

Business Continuity Planning (BCP) Effectiveness in Multi-Hazard Environments: A Qualitative Evidence Synthesis

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Abstract

Business continuity planning (BCP) has emerged as a critical organizational capability for navigating increasingly complex and interconnected disaster scenarios. This qualitative study examines the effectiveness of BCP strategies when organizations face overlapping or sequential multi-hazard environments, including compound disasters such as pandemic-natural disaster combinations, cyber-attacks concurrent with supply chain disruptions, and cascading infrastructure failures. Drawing on thematic analysis of 90 recent scholarly works (2022-2026) encompassing case studies, semi-structured interviews, and qualitative frameworks across diverse sectors and geographic contexts, this research identifies five major themes that characterize effective BCP in multi-hazard contexts: 1) Adaptive BCP Frameworks and Flexibility, 2) Leadership, Governance, and Decision-Making Structures, 3) Communication and Information Flow Systems, 4) Inter-organizational Collaboration and Cross-Sector Coordination, and 5) Training, Preparedness Culture, and Organizational Learning. Findings reveal that traditional single-hazard BCP approaches prove inadequate when confronting compound disasters, necessitating dynamic capabilities, scenario-based planning for multiple simultaneous threats, and enhanced organizational resilience through continuous learning mechanisms. The study demonstrates that effective multi-hazard BCP requires moving beyond rigid, plan-centric approaches toward adaptive, capability-based systems that integrate risk sensing, strategic agility, and transformative organizational routines. Practical implications include recommendations for impact-based BCP development, enhanced cross-functional coordination, investment in digital infrastructure for crisis communication, and institutionalization of preparedness culture through regular training and simulation exercises. This research contributes to disaster management and organizational resilience literature by

providing an integrated qualitative framework for understanding BCP effectiveness in increasingly complex hazard landscapes.

Keywords

Business Continuity Planning, Multi-Hazard Environments, Organizational Resilience, Adaptive Capacity, Crisis Management, Disaster Preparedness, Qualitative Analysis, Compound Disasters, Inter-Organizational Collaboration, Leadership

1. Introduction

The contemporary organizational landscape is characterized by unprecedented complexity in disaster risk profiles, with enterprises increasingly confronting not isolated hazards but rather overlapping, cascading, and compounding disaster scenarios that challenge traditional business continuity planning (BCP) paradigms. The COVID-19 pandemic starkly illustrated this reality, as organizations simultaneously navigated public health crises, supply chain disruptions, workforce displacement, cybersecurity threats, and economic volatility—a confluence of hazards that exposed critical vulnerabilities in conventional single-hazard BCP frameworks (Riglietti, 2024; Ali et al., 2025). Recent catastrophic events, including the 2022 floods in Pakistan occurring amid ongoing political instability and economic crisis, the 2023 Turkey-Syria earthquakes compounded by pre-existing humanitarian emergencies, and the increasing frequency of climate-induced disasters overlapping with technological and socio-economic disruptions, underscore the urgent need to reconceptualize BCP effectiveness for multi-hazard environments (Kourehpaz et al., 2025; Chiba & Nagamatsu, 2023).

Business continuity planning, traditionally defined as the proactive development of strategies and procedures to ensure critical business functions can continue during and after disruptive events, has evolved significantly since its formalization in the 1970s (Hassel & Cedergren, 2024; Steen et al., 2023). Contemporary BCP frameworks, codified in international standards such as ISO 22301:2019, emphasize systematic approaches to identifying threats, assessing impacts, developing response strategies, and establishing recovery procedures (Puspitaningrum, 2022; Hadiwibowo et al., 2025). However, these frameworks predominantly reflect single-hazard thinking—planning for discrete events such as fires, floods, or cyberattacks in isolation—rather than addressing the complex interdependencies and cascading effects characteristic of multi-hazard scenarios (Chiba & Nagamatsu, 2023; MEECHANG, 2023). For the purposes of this study, BCP effectiveness is operationally defined as an organization's demonstrated capacity to: 1) maintain continuity of critical business functions during and after disruptive events; 2) recover operations within pre-defined time and service-level objectives; 3) adapt plans and capabilities in response to evolving or compounding threats;

and 4) coordinate responses across internal functions and external partners. This definition is used consistently throughout the paper to evaluate and compare BCP approaches across the analyzed studies.

Multi-hazard environments present qualitatively different challenges than single-hazard contexts. When disasters overlap temporally or sequentially, they create compounding effects that exceed the sum of individual hazard impacts, overwhelming organizational response capacities, depleting resources more rapidly, and generating novel vulnerabilities not anticipated in traditional BCP documents (Kourehpaz et al., 2025; Khajehei et al., 2026). For instance, organizations responding to natural disasters during the COVID-19 pandemic faced simultaneous challenges of physical infrastructure damage, public health protocols limiting response activities, supply chain disruptions affecting recovery resources, and workforce constraints due to illness or quarantine requirements—a complexity that rendered many existing BCPs inadequate or obsolete (Bou-Slihim et al., 2023; Sachiyuka & Mwanza, 2024).

The concept of organizational resilience has emerged as a critical complement to traditional BCP, emphasizing not merely the ability to maintain operations during disruptions but the capacity to adapt, learn, and transform in response to changing threat landscapes (Hollands et al., 2023; Aksay & Şendoğdu, 2022). Resilient organizations demonstrate dynamic capabilities—the ability to sense emerging threats, seize opportunities for adaptation, and transform organizational routines and structures to enhance future preparedness (Kristian et al., 2025; de Moura & Amelia Tomei, 2021). This resilience perspective shifts focus from rigid, plan-centric approaches to flexible, capability-based systems that can respond effectively to unanticipated scenarios and compound disasters (Yulianto et al., 2025; Lutz & Schutte, 2025).

Despite growing recognition of multi-hazard risks and the importance of organizational resilience, significant gaps persist in understanding how BCP effectiveness manifests in compound disaster contexts. Existing research has predominantly examined BCP implementation in single-hazard scenarios or focused on specific sectors or geographic regions, limiting generalizability (Qutieshat & Musumali, 2022; Poto et al., 2025). Moreover, while quantitative studies have identified factors associated with BCP adoption and compliance, qualitative research exploring the lived experiences of organizations navigating multi-hazard environments, the mechanisms through which BCP contributes to resilience, and the contextual factors shaping effectiveness remains limited (Riglietti, 2024; Dorbor, 2024).

This study addresses these gaps through a comprehensive qualitative analysis examining BCP effectiveness in multi-hazard environments. The research is guided by the following overarching question: *How do business continuity planning strategies contribute to organizational resilience and operational continuity when organizations face overlapping or sequential multi-hazard scenarios?* Subsidiary questions include: 1) What characteristics distinguish effective BCP frameworks in multi-hazard contexts from traditional single-hazard approaches? 2) How do leadership, govern-

ance structures, and organizational culture influence BCP effectiveness during compound disasters? 3) What role do communication systems and inter-organizational collaboration play in enabling continuity across multi-hazard scenarios? 4) How do training, preparedness culture, and organizational learning mechanisms enhance adaptive capacity in the face of compound disasters?

To address these questions, this study employs thematic analysis of 90 recent scholarly works (2022-2026) that examine BCP implementation, organizational resilience, and disaster management across diverse sectors, organizational types, and geographic contexts. The analysis synthesizes findings from case studies, semi-structured interviews, document analyses, and mixed-methods investigations to identify common themes, patterns, and mechanisms characterizing effective BCP in multi-hazard environments. This approach enables rich, contextualized understanding of BCP effectiveness while identifying transferable principles applicable across varied organizational settings.

The significance of this research is multifaceted. Theoretically, it contributes to business continuity and disaster management literature by developing an integrated qualitative framework that bridges BCP planning, organizational resilience, and multi-hazard risk management—domains that have often developed in parallel with limited cross-fertilization. The study extends dynamic capabilities theory by examining how organizations develop, deploy, and reconfigure continuity capabilities in response to compound disasters. Methodologically, the research demonstrates the value of qualitative synthesis approaches for generating actionable insights from diverse case-based evidence, complementing quantitative meta-analyses that dominate the field.

Practically, this research provides evidence-based guidance for organizational leaders, business continuity professionals, and policymakers seeking to enhance preparedness for increasingly complex disaster scenarios. The identified themes and mechanisms offer concrete targets for BCP improvement, while the comparative analysis across sectors and contexts illuminates transferable best practices and context-specific adaptations. Given projections of increasing disaster frequency and complexity due to climate change, urbanization, technological interdependencies, and socio-economic volatility, enhancing BCP effectiveness in multi-hazard environments represents a critical imperative for organizational sustainability and societal resilience (Musa & Seetharaman 2025; Jain & Mitra, 2025).

The remainder of this article is structured as follows. Section 2 reviews relevant literature on business continuity planning, multi-hazard environments, organizational resilience, and BCP implementation challenges. Section 3 details the qualitative methodology, including data sources, thematic analysis procedures, and quality considerations. Section 4 presents five major themes emerging from the analysis, supported by extensive evidence from the reviewed studies. Section 5 discusses theoretical and practical implications, integrating findings with existing frameworks and identifying limitations. Section 6 concludes with key contributions, practical recommendations, and directions for future research.

2. Literature Review

2.1. Business Continuity Planning: Conceptual Foundations

Business continuity planning (BCP) represents a systematic approach to ensuring organizational survival and operational continuity in the face of disruptive events. Rooted in disaster recovery planning that emerged in the 1970s, BCP has evolved into a comprehensive management discipline encompassing risk assessment, business impact analysis, strategy development, plan implementation, testing, and continuous improvement (Steen et al., 2023; Hassel & Cedergren, 2024). Contemporary BCP frameworks, codified in international standards such as ISO 22301:2019 and ISO 27031:2011, emphasize proactive identification of critical business functions, systematic analysis of potential threats, development of response and recovery strategies, and establishment of governance structures to ensure plan effectiveness (Puspitaningrum, 2022; Kosmowski et al., 2022).

The conceptual foundation of BCP rests on several core principles. First, BCP adopts a risk-based approach, requiring organizations to identify and assess potential threats to operations, evaluate their likelihood and potential impact, and prioritize continuity efforts accordingly (Bobel et al., 2022; Ostadi et al., 2023). Second, BCP emphasizes business impact analysis (BIA) as a critical tool for understanding dependencies among business processes, identifying critical functions that must be maintained or rapidly restored, and establishing recovery time objectives (RTOs) and recovery point objectives (RPOs) that guide response priorities (Rosini & Neubarth, 2023; Hendaryatna et al., 2023). Third, effective BCP requires integration across organizational functions, ensuring coordination among operations, information technology, human resources, facilities management, and external stakeholders (Hadiwibowo et al., 2025; Farinha et al., 2025).

Recent scholarship has increasingly emphasized the distinction between business continuity management (BCM) as an ongoing organizational capability and business continuity plans as documented artifacts (Steen et al., 2023; Gracey & Yearwood, 2022). This distinction recognizes that effective continuity requires not merely written plans but embedded organizational capabilities, including trained personnel, established communication channels, tested procedures, and a culture of preparedness that enables rapid, coordinated response when disruptions occur (Yulianto et al., 2025; Jain & Mitra, 2025). The “Continuity Governance” model proposed by recent researchers adds a critical process stage to traditional BCM systems, emphasizing the role of governance structures in underpinning organizational resilience (Loyarte et al., 2024).

Despite widespread recognition of BCP importance, implementation remains uneven across organizational types and sectors. Large enterprises and critical infrastructure organizations typically maintain mature BCP programs, often driven by regulatory requirements, stakeholder expectations, or prior experience with disruptions (Gracey & Yearwood, 2022; Rosini & Neubarth, 2023). In contrast, small and medium-sized enterprises (SMEs) frequently lack comprehensive BCP, constrained by limited resources, competing priorities, and insufficient awareness of continuity plan-

ning benefits (Qutieshat & Musumali, 2022; Ohiwere & Alumbugu, 2024). Sector-specific factors also influence BCP adoption and effectiveness, with financial services, healthcare, and telecommunications demonstrating higher maturity levels than retail, hospitality, or construction sectors (Bobel et al., 2022; Naidoo & Hoque, 2024).

The COVID-19 pandemic served as a global stress test for organizational BCP, revealing both strengths and critical weaknesses in existing frameworks. Organizations with established BCPs generally demonstrated superior resilience, maintaining operations more effectively and recovering more rapidly than those without formal continuity plans (Riglietti, 2024; Musesengwa & Zvikaramba, 2023). However, the pandemic also exposed limitations in traditional BCP approaches, particularly their focus on short-term disruptions and single-hazard scenarios rather than prolonged, multi-faceted crises (Bou-Slihim et al., 2023; Dorbor, 2024). Many organizations found their BCPs became obsolete as the pandemic evolved, requiring continuous adaptation and improvisation beyond documented procedures (Shamieh, 2026; Mafimisebi et al., 2023).

2.2. Multi-Hazard Environments and Compound Disasters

Multi-hazard environments are characterized by the presence of multiple potential threats that may occur simultaneously, sequentially, or in cascading patterns, creating compound effects that exceed the sum of individual hazard impacts (Kourehpaz et al., 2025; Chiba & Nagamatsu, 2023). These environments present qualitatively different challenges than single-hazard contexts, as interactions among hazards can amplify vulnerabilities, overwhelm response capacities, and generate novel risks not anticipated in traditional planning frameworks (Khajehei et al., 2026; Senevirathne et al., 2024).

Compound disasters manifest in several forms. Simultaneous hazards occur when multiple threats impact an organization concurrently, such as a cyberattack during a natural disaster or a pandemic coinciding with an economic crisis (Chiba & Nagamatsu, 2023; MEECHANG, 2023). Sequential hazards involve successive disasters that prevent full recovery from initial events, depleting resources and compounding vulnerabilities—exemplified by aftershocks following major earthquakes or secondary floods after hurricanes (Kourehpaz et al., 2025; Caldera et al., 2025). Cascading hazards describe scenarios where initial disruptions trigger secondary and tertiary effects across interconnected systems, such as power outages causing water system failures, telecommunications disruptions, and supply chain breakdowns (Castro Rodriguez et al., 2025; Kosmowski et al., 2022).

The increasing prevalence of multi-hazard scenarios reflects several converging trends. Climate change is intensifying natural hazards and increasing the frequency of extreme weather events, while urbanization concentrates populations and assets in hazard-prone areas, amplifying potential impacts (Yulianto et al., 2025; Rahayu et al., 2024). Technological interdependencies create new vulnerabilities, as organizations rely on complex networks of digital systems, supply chains, and infrastructure that can fail in cascading patterns (Musa & Seetharaman,

2025; Kosmowski et al., 2022). Globalization links organizations to distant suppliers, markets, and partners, transmitting disruptions rapidly across geographic boundaries (Riglietti, 2024; Jones, 2024).

Research on multi-hazard risk perception and preparedness reveals significant gaps in organizational readiness. Studies indicate that emergency managers and organizational leaders often focus on single hazards that are most salient or have occurred recently, neglecting less frequent but potentially catastrophic compound scenarios (Mercado, 2024; Nakasu et al., 2022). This single-hazard bias is reinforced by institutional structures, funding mechanisms, and planning frameworks that compartmentalize risks rather than addressing interactions and cascading effects (Tanner, 2022; Al Hajri, 2024). Consequently, many organizations lack scenarios, response protocols, or resource allocations for compound disasters, leaving them vulnerable when multiple hazards converge (Chiba & Nagamatsu, 2023; MEECHANG, 2023).

The concept of Area-Business Continuity Management (Area-BCM) has emerged as one approach to addressing multi-hazard challenges, particularly in contexts where multiple organizations and stakeholders must coordinate responses across geographic areas (MEECHANG, 2023; Hassel & Cedergren, 2024). Area-BCM recognizes that effective continuity in multi-hazard environments requires not only internal organizational preparedness but also coordination with external actors, including government agencies, critical infrastructure providers, suppliers, and community organizations (Hassel et al., 2024; Osei-Kyei et al., 2024). This multi-stakeholder perspective acknowledges that compound disasters often exceed individual organizational response capacities, necessitating collaborative approaches to resource sharing, mutual aid, and coordinated recovery (Khajehei et al., 2026; Ntale et al., 2026).

2.3. Organizational Resilience and Adaptive Capacity

Organizational resilience has emerged as a critical complement to traditional BCP, shifting focus from maintaining predetermined operations to developing adaptive capabilities that enable organizations to navigate uncertainty, learn from disruptions, and transform in response to changing environments (Hollands et al., 2023; Aksay & Şendoğdu, 2022). While BCP emphasizes planning and preparation for anticipated scenarios, resilience encompasses the broader capacity to absorb shocks, adapt to unexpected circumstances, and emerge stronger from crises (Yulianto et al., 2025; Cuno-Chunga et al., 2025).

Theoretical frameworks for organizational resilience draw on multiple disciplines, including ecology, psychology, engineering, and organizational studies. Ecological resilience concepts emphasize the ability of systems to absorb disturbances while maintaining essential functions and structures (de Moura & Amelia Tomei, 2021; Matos et al., 2022). Engineering resilience focuses on the speed and efficiency of return to equilibrium following disruptions (Kourehpaz et al., 2025). Organizational resilience integrates these perspectives, emphasizing both stability (maintaining critical functions) and flexibility (adapting to new circumstances) as

complementary capabilities (Steen et al., 2023; Benardi et al., 2024).

Dynamic capabilities theory provides a particularly relevant lens for understanding organizational resilience in multi-hazard contexts (Kristian et al., 2025; Jones, 2024). Dynamic capabilities encompass three core processes: sensing (identifying and assessing emerging threats and opportunities), seizing (mobilizing resources and taking strategic actions in response to identified changes), and transforming (reconfiguring organizational routines, structures, and capabilities to enhance future adaptiveness) (Kristian et al., 2025; de Moura & Amelia Tomei, 2021). Organizations with strong dynamic capabilities can detect early warning signals of compound disasters, rapidly deploy response strategies, and learn from experiences to enhance future preparedness (Guo et al., 2025; Hollands et al., 2023).

Empirical research has identified multiple factors contributing to organizational resilience. Leadership emerges consistently as a critical enabler, with resilient organizations characterized by leaders who demonstrate adaptive decision-making, maintain clear communication during crises, prioritize employee well-being, and foster cultures of learning and innovation (Aksay & Şendoğdu, 2022; Cuno-Chunga et al., 2025). Resource management and flexibility, including financial reserves, diversified supply chains, and technological infrastructure, provide buffers against disruptions and enable rapid adaptation (Matos et al., 2022; Atkinson, 2022). Communication and coordination mechanisms, both internal and external, facilitate information flow, enable collaborative problem-solving, and support coordinated responses across organizational boundaries (Mercado, 2024; Danzi et al., 2024).

Organizational learning represents another critical dimension of resilience, encompassing the ability to extract lessons from disruptions, update mental models and procedures, and institutionalize improvements in preparedness (Hollands et al., 2023; Da Matta Felisberto et al., 2022). Resilient organizations establish feedback loops that capture insights from crisis experiences, conduct after-action reviews to identify strengths and weaknesses, and translate lessons into updated plans, training programs, and organizational routines (Jain & Mitra, 2025; Musa & Seetharaman, 2025). This learning orientation enables continuous improvement in BCP effectiveness and adaptive capacity over time (Yulianto et al., 2025; Lutz & Schutte, 2025).

The relationship between BCP and organizational resilience has been conceptualized in multiple ways. Some scholars view BCP as a component of broader resilience capabilities, providing structured approaches to anticipation and preparation that complement adaptive and learning capacities (Steen et al., 2023; Ostadi et al., 2023). Others emphasize tensions between planning and adaptation, noting that rigid adherence to predetermined plans can inhibit the flexibility required for effective response to unanticipated scenarios (Bou-Slihim et al., 2023; Mafimisebi et al., 2023). Recent integrative frameworks propose that effective resilience requires balancing planned and adaptive approaches, with formal BCP providing foundational capabilities while organizational culture, leadership, and learning mechanisms enable adaptation when plans prove insufficient (Ali et al., 2025; Yulianto et al., 2025).

2.4. BCP Implementation Challenges and Success Factors

Despite widespread recognition of BCP importance, organizations face numerous challenges in developing, implementing, and maintaining effective continuity capabilities. Understanding these barriers and enablers is critical for enhancing BCP effectiveness, particularly in multi-hazard contexts where implementation complexity increases substantially (Qutieshat & Musumali, 2022; Lutz & Schutte, 2025).

Organizational barriers represent a primary category of implementation challenges. Resource constraints, including limited financial budgets, insufficient personnel, and competing priorities, frequently impede BCP development and maintenance, particularly in SMEs and resource-constrained public sector organizations (Qutieshat & Musumali, 2022; Poto et al., 2025). Organizational culture can either facilitate or hinder BCP implementation, with cultures emphasizing short-term performance, risk-taking, or operational efficiency sometimes viewing continuity planning as bureaucratic overhead rather than strategic investment (Aksay & Şendoğdu, 2022; Musa & Seetharaman, 2025). Leadership commitment and support prove critical for BCP success, yet many organizations struggle to maintain executive attention and resource allocation for continuity planning absent recent crisis experiences (Enriquez & Anthony, 2025; Oliynik, 2025).

Technical challenges also impede BCP effectiveness. The complexity of modern organizational operations, with intricate dependencies among processes, technologies, and external partners, makes comprehensive business impact analysis and continuity planning technically demanding (Rosini & Neubarth, 2023; Hadiwibowo et al., 2025). Rapid technological change can render BCP documents obsolete, requiring continuous updates to reflect new systems, processes, and vulnerabilities (Oliynik, 2025; Musa & Seetharaman, 2025). Testing and exercising BCPs presents logistical challenges, as realistic simulations may disrupt operations, while limited testing leaves plans unvalidated and personnel unprepared (Rosini & Neubarth, 2023; Gracey & Yearwood, 2022).

External constraints further complicate BCP implementation. Regulatory requirements vary across jurisdictions and sectors, creating compliance burdens while sometimes failing to address organization-specific risks (Hadiwibowo et al., 2025; Poto et al., 2025). Economic instability and market volatility can constrain resources available for continuity investments, particularly during periods when BCP may be most needed (Oliynik, 2025; Sachiyyuka & Mwanza, 2024). Supply chain dependencies and reliance on external service providers introduce vulnerabilities beyond organizational control, requiring collaborative continuity planning that many organizations find difficult to coordinate (Riglietti, 2024; Jones, 2024).

Research has also identified numerous enablers and success factors for effective BCP implementation. Top management support and visible leadership commitment provide legitimacy, resources, and organizational attention necessary for sustained continuity efforts (Gracey & Yearwood, 2022; Benardi et al., 2024). Integration of BCP into organizational culture and routine operations, rather than treating it as a separate compliance exercise, enhances engagement and effective-

ness (Yulianto et al., 2025; Jain & Mitra, 2025). Regular training and awareness programs build competencies, maintain preparedness, and reinforce the importance of continuity planning across the organization (Cuno-Chunga et al., 2025; Hadiwibowo et al., 2025).

Adoption of recognized standards and frameworks, such as ISO 22301, provides structured methodologies, enhances credibility, and facilitates benchmarking and continuous improvement (Puspitaningrum, 2022; Jones, 2024). Investment in digital technologies, including cloud computing, collaboration platforms, and data analytics, enables remote work capabilities, enhances communication during disruptions, and supports real-time monitoring and decision-making (Musa & Seetharaman, 2025; Sachiyuka & Mwanza, 2024). Establishment of cross-functional continuity teams and clear governance structures ensures coordination across organizational silos and maintains accountability for continuity preparedness (Hadiwibowo et al., 2025; Richardson, 2025).

External collaboration and partnerships extend organizational continuity capabilities beyond internal resources, enabling mutual aid, resource sharing, and coordinated responses during large-scale disruptions (Hassel & Cedergren, 2024; Osei-Kyei et al., 2024). Learning from past disruptions and incorporating lessons into updated plans and procedures drives continuous improvement in BCP effectiveness (Hollands et al., 2023; Shamieh, 2026). Finally, adaptive approaches that balance formal planning with flexibility and improvisation enable organizations to respond effectively to unanticipated scenarios and compound disasters that exceed predetermined plan parameters (Mafimisebi et al., 2023; Ali et al., 2025).

3. Methodology

3.1. Research Design and Philosophical Approach

This study employs a qualitative research design grounded in interpretivist epistemology, which recognizes that understanding organizational phenomena requires examining the meanings, experiences, and contexts through which actors construct and enact social reality (Cuno-Chunga et al., 2025; Aksay & Şendoğdu, 2022). The interpretivist approach is particularly appropriate for investigating BCP effectiveness in multi-hazard environments, as it enables exploration of how organizational members experience compound disasters, the sense-making processes through which they interpret and respond to complex threats, and the contextual factors shaping continuity outcomes (Riglietti, 2024; Dorbor, 2024).

The research adopts a qualitative synthesis methodology, specifically thematic analysis of published case studies, interview-based investigations, and qualitative frameworks examining BCP implementation and organizational resilience across diverse contexts. Qualitative synthesis approaches have gained recognition as valuable methods for generating actionable insights from accumulated case-based evidence, complementing traditional systematic reviews focused on quantitative studies (Ostadi et al., 2023; Qutieshat & Musumali, 2022). By systematically analyzing patterns across multiple qualitative studies, this approach enables identifi-

cation of transferable themes and mechanisms while preserving the rich, contextualized understanding characteristic of qualitative research (Hollands et al., 2023; Mercado, 2024). To be explicit: this study is a qualitative evidence synthesis. It systematically identifies, selects, and interpretively integrates findings from published qualitative and mixed-methods research rather than collecting primary data. The corpus includes empirical studies, conceptual frameworks, doctoral dissertations, and repository-based working papers, all of which were analyzed alongside peer-reviewed journal articles because they contribute substantive evidence on BCP practice in multi-hazard contexts. This inclusive approach is consistent with the study's interpretivist epistemology and its aim to capture the full range of available qualitative evidence on the topic.

The study's analytical framework draws on grounded theory principles, particularly the iterative process of moving between data and emerging concepts to develop theoretically informed yet empirically grounded understanding (Aksay & Şendoğdu, 2022; Cuno-Chunga et al., 2025). While not conducting primary data collection, the analysis treats published qualitative findings as data, systematically coding and categorizing insights to identify recurring themes, patterns, and relationships characterizing effective BCP in multi-hazard contexts (Riglietti, 2024; Yulianto et al., 2025).

3.2. Data Sources and Selection Criteria

The study's evidence base comprises 90 scholarly works published between 2022 and 2026, selected through systematic searches of academic databases including SciSpace, Google Scholar, and full-text repositories. The temporal focus on recent publications ensures relevance to contemporary multi-hazard challenges, particularly insights emerging from COVID-19 pandemic experiences and recent compound disaster events (Riglietti, 2024; Chiba & Nagamatsu, 2023). Searches were conducted between January and March 2025. Database-specific limits applied were: SciSpace (publication year 2022-2026, all document types); Google Scholar (publication year 2022-2026, English-language); and full-text repositories (no language restriction, 2022-2026). No grey-literature databases (e.g., OpenGrey) were searched; grey literature entered the corpus only when retrieved through the three primary search streams and meeting all inclusion criteria.

Three complementary search strategies were employed to ensure comprehensive coverage. The first search focused specifically on "BCP effectiveness in multi-hazard environments," yielding 68 unique papers examining business continuity planning in contexts involving multiple or compound hazards (MEECHANG, 2023; Hassel & Cedergren, 2024). The second search targeted "organizational resilience and multi-hazard disaster recovery," producing 76 papers exploring resilience mechanisms and recovery processes in compound disaster contexts (Khajehei et al., 2026; Kourehpaz et al., 2025). The third search addressed "BCP implementation challenges and adaptive capacity," generating 74 papers examining barriers, enablers, and adaptive approaches to continuity planning (Riglietti, 2024; Lutz & Schutte, 2025). The exact search strings used were as follows. Stream 1:

("business continuity plan*" OR "BCP") AND ("multi-hazard" OR "compound disaster" OR "cascading disaster" OR "overlapping hazard") AND ("effectiveness" OR "resilience" OR "adaptive capacity"). Stream 2: ("organizational resilience" OR "business resilience") AND ("multi-hazard" OR "compound disaster" OR "disaster recovery") AND ("qualitative" OR "case study" OR "interview"). Stream 3: ("business continuity" OR "BCM") AND ("implementation challenge*" OR "adaptive capacity" OR "preparedness") AND ("multi-hazard" OR "crisis management" OR "pandemic"). The three streams returned 68, 76, and 74 unique records respectively (218 total before deduplication). Deduplication was performed manually by comparing titles and DOIs across the three result sets, removing 87 duplicates to yield 131 unique records. Abstract screening against the inclusion criteria excluded a further 41 records. Full-text review of the remaining 90 records confirmed eligibility, resulting in the final corpus of 90 studies.

Inclusion criteria required that papers: 1) address business continuity planning, organizational resilience, or disaster preparedness as primary topics; 2) employ qualitative methods (case studies, interviews, document analysis) or mixed methods with substantial qualitative components; 3) examine organizational responses to disasters, crises, or disruptions; 4) provide empirical evidence rather than purely conceptual or theoretical contributions; and 5) be published in peer-reviewed journals, conference proceedings, or reputable institutional repositories. Papers were excluded if they focused exclusively on technical disaster recovery (e.g., IT systems backup) without addressing broader organizational continuity, examined individual or community resilience without organizational dimensions, or lacked sufficient methodological detail to assess quality. **Figure 1** provides a visual summary of the search and selection process below.

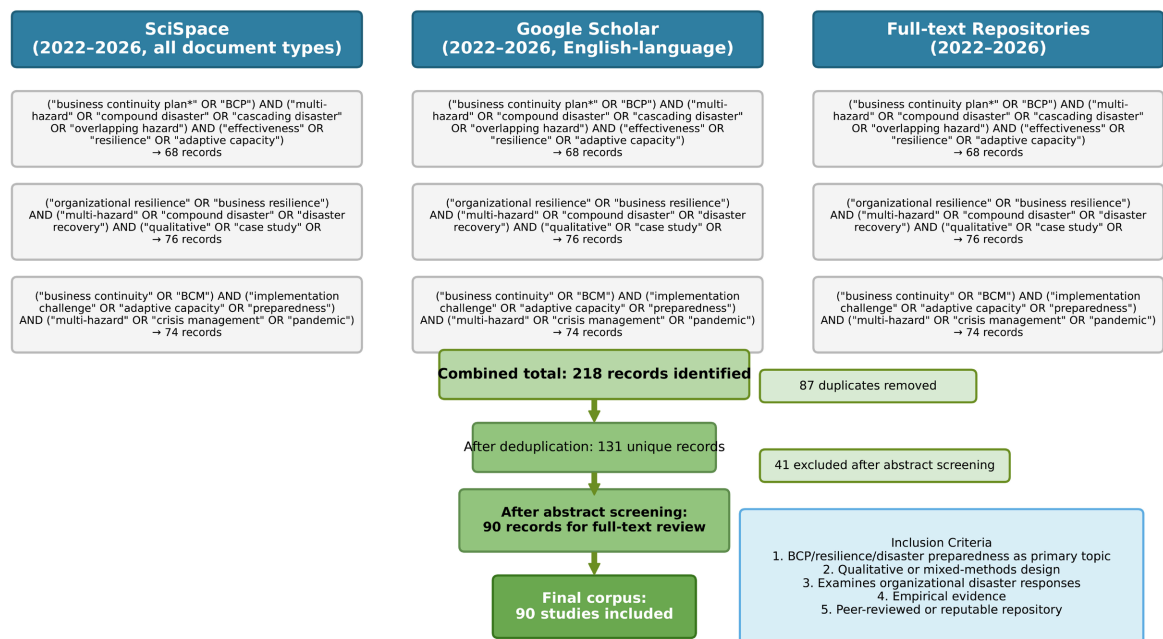


Figure 1. PRISMA-style flowchart illustrating the three-stream literature search strategy, deduplication process, and final study selection for the qualitative synthesis (January-March 2025).

The final corpus encompasses diverse sectors including healthcare, financial services, tourism and hospitality, manufacturing, public administration, critical infrastructure, and small-medium enterprises. Geographic coverage spans developed and developing contexts across Asia, Europe, Africa, North America, South America, and Oceania, enabling examination of how contextual factors shape BCP effectiveness (Poto et al., 2025; Alhammadi, 2025). Hazard types examined include natural disasters (earthquakes, floods, hurricanes, wildfires), public health emergencies (COVID-19 pandemic), technological disruptions (cyberattacks, infrastructure failures), and socio-economic crises (economic downturns, supply chain disruptions, political instability) (Chiba & Nagamatsu, 2023; Riglietti, 2024).

3.3. Thematic Analysis Framework

The study employed Braun and Clarke's six-phase thematic analysis framework, adapted for synthesis of published qualitative research. This systematic approach ensures rigor and transparency while enabling flexible, iterative engagement with the evidence base (Cuno-Chunga et al., 2025; Mercado, 2024).

Phase 1: Familiarization with the data. The analysis began with comprehensive reading of all 90 papers, focusing on sections reporting empirical findings, participant quotes, case descriptions, and author interpretations. Initial notes captured key concepts, interesting patterns, and potential themes relevant to BCP effectiveness in multi-hazard contexts (Riglietti, 2024; Yulianto et al., 2025).

Phase 2: Generating initial codes. Systematic coding identified specific features of the data relevant to the research questions. Codes captured factors contributing to BCP effectiveness (e.g., "leadership decision-making," "cross-functional coordination," "scenario-based planning"), challenges and barriers (e.g., "resource constraints," "plan obsolescence," "single-hazard bias"), and contextual influences (e.g., "organizational size," "sector characteristics," "regulatory environment"). Coding was conducted iteratively, with codes refined and consolidated as patterns emerged (Aksay & Şendoğdu, 2022; Hollands et al., 2023).

Phase 3: Searching for themes. Codes were organized into potential themes representing broader patterns across the dataset. This phase involved grouping related codes, identifying relationships among concepts, and developing preliminary thematic structures. For example, codes related to "adaptive planning," "flexibility," "improvisation," and "dynamic capabilities" were grouped under a potential theme of "Adaptive BCP Frameworks" (Mafimisebi et al., 2023; Ali et al., 2025).

Phase 4: Reviewing themes. Potential themes were refined through iterative review against coded data and the full dataset. This phase assessed whether themes were internally coherent (codes within themes fit together meaningfully), externally distinct (clear boundaries between themes), and adequately represented the data (sufficient evidence supporting each theme). Some themes were merged, others subdivided, and several refined to better capture the data's complexity (Hassel & Cedergren, 2024; Steen et al., 2023).

Phase 5: Defining and naming themes. Final themes were clearly defined, with boundaries specified and relationships among themes articulated. Each theme was named to capture its essence concisely while remaining accessible to diverse audiences. Detailed descriptions specified what each theme encompasses, how it relates to BCP effectiveness in multi-hazard contexts, and how it connects to broader theoretical frameworks (Kristian et al., 2025; de Moura & Amelia Tomei, 2021).

Phase 6: Producing the report. The final phase involved constructing a coherent narrative that presents themes with supporting evidence, illustrative examples, and connections to existing literature. The analysis emphasizes both description (what characterizes effective BCP in multi-hazard contexts) and interpretation (why these characteristics matter and how they contribute to organizational resilience) (Yulianto et al., 2025; Jain & Mitra, 2025).

3.4. Quality and Rigor Considerations

Several strategies ensured the quality and rigor of this qualitative synthesis. Systematic search and selection procedures enhanced comprehensiveness and transparency, with explicit inclusion/exclusion criteria and documentation of search strategies enabling assessment of the evidence base's scope and potential biases (Qutieshat & Musumali, 2022; Naidoo & Hoque, 2024). Iterative coding and theme development involved multiple rounds of analysis, with themes refined through continuous comparison with the data to ensure adequate representation and avoid premature closure on interpretations (Aksay & Şendoğdu, 2022; Hollands et al., 2023). An explicit quality-appraisal step was applied to all 90 included studies prior to thematic coding. Each study was assessed using an adapted version of the Critical Appraisal Skills Programme (CASP) Qualitative Checklist (10 criteria), supplemented by two additional criteria specific to BCP synthesis: 1) clarity of hazard context description, and 2) specificity of BCP-related findings. Studies were rated as high (≥ 10 criteria met), moderate (7 - 9), or low (≤ 6). Of the 90 studies, 41 were rated high quality, 38 moderate, and 11 low. Low-quality studies were retained but flagged; during theme development, claims supported exclusively by low-quality studies were treated as tentative and noted as requiring further empirical verification. This appraisal process directly influenced the confidence assigned to each theme: themes supported predominantly by high-quality evidence are presented with greater certainty, while areas relying on lower-quality evidence are explicitly flagged in the findings.

Attention to context and variation ensured that themes captured both common patterns and important contextual differences, avoiding overgeneralization while identifying transferable insights (Poto et al., 2025; Yulianto et al., 2025). Reflexivity involved ongoing attention to how the researchers' perspectives, assumptions, and disciplinary backgrounds might influence interpretation, with explicit acknowledgment of the study's interpretivist epistemology and qualitative synthesis methodology (Cuno-Chunga et al., 2025; Riglietti, 2024). Regarding the coding

process: all 90 studies were coded by the lead researcher. To reduce interpretation bias in a single-coder design, three procedural safeguards were employed. First, a coding guide was developed a priori from the research questions and relevant theoretical constructs (dynamic capabilities, organizational resilience, BCP effectiveness), providing explicit definitions and decision rules for each code category. Second, a random 20% subsample (18 studies) was independently coded by a second reviewer with expertise in disaster management; intercoder agreement was assessed using Cohen's kappa ($\kappa = 0.78$, indicating substantial agreement), and discrepancies were resolved through discussion before proceeding with full corpus coding. Third, all candidate themes were reviewed by the full research team in a structured theme-review session, where each theme's definition, boundaries, and supporting evidence were interrogated and refined. These steps collectively strengthen the trustworthiness of the thematic structure.

Thick description provides sufficient detail about themes, supporting evidence, and contexts to enable readers to assess transferability to their own settings (Hassel & Cedergren, 2024; MEECHANG, 2023). **Triangulation across multiple studies** enhances credibility, as themes are supported by convergent evidence from diverse sectors, geographic contexts, and methodological approaches rather than single sources (Chiba & Nagamatsu, 2023; Kourehpaz et al., 2025). Finally, **explicit linkage to existing theory** situates findings within established frameworks while identifying novel contributions, enhancing both theoretical and practical utility (Kristian et al., 2025; Steen et al., 2023).

4. Findings

The thematic analysis identified five major themes characterizing effective business continuity planning in multi-hazard environments. These themes are interconnected and mutually reinforcing, collectively representing a comprehensive framework for understanding how organizations achieve operational continuity and resilience when confronting compound disasters. Each theme is presented with supporting evidence from the analyzed studies, illustrative examples, and connections to broader theoretical concepts.

4.1. Study Profile

Before presenting the thematic findings, a brief profile of the 90 included studies is provided to situate the evidence base. In terms of sector representation, the corpus spans healthcare and public health ($n = 18$), critical infrastructure and utilities ($n = 14$), tourism and hospitality ($n = 12$), manufacturing and supply chains ($n = 11$), public administration and government ($n = 13$), financial services ($n = 7$), and small-to-medium enterprises across mixed sectors ($n = 15$). Geographic coverage is broadly international: Asia-Pacific ($n = 27$), Europe ($n = 22$), Africa ($n = 14$), North America ($n = 13$), South America ($n = 9$), and multi-country or global studies ($n = 5$). Hazard types examined include natural disasters—earthquakes, floods, hurricanes, and wildfires ($n = 31$); public health emergencies, predomi-

nantly COVID-19 ($n = 35$); technological disruptions including cyberattacks and infrastructure failures ($n = 12$); and compound or multi-hazard scenarios combining two or more of the above categories ($n = 12$). Methodologically, the corpus comprises qualitative case studies ($n = 42$), interview-based investigations ($n = 21$), document and policy analyses ($n = 14$), mixed-methods studies with substantial qualitative components ($n = 9$), and conceptual or framework-building papers grounded in empirical evidence ($n = 4$). An appendix mapping each of the five themes to the specific studies providing primary support is provided at the end of this article (see Appendix A: Theme-to-Study Mapping).

4.1.1. Theme 1: Adaptive BCP Frameworks and Flexibility

The first major theme emphasizes that effective BCP in multi-hazard environments requires adaptive frameworks characterized by flexibility, dynamic capabilities, and capacity for improvisation rather than rigid adherence to predetermined plans. This theme emerged consistently across studies examining organizational responses to compound disasters, particularly COVID-19 pandemic experiences where traditional BCPs proved inadequate for prolonged, evolving crises (Bou-Slihim et al., 2023; Riglietti, 2024).

Organizations with effective multi-hazard BCP demonstrated several characteristics distinguishing them from traditional single-hazard approaches. First, they employed **impact-based planning** rather than hazard-specific scenarios, developing response capabilities applicable across multiple threat types (Chiba & Nagamatsu, 2023). Japanese companies adopting this approach found it “simplifies BCP development by applying to multiple hazards and unexpected damages, reducing operational burdens” while enabling more comprehensive preparedness than single-hazard plans (Chiba & Nagamatsu, 2023). This impact-based approach focuses on consequences (e.g., loss of facilities, supply chain disruption, workforce unavailability) rather than specific hazard types, enabling more flexible response to compound scenarios (MEECHANG, 2023; Hassel & Cedergren, 2024).

Second, effective multi-hazard BCP incorporated **scenario-based planning for compound disasters**, explicitly considering how multiple hazards might interact, overlap, or cascade (Nakasu et al., 2022; Kourehpaz et al., 2025). Research on multi-hazard recovery modeling demonstrated that “accounting for multi-hazard interactions yields exacerbated restoration times,” with compound disasters creating delays and resource constraints not captured in single-hazard scenarios (Kourehpaz et al., 2025). Organizations that developed scenarios for simultaneous or sequential hazards were better prepared to respond when compound disasters occurred, having anticipated resource conflicts, competing priorities, and cascading effects (Chiba & Nagamatsu, 2023; MEECHANG, 2023).

Third, adaptive BCP frameworks emphasized **continuous monitoring and revision** rather than static plans (Bou-Slihim et al., 2023; Rosini & Neubarth, 2023). Studies found that BCPs “become obsolete due to lack of revision” and that effective continuity requires “ongoing process with revisions, updates, and adapta-

tions” as organizational contexts and threat landscapes evolve (Bou-Slihlim et al., 2023; Rosini & Neubarth, 2023). Organizations implementing regular BCP reviews, triggered by organizational changes, emerging threats, or lessons from exercises and actual events, maintained more relevant and effective continuity capabilities (Gracey & Yearwood, 2022; Jain & Mitra, 2025).

Fourth, effective multi-hazard BCP balanced **formal planning with improvisation and adaptive capacity** (Mafimisebi et al., 2023; Ali et al., 2025). Research on small business responses to crises found that “crisis planning, improvisation, and resilience occurring simultaneously are valuable and enrich crisis management practices,” with the most effective organizations demonstrating both preparedness and flexibility (Mafimisebi et al., 2023). This balance enabled organizations to leverage prepared capabilities while adapting to unanticipated circumstances, avoiding both the paralysis of having no plan and the rigidity of inflexible adherence to predetermined procedures (Shamieh, 2026; Yulianto et al., 2025).

The concept of **dynamic capabilities** provided theoretical grounding for adaptive BCP frameworks (Kristian et al., 2025; Jones, 2024). Organizations demonstrating effective multi-hazard continuity exhibited three core dynamic capabilities: **sensing** (detecting early warning signals of emerging threats and changing conditions), **seizing** (rapidly mobilizing resources and implementing response strategies), and **transforming** (reconfiguring organizational routines and structures based on crisis experiences) (Kristian et al., 2025). Public sector organizations developing these capabilities moved “beyond bureaucratic rigidity,” fostering “responsiveness and agility in navigating complex disaster environments” (Kristian et al., 2025).

Organizational learning mechanisms proved critical for maintaining adaptive BCP frameworks (Hollands et al., 2023; Jain & Mitra, 2025). Resilient organizations established feedback loops capturing insights from crisis experiences, conducted after-action reviews identifying strengths and weaknesses, and translated lessons into updated plans, training programs, and organizational routines (Hollands et al., 2023; Musa & Seetharaman, 2025). This learning orientation enabled “continuous improvement in BCP effectiveness and adaptive capacity over time,” with organizations becoming progressively better prepared for compound disasters through accumulated experience (Yulianto et al., 2025; Lutz & Schutte, 2025).

Technology played an important enabling role in adaptive BCP frameworks. Organizations investing in **digital infrastructure**, including cloud computing, collaboration platforms, and data analytics, demonstrated enhanced flexibility and continuity capabilities (Musa & Seetharaman, 2025; Sachiyyuka & Mwanza, 2024). Digital technologies enabled rapid transition to remote work during pandemic lockdowns, facilitated real-time communication and coordination during disruptions, and supported data-driven decision-making through monitoring and analytics (Atkinson, 2022; Aksay & Şendoğdu, 2022). However, technology alone proved insufficient without complementary organizational capabilities, culture, and governance structures (Musa & Seetharaman, 2025; Oliynik, 2025).

Challenges to implementing adaptive BCP frameworks included **organizational inertia and resistance to change**, particularly in bureaucratic or hierarchical organizations where established procedures and risk-averse cultures impeded flexibility (Kristian et al., 2025; Poto et al., 2025). **Resource constraints** limited capacity for continuous monitoring, regular updates, and investment in adaptive capabilities, especially in SMEs and resource-constrained public sector organizations (Qutieshat & Musumali, 2022; Lutz & Schutte, 2025). **Complexity and uncertainty** inherent in multi-hazard scenarios made comprehensive planning difficult, with organizations struggling to anticipate all possible compound disaster combinations and their interactions (Chiba & Nagamatsu, 2023; Kourehpaz et al., 2025).

Despite these challenges, the evidence strongly supports adaptive BCP frameworks as essential for effectiveness in multi-hazard environments. Organizations that developed flexible, learning-oriented continuity capabilities demonstrated superior resilience during compound disasters, maintaining operations more effectively and recovering more rapidly than those relying on rigid, single-hazard plans (Riglietti, 2024; Ali et al., 2025).

4.1.2. Theme 2: Leadership, Governance, and Decision-Making Structures

The second major theme highlights the critical role of leadership, governance structures, and decision-making processes in enabling effective BCP during multi-hazard scenarios. Leadership emerged consistently across studies as a primary determinant of organizational resilience, with effective leaders demonstrating adaptive decision-making, clear communication, employee-centered approaches, and commitment to continuity preparedness (Aksay & Şendoğdu, 2022; Cuno-Chunga et al., 2025).

Adaptive leadership characterized organizations successfully navigating compound disasters (Benardi et al., 2024; Matos et al., 2022). Resilient organizations benefited from “leaders who are intuitive, make quick decisions, and prioritize employee well-being,” demonstrating flexibility in response strategies while maintaining clear direction during uncertainty (Aksay & Şendoğdu, 2022). This adaptive leadership involved “setting the tone and making informed choices during emergencies,” balancing the need for decisive action with openness to new information and willingness to adjust strategies as situations evolved (Mercado, 2024; Enriquez & Anthony, 2025).

Top management support and visible commitment proved essential for sustained BCP effectiveness (Gracey & Yearwood, 2022; Benardi et al., 2024). Organizations where senior leaders actively championed continuity planning, allocated resources, and participated in exercises demonstrated more mature BCP capabilities and better crisis outcomes (Gracey & Yearwood, 2022; Jain & Mitra, 2025). Conversely, lack of executive support emerged as a primary barrier to BCP implementation, with continuity efforts struggling to gain traction absent leadership legitimacy and resource commitment (Enriquez & Anthony, 2025; Oliynik, 2025).

Governance structures provided critical frameworks for coordinating BCP across organizational functions and ensuring accountability (Hadiwibowo et al., 2025; Rosini & Neubarth, 2023). Effective governance included “internal audit committees, operational risk committees, and senior management involvement” in continuity oversight, with clear roles and responsibilities for BCP development, maintenance, and activation (Rosini & Neubarth, 2023). The “Continuity Governance” model proposed by recent research adds a critical process stage to traditional BCM systems, emphasizing governance as foundational to organizational resilience (Jones, 2024).

Cross-functional coordination emerged as essential for multi-hazard BCP effectiveness, given that compound disasters typically impact multiple organizational domains simultaneously (Hadiwibowo et al., 2025; Richardson, 2025). Organizations establishing cross-functional continuity teams, with representation from operations, IT, HR, facilities, and other key functions, demonstrated superior coordination during crises (Hadiwibowo et al., 2025; Musa & Seetharaman, 2025). However, many organizations struggled with coordination challenges, with 46% of large Japanese companies reporting “difficulty coordinating between departments” as a primary BCP implementation barrier (Chiba & Nagamatsu, 2023).

Decision-making processes during compound disasters required balancing speed with deliberation, centralization with distributed authority, and consistency with flexibility (Kristian et al., 2025; de Moura & Amelia Tomei, 2021). Effective organizations demonstrated “strong decision-making ability” supported by “systematic analysis of scenarios” and “rapid response” capabilities (Moura et al., 2022). They established clear decision-making protocols specifying authority levels, escalation procedures, and criteria for activating different response levels, while maintaining flexibility to adapt protocols when circumstances exceeded predetermined parameters (Gracey & Yearwood, 2022; Benardi et al., 2024).

Empowerment and distributed leadership complemented centralized coordination, enabling rapid response at operational levels while maintaining strategic coherence (Cuno-Chunga et al., 2025; Ali et al., 2025). Healthcare organizations demonstrating resilience during disasters empowered frontline workers to make decisions within their domains, supported by “leadership support and a shared sense of mission” that aligned distributed actions with organizational priorities (Cuno-Chunga et al., 2025). This distributed approach proved particularly valuable during compound disasters when communication disruptions or overwhelming demands prevented centralized decision-making for all issues (Atkinson, 2022; Guo et al., 2025).

Organizational culture shaped how leadership and governance structures functioned during crises (Aksay & Şendoğdu, 2022; Musa & Seetharaman, 2025). Organizations with cultures emphasizing “agility, innovation, digital transformation, and collaboration” demonstrated greater resilience, as cultural norms supported the flexibility and coordination required for effective multi-hazard response (Musa & Seetharaman, 2025). Conversely, cultures characterized by “bu-

reaucratic rigidity,” risk aversion, or siloed operations impeded effective BCP implementation and crisis response (Kristian et al., 2025; Poto et al., 2025).

Stakeholder engagement extended leadership and governance beyond organizational boundaries, recognizing that multi-hazard scenarios often require coordination with external actors (Hassel & Cedergren, 2024; Osei-Kyei et al., 2024). Effective leaders maintained relationships with government agencies, industry partners, suppliers, and community organizations, enabling collaborative responses when compound disasters exceeded individual organizational capacities (Khajehei et al., 2026; Danzi et al., 2024). This external engagement required “communication with all stakeholders and partners,” balancing organizational interests with broader community and societal needs (Rosini & Neubarth, 2023; Rivera et al., 2022).

Challenges to effective leadership and governance during multi-hazard scenarios included **information overload and uncertainty**, with leaders confronting incomplete, conflicting, or rapidly changing information about evolving threats (Pathak et al., 2022; Bou-Slihim et al., 2023). **Competing priorities and resource constraints** forced difficult trade-offs among response activities, recovery efforts, and ongoing operations (Kourehpaz et al., 2025; Poto et al., 2025). **Coordination complexity** increased exponentially with the number of affected functions, external partners, and simultaneous response activities required during compound disasters (Al Hajri, 2024; Chiba & Nagamatsu, 2023).

Despite these challenges, the evidence demonstrates that effective leadership, robust governance structures, and adaptive decision-making processes are foundational to BCP effectiveness in multi-hazard environments. Organizations with strong leadership and governance capabilities navigated compound disasters more successfully, maintaining operational continuity and organizational resilience even under extreme stress (Aksay & Şendoğdu, 2022; Benardi et al., 2024).

4.1.3. Theme 3: Communication and Information Flow Systems

The third major theme emphasizes the critical importance of communication and information flow systems for BCP effectiveness in multi-hazard environments. Effective communication emerged as a cross-cutting enabler, facilitating coordination, supporting decision-making, maintaining stakeholder confidence, and enabling organizational learning during and after compound disasters (Cuno-Chunga et al., 2025; Mercado, 2024).

Internal communication systems proved essential for coordinating organizational responses during multi-hazard scenarios (Benardi et al., 2024; Gracey & Yearwood, 2022). Organizations with “robust communication channels” maintained operational continuity more effectively, as communication enabled “timely information dissemination” about threats, response activities, and changing priorities (Benardi et al., 2024; Mercado, 2024). Effective internal communication included multiple channels (email, phone, messaging platforms, face-to-face), redundancy to ensure continuity if primary systems failed, and protocols specifying communication frequency, content, and audiences during different crisis phases

(Gracey & Yearwood, 2022; Hadiwibowo et al., 2025).

Crisis communication protocols provided structured approaches to information sharing during disruptions (Gracey & Yearwood, 2022; Musa & Seetharaman, 2025). These protocols specified who communicates what information to whom, when, and through which channels, reducing confusion and ensuring consistent messaging (Hadiwibowo et al., 2025; Jain & Mitra, 2025). However, effective crisis communication also required flexibility, as compound disasters often generated unanticipated information needs and communication challenges not addressed in predetermined protocols (Bou-Slihim et al., 2023; Atkinson, 2022).

Digital communication technologies enabled continuity during disruptions that prevented face-to-face interaction, particularly during the COVID-19 pandemic when remote work became necessary (Musa & Seetharaman, 2025; Sachiyuka & Mwanza, 2024). Organizations with established digital collaboration platforms, video conferencing capabilities, and cloud-based information systems transitioned more smoothly to remote operations, maintaining communication and coordination despite physical separation (Atkinson, 2022; Aksay & Şendoğdu, 2022). However, digital communication also introduced vulnerabilities, including cybersecurity risks, technology failures, and digital divides affecting employees with limited technology access or skills (Musa & Seetharaman, 2025; Oliynik, 2025).

External communication with stakeholders, including customers, suppliers, regulators, media, and communities, proved critical for maintaining trust, coordinating responses, and managing reputational risks during compound disasters (Rosini & Neubarth, 2023; Danzi et al., 2024). Effective external communication involved “fostering public trust” through transparent, timely, and accurate information sharing, while managing expectations about service disruptions and recovery timelines (Mercado, 2024; Osei-Kyei et al., 2024). Organizations that maintained proactive external communication during crises generally experienced better stakeholder relationships and faster recovery than those that communicated reactively or inadequately (Gracey & Yearwood, 2022; Sachiyuka & Mwanza, 2024).

Information management systems supported decision-making by collecting, analyzing, and disseminating relevant information about threats, impacts, response activities, and recovery progress (Guo et al., 2025; de Moura & Amelia Tomei, 2021). Organizations with “systematic sharing of information” and “cross-organizational intelligence systems” demonstrated enhanced situational awareness and more effective coordination during compound disasters (Moura et al., 2022; Guo et al., 2025). These systems integrated information from multiple sources, including internal monitoring, external partners, government agencies, and media, providing comprehensive pictures of evolving situations (Osei-Kyei et al., 2024; Nakasu et al., 2022).

Communication during uncertainty presented particular challenges in multi-hazard scenarios, where information about threats, impacts, and appropriate re-

sponses often remained incomplete or ambiguous (Pathak et al., 2022; Bou-Slihim et al., 2023). Effective organizations balanced transparency about uncertainties with provision of actionable guidance, avoiding both false reassurance and paralyzing ambiguity (Atkinson, 2022; Cuno-Chunga et al., 2025). They communicated what was known, what remained uncertain, and what actions were being taken to address gaps, maintaining credibility while enabling informed decision-making by employees and stakeholders (Gracey & Yearwood, 2022; Mercado, 2024).

Coordination mechanisms extended beyond communication to include structured processes for aligning activities across organizational units and external partners (Kristian et al., 2025; Al Hajri, 2024). Effective coordination involved “inter-agency collaboration” and “ensuring collaborative efforts among agencies and community members,” with communication serving as the foundation for coordinated action (Mercado, 2024; Ntale et al., 2026). Organizations establishing coordination centers, regular coordination meetings, and clear protocols for information sharing and joint decision-making demonstrated superior multi-hazard response capabilities (Guo et al., 2025; Danzi et al., 2024).

Feedback loops and organizational learning depended on effective communication systems to capture insights from crisis experiences and translate them into improved preparedness (Hollands et al., 2023; Jain & Mitra, 2025). Organizations conducting after-action reviews, soliciting employee and stakeholder feedback, and communicating lessons learned demonstrated continuous improvement in BCP effectiveness (Hollands et al., 2023; Yulianto et al., 2025). These learning-oriented communication practices helped organizations “extract lessons from disruptions, update mental models and procedures, and institutionalize improvements in preparedness” (Jain & Mitra, 2025; Musa & Seetharaman, 2025).

Challenges to effective communication during multi-hazard scenarios included **information overload**, with organizations and individuals overwhelmed by volumes of information during crises (Pathak et al., 2022; Bou-Slihim et al., 2023). **Communication system failures** during disasters disrupted information flow, particularly when compound disasters damaged telecommunications infrastructure or overwhelmed digital systems (Kosmowski et al., 2022). **Language and cultural barriers** complicated communication in diverse organizations and multi-stakeholder contexts (Rivera et al., 2022; Poto et al., 2025). **Confidentiality and security concerns** limited information sharing, particularly regarding sensitive operational details or security vulnerabilities (Bou-Slihim et al., 2023; Kosmowski et al., 2022).

Despite these challenges, the evidence demonstrates that effective communication and information flow systems are essential for BCP effectiveness in multi-hazard environments. Organizations with robust, flexible, and redundant communication capabilities maintained better coordination, decision-making, and stakeholder relationships during compound disasters, contributing significantly to operational continuity and organizational resilience (Benardi et al., 2024; Guo

et al., 2025).

4.1.4. Theme 4: Inter-Organizational Collaboration and Cross-Sector Coordination

The fourth major theme emphasizes that effective BCP in multi-hazard environments requires inter-organizational collaboration and cross-sector coordination, as compound disasters typically exceed individual organizational response capacities and impact interconnected systems spanning organizational and sectoral boundaries (Hassel & Cedergren, 2024; MEECHANG, 2023).

Multi-stakeholder approaches to business continuity planning emerged as essential for addressing multi-hazard scenarios (MEECHANG, 2023; Hassel et al., 2024). Area-Business Continuity Management (Area-BCM) represents one framework for multi-stakeholder continuity planning, recognizing that “effective Area-BCP involves multi-hazard and multi-sectoral reduction practices, distinguishing it from traditional BCP by securing external aspects” (MEECHANG, 2023). This approach requires “integration of multiple stakeholder viewpoints” and coordination among government agencies, businesses, critical infrastructure providers, and community organizations (MEECHANG, 2023; Hassel & Cedergren, 2024).

Public-private partnerships (PPPs) provided mechanisms for collaborative resilience building, particularly in critical infrastructure and community disaster preparedness contexts (Osei-Kyei et al., 2024; Khajehei et al., 2026). Research identified “critical resilience strategies for building urban community resilience through public-private partnerships,” including “communication and coordination, financial incentives, and business continuity” as key elements (Osei-Kyei et al., 2024). These partnerships enabled resource sharing, coordinated planning, and mutual aid during compound disasters, extending organizational capabilities beyond internal resources (Khajehei et al., 2026; Ntale et al., 2026).

Supply chain collaboration proved critical for maintaining continuity during disruptions affecting interconnected production and distribution networks (Riglietti, 2024; Jones, 2024). Research on supply chain resilience during COVID-19 found that “Business Continuity Management (BCM) contributes to supply chain resilience” through collaborative planning with suppliers, customers, and logistics providers (Riglietti, 2024). Organizations that “mapped external connections and critical suppliers” and established collaborative continuity arrangements demonstrated superior supply chain resilience during compound disasters (Rosini & Neubarth, 2023; Jones, 2024).

Inter-agency coordination in public sector and humanitarian contexts enabled more effective disaster response, particularly for large-scale compound disasters requiring coordinated action across multiple government agencies and non-governmental organizations (Al Hajri, 2024; Ntale et al., 2026). However, research also identified significant challenges in inter-sectoral coordination, including “complexities of inter-sectoral coordination” arising from different organizational cultures, priorities, and operating procedures (Al Hajri, 2024). Effective inter-

agency coordination required “strengthening public-private-civil cooperation” and establishing clear coordination mechanisms, shared information systems, and mutual understanding of roles and responsibilities (Khajehei et al., 2026; Guo et al., 2025).

Network structures and brokering roles shaped collaboration effectiveness during disasters (Danzi et al., 2024; Osei-Kyei et al., 2024). Research on tourism disaster management found that “Emergency Management Organizations and Regional Tourism Organizations act as central and brokering actors,” playing critical roles in “coordination and resource allocation” across networks of tourism operators, government agencies, and community organizations (Danzi et al., 2024). These brokering organizations facilitated information flow, coordinated joint activities, and connected otherwise disconnected actors, enhancing overall network resilience (Danzi et al., 2024; Guo et al., 2025).

Collaborative relationships varied in depth and formality, ranging from informal acquaintance to formal agreements (Danzi et al., 2024; Ntale et al., 2026). Research identified “five types of collaborative relationships: acquaintance, communication, resource sharing, business relations, and formal agreements,” with more formal and resource-intensive relationships generally supporting more effective coordination during crises (Danzi et al., 2024). However, informal relationships also provided value, particularly for rapid information sharing and flexible adaptation during evolving situations (Khajehei et al., 2026; Mafimisebi et al., 2023).

Community-based organizations played essential roles in disaster recovery, particularly for vulnerable populations and in contexts where government and private sector responses proved inadequate (Khajehei et al., 2026; Rivera et al., 2022). Research on recovery following compounding disasters in Puerto Rico highlighted “the essential role of nonprofits in disaster recovery” and the importance of “strengthening organizational resilience” through “improving public-private-civil cooperation” (Khajehei et al., 2026). These community organizations provided localized knowledge, trusted relationships, and flexible responses complementing formal organizational capabilities (Khajehei et al., 2026; Mercado, 2024).

Cross-sector learning and knowledge sharing enhanced collective preparedness and response capabilities (Hollands et al., 2023; Jain & Mitra, 2025). Organizations participating in industry associations, professional networks, and multi-stakeholder forums benefited from shared experiences, best practices, and collective problem-solving during compound disasters (Jain & Mitra, 2025; Yulianto et al., 2025). However, competitive concerns, confidentiality constraints, and lack of established sharing mechanisms sometimes limited cross-organizational learning (Bou-Slihim et al., 2023; Naidoo & Hoque, 2024).

Regulatory frameworks and government policies shaped inter-organizational collaboration, with some policies facilitating coordination while others created barriers (Hadiwibowo et al., 2025; Rivera et al., 2022). Effective policies provided “legal frameworks” supporting collaboration, established “financial incentives”

for joint preparedness investments, and created coordination mechanisms bringing together diverse stakeholders (Osei-Kyei et al., 2024; Rivera et al., 2022). Conversely, fragmented regulatory structures, conflicting requirements across jurisdictions, and lack of coordination mandates sometimes impeded collaborative continuity planning (Al Hajri, 2024; Poto et al., 2025).

Challenges to inter-organizational collaboration included **coordination complexity**, with transaction costs and communication demands increasing substantially as the number of collaborating organizations grew (Al Hajri, 2024; Chiba & Nagamatsu, 2023). **Trust and relationship building** required time and sustained engagement, with many organizations lacking established relationships before crises occurred (Danzi et al., 2024; Khajehei et al., 2026). **Power imbalances and competing interests** sometimes undermined collaboration, particularly when organizations had different priorities, resources, or influence (Rivera et al., 2022; Ntale et al., 2026). **Information sharing barriers**, including confidentiality concerns, competitive sensitivities, and lack of interoperable systems, limited the information flow necessary for effective coordination (Bou-Slihim et al., 2023; Guo et al., 2025).

Despite these challenges, the evidence strongly supports inter-organizational collaboration and cross-sector coordination as essential for BCP effectiveness in multi-hazard environments. Compound disasters typically exceed individual organizational capacities and impact interconnected systems, necessitating collaborative approaches to preparedness, response, and recovery (Hassel & Cedergren, 2024; MEECHANG, 2023). Organizations that invested in building collaborative relationships, participating in multi-stakeholder planning, and establishing coordination mechanisms demonstrated superior resilience during compound disasters (Osei-Kyei et al., 2024; Danzi et al., 2024).

4.1.5. Theme 5: Training, Preparedness Culture, and Organizational Learning

The fifth major theme highlights the critical importance of training, preparedness culture, and organizational learning mechanisms for sustaining BCP effectiveness in multi-hazard environments. While formal plans and structures provide foundations for continuity, their effectiveness depends fundamentally on organizational members' competencies, awareness, and commitment to preparedness (Cuno-Chunga et al., 2025; Jain & Mitra, 2025).

Training and competency development emerged as essential enablers of BCP effectiveness (Cuno-Chunga et al., 2025; Hadiwibowo et al., 2025). Organizations with "continuous training" and "certified staff for business continuity management" demonstrated superior crisis response capabilities, as trained personnel understood their roles, could execute procedures effectively, and adapted appropriately when situations exceeded plan parameters (Rosini & Neubarth, 2023; Cuno-Chunga et al., 2025). Training encompassed multiple dimensions, including technical skills for specific continuity functions, decision-making and problem-solving capabilities for managing uncertainty, and interpersonal skills for communi-

cation and coordination during high-stress situations (Cuno-Chunga et al., 2025; Mercado, 2024).

Exercises and simulations provided critical opportunities to test plans, build competencies, and identify gaps before actual crises occurred (Gracey & Yearwood, 2022; Jain & Mitra, 2025). Organizations that conducted “regular testing” of BCPs, including tabletop exercises, functional drