronted with turbulent situations. We used semi-structured interviews and observations to collect data in a large public-sector rescue organization. Findings reveal that improvisation is an essential part of projects in turbulent situations bounded by time limitations, resource constraint factors such as lack of technology, information, resources, rugged terrains, and collectivistic societal and cultural issues. Rescue workers improvise through sensemaking, problem identification, and tacit knowledge utilization to handle emergencies.

Keywords: Turbulent environment, rescue projects, tacit knowledge, improvisation, developing countries.

1. Introduction

Over time, all sorts of projects face challenging circumstances that require effective knowledge utilization to avoid failures (Iftikhar and Mawra, 2022). Under certain situations, organizational projects repeatedly deal with highly uncertain environments (Pellegrini et al., 2022; Velásquez & Lara., 2021) triggered by unpredictable events such as the global pandemic of Covid-19 (Mota et al., 2022), financial collapses, or natural disasters (e.g., Hurricane Katrine, and California wildfire), where society and business continuity are jeopardized (Kirchner et al., 2021; Mendonça & Fiedrich, 2006; Schiuma et al., 2021). In such turbulent environments, an effective and efficient emergency response is required (Donelli et al., 2022), with little time at the hands of organizations to think and respond (Keszey, 2018). Practitioners' role is critical in projects in such environments, as they must draw on their (tacit) knowledge to deal with such critical circumstances. Tacit knowledge is one of the most important assets of any company (Baronian, 2022) and is characterized as the intangible asset residing in the heads of the employees, gained through experience (Sumbal et al., 2021; Venkitachalam & Schiuma, 2022). Projects in turbulent environments pose various challenges due to factors such as uncertainty attached to the unique incidents, time pressure, employee coordination, and resource constraints (Iftikhar & Lions, 2022; O'Sullivan et al., 2013), which are typical for organizations handling emergencies in developing economies. These factors, thus, add additional complexity regarding knowledge utilization where preplanning does not work and employees act spontaneously (Ratten & Hodge, 2016), leading to improvised solutions or improvisation. Improvisation is, thus, an adaptive reaction toward unexpected circumstances when an organization cannot apply known procedures (Song et al., 2022; Magni et al., 2009; Woods & Hollnagel, 2006; Vera & Crossan, 2005).

Earlier researchers have studied the phenomenon of improvisation in emergency organizations, considering it a tool for handling critical situations (Wachtendorf, 2005; Frykmer et al., 2018). However, limited work has been conducted on linking knowledge management practices to improvisation, as recent research indicates (e.g., Song et al., 2022; Sanford et al., 2020). The extant literature indicates that some aspects of KM have been studied about improvisation, yet how tacit knowledge improves improvisation behaviors in projects carried out in turbulent environments remains unclear. Nisula and Kianto (2016) studied the role of documented knowledge in relation to improvisation,

highlighting their positive association and contribution towards organizational learning (Barrett, 1998). Other studies have focused on useful knowledge creation through improvisation in startups when they do not have established linkages in the market with existing companies (Song et al., 2022); improvisation in the IT systems for knowledge transfer from the headquarters of MNCs to the subsidiaries in developing economies (Heeks, 2002); viewpoints by Krylova et al. (2016) and Dehlin (2013) that knowledge workers are better at improvisation.

An important aspect is that most of these studies have been conducted for organizations managing projects in controlled environments (e.g., Nawaz and Tian, 2022). To the best of the author's knowledge, knowledge management in the context of turbulent environment projects is an underexplored area, specifically the linkage of improvisation and tacit knowledge utilization. The context plays a vital role in this regard, and turbulent organizations, such as military and rescue organizations, operate very differently from regular for-profit organizations. Specifically, they are confronted with limited resources, information/technological advancement, and a lack of infrastructure (Dragan et al., 2022), for example, in developing countries. This study, thus, explores the aforementioned research gap through the following research question:

RQ: What are the antecedents of tacit knowledge utilization leading to improvisation in turbulent project environments with limited resources?

Baked up by the Dynamic Capabilities theory, i.e., "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece et al., 1997, p. 516), the study adopts an inductive approach based on a case study design (Eisenhardt, 1989; Yin, 2009). In the direction of our study, Barreto (2010, p. 271) defines dynamic capability as "the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resource base." Carvalho (2023), in this direction, pointed out the need for empirical studies adopting dynamic capability theory to study improvisation in organizations. A large public sector rescue organization in mountaineering areas of Pakistan, characterized by rugged terrain, reduced equipment, infrastructure, and technology, has been chosen according to its peculiar attributes (Oliva et al., 2018; Sullivan & Yates, 1988). Interviews and field observations have been used to collect data. The findings indicate that rescue workers improvise through sensemaking, problem identification, and tacit knowledge utilization

in turbulent situations bounded by time limitations, resource constraints, rugged terrains, and collectivistic societal and cultural issues. With the perspective of dynamic capability theory, using the lens of tacit knowledge utilization as an important organizational resource, the findings of this study extend the process of improvisation in projects working in turbulent environments or crises.

The rest of the article is structured as follows: Section 2 covers the literature background, section 3 entails methodology, followed by findings and a comprehensive discussion in Sections 4 and section 5. Section 6 concludes the study.

2. Literature review

2.1 Tacit Knowledge in Organizations

Knowledge management has become an inevitable part of the organization where organizations are expected to use explicit (documented) and tacit knowledge (residing in the heads of the employees) in an optimum way (Panda & Rath, 2021; Oliva et al., 2018). Employees' tacit knowledge comprises a significant portion of the organizational knowledge. According to Polanyi (1967), tacit knowledge is developed from learning, observation, and practice, which becomes engrained in the minds and actions of employees. According to him, knowledge is categorized into explicit and implicit, where explicit knowledge uses formal language and implicit knowledge is mostly conveyed informally by an individual based on his/her experiences. Nonaka and Takeuchi (1995), in a similar vein, talked about the explicit and tacit types of knowledge, i.e., explicit knowledge is available in the form of documents and databases whereas tacit knowledge is explained as "know-how" or the "practical knowledge" gained through experience.

Explicit knowledge is based on facts and is easy to communicate. In contrast, tacit knowledge is based on experiences and is hard to communicate, such as driving a car, constructing a mall, etc. Davenport and Prusak (1998, p.5) define tacit knowledge as "a fluid mix of framed experiences, values, contextual information, and expert insights that provide a framework for evaluating and incorporating new experiences and information." Cook and Brown (1999) explain knowledge creation in organizations through collaboration and interaction of employees. Both tacit and explicit knowledge are important in organizations. However, tacit knowledge is more critical for organizations and projects dealing with disasters, crises, and turbulent phases.

