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Business continuity and resilience management: A conceptual framework

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Abstract

The overall objective of business continuity management (BCM) systems is to provide guidance and analytical subcomponents on how to assess and manage risk and sustain operations when facing a disruptive event. Current BCM practices largely follow a standard structure for formal planning processes and risk-assessment activities. An underlying assumption in standard practices is that systems can be decomposed in subsystems in a meaningful way, as they are tractable and data are available to predict the system's future functionality. However, the reality is much more complex in our volatile world. Standard BCM approaches do not pay adequate attention to the treatment of uncertainties. Thus, they fall short of addressing the complexity of operations involved with emergencies and crisis. Lack of focus on uncertainty hampers the ability of BCM systems to provide sufficient support for decision making in highly uncertain situations. Dealing with such situations necessitates a shift from a defensive risk-management approach, grounded on an illusion of control and accountability, to a proactive stance based on resilience thinking. Responding to this call, we use concepts from the resilience engineering (RE) field and link them to different components of a BCM system. We develop a novel BCM framework and identify a set of resilience influence factors to enhance resilience in BCM systems. We use a case-example, hosted by a leading organization in a second-line emergency response operation in Norway to reflect on the application of a suggested BCM framework.

KEYWORDS
business continuity, emergency response operation, resilience engineering

1 | INTRODUCTION

Aspects of business continuity management (BCM) include planning, preparation and mitigation activities that aim to deal with potential threats to a company, reduce vulnerability and maintain operations after experiencing disturbing circumstances (ISO22301, 2019). A range of challenges has triggered research interest in the BCM field over the past decade. These challenges include sustainability (Maas et al., 2016; Miller, 2011; Mukherjee et al., 2020), innovation and efficiency (Bakar et al., 2015), organizational resilience (Linnenluecke, 2017) and adaptability in the workplace (Loughlin & Priyadarshini, 2021). Despite this vast research effort, the BCM field

has been criticized for its tendency to be fragmented, focusing on specific mechanisms of planning and controls, instead of applying a more complete and integrated approach (Pollitt, 2013; Tangenes & Steen, 2017).

Various anticipatory and formal planning processes and risk assessment activities (Groenendaal & Helsloot, 2020), which are commonly applied in BCM, are based on a causality credo. An underlying assumption in these tools is that different systems in an organisation are tractable and data are available to predict their future performance (Hollnagel, 2015; Patriarca, 2021; Zuiderwijk et al., 2022). Additionally, subsystem details and descriptions are ultimately achievable, system properties do not change while being described (Hollnagel, 2018, p. 9), and major risks are identifiable. However, as Groenendaal and Helsloot (2020) argue, existing BCM systems are not appropriate to deal effectively with 'black swan'—large-impact types of circumstances with high impact. The main problem is related to the treatment of uncertainties in operational settings, both at the strategic and tactical levels (Aven, 2015; Steen, Patriarca, et al., 2021). Growing complexity in the technical and social components jointly operating for everyday system functioning (Leveson, 2012, p.3) increases uncertainty and thus intractability. Complexity entails none-linear interactions and tight couplings between system components (Perrow, 2011). Simon (2019, Ch. 8) revised his classical work on the architecture of complexity (Simon, 1962) and categorizes complexity into four aspects, including (i) hierarchy (system composed of interrelated subsystems), (ii) time required for evolution, (iii) dynamic properties of hierarchies and (iv) relation between complex systems and their descriptions. This perspective extends what Anderson (1999) suggested about complex processes to be highly sensitive to even minor variations in their initial conditions. This means that two entities with similar starting points may diverge significantly over time and exhibit vastly different behaviours. To ensure BCM in complex organisations, it is crucial to utilize 'complex adaptive systems models' in strategy management, as proposed by Anderson (1999), to enhance the ability to adapt to change (Whyte et al., 2022). Groenendaal and Helsloo (2020) have introduced an approach based on the concept of 'anticipated improvisation' as an extension of conventional BCM, which enhances the organisational adaptive capacity to deal with unpredictable major impact events. This approach recognises the need for organizations to be agile (Woltjer et al., 2022) and flexible in response to dynamic environments, while also being able to anticipate and prepare for unexpected disruptions. By embracing complex adaptive systems models, organisations can better navigate the challenges posed by complex and unpredictable events, ultimately improving their resilience and ability to survive and thrive in the face of adversity. In the same vein, Baldwin (2019) points to the gap between complex realities and the primary historic objective of BCM in practise and argues that what organizations need to focus on in dealing with uncertainties is indeed OR. He argues that the operationalisation of BCM within an OR framework is still relatively blurred.

Responding to this call, this paper explores how to enhance resilience potentials in BCM and how to operationalise the 'anticipated improvisation' concept in practice. To this end, we conduct literature studies (Section 2) as well as interaction with a leading organization in a second-line emergency response (ER) operation in Norway, the Operators' Association for Emergency Response Organization (OFFB) (Section 4) to identify the requirements (Johannesson & Perjons, 2021, p. 82). We develop artefacts in terms of a framework and a set of resilience influence factors (RIFs) to enhance resilience potentials in a BCM system. It is important to note that the design of the study's artefacts is only outlined; the final evaluation is not carried out, as it is beyond the scope of this paper.

This contribution of this work to the existing literature is threefold: (1) It presents a structure developed to understand and analyse the related features of BCM and resilience in a unified approach, which connects the fields of business continuity and safety management. In this way, this work could be seen as an interdisciplinary research endeavour, integrating insights and methods from multiple disciplines. By developing this framework, we aim (and hoped) providing a platform for better understanding the complex interplay between organisational resilience and BCM. (2) By exploring the link between strategy formation, and performance management from a resilience perspective, this work provides insights into how resilience-seeking organizations could 'reinvent strategy making as an emergent process… [to]… reinvent management and make it more relevant to a volatile world' (Hamel, 2009). (3) The work constitutes a constructive approach to dealing with critiques on the concept of resilience engineering (RE) for being more theoretical than operational. Thus, the proposed framework contributes to the definition of reality-based research in the context of organizational management (Provan et al., 2020). Furthermore, by linking RE to the instrumentalism of BCM, we seek to contribute to the increased practical relevance of the RE concept itself.

2 | THEORETICAL BACKGROUND

2.1 | Business continuity management (BCM)

The focus on business continuity as a research topic in management theories goes back to the 1970s in response to the technical and operational risks that threaten an organization's recovery from disruptions. The International Organization for Standardization (ISO22301, 2019) defines the BCM system as a 'set of interrelated elements that organizations use to establish, implement, operate, monitor, review, maintain, and improve their business continuity capabilities'. The main part of this standard focuses on activities that maintain operational continuity when facing challenging circumstances, including:

- Operational planning and control
- Business impact analysis and risk assessment
- Business continuity strategies, solutions, plans and procedures
- Exercise programs and evaluation of business continuity documentation and capabilities

As a scientific platform, BCM provides supportive mechanisms for the formation, implementation, review, performance measures and evaluation of strategies. As an 'operational risk service provider' (Baldwin, 2019), BCM relies on an adaptive performance management system (Fischbacher-Smith, 2017), which aims to control organisational behaviour by following organisational objectives (Heger et al., 2017), broaching and analysing relevant information (Bourne et al., 2003), and managing reliability and benchmarking efficiencies (Thekdi & Aven, 2019). BCM best practises include the ability to handle various disruption scenarios, having contingency resources that match the supported business processes, maintaining effective documented plans that are owned and updated by the organisation, and having a proficient team to manage the organization's response and recovery (Drewitt, 2013, p. 16). Risk awareness is crucial to integrating BCM into core organisational values and effective management throughout the organization (Ibid., p. 155). All these aspects in a BCM system can be categorised into three main domains:

i) strategic planning to achieve the goals of an organisation
ii) monitoring and measuring achievement
iii) anticipation activities, risk management and control system

However, adversity, stress and reduced functionality that typically relate to the treatment of uncertainties (Steen & Pollock, 2022) are not explicitly reflected in standard BCM systems. In addition to uncertainty in operational environments, Whyte et al. (2022) point to the ethical dimension of decision-making when choosing technologies and growing organisational complexity with multiple actors. In the context of BCM, addressing these challenges in the face of the emergent nature of complexity (Section 1) necessitates a distinct understanding of how systems operate and evolve. The concept of emergence, which is intricately tied to complexity, pertains to the nonlinear, self-organizing and profoundly uncertain nature of systems, where patterns may potentially arise that cannot be fully predicted beforehand. It proposes novel system properties and relationships between subsystems that did not exist within the individual components of the system (Simon, 2019, p. 170).

A suitable BCM design acknowledges the inherent dynamic nature of real-life complexities, and factors in their underlying logic. In other words, organizations need to figure out how they manage their operational processes when plans no longer provide adequate guidelines for action in everyday work (Woods & Allspaw, 2020). Faced by such limitations, organizations must shift their focus from a static to a more dynamic view in the BCM system and consider the changing nature of events and complexity of systems.

In developing a BCM system, it is important to realise that past success is not a guarantee of future achievements (Dekker et al., 2008), and performance variability is inevitable to provide the adaptations needed to ensure responses to emergent situations (Woods, 2018). It is also critical to be aware of conditions in which performance variability can become difficult or impossible to monitor and control and acknowledge the limitations of reductionist approaches (Hollnagel, 2015). Naderpajouh et al. (2020) even suggest a paradigm shift, in this regard, from managing uncertainty and risks to governing resilience in developing plans. This shift aligns with the core idea behind this study that rather than developing plans based on diagnostic control systems, a potential solution to uncertain situations is to develop a holistic BCM approach, integrating risk- and resilience-based thinking (Groenendaal & Helsloot, 2020; Steen & Aven, 2011).

To conceptualize BCM as a collection of dynamic (sub-) systems, a functional approach is necessary to assess the organizational ability to anticipate internal and external changes and respond to them in a timely and effective manner. The emphasis should not solely be placed on identifying or preventing initiating events, as they may be numerous, improbable or highly uncertain. Instead, the focus should be on ensuring continuity of operations irrespective of the event that occurs (Bailey, 2015). Resilience and its engineering in a system, through system thinking and dynamics modelling (Patriarca et al., 2022), strengthens the adaptive capacity to sustain strategy under predictable and unknown stressors and shocks. It enhances the understanding of nonlinearity between causes and effects related to adopted policies, pursued actions and results. In addition, it addresses how each system component is articulated and interrelated within a large-scale organization, thus improving the quality of BCM systems.

2.2 | Engineering system resilience

The notion of resilience is commonly adopted in various scientific fields, including material sciences, psychology, ecology, safety management and so forth. Regarding the context of this study, we incorporate resilience as defined in the context of safety management. This latter encompasses resilience with the Resilience Engineering (RE) approach, that is, the science devoted to engineering means enhancing the system's resilience capacity. RE was born in the mid-2000s from a confused consensus on the need for a complexity-oriented approach to managing the safety of socio-technical systems (Dekker et al., 2008). Conventional safety management approaches usually consider safety as a condition in which as few things as possible can go wrong. On the contrary, modern safety management relies on safety as a condition in which as many of these things 'can possible go well'. Besides their semantic differences, the underlying idea of modern safety science is that 'we cannot make things go right simply by preventing them from going wrong' (Hollnagel, 2014). In the same field, it has been argued that a traditional safety perspective might be appropriate and effective until system complexity is limited in terms of interactions and couplings among different system agents (Patriarca et al., 2016). More specifically, it is considered necessary to embrace an RE perspective based on the following assumptions (Hollnagel, 2014):

- Systems cannot be decomposed in a meaningful way.
- Everyday performance is flexible and variable, that is, system functions are not bimodal.

- Success and failures are a result of human performance variability.
- Even though some outcomes can be interpreted as linear consequences of other events, some events result from coupled performance variability.

Considering these assumptions, which are not negligible for modern sociotechnical systems, the RE perspective aims to enhance organizations' resilience and focus on synchronizing activities for conflict resolution and achieving shared goals (Provan et al., 2019). Rather than prescription planning on how to respond to specific unwanted events and predefined scenarios, RE's attention is on the improvement of resilience potentials in an organization (or system) by managing the system's adaptive capacity in an uncertain and dynamic world. Within RE, organizations should focus their efforts on developing their capacity for anticipation, readiness to respond, synchronization and proactive learning (Ibid):

- Anticipation is about creating foresight on future operating conditions and revising risk models. Anticipating future scenarios allows organizations to monitor the conditions and threats associated with these scenarios and build resources and capacities to respond.
- Readiness to respond concentrates on maintaining deployable reserve resources to be available to keep pace with demand. Deployment entails employees having sufficient autonomy to make decisions about their work in real time. This requires employees to have the psychological safety to apply their judgement without fear of repercussion.
- Synchronization focuses on coordinating information flows and actions across the networked system. This synchronization provides a constant opportunity to understand the changing shape of the system, and the extent to which operations remain within safe operating boundaries.
- Proactive learning is about seeking context and understanding what is needed to support safe adaptation and success on the front line. It emphasizes a search for brittleness, gaps in understanding underlying elements in Work as Done and Works as Imagined, trade-offs, and re-prioritisations. Organizations should embrace and monitor the adaptive cycles of work to create proactive learning.

These aspects of organizational resilience (OR), as mentioned above, remain relevant for managing business continuity by adapting to adversity while sustaining operations.

Groenendaal and Helsloot (2020) point to other aspects of OR, including adaptability, cohesion, efficiency and diversity. While diversity highlights the importance of multiple talents in fostering innovation, cohesion emphasises the unifying forces to preserve continuity. These scholars introduce the concept of anticipated improvisation as a key element in OR, in which the improvisation element would be enhanced by 'taking preparatory actions' in four steps:

- Developing and maintaining a risk-agnostic and condensed crisis-management structure.
- Ensuring effective information sharing between involved actors (management, experts and other organizational members) in dealing with a business-disruptive event.
- Establishing effective internal communication, informing employees in advance about roles and responsibilities during a major disruptive event.
- Developing training and exercise activities to enhance improvisation capacity in facing unpredictable major-impact events.

From a resilience perspective, anticipated improvisation enriches the adaptability of a BCM system, driven by informal processes grounded in collaborative practices (Provan et al., 2019; Zuiderwijk et al., 2022), influenced by the authority interactions (Roberts & O'Reilly, 1979) and formal structure of the organization (van der Vegt et al., 2015). The term 'authority interactions' describes the communication that revolves around the formal control aspects of an organization. On this ground, BCM through the lens of OR should rely on exploring the system's functionality in terms of operational variability, both at the sharp and the blunt end.

3 | A CONCEPTUAL MODEL FOR FOSTERING RESILIENCE IN BCM

Based on the anticipated improvisation concept (Section 2.2), this section develops an extended BCM framework that links different components of the BCM system to RE in three stages. The proposed framework is developed in the context of an ER organization. While the first stage focuses on essential activities related to anticipation and preparation to support the core business, in terms of planning for resources allocation and coordination, in day-to-day operation (stage two), stage three seeks impulses to strategy adjustments/modifications to increase the organization's adaptive capacity, through proactive learning.

3.1 | Stage 1: Preparedness

The first stage focuses on anticipation and preparedness activities, founded on the strategic role and objective of the system/organization in focus. Strategy formation includes identifying organizational goals, determining the business scope, performance variables, targets and resources as well as stakeholders and measures. In attention-based theory, Ocasio and Joseph (2018) state that attention 'distributed throughout the firm and its communication channels' shapes strategy formation. The authors argue that attention structures such as a change in the 'rules of the game' and the participation of 'new players' (Ocasio, 1997, p. 196) affect the degree to which decision-makers focus their attention on external or internal latent possibilities. In turn, these structures stimulate actions to

enhance an organization's adaptive capacity, and hence, its business continuity.

In the spirit of four essential RE potentials (anticipate, response, synchronize and learn), choosing appropriate metrics and targets that address these essentials provides direction for attention, and thus, a business continuity plan. However, planning and resource allocation are still centred largely on traditional budgeting. This situation, in which budgets communicate business goals, obstructs responsibility, motivation and improvements through learning (see Hope & Fraser, 2003). Nevertheless, as a strategic tool, budgeting can contribute to OR when its roles are redefined, for instance, as forecasts to test the financial implications of business continuity plans. In this way, the budget does not communicate business goals and is not part of the strategy and business continuity plan (Tangenes & Steen, 2017). On the bright side, the application of budget as a flexible forecasting tool can improve resource allocation, and accordingly, adaptive capacity in an organization. Moreover, different sorts of analysis are included in this phase, including resilience analysis and risk and vulnerability analysis. These tools provide insights to anticipate changes, including competency requirements (Marnewick & Marnewick, 2021) across the organization. Identified requirements further provide insights on actions that need to be taken for continuous improvement. Resilience analysis investigates the functionality of business management systems, both from a strategic and operational level, without specifying concrete event scenarios, such as scenario 'S' (e.g., falling global oil demand or increasing oil prices caused by geopolitical volatility). Such analysis focuses on the complexity of a system and its different components and their interconnections.

Inspired by the Resilience Analysis Grid, RAG (Hollnagel, 2011), Steen, Ingvaldsen, et al. (2021) identify a list of factors that contribute to resilience potentials in a correctional service context. This manuscript relies on these factors, here called Resilience Influence Factors (RIFs), to provide relevant measures of organizational performance. Table 1 includes factors gathered through the literature review (as detailed in Section 2) and the ones already developed by Steen, Ingvaldsen et al. (2021). The listed factors have been contextualized and justified in the context of the study, that is, business continuity in an emergency response organization. A critical appraisal of their utility is proposed in the discussion section (cf. Section 4.2).

These RIFs (Table 1) could be used as a point of departure for developing metrics, for instance related Key Performance Indicators (KPIs), when conducting resilience analysis.

The next component in Figure 1 is conducting risk and vulnerability analysis, which focuses on the evolving knowledge about different risk scenarios and their possible impacts. In line with the Society for Risk Analysis glossary (SRA, 2015, p. 8), the risk-analysis process includes 'risk assessment, risk characterization, risk communication, risk management, and policy relating to risks, in the context of risks of concern'. Insights from resilience, risk and vulnerability analyses provide insights for developing plans to deal with uncertainties, risks and opportunities ahead.

3.2 | Stage 2: Day-to-day operation

The second stage consists of activities involved in day-to-day operations. This stage is highly contextual. Regarding the context of this study, daily activities are related mainly to emergency response operations (ERO). ERO involve a cross-organization effort, and therefore, coordinating activities, shared decision making and implementation of decisions (i.e., incident response measures) are essential for conducting ERO successfully. In line with Standardization, I. O. F. ISO 22320 (2011), the main steps in ERO are continual situational assessment, coordinated planning on how to respond to an incident and shared decision-making, as well as the implementation of those decisions. Effective information gathering and sharing enable response authorities to implement measures with 'maximal interoperability according to information and communication exchange needs during incident response' Standardization, I. O. F. ISO22320 (2011).

TABLE 1 List of RIFs for four OR essentials for BCM.

Anticipation	Readiness to respond	Synchronization	Proactive learning
A1. Sense-making	R1. Resourcefulness	S1. Activity level and simultaneous operations	L1. Learning sources and selection criteria
A2. Risk awareness	R2. Thoroughness of protocols and plans	S2. Redundancy	L2. Coaching and mentoring
A3. Information sharing	R3. Multiple skills/competencies of ERT personnel	S3. Communication between first-, second and third-line response authority	L3. Adaptability of training
A4. Administrative support	R4. Dynamic and communication in ERR	S4. Group dynamic	L4. Frequency of cross-training activities
A5. Updating frequency	R5. Improvisation and autonomy	S5. Joint decision-making and interaction	L5. Motivational/educational support

Abbreviations: BCM, business continuity management; ERR, emergency response room; ERT, emergency response team.

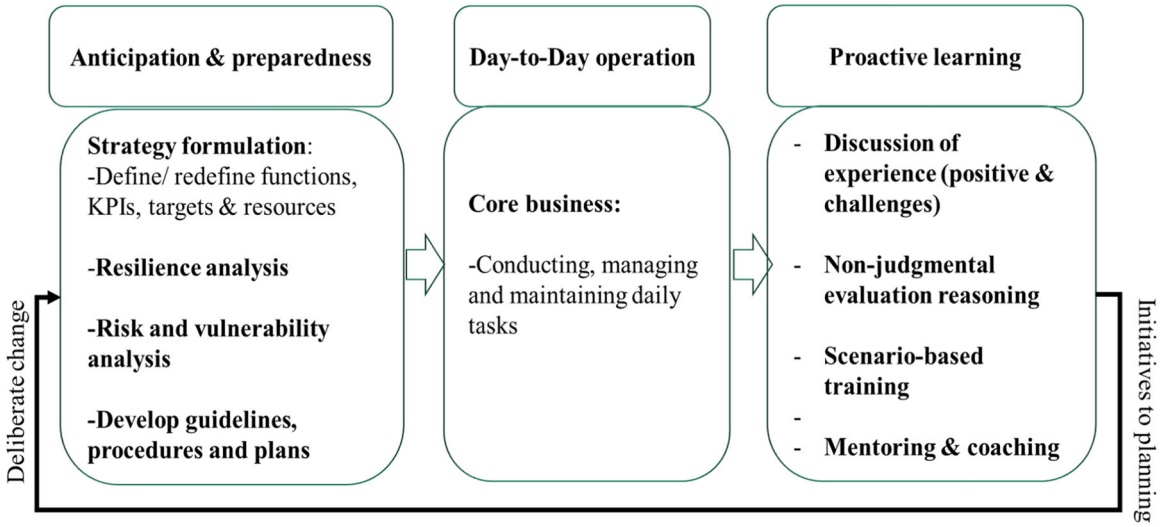

FIGURE 1 Resilience BCM framework: a conceptual model.

3.3 | Stage 3: Proactive learning

The third stage consists of activities related to proactive learning (e.g., discussion of experience, evaluation-reasoning, incident analysis, scenario-based training, mentoring and coaching). To effectively learn from a situation or an event, Hollnagel (2011, p. 287) outlines three preconditions: that there are sufficient opportunities to learn, that events should have some degree of similarity and that it is possible to confirm (determine) that something has been learned, such as changes in behaviour, systems and so forth. He argues that as the number of things that go right (e.g., well-performed operation and successful improvisation) is larger than the number of things that go wrong (e.g., failed operation), we should learn from representative events (things that go right and from everyday activities), rather than from failures alone (from accident investigation). While incident investigations and evaluation reports are usually used as the sources of (re)learning, learning in proactive mode requires a discussion of experiences, challenges and successes. The answer to the question of 'how we managed the situation successfully?' provides insights about the practices that allow organizations to support people's capacity to achieve what Woods (2018) refers to as graceful extensibility: 'the ability of a system to extend its capacity to adapt when surprise events challenge its boundaries'. Learning outcomes provide insights that enable organizations to adjust plans, reorganize structures or innovate new ways to respond to expected and unforeseen changes through an iterative process.

4 | APPLICATION OF THE PROPOSED FRAMEWORK AND RIFS

4.1 | A case example: Organization

To illustrate the main ideas behind the proposed framework, RBCM, we discuss the main components of RBCM in the context of an emergency response organisation. The Operators Association for Emergency Response Organisation (OFFB). In September 2009, OFFB was established as an association following a feasibility study conducted with the participation of 27 small and medium oil companies known as the 'Small Operators with a Licence to operate' (SOL) group. The study aimed to explore the feasibility of creating a credible and professional second-line ER centre for actors on the Norwegian continental shelf, taking into account regulations, resource efficiency and increased quality (Stein, 2021, p. 4). Whereas first-line ER activities are performed by those closest to the scene (e.g., on a platform installation or rig), and the third line acts as the operating company's strategic emergency management, the second-line ER provides operational and tactical support to both the first and third line. OFFB's primary business is to manage, maintain and operate a wide range of second-line ER services utilized by numerous oil and gas operating companies on the Norwegian continental shelf. Its main responsibilities include responding to incidents that may endanger people, the environment, and material assets, and handling of Next-of-Kin and media inquiries during ER operations. Following Table 2 outlines the scope of OFFB's activities.

The interconnectivity among participants from various organizations involved in multiple planning levels underscores the complex and distributed nature of OFFB operations. OFFB operates a Next of Kin call centre, with 40 professional telephone operators and managers providing support in case of emergencies, as well as stakeholder analysis and monitoring of traditional and social media. The organization conducts over 100 exercises and up to 300 themed days annually, in addition to offering courses for ER training. It handles approximately 50 to 100 incidents reported to the Petroleum Safety Authority (PSA) each year and mobilizes ER resources for about 5 to 15 incidents per year. In responding to emergencies, a collaborative approach is often necessary, which involves coordination among first, second and third-line emergency response organizations in close collaboration with other agencies and institutions, both in the private and governmental sectors. Collaborative partners include the Joint Rescue Coordination Centre

TABLE 2 The scope of OFFB's activities.

Operational categories	Main activities
Planning and conducting ER activities	• Operational planning and developing ER best practices • Centres for Evacuees and Next of Kin (OSEP) • Next of Kin Call Centre • Emergency facilities for the third line • Conducting technical assessments and advise the first line ER organization on potential actions and countermeasures • Strategic crisis communication in the third line
Training and ER exercises	• Planning and implementation of training and exercises • Seminars and workshop • Tabletop training sessions • Major exercise • Conducting exercise and training for own organization, members and cooperating third parties
Competence centre for ER operations	• Training courses and themed days • Counselling and exchange of experiences • Technical forum for members with underlying professional groups • Collaboration with universities and research institutes

(JRCC), the Norwegian Clean Seas Association for Operating Companies (NOFO) and the Norwegian Coastal Administration (NCA), among others (for more details on the scope of OFFB's operations, see Steen, Patriarca, et al., 2021). As of the time of writing this paper, OFFB has been providing daily ER services to up to 9 oil and gas companies for the last 14 years, including Wintershall Dea, Neptune Energy Norge AS, Norske Shell AS and the AkerBP. These operating companies have varying levels of activity when it comes to operations, ER training and exercises. The OFFB's ER services, meeting the reliability standards set by Norwegian regulations and closely integrated with operators' ER systems, play a crucial role in maintaining stability and continuity in ER strategies, as well as facilitating collaboration with other organizations in the industry. It is also responsible for training and exercises involving its personnel and those employed by the operating companies and associated third parties. The organization represents a centre for skills and expertise development, enhanced resource utilization, and improved standards and quality. In the short term, the OFFB aims to provide services for operating companies and other holders of shares in production licences on the Norwegian shelf. In the long term, the organization aims to provide services to other related offshore activities. The OFFB business philosophy is based on the 'no-gain-no loss' principle.

4.2 | Discussions and implications of RBCM for the OFFB

4.2.1 | Preparedness

Preparedness is about anticipation

Since the OFFB came into operation in 2009, the organization has established itself as a leading professional second-line emergency organization for oil and gas operators on the Norwegian continental shelf. Nevertheless, the overall picture of the oil and gas (O&G)-related industry has changed in the past few years. It is constantly changing due to climate change and sustainability, energy consumption and production, as well as geopolitics. OFFB operates in a highly uncertain O&G sector, with various factors such as oil price volatility, technological advancements, political and organizational changes and the ongoing pandemic adding to the complexity. The study by Phan et al. (2019) examines how crude oil price uncertainty can have a negative impact on corporate investment expenditure, resulting in less investment in O&G operations. This, in turn, could lead to a decreased demand for products and solution from oilfield service companies. It's worth noting that OFFB's organizational structure and financing are significant factors to consider. Being owned by various O&G companies provides OFFB with the financial resources to develop exercises and training programs without any budget restrictions, enabling them more flexibility. OFFB professional reputation in the O&G market is critical for its survival and growth in such a highly volatile sector. An additional challenge arises when OFFB owners face financial challenges, which may impact their ability to provide the necessary financial resources to support OFFB operations. Additionally, the O&G sector is facing an increasing demand for alternative energy sources, which further adds to the uncertainty. OFFB must prepare for the future when O&G markets stabilize in 'a reduced addressable market' (Gupta et al., 2021).

The oil and gas industry is facing a new challenge as a result of its ongoing digitalisation trend. As more companies turn to technology to improve efficiency and operations, the sector is also becoming more vulnerable to cyberattacks. The emergence of digitalisation has led to a surge in the number of cyberattacks on the energy infrastructure, highlighting the need for emergency preparedness in the cybersecurity context. To adapt to this new challenge, OFFB should expand its focus on traditional ER operations to include the tackling of cyberattacks.

However, emergency preparedness in the cybersecurity context has its limits and boundary conditions, which can lead to 'brittleness'. According to Woods (2018), brittleness refers to the sudden collapse or failure of a system when events push it up to and beyond its boundaries for handling changing disturbances and variations. To deal with brittleness, in the context of this study, ER plans and protocols should be regularly reviewed, updated and tested to ensure their effectiveness in the face of evolving threats. This shift requires a fundamental change in the way OFFB approach cybersecurity, including the need for a skilled workforce with strong knowledge of cybersecurity.

From a management perspective, strategy formation should ensure the organisation's resilience (Section 2.2), clarifying how the OFFB extends its capacity to adapt when changes challenge its boundaries. From a strategic point of view, the OFFB should direct its attention to these changes and how they might be addressed in strategy formation; for instance, in terms of the objectives, scope and boundaries of the OFFB overall operations. From a BCM perspective, long-term strategy planning shapes the direction of an organisation. Long-term planning involves forecasting an organisation's activities over multiple years and is generally less detailed than short-term or operational plans (Kabeyi, 2019). Although some aspects of risk management focus on strategic planning, Bailey (2015) argues that operational risk and BCM deal inherently with shorter-term risks and are primarily tactical in nature. The most significant advantage of these disciplines, according to Bailey, is their direct impact on a company's capacity to achieve strategic plans and goals, both individually and collaboratively.

On this basis, given the uncertainties created by the turbulent changes mentioned earlier at the beginning of this section, OFFB might benefit from redesigning its long-term planning to focus on shorter periods. This could involve outlining specific annual objectives, related activities, tasks, procedures, timelines and responsibilities. This approach would align with the nature of OFFB's core business and its sensitivity to emerging threats and updating needs. It is crucial to recognize that the OFFB's assessment of its future activity level will directly impact its resource acquisition and allocation, ultimately influencing its business continuity. Therefore, a well-planned and executed strategy with regular evaluations can help ensure that the OFFB has the necessary resources and flexibility to adapt to changing circumstances and maintain continuity of its critical operations.

The OFFB should consider various scenarios when developing a business continuity plan, such as a significant reduction in oil and gas production activity levels. To prepare for such uncertainties, the OFFB could rescale its operations to a lower activity level by downsizing or expanding its operation to other areas not directly affected by changes in the oil and gas market. Sensemaking (A1 to Table 1) is crucial in anticipating and analysing these scenarios. Sensemaking is often used, according to Weick (2012), in the context of beginnings and emerging, which suggests a continuous process of forming and dissolving. As an ongoing process, it enables organizations to understand and interpret emerging signals, identify potential threats and opportunities and formulate appropriate responses in a timely manner (Weick, 1993). For OFFB, it allows to determine the feasibility of different options at a strategic level. This includes prioritizing strategies and assessing the availability of tangible and intangible resources to respond to specific scenarios. One potential response could be to consider expanding their membership to include companies operating in the renewable energy market, such as wind, hydropower and geothermal energy. This would allow the OFFB to diversify its operations and mitigate potential risks associated with changes in the oil and gas market.

Preparedness and bottom-up strategy formation

In its traditional form, strategy formation is a top-management matter based on the organisation's vision, combined with linear planning consolidated by budgeting and management. On the contrary, from an RE perspective, strategy formation invites and fosters autonomous strategic initiatives in a bottom-up approach, contesting its content continuously. It develops from front-line operators and middle managers through strategic and structural context-determination processes to uncover existing and potential opportunities in the resource base. Context-aware strategy formation involves developing strategies that are aligned with the specific context, characteristics, and dynamics of an organization, rather than relying solely on top-down, generic strategies that may not fully account for the complexities of the organizational environment (Linnenluecke, 2017). To contextualise these factors for the OFFB, let us consider a scenario of a future pandemic outbreak. In August 2020, when a COVID-19 outbreak occurred on a West Phoenix floating oil rig in the North Sea, OFFB provided second-line ER support. In the same context, research by Steen et al. (2023) and Cantelmi et al. (2022) indicates that ER operations' uncertain nature necessitates emergent problem solving. This requires mindful behaviour, with support at the strategic level (leaders) to continuously assess the existing status of the system. The incident underscores the importance of efficient information gathering and sharing, which advanced a common ground for cross-organisational collaboration in ER operations.

Applying a bottom-up approach to develop strategies for dealing with future pandemics encourages the involvement of front-line ER operators who have relevant experience dealing with previous incidents. Learning from the COVID-19 outbreak on the West Phoenix oil rig involves information sharing (A3-Table 1) facilitated by adequate administrative support (A4-Table 1). This includes effective communication channels and bidirectional communication flows that are supported by deep business intelligence, continuous measurements and forecasting. In the anticipation and preparedness stage, one critical factor is risk awareness (A2-Table 1). A useful indicator for measuring A2 is Risk Context Information, which is a list that includes various types of risks to which the OFFB could be exposed. By identifying potential risks, the OFFB can take proactive measures to mitigate them and develop contingency plans. Ultimately, effective risk management and preparation can significantly improve the organization's ability to respond to future emergencies.

Preparedness and planning

Planning is widely recognized as a critical component of BCM. A well-constructed plan that addresses risks and opportunities is essential for the response team to make informed decisions during an incident

(Drewitt, 2013, p. 35). The results from risk and vulnerability analysis provide crucial data to develop plans, guidelines and procedures and to formulate measures founded on a credible, evidence-based analysis. From an RE perspective, a central aspect of plans is flexibility. Flexibility in plans means considering a plan as a living document that needs to be updated frequently. The answer to the question 'how frequent?' (A5-Table 1) depends on the lessons learned from day-to-day operations and ER evaluation after each operation. Moreover, from an interpretive planning view, flexibility means that the planning process is 'iterative rather than linear' (Davoudi, 2012), driven by an interest in understanding a situation (Innes & Booher, 2015) and imaginative visioning and learning (Sandercock, 2003). Given that the OFFB acts as a second-line response organisation in close collaboration with first- and third-line response authorities, the thoroughness of planning and flexibility depend on a collaborative culture and strategies to improve adaptive capacity for the organization involved in a joint emergency response operation. To enhance a collaborative culture, the OFFB needs to understand the context of collaboration, as it could involve multi-faceted factors such as power structure, organisational culture and institutional complexity.

Mechanisms that ensure the synchronisation of activities, thus strengthening the ability to interact, are linked to an operational communication strategy grounded on trust, respect and openness between the parties involved (Pollock & Steen, 2020). Resilience in this context is about having effective and proactive communication. While effective communication is concerned with sharing all relevant information in an open, honest, accurate and precise way (Spetalen et al., 2015), proactivity embraces being at the forefront of changes in situations. The ability to remain calm and maintain focus on the tasks at hand under stressful conditions is crucial to performing satisfactorily during threatening situations (Driskell & Salas, 2013, p. 254). This underscores the most challenging demands on front-line operations in dealing with emergencies. Consider a rapid escalation in which the situation gets out of hand. An example is that of pandemics. The question that arises is how to extend the boundaries of tolerance and withstand unpredictable changes. Klein (2011, p. 247) reflects on complex situations and suggests the deployment of an anticipate-and-adapt strategy. The successful implementation of this strategy depends on the adaptive capacity, flexibility and authorisation to improvise (R5-Table 1). The consequence of inadequacies in anticipation and a lack of foresight affects the thoroughness of emergency planning (R2-Table 1) and create challenges for day-to-day emergency operations.

4.2.2 | Day-to-day operation

Day-to-day operation and response capacity

As an emergency response organisation, the resilience of the day-to-day operation in the OFFB depends on its capacity and readiness to respond and the effectiveness of the synchronisation (coordination) process. From an RE perspective, response readiness is about an organisation's capacity, robustness and speed in responding promptly. According to Bourne et al. (2003), while robustness and speed could be considered as the desired results of resilience-enhancing measures, redundancy (S2-Table 1) and availability of measures and resourcefulness (R1-Table 1) are the means to these ends.

Regarding readiness to respond, besides the multiple skills of the interdisciplinary emergency response team (R3-Table 1), one of the identified RIFs is the ability of the individuals and teams to apply critical thinking to their tasks. While policy, standards and regulations are important elements of ER operation, improvisation and autonomy (R5-Table 1) indicate critical thinking capability (e.g., innovation capacity, capacity to adjust to change and coping strategies). A potential conflict here is the imperative of using standard procedures and instructions, on the one hand, and performance variability and the need for improvisation (R5-Table 1) on the other. Defining improvisation as a deviation from standard procedures leads to less motivation and room for spontaneity and improvisation. This point raises an important question about the appropriateness of precisely defined structures and plans (R2-Table 1) for a certain activity in the OFFB.

Nevertheless, improvisation depends on the capacity and authorization of individuals in an ER team to allocate and prioritize necessary resources and implement them. Organizational politics and advocacy may interfere with effective problem-solving and resource allocation. This interference indicates the need to clarify how the operational manual allows individuals to adjust their actions as they deem appropriate. While measuring improvisation capability is a very challenging task, there are some ways to do so. For instance, at the individual level of analysis, improvisation could be measured by the extent of authority to perform process activities and the novelty of an approach used to perform a specific task, that is, approved deviation from existing practices and patterns, and so forth.

A potential conflict here is the imperative of using standard procedures and instructions, while confronting the need to improvise. However, when standard operating procedures are not appropriate for the situation at hand, flexible and creative thinking is required and imposes an additional source of stress (Flin, 1996). The communication in the ER room (S3-Table 1) affects ER operation through sense-making, sharing information and joint decision-making. These factors are inherently related to organizational culture (Section 2.2).

Day-to-day operation and synchronization

The mechanisms that ensure the synchronization of activities, thus strengthening the ability to interact, are linked to an operational communication strategy grounded on trust, respect and openness between the parties involved (Pollock & Steen, 2020). Resilience in this context is about having effective and proactive communication. While effective communication is concerned with sharing all relevant information in an open, honest, accurate and precise way (Spetalen et al., 2015), proactivity embraces being at the forefront of changes in situations. A joint ER operation is often involved with 'multi-organizational, trans-jurisdictional response networks [and] it

requires lateral coordination, not a centralized, top-down command and control' (Boin, 2017, p. 140). The uncertainty element involved in synchronization processes relates to 'coordination capacity, mutual trust and administrative level' (Christensen & Lægreid, 2019). The OFFB capacity to cope with these sorts of uncertainty depends on collaboration culture, consensus building, cluster-thinking and effectiveness of the communication process. Drawing on Jones and Roelofsma's (2000) concept of group dynamic (S4-Table 1), the social contextual and group decision biases, alongside team members' interaction (S5-Table 1), affect the quality of the collaborative decision-making process, hence the resilience of the ER process. Under 'normal conditions' complex problems (e.g., blowout/well-control problems, toxic release and man overboard), the OFFB emergency response team (ERT) members perform their duties according to plans and procedures based on incident information from the first line and exchange the necessary information with third-line response authorities. However, when a situation is characterized by insufficient information about some aspect of a target group, possibly considering ambiguity and uncertainty in highly dynamic information, the ERT should make its decision based on its assumptions, estimation and predictions. In such a situation, the issue of false consensus, that is, the tendency to overestimate the degree of similarity between own assumption and others, may cause some biased judgements or decisions (ibid). Another issue associated with the group dynamic (S4-Table 1) is group thinking and the line of communication. For instance, using terms such as threat, hazard or probability/likelihood might indicate different meanings and thus might affect a common situational awareness. Dekker (2015, p. 141) stresses the importance of coping resources, such as experiences, knowledge, workload management skills, and organisational support, to handle ill-structured problems, goal conflicts and high uncertainty levels during operations. Organisational support can be provided through technological and informational aid, policy and compliance guidance, prioritisation of goals and training programs.

Moreover, an abbreviation is often applied in the information-sharing process throughout the ER lifecycle. To secure internal and external emergency communication requirements, redundancy in communication infrastructure (S2) is crucial. Alongside the verbal communications, the OFFB's use of Incident & Crisis Management (CIM) software as a communication platform to share all information received and decisions made with the relevant stakeholders enhances the response operation. However, issues related to information overload or releasing sensitive information before relevant authorities confirm it might jeopardize joint decision-making. Online collaboration requires the competence to communicate and collaborate seamlessly in a digital environment (Marnewick & Marnewick, 2021) such as CIM. Commenting on the level of ERT's digital intelligence in the OFFB is beyond the scope of the current study. Establishing effective communication and sharing data among different ER organizations' (S3) levels are critical for increasing a common situational awareness about what is at stake. Such communication offers a common operational picture that enhances the decision-making process in a highly uncertain environment. For the second-line operation, conducted in the ER room, the dynamic of communication between the ER team (R4) consists of six different roles (e.g., ER manager, chief of staff, logistics, authority, personnel and information coordinator), all of which are crucial. By dynamic communication, we mean validating information, facilitating ER decisions and synchronizing the implementation of these decisions.

4.2.3 | Proactive learning

Proactive learning is a dynamic process that aims to improve knowledge about the operational context, working environment, strengths and brittleness of day-to-day operations. It also covers 'confirmation of existing knowledge and gaining a deeper comprehension of existing practice'.

The learning source (L1-Table 1) for the OFFB derives mainly from the problem-solving and decision-making activities in response to emerging problems and conscious adjustment of prior knowledge and experiences concerning dynamic reality. The possible means to transfer knowledge and support proactive learning are sharing experiences (positive aspects as well as challenges), developing nonjudgmental response evaluation, shifting focus from 'who' and 'why' to 'how', creating worst-case scenarios from an incident analysis by indulging the imagination and mentoring and coaching (L2-Table 1). Mentoring is a process that improves employees/leaders' performance, enabling them to perform optimally. The results from proactive learning generate options to 'choose worthy synthetic indicators and give means to anticipate potential future threats and opportunities', thus, adjusting/renewing plans and improving efforts' effectiveness (Patriarca et al., 2018). In the OFFB, following any ER operation (both real events and exercises), the ERT provides an internal evaluation of their performance during the response process and how previous experiences have helped enhance competence and knowledge. To improve the thoroughness of evaluation reports, they might also include an in-depth examination of the decisions and actions taken and reflect on the underlying assumptions. These reflections can further identify gaps that may exist between response capacity and what is required and enable the ERT to update assumptions and plans.

Moreover, the OFFB has a matrix organizational structure, where the staff has multiple managerial accountability and responsibility. Working with different ER operations over the years, they develop competences, knowledge (implicit and explicit) and skills. This inherent expertise calls for some sort of institutionalized memory (e.g., establishing best practices documents, personal notes, experiences database, a collective system of sense-making and information-processing systems and toolbox meetings) to support learning by preserving acquired knowledge (L5-Table 1). However, note that our experiences are always related to the context of what we encountered. Therefore, in using a best-practice document, it is important that 'practitioners at the sharp end who are embedded in an evolving context' (Woods & Branlat, 2011, p. 201) interpret the content of the best-practice document and reassess whether it fits with the current context of the situation at hand.

Crue and Francis (2020) argue that the variety of operational environments, and divergence of tasks and area of responsibilities between normal versus emergency situations, challenge developing training activities within the emergency-management context. The adaptability of cross-training (L3-Table 1) deals with these challenges and promotes proactive learning. As a part of the organizational objective, the OFFB seeks to offer several level-three exercises (L4-Table 1) that involve active participation from all lines in the emergency response organization, together with as many organizations/personnel as possible that would be interested in a real incident. As an indicator in this sense, the OFFB uses the 'number of conducted exercises' to measure training activities. However, this index relies on lagging indicators rather than leading ones. If the objective of such an overwhelming exercise is to improve coordination capacity, leading indicators could be related to decision support and joint decision-making and interaction (S5). Furthermore, the number of critical comments gathered through training activities, the development of an incentive plan, and an assessment of the training effects on critical thinking skills by post-testing employees after each training session could represent additional indicators to measure RIFs regarding the adaptability of cross-training activities. A mix of leading and lagging indicators to measure RIFs provides insights about organizational performance, both from strategic and operational levels in everyday activities.

5 | FINAL REMARKS

In this paper, we have presented a framework that links BCM and resilience engineering (RE). This unified approach allows for a shift in thinking from control to flexibility and from accountability to adaptability, thereby enhancing the capacity for 'anticipated improvisation'. Furthermore, we have highlighted different issues that affect the resilience of the system's performance (e.g.,) a strategy formation that invites induced and autonomous strategic initiatives in a bottom-up fashion, the importance of critical thinking capabilities and improvisation and dynamic communication in the ER team.

To many, this perspective might represent a new approach since it allows questions to be asked concerning existing methods and established practices. In our view, it is more suited for managing business continuity in a turbulent world in which operations are conducted in an environment of great uncertainty. The approach to BCM presented in this work, however, does not make it easier to take a stand on the 'level' of resilience in an organization, as the traditional approach does, measuring performance by KPIs. The reality is much more complicated, allowing us to use a linear and causal method to develop BCM system. We believe the presented framework is more suitable for this purpose as it encourages broader knowledge processes, as indicated by the analysis in the previous section discussing RIFs. Although the context of this study is related to an emergency response organization, we believe the proposed framework can be applied in other contexts because of its generative nature.

While the proposed framework serves as the first stage for joint strategic research efforts in the intersection of BCM, strategy formation and RE, there is room for further development. Future research should aim to explore this area through normative and descriptive research methods to derive operational implications. To achieve this purpose, more practical applications should be encouraged to identify practical challenges as well as best practices for its implementation.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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