In turbulent environments where the situations are unpredictable and unique (Chatterjee et al., 2022), the documented knowledge is of little help. Under such circumstances, the tacit knowledge of employees is the key to success (Sumbal et al., 2018; Li, 2017). Researchers have highlighted that organizations having dynamic capabilities can survive in turbulent environments (Frykmer et al., 2018; Oliva et al., 2018), and employee experiences, knowledge, and abilities are the sources of dynamic capabilities for such organizations (Sanford et al., 2020). Individuals apply this knowledge even though they cannot formally express it (Carla and Jacson,1998) and can help improvise in uncertain project environments.

2.2. Improvisation as Problem-Solving and Learning Mechanism

The idea of improvisation has attracted various disciplines, including organizational studies (Fisher & Amabilie, 2009), music and theatre (Bresnahan, 2015), and education (Sawyer, 2011). Improvisation has been widely recognized in the literature as a problem-solving mechanism. According to Mintzberg (1973), improvisation arises when preplanned solutions prove ineffective. Thus, improvisation involves identifying problems and creating a novel response to the problem (Cunha et al., 1999). Moorman and Miner (1998) noted that improvisation is "the degree to which the composition and execution of an action converge in time" (p.698). According to Carvalho (2023), "Improvisations are actions that people deliberately decide to perform in the face of some unexpected event that requires an urgent response and that departs from the usual course of action" (p.7). Employees who participate in improvisational activity think, analyze, and adjust their experience. As a result of this iterative process of experimentation, they gain experience and improve their methodology (Xiong, 2020; Macpherson et al., 2022). The relationship between spontaneous creation and execution (improvisation) can significantly affect learning processes (Fisher & Barrett, 2019). Learning from improvisation includes remembering learned lessons and analyzing them at times for improvement. Thus, improvisation is a problem-solving mechanism and is pivotal in creating new knowledge. The knowledge created from improvisation could be turned into routines as routines minimize operational uncertainty (Cunha et al., 2015). This transformation into routines is essential for personal and organizational success as it helps build organizational memory. Improvisation also has a positive link with innovation and creativity (Chen et al., 2023), Learning (Wu et al., 2023), Learning in education (Ng,

2023), learning in projects (Abuseem et al., 2023), etc. It is, therefore, important for organizations and projects dealing with disasters and turbulent situations to focus more on improvisation.

2.3 Turbulent environments, Tacit knowledge utilization, and Improvisation

Terreberry (1968) first described the turbulent environment as "the turbulent field is that the accelerating rate and complexity of interactive effects exceed the component system, capacities of prediction and, hence, control of the compounding consequences of their actions. The turbulent environment is complex and where change is rapid in the environmental components. In the turbulent environment, the pace and magnitude of change are unpredictable; firms with dynamic capabilities increase innovation and performance in such an environment" (P. 593). Thus, a turbulent environment concerns a high magnitude of change with unpredictable future events (Yasir et al., 2017). In such environments, employees' experiences, knowledge, and abilities are the sources of dynamic capabilities for the organization (Frykmer et al., 2018; Schiuma, 2012). Operations in turbulent environments utilize more knowledge to weigh various alternatives to deal with the situation (Mahon and Jones, 2016; Venkitachalam & Schiuma, 2022). Time is limited, and resources are scarce in turbulent environments, forcing employees to seek improvisation.

Improvisation is context-dependent and constraint-bound action with two stages (Mendonca & Fiedrich, 2006). The first stage is identifying a situation where preplanning does not work. The second stage is concerned with the creation of new responses to solve the problem. The new responses range from slight adjustments to the desertion of all pre-existing plans (Moorman & Miner, 1998). According to Magni et al. (2009), spontaneous and creative behaviors are an essential part of improvisation, and organizations cannot always rely on routines (Fisher and Amabile, 2009), especially in the wake of recent global challenges such as Covid-19 (Chatterjee et al., 2022). Thus, improvisation is an inevitable strategy to cope with uncertain situations (Cunha et al., 1999). Past studies found that various factors such as environmental turbulence, flow of accurate time information, organizational memory, quality of teamwork, and semi-structures allow employees to improvise and work as moderators between improvisations and various new product development and innovation outcomes (Song et al., 2022; Krylova et al., 2016; Moorman & Miner, 1998). Moreover, factors such as communication, joint briefing,

work pressure, information recording in logbooks, and role-taking influence the role of improvisation in the crisis response team (Rankin et al., 2013).

The existing work on knowledge management and improvisation revolves around the following domains. One of the earliest studies by Heeks (2002) asserted that multinational companies transfer IT and information systems from headquarters (developed countries) to subsidiaries (developing countries), where employees experience a gap between the usage and design of the system. Employees then improvise and change the IT systems to meet the local needs for knowledge application and transfer (Yan et al., 2019). Dehlin (2013), in his view article, opined that knowledge workers are spontaneous and innovative people (Bäcklander et al., 2021) and, thus, better at improvisation. This article poses the idea that knowledge work can be seen as a process of improvisation. Further, Nisula and Kianto (2016) argued that the availability of documented knowledge (explicit knowledge) increases employee improvisation. Building on the work of Dehlin (2013), Krylova et al. (2016) proposed that improvisation increases the value of knowledge transfer as knowledge workers are better at improvisation. Further, improvisation protects knowledge imitation from outside the firm as this knowledge is rooted in practice. They further argued that minimal structures help knowledge-intensive organizations foster novelty. In contrast, minimal structures refer to the minimum set of rules to provide higher autonomy to employees in their job roles. The most recent work is by Song et al. (2022), who argued that improvisation is critical for new knowledge creation, especially in startups, to cope with competitors and adapt to rapidly changing environments.

Based on this literature, organizations need to adapt to challenging conditions and develop actionable insights to navigate uncertainties. The role of tacit knowledge is critical in this aspect when organizations are bounded by scarcity of resources and unpredictable situations. Improvisation is the outcome of such an interplay of tacit knowledge among employees. Thus, this study explores this context to understand the antecedents of tacit knowledge leading to improvisation to handle emergency responses.

3. Research Methodology

3.1. Case study context and description

This qualitative research paper is based on a single embedded case study. A case study approach helps to get fine-grained details of the research problem, as well as it is useful when the case is unique, and there are no similar samples available in that specific

context (Dubois & Gadde, 2002; Sumbal et al., 2020). The selected case is a large public sector rescue organization in a developing economy – Pakistan. The organization deals with various emergencies and repeatedly faces challenging situations where employees cannot stick with pre-existing routines because of unpredictable scenarios. Additionally, rescue workers do not wait to get additional resources because people's lives and properties are at stake. They need to act quickly and handle the situation on the spot. The selected rescue organization operates in a mountain area and lacks updated technology and equipment. It deals with various rescue operations such as dread rescuing, firefighting, and handling natural calamities (e.g., land-sliding and fire-related incidences). The organization comprises various employees, for example, medical staff to deal with accidents, divers to deal with water-related incidents (floods, drowning, etc.), firefighters to deal with fire-related operations, and dread rescuers to deal with earthquakes and land sliding, etc. Based on the aforementioned characteristics, it was a suitable case to answer the research question.

3.2. Data Collection and Analysis

Data was collected through on-field observations and semi-structured interviews with employees directly involved in rescue activities. Purposive sampling was used to choose respondents with specific characteristics to answer the research question (Spradley, 2016). Interview questions were left open-ended to give respondents flexibility to discuss the topic according to their expertise. Overall, 16 interviews were conducted with knowledgeable (elite informants) employees with hands-on field experience (Table 1).

[TABLE 1]

Interviews were conducted in the respondent's native language and recorded with their consent. The recorded interviews were transcribed later by two researchers. Another researcher cross-checked the transcribed data to ensure its validity after transcription. A computer-assisted qualitative data analysis software (CAQDAS) called ATLAS.ti was used to arrange the collected data systematically. The researchers initially analyzed the transcriptions and observations through line-by-line coding, followed by focused coding (Friese, 2019). The transcribed data was constantly compared and contrasted during coding to find similarities and differences and generate categories/families. The codes were grouped and assigned a category based on their similarity. The broader categories that emerged out of data in connection with tacit knowledge and improvisation are a) problem identification, b) sensemaking, c) situational factors, d) team characteristics, and

e) tacit knowledge utilization leading to improvisation. These categories contain different codes, the details of which are provided in Table 2. The data collected in this study is based on personal experiences and social interactions, which require studying the conversation in order to explore the literary elements in the form of a story. "Stories express a kind of knowledge that uniquely describes the human experience in which actions and happenings contribute positively and negatively to attaining goals and fulfilling purposes" (Polkinghorne, 1995, p. 8). The respondents have shared their experiences with examples related to the study constructs. Therefore, narrative coding was performed to include the literary perspective of the study phenomena, especially for retelling purposes.

Various coding stages are necessary to re-organize and reconfigure the data. Saldaña (2015) has provided different coding techniques for each coding stage. Researchers can also opt for multiple methods in this stage if required. Among the several techniques of coding, the theoretical coding technique is adopted for this research. In theoretical coding, "all categories and subcategories now become systematically linked with the central/core category, the one that appears to have the greatest explanatory relevance for the phenomenon" (p. 224). Theoretical coding is not about the theory or theory development but about integrating concepts towards theory; therefore, this technique is best suited to this study. The coding process is illustrated in Figure 1.

[FIGURE 1]

In qualitative studies, triangulation methods show the credibility of the research. Therefore, to increase the credibility of the research, triangulation is performed. As in this study, participants verified the transcribed data and provided further comments, which were incorporated after getting the feedback from the participants. Transferability shows if the study's findings are generalizable in other related circumstances and contexts. Though it relies on the reader to evaluate the level of similarity, the researchers need to provide a thick description of the findings so that they may be applicable in a similar situation. Various measures have been taken to increase the transferability of this study, for instance, verbatim, triangulation, and peer reviews. They are writing exact quotations from the interview transcription to provide a thick description of the data and develop an understanding of the phenomena. The findings and the results had been shared and argued

with supervisors and GEC members to develop interpretations and conclusions. These methods would increase the validity and transferability of the study.

[TABLE 2]

4. Results

This section will discuss the results in relation to the categories developed from the data. It starts with scene assessment involving problem identification, then making sense of the environment or scenario, and finally deciding on the course of action, which will be either an improvised method or an existing tested method based on the scenario.

4.1 Challenges of Unforeseen Situation/Turbulent Environment

Organizations do not always work in a stable environment. They may face different challenges, such as infrequent demands from stakeholders such as suppliers, customers, governments, etc. Such a situation represents uncertainty where pre-planned routines do not work. Organizations and employees must become flexible to cope with the uncertainty in such a situation. Organizations and employees respond to such evolving and changing situations through improvisation. The ability of organizations and their employees to deal with complex and uncertain situations creatively and professionally is termed improvisation. That is why studying the role of tacit knowledge and improvisation in turbulent situations is essential. These challenges are highlighted in the subsequent sections as we explain various examples linked to improvisation coupled with respondent's own statement.

4.2 Problem identification

Problem identification is an important step in unpredictable situations. In rescue operations, rescue workers try to find the problem before reaching a conclusion. Rescue teams use a specific term, "Scene assessment" for this. For example, in the case of a fire incident, they assess the seat (origin) of the fire. If they come to know about the seat of the fire, they can extinguish it quickly. Interviewee 14 described the situation through an example as:

"The terrorists attacked oil tankers through bullet fire. We got a call and reached the

destination. It was a huge fire. Security guards who were on duty were killed. We assessed the situation and planned accordingly. Five oil tankers had caught fire. Through mud and soil, we set up a barrier between these and other oil tankers so that fire could not spread any more. We saved 12 oil tankers after 12 hours of firefighting".

Most of the time, scene assessment involves looking at various factors and situations at the incident and then dealing accordingly, for example, the type of fire as interviewee 11 described:

"*We understand the type of emergency and category of fire using our past expertise and knowledge… If the fire is caught through inflammable liquids (petrol, etc.), we use an AFFF (Aqueous film forming foam) fire extinguisher because foam seals the liquids and stops further re-ignition. Three elements are needed to ignite the fire: heat, fuel, and oxygen. If we remove oxygen from the surroundings, the fire will extinguish; this process is known as smothering."*

Similarly, rescue workers sometimes assess the nature of fire by its color because of experience. In one situation, participants revealed that a fire had been caught through polyester bedsheets. Its smoke was very bitter and spread so much that people could not stand in the street. Through the color and odor, the rescue employees identified the seat of the fire. After problem identification, the next step is sensemaking, which focuses on devising a solution to the identified problem. It involves improvisation based on the situation and availability of resources. Coordination is an essential factor that plays a vital role in sensemaking. Rescue workers require coordination from idea generation to the execution of the plan as it requires mental and physical efforts from the employees. Employees exchange and share their tacit knowledge through coordination to make sense of the situation and improvise accordingly.

4.3 Sensemaking

Accumulation of experience in various situations means that employees have much knowledge and expertise related to their domain. The nature of the emergency affects the level of improvisation. The rescue employees who had dealt with various emergencies exhibited spontaneity in times of crisis. Interviewee 1 explained the nature of the emergency in the following words:

"Every emergency is different and gives new insight. For example, in a fire case, we comprehend what kind of fire it is. Whether it is a large-scale fire or a small-scale fire, control it with which types of hose? This depends on the situation, and we use our knowledge to tackle the emergency effectively".

Interviewee 15 revealed one of the incidents of sense-making in the following words:

"The presence of the mind is necessary for performing our task. We got a call from the control room for a water rescue. When we went to location, a girl had jumped into the river, and we saw her sitting on a stone in the middle of river. We thought that she was now safe and planning to get her out of that situation. Meanwhile, she jumped again into the river. Luckily, we had everything, like a life jacket, rope, etc. We were four employees at that time. She was sixteen years old. If I had jumped to the place from where she jumped, it would be a futile attempt. I could not reach her in such a situation. So, I ran along the river, and I jumped into it when I was ahead of her. Her angle was towards the shore, and finally caught her hand and took her out of the water".

4.4 Situational Factors - Resource Constraints

Rescue teams improvise when they face resource-constrained situations. Resource constraints include a lack of technology, material resources such as machinery tools, and lack of time. In such a situation, employees rely on the resources at hand or the resources around them. Interviewee 3 stated:

"... the majority of situations are unexpected. Now, we exploit natural resources, if they are available. Natural resources, such as the anchor point when we ascend or descend from a hill, are the most important things for us as we tie our ropes and reach the exact point. If we are in a situation where no anchor point is available, we take the nearby tree as our anchor point. A pillar could be our anchor point…"

Further, interviewee 11 described the situation in the following words:

"*In order to rescue people from the trench, field employees need to have seat harness to go down. However, in most cases, the employees do not have seat harness. They make seat harness through a rope to rescue people*".

Interviewee 5 provided an improvisation example in this way:

"A lamb fell inside the well. When we reached there and performed a scene assessment, we found that the well was 50 to 60 feet deep and 1.5 feet wide. We did not have any such equipment to deal with it. Luckily, there was a construction site nearby. We got steel bars

from them and constructed a hook out of a steel bar with a rope tied to it. Thus, we pulled out the lamb safely."

The most critical resource constraint is time in an emergency. The rescue teams have limited time to deal with an emergency. Due to time constraints, they do not call back to the emergency room for more resources. They make sense of the situation and exploit the resources at hand. Interviewee 11 described it as follows:

"A bridge collapsed due to a natural calamity. We had to carry an appendicitis patient to the hospital. It involved a high-risk task. There was no proper road to walk. We made a bridge through a crane ladder available to us at that time. We crossed the area by crawling on the ladder".

Interviewee 16 gave another example:

"We do not have a buoyancy compensator that helps thrust the diver's body upward from the bottom of the river. In such cases, we improvise. I go into the water carrying one end of the rope for dead body searching, with the other end of the rope held by staff standing outside of the water. When I reach the bottom of the river, I shake the rope once, making the person understand that I have reached. We plan before going into the water from where to start the search and where to end. If I go against the plan, the staff outside water holds back the rope. This holding back means that I need to change direction. When I find the body in the water, I shake the rope for a few seconds. It means I got the body, and they start pulling me out of the water".

The rescue organization lacks advanced technologies such as vehicle GPS systems and aerial robots to perform rescue tasks. Weak road networks and road blockages are common issues in mountain areas. So, there are alternate choices to cope with such a situation. For example, the rescue organization recruits local drivers in their teams as they know the place very well. If rescue teams receive an emergency call, these drivers know the place and location. It has rarely happened that they are unable to find the location. Even these drivers know the alternative routes during traffic rush hours. One of the respondents revealed that they had to go to an emergency location. It was around 2 pm. The driver took them from a different route. Upon asking why he chose this road, he said it was school off time. There would be much rush on the main road, which would take longer. Interviewee 10 described a situation where immobility was the reason for improvisation in the following words:

"In "C" valley (a place in Gilgit Baltistan), a helicopter crashed, and it was raining heavily. We covered an hour's distance on foot as it was a hilly area, and there was no

road to that place. We could not take the stretchers there. Also, it is impossible for a helicopter to land because of the nature of the landscape. To handle this situation, we got a few sticks from a nearby place, pulled off our shirts, and made an improvised stretcher. We placed dead bodies over them and carried the dead bodies to the hospitals".

Interviewees described that during incidents where a person falls and sustains neck injuries, the rescue workers, based on past knowledge and experience, train the people to make a splint in an emergency, for example, using shoes and socks, so the broken bone is stabilized and injuries do not get severe due to body movement. We have integrated all these findings to develop a framework, which will be discussed in the next section.

4.5 Team Characteristics

The minor level of improvisation happens when the team improvises within existing processes. During the observation, it was noted that the emergency room had a bell. If the bell rings slightly, a road accident has occurred. If the bell rings for a longer time, there is a fire emergency, and firefighters will go. If the bell rings repeatedly, it signifies that dread rescuers will go for handling the situation. As every minute is essential for the organization, the emergency room has developed this minor improvisation for workers to identify the type of emergency. In a highly complex situation, employees altogether rely on novel actions. Interviewee 2 described such situations in the following words:

"In B (name of the place), a boy jumped into the river for a bath during summer and drowned. On location, we found that there was no place to run the boat. We gathered a few rods and tyre tubes to build a boat in such a situation. We got Bamboo poles from a nearby place to look for a dead body. We attached a sickle at the end of the bamboo to make a hook so that we could find the dead body easily…"

Interviewee 5 concluded:

"*Teamwork is vital to our job. In high-accident cases, each second is important for the lives of victims. That is why we perform our job in teamwork."*

Team coordination is another crucial factor in tacit knowledge utilization.

An example of team coordination has been mentioned by interviewee 16.

"Coordination plays a vital role in improvisation. Team members coordinate with each other to get the job done. They require coordination from idea generation to the execution of the plan as it requires mental as well as physical efforts of the team members".

4.6 Tacit Knowledge Utilization

Utilizing tacit knowledge starts with the commencement of any incident. Employees utilize their tacit knowledge when there is vague information. In emergencies, the first respondents are unable to describe the situation. Most of the time, the first respondent tells the nature of the emergency to the emergency control room. This vague information also provides an opportunity to improvise whether they received a fake or real call. Employees can differentiate between fake calls and actual calls through experience. Interviewees described that the caller looks perplexed and babbles in a real emergency. On the contrary, the caller is relatively calm in a fake emergency call and speaks at an average pace. However, they do not rely on this because it can risk people's lives and property. They do call again to the same caller. In case of a fake call, the responder will not attend the call for the second time because of the fear of getting caught and punished. Secondly, the emergency room confirms it from other sources as well. This minor improvisation is essential for saving time and utilizing resources in the right place. The following field observation, in which one of the researchers spent time with the rescue team to observe the handling of real-time incidents, further supports the above arguments.

"*On August 14 (Independence Day), a tragic incident happened wherein a ground wall collapsed, resulting in lots of people buried under the debris. When the wall was on the verge of collapse, one of the vigilant rescuers noticed a child and a woman near the wall. The rescue team rushed towards them and tried to get them out of it. Within minutes, the rescue team managed to locate the woman. Eventually, both women and children were successfully rescued. In accident cases, employees assess critical parts first, such as the neck, head, spinal cord, etc., to check if there is some serious injury. Throughout the rescue operation, the community actively engaged, offering various noises, suggestions, and opinions. However, rescue teams paid heed to those valuable suggestions they deemed valuable and relevant in the rescue operation".*

Emergency response teams in real-time situations incorporate communal views, knowledge, and experiences during an emergency. Many interviewees have seconded that utilizing their experience or tacit knowledge needs community involvement. Community as a first respondent (prerequisite), provides essential information to the emergency room. The emergency room, as per the guidelines of the first respondents, deploys its staff according to the information they received from the first respondent. Interviewee 2 stated the role of the community in the emergency case as follows:

"When we get on location, we seek advice from the community. We take their input where necessary, as they are familiar with the incidents' geography, terrain, and nature. For example, in the fire case, we get information about the seat of fire from the community or first respondents. It is easy to extinguish the fire if we can find the seat of fire". The seat of fire is the location from where the body of fire ignites.

The community provides basic information about the nature of the incident as the first respondent to the situation. Rescue teams do not have time to see the location and mobilize the resources accordingly. That is why they rely on the information provided by the community. However, they cross-verify the information through different sources as quickly as possible. They still mobilize their resources to perform their task if they need to cross-check the information received from the community. Interviewee six also confirmed the stance of the first interviewee in these words.

"It is impractical for the staff to be available to provide first-hand information in each emergency. We need to rely on the community's information. These are the people who inform us about the incident. We cross-check the information from different sources. For example, sometimes, we receive calls from multiple people who witnessed the incident. We also cross-check the information by calling the first responder who informed us about the emergency. We take their input to achieve the objective successfully."

In such a case, community support and information help utilize employee's tacit knowledge. In a collectivist society, employees also try to handle the situation by risking their lives. Interviewee 4 described such a situation in the following words:

"People around us in the emergency area help us rescue people and property. For example, if there is a fire, people help us rescue individuals from the areas where the fire has not reached yet. In such a situation, people get involved in that activity. They also help us if we get a limited number of rescue staff."

However, the organization does not always take the community's help in physical activity because the community is not as trained as the employees are. To stop the people from entering the emergency area, they get help from the police to cordon off the area. Sometimes, people give unnecessary information to the employees, which can distract them from the task at hand. The employees filter unnecessary information during an emergency. Interviewee 9 describes such a situation in the following words.

"The annoying thing is people's wrong ideas. Everyone wants to share their opinion. In such a situation, we do not listen to useless suggestions. We have tackled hundreds of emergencies and know which suggestions to take and which to drop."

Although with the community's information and help, the emergency team utilizes their experience and knowledge to cope with the emergency. There are undoubtedly other reasons from the employees' perspective, such as the emotions of the people, people's concerns, and unusual expectations, which compel employees to utilize their knowledge. Being a member of the collectivist society, most of the emergency employees have a personal rapport with the community as most of the employees are aboriginal. In such a situation, employees perform their duty and try to go beyond their duty to meet society's expectations. In such a situation, employees utilize their knowledge and experience to the extent that even can pose challenge to themsleves. The emergency staff goes beyond specific SOPs to save the people and their property. Interviewee six seconded such views in these words.

"*There was a fire incident in a nearby home. ------The tenets were the new couple who got married two days ago. The bride was out of the home, but when she saw her room had caught fire, she went into the room to save her gold property. We heard her screaming. At that moment, I wore only a firefighting jacket and long shoes. I knew that to enter into the house was very risky to my life, but her screaming and situation made me fearless of the danger."*

4.7 Tacit Knowledge Utilization and Improvisation

Rescue teams perform their job while resorting to improvisation due to many reasons. One of the reasons is difficult and unforeseen situations where routines and pre-approved solutions do not work. Secondly, they improvised because of a shortage of time in real-time situations, as it is a matter of people's lives and property, and a single second makes a huge difference. Another reason is the unavailability of resources and infrastructure, as well as the immobility of resources due to the physical nature of the area's geography and lack of technology. Interviewee 16 described one of the reasons for improvisation as

"We do not have a buoyancy compensator that helps thrust the diver's body upward from the bottom of the river. In such cases, we improvise. I go into the water carrying one end of the rope for dead body searching, with the other end of the rope held by staff standing outside of the water. When I reach the bottom of the river, I shake the rope once, making the person understand that I have reached. We plan before going into the water from where to start the search and where to end. If I go against the plan, the staff outside water holds back the rope. This holding back means that I need to change direction. When

I find the body in the water, I shake the rope for a few seconds. It means I got the body, and they start pulling me out of the water."

Interviewee 10 described a situation where immobility was the reason for improvisation in the following words.

"In "C" valley (a place in Gilgit Baltistan), a helicopter crashed, and it was raining heavily. We covered an hour's distance on foot as it was a hilly area, and there was no road to that place. We could not take the stretchers there. Also, it is impossible for a helicopter to land because of the nature of the landscape. To handle this situation, we got a few sticks from a nearby place, pulled off our shirts, and made an improvised stretcher. We placed dead bodies over them and carried the dead bodies to the hospitals"

It is worth mentioning here an example of a problem that the rescue team faces daily in Pakistan, specifically in Gilgit Baltistan. The organization receives hundreds of fake calls. Sometimes, people call the emergency number just to kill their boredom because the call to the emergency number is free of cost. This issue has been reported on several renowned TV channels in Pakistan. The rescue workers came up with different ideas to sort out the problem. One was to launch an awareness session regarding the seriousness of the issue. After the awareness session, the number of calls decreased. Employees can differentiate between fake calls and actual calls through sensemaking and institutions. As a result, they are now able to decode a fake emergency call and a real emergency call. During the interview, they described that the first responders seem very perplexed in a real emergency. In contrast, in a fake emergency call, the first responder is relatively calm and speaks at an average pace. However, they do not rely on this because it can risk people's lives and property. They do call again to the same responder. In most fake calls, the responder does not pick up the call for the second time because of the fear that he may not get caught. However, fake calling is an unlawful act and is punishable by law. Secondly, the emergency room confirms it from different sources. Being a backward area, if the rescue team goes to tackling the fake emergencies, the real emergency cannot be tackled because the resources are already being deployed. It is to be noted that the rescue organization receives multiple emergency calls daily. If they respond to fake calls, they cannot help the people in real trouble.

Interviewee three quoted improvisation examples as

"*As we do contain resources to manage and control the situation. However, sometimes, we do not carry all the necessary equipment because of the nature of the emergency. A helicopter crashed in the hills where we had planned to bring the dead*

bodies down the hill, but luckily, the helicopter reached the location and recovered all the dead bodies. In this incident, dead bodies were trapped within the helicopter; there, we used iron parts of airplanes as cutters to extract the bodies. We do have cutters in the rescue vehicle, but at that time, we could not move vehicles to the location".

Interviewee 14 narrated one example of improvisation as:

"Once we got a call. Our main motive is to save a life, whether human or animal. A lamb had fallen inside the boring. We went to the emergency site and found it was 50 to 60 feet deep and 1.5 feet wide. We did not have any equipment to deal with, but luckily, a construction site was nearby. We got steel bars from them. They were available in large numbers and were also lightweight. We constructed a hook and dropped it with a rope bound to it. And we pulled out the lamb safely".

Interviewee 4 describes an improvisation example:

"Yearly, we provide community awareness sessions with schools and colleges. We sometimes visit to revise the training session. On such visits, a girl told us that there was much rush on the stairs during the off-time of school. One girl slipped and fell from the stairs. We did not have any medical aid with us. As you told us in your last training, you need to make a splint in an emergency. We put off shoes and socks. We tied her broken bone with shoes and socks to stabilize it. If those girls had not done that, her injuries would have been more severe".

The above discussion manifests that some stimuli trigger employees to improvise to handle that particular situation. Literature has explained the reasons for improvisation, too. An organization with unexpected situations needs instant action, and pre-approved solutions cannot work well. In such a situation, some multinational companies resort to improvisation. Rescue teams improvise when they find it difficult to reach a particular conclusion. These employees improvised by using their past knowledge and experience (tacit knowledge) in unforeseen and complex situations.

5. Discussion

There is considerable evidence in recent years that organizations are coping with turbulent environments (Velásquez & Lara., 2021; Sumbal et al., 2018; O'Sullivan et al., 2013; Rankin, 2013). In such an environment, organizations utilize knowledge as an essential tool for adaptation, existence, and increased performance (Schiuma, 2012). Improvisation through knowledge utilization is the key to success and survival, which, in

the case of today's turbulent environments, is more linked to flexibility and a less structured working style. Organizations must embrace the "informal" to resolve the ambiguity and uncertainty present in today's environments and depart from the traditional "command and control" management style, which is backed by the organizational theories focusing on rationale, adaptive modes of inquiry with rational-cognitive orientation. This study highlights the concepts of empowerment, team building, and motivation, where intuitive and emotional connections play a pivotal role. This intuitive connection paves the way for utilizing tacit knowledge when encountering unforeseen or unique situations. This study, thus, explores this linkage of tacit knowledge and improvisation in uncontrolled and turbulent environments with the Levi-Strauss' (1966) concept of Bricolage, the art of making use of whatever is in hand.

Different stimuli trigger employees to improvise by utilizing their tacit knowledge in a non-profit organization. One of the stimuli for improvisation is resource constraint. As explained by Barrett (1998) in his seminal work on jazz musicians, organizations need to cope with indeterminant tasks that are very often present in turbulent environments and solved through recombination and trying out different possibilities. An essential aspect of this way of organizational learning is legitimate peripheral participation, which is apparent through various examples provided in the findings section. Legitimate peripheral participation (Lave & Wenger, 1991) is a concept in which the new employees/participants observe and learn before assuming an active/lead role in rescue operations or communities (Cuddapah & Clayton, 2011). The extant literature indicates that rescue operation teams and software development teams are termed as temporary organizations (TOs) (Burke & Morley, 2016), which need dynamic capabilities to handle temporary projects such as rescue operations or developing a particular software for a client. This dynamic capability perspective comes through the input from the employees, precisely the tacit knowledge realization through socialization, as shown through examples in the results section. The resource constraint factor also enables this dynamic capability in which the employees work on emergency projects with clear and specific goals (Spanuth et al., 2020). Moreover, as is evident from the results, rescue operations require different specializations, as the working structure is unlike regular organizations, which also falls in line with the characteristics of temporary organizations (Spanuth et al., 2020). Furthermore, in TOs, tasks are new, requiring creativity and temporary leadership, and involve learning new aspects (Lundin & Soderholm, 1995; Burke et al., 2016), and these perspectives are highly correlated in the current context of emergency operations

building on dynamic capability perspective that organizations need to adapt themselves according to changing environments.

Rescue teams coordinate with one another when they receive an emergency call. Antonelli (2006) described the heterogeneity of knowledge and the fact that people who possess knowledge need coordination. For instance, it has been observed that, in unusual situations, employees become more involved in decision-making to serve humanity, increasing their coordination level (Mendonca & Fiedrich,2006). All these aspects play a critical role in scene assessment and sensemaking in a turbulent environment, as evident from the various examples in the findings section. Unlike previous studies, we position improvisation as a mechanism that is the outcome of tacit knowledge utilization contributing towards organizational learning. This is possible through the socialization of tacit knowledge among employees, where they discuss the pros and cons of the situation during the sensemaking process. Thus, socialization is an antecedent for improvisation. The success of the task depends on how well the knowledge was utilized. Quick actions are needed with the various aspects of the situation (Leybourne et al., 2015). The nature of the emergency has a more significant impact on the level of improvisation. Complex situations need a higher level of knowledge and expertise, as is evident from the examples of the helicopter crash, building a crane ladder bridge, and taking out dead bodies from the fast-flowing river. At the same time, new knowledge is being created but needs to be documented to become part of the organizational documented knowledge. Thus, knowledge mainly resides with the employee, and as long as he is working in the organization, it is part of the organizational memory and might be transferred to other employees if a similar situation is reencountered. Because of existing resource constraints and lack of formal structures, it can be termed as the "New Normal" in case of turbulent environments. However, in such situations, the risk of losing this knowledge is always high when employees leave. As previous knowledge is not there anymore, it paves the way for more chances of improvisation.

Past studies have also explained the sensemaking process in crisis (Maitlis & Sonenshein, 2010; Weick, 1993;). According to Klein et al. (2010) and Wieck (1998), sensemaking is the process in which a team exerts efforts to understand the current situation and anticipate the future, specifically in an unusual situation. According to them, sense-making co-creates knowledge. Rescue teams make sense of the situation by assessing the scene and processing the relevant information through brainstorming to reach appropriate decisions. The shared understanding is deeply rooted in repeated

practice (Zollo & Winter, 2002). Team members have multiple mental models related to the task, technology, and equipment, as well as their adaptation to specific situations, highlighting their shared understanding (Mathieu., 2000). This shared understanding is possible through the experience of working together. Moreover, the mental models match more when there is more experience of working together. According to Crossan (1998), spontaneity and intuition (sensemaking and gut feelings) are the essential dimensions of improvisation and critical factors for tacit knowledge utilization. Therefore, a group needs to develop a collective mind through socialization to improvise in uncertain and unpredictable situations (Awati and Nikolova, 2022; Erden et al.,2008). This means that improvisation results from a high level of group tacit knowledge (GTK) that advances collective knowledge. However, two teams having the same situations may reach different outcomes because of the quality of tacit knowledge; team characteristics such as cohesiveness, team communication, and contextual influences significantly impact team improvisation (Moorman and Miner,1998; Cunha et al., 1999). Based on these arguments, we have developed a framework mentioned in Fig.1, which explains improvisation through tacit knowledge utilization in turbulent environments.

6. Conclusion

This study has focused on linking tacit knowledge and improvisation in a turbulent environment. Our findings reveal that tacit knowledge utilization is inevitable in a turbulent environment because employees need to deal with the situation by using their past experience and knowledge. Rescue employees resort to improvisation when all the predetermined rules and roles become ineffective due to the nature of the emergency, time, and resource constraints. Multiple stimuli lead to this improvisation behavior, whereas employees utilize their knowledge – deeply rooted in specific incidents and contexts – to handle the situation. The turbulent context, however, has limited scope to foster organizational memory through the knowledge created from various improvisation situations; however, the knowledge resides and gets transferred among employees when similar situations repeat. The fact that employees face new circumstances demanding a different improvisation every time also can be treated as a "New normal" where there is less need to maintain an organizational memory, but the focus should be more on retaining the critical and experienced employees from whom the less experienced employees could learn. The findings of this study confirm our conceptualization of the importance of tacit knowledge utilization in projects dealing with turbulent environments.

It also provides a mechanism for managers to understand and be cognizant of the improvisation phenomenon with all the antecedents. The study findings also extend dynamic capability theory to explain the improvisation process in projects in crises and turbulent environments.

[FIGURE 2]

6.1 Research contributions and implications

This study contributes to the literature by exploring how tacit knowledge led to improvisation in turbulent environments. In particular, it highlights the strategic role of tacit knowledge utilization leading to improvisation under various contextual conditions. Secondly, our exploratory investigation allowed us to identify its antecedents to comprehend the strategic attribute of tacit knowledge better. Furthermore, this research offers some managerial implications. We outline the knowledge of employees as a strategic resource that supports the organization in foreseeing emergencies, where tacit knowledge serves as a crucial element. In addition, an organization should foster mutual trust, sharing, and employee autonomy for effective knowledge utilization. Employees improvise through various motivational factors concerning society and culture, for example, saving people's lives and getting intrinsic motivation through support and recognition from people. The unavailability of resources and time constraints also fuel this process of improvisation coupled with the organizational shared understanding of the situation and job autonomy. Therefore, the findings of this study guide managers on how they can promote tacit knowledge exchange and utilization in an effective way to achieve improvisation of teams and projects, especially when working in turbulent environments or crises. Organizations managing such projects may also get guidance on formulating strategies to foster an environment of knowledge sharing among employees and teams working in crises and turbulent environments.

6.2 Research limitation and future research direction

This study has a few research limitations. The findings are specific to a developing country (Pakistan) and centered around a rescue organization that may not reflect the realities of other organizations. However, the findings of this study could be used as a starting point to be cognizant of the importance of tacit knowledge management for employees' and teams' improvisation to handle turbulent environments and crisis

situations effectively. Future studies could explore similar phenomena in different organizational and cultural contexts, providing a comparative perspective that would enrich the understanding of tacit knowledge and improvisation in project management. A comparative analysis with other models of improvisation and tacit knowledge utilization in different types of organizations or industries could offer valuable insights. This could help understand whether the findings are unique to the rescue organization context or have broader applicability.

Moreover, this study incorporates a purposive data collection technique that is not free from certain research biases. There is little chance of unintentional personal prejudice, regardless of appropriate measures. However, future research may address the understanding of tacit knowledge utilization and improvisation across other organizations and draw comparisons.

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TABLES

Table 1. Details of Respondents

Interviewees	Year of Experience	Expertise
1	12	Fire Fighter
2	7	Dread Rescuer (DR)
3	7	Dread Rescuer
4	8	Road traffic accident (RTA)/Medical staff
5	8	Dread Rescuer/Firefighter
6	8	Dread Rescuer
7	12	Dread Rescuer
8	11	Road traffic accident (RTA)/Medical staff
9	7	Diver
10	3	Dread Rescuer
11	7	Dread Rescuer/Firefighter
12	8	Dread Rescuer/ Firefighter
13	3	Diver
14	3	Dread Rescuer/ Firefighter
15	8	Diver
16	8	Diver

Table 2. Families, codes, and sample quotes

Categories	Codes	Example Quotes
Problem Identification	• Scene Assessment	During the fire emergency, we do a scene assessment and try to find the seat of the fire. Things get under control when we find the seat of the fire. Our experience, knowledge, and from eyewitnesses we find the seat of fire.
	• Location of the cause	In emergency, we assess the situation when we reach the location, termed as scene assessment. Through scene assessment we make sense of the situation.
	• Chat with informants Clues/Signs	When we get on location, we seek advice from the community. We take their input where necessary, as they are familiar with the incidents' geography, terrain, and nature. For example, in the fire case, we get information about the seat of fire from the community or first respondents. It is easy to extinguish the fire if we can find the seat of fire. The seat of fire is the location from where the body of fire ignites.
Sense Making	• Brainstorming	During emergencies, we face different situations. Every situation has different characteristics. We brainstorm to find a viable solution. We do it before starting rescue operations.
	• Buddy system	In rescue operations, we perform tasks in a group; we call it buddy system. We never go to an emergency individually.

Tacit Knowledge Utilization	• Nature of emergency leading to Minor vs Major improvisations	Every emergency is different in nature. Every emergency gives new insight and new experiences. For example, in a fire case, we comprehend what kind of fire it is. Either it is a large-scale fire or a small-scale fire. Same is the case for water and other rescue operations.
	• Fire origin and type-fire	During the fire emergency, after scene assessment, we tried to find the seat of the fire. Sometimes we get to know the cause of the fire because of its colour.
	• Handling Vague Information	Most of the time we do not get accurate information from the emergency respondent. Things get clear when we reach the location. In our case, each second is vital for the life of victims.
Situational Factors Leading to Improvisation	• Resource Constraints- An enabler for improvisation	There are certain situations where we face resource constraints and at such moments of time, we rely on the resources around us in the emergency area. All this depends upon the nature of the emergency.
	• Time Constraint	We deal with situations according to the nature of emergency and because of time constraint, we make use of whatever is at hand.
	• Technological Equipment	We do not have GPS system in place to go to the exact location. The Organization hires local drivers who are familiar with nook and corner of the area. We do not face any issues to get on the exact location
	• Lack of required material required for the situation	We do not have a buoyancy compensator that helps thrust the diver's body upward from the bottom of the river. In such cases, we improvise

	• Rugged Terrains for equipment transport • Social and Cultural Issues	In C valley (a place in Gilgit Baltistan), a helicopter crashed, and it was raining heavily. We covered one and half hour distance on foot as it was a hilly area and there was no road to that place. Sometimes, people make false calls just to pass their time, as dialing emergency numbers is free of cost. Moreover, people ask emergency employees for tasks beyond the organization's scope, such as cleaning the drainage system as such task comes under the scope of waste management.
Team Characteristics	• Experienced vs New recruited workers • Team Coordination	I still remember my first experience in rescue. I had my first experience in hospital. When I went there, I vomited while seeing blood, and I was nervous. That day and now, I feel significant differences in terms of handling the situations. With experience and time, we deal from simpler to complex task without being nervous. When we go to the emergency, we assign tasks to each other. Coordination is necessary for our job . One can be assigned a task to unfold a hose, and the other has to do firefighting.
Improvisation	• Informal organizational learning	Dead bodies were trapped within the helicopter, there we used iron parts of airplanes as a cutter to extract the bodies. We do have cutters in the rescue vehicle but at that time we cannot move vehicles to the location".

FIGURES

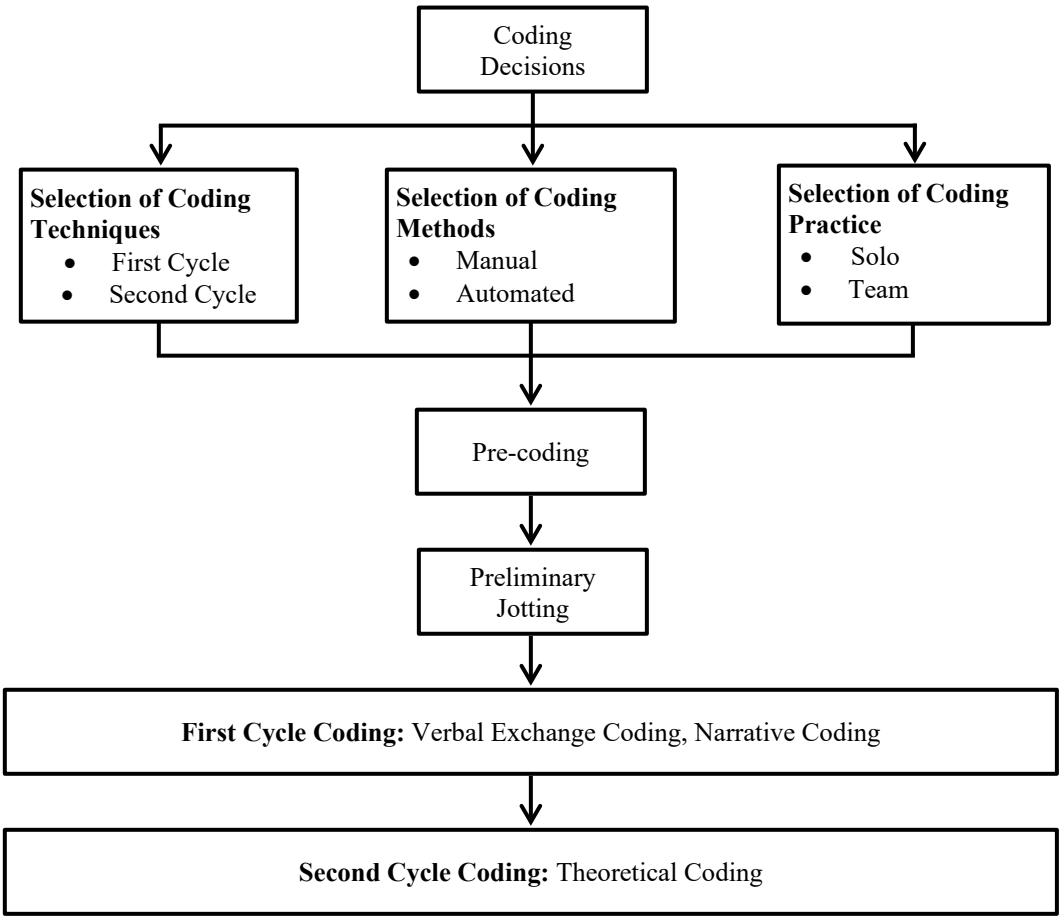

Figure 1: Coding of Qualitative Data

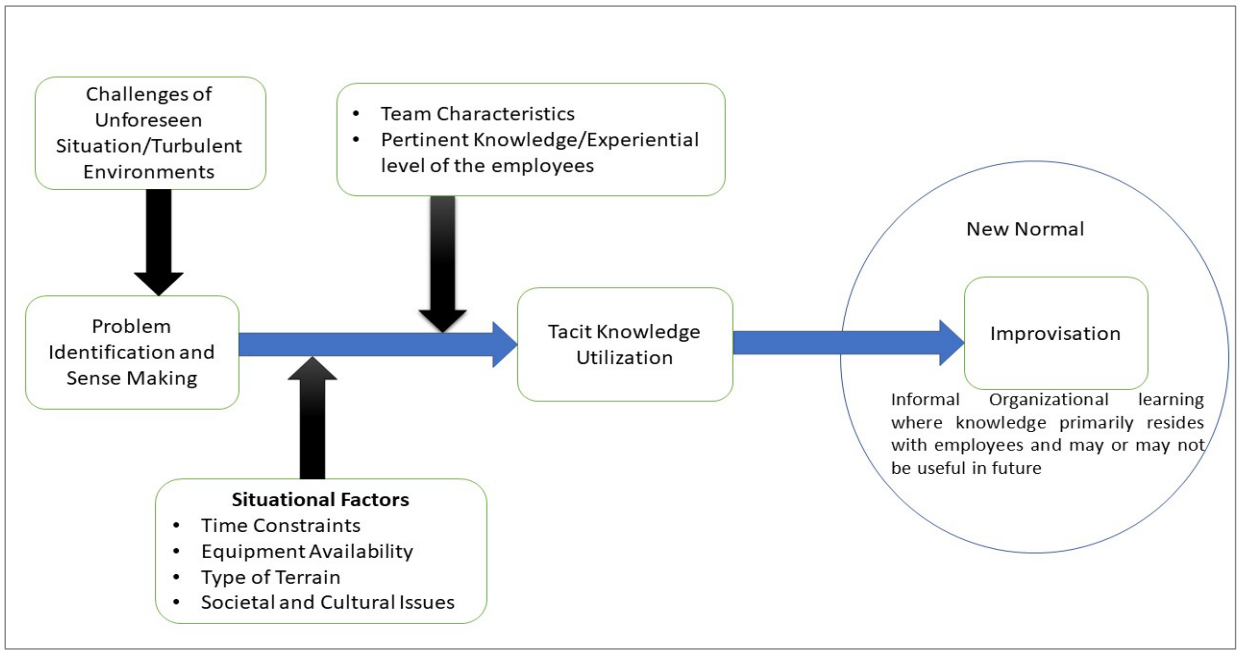

Figure 2. Framework explaining the linkage of tacit knowledge to improvisation in turbulent environments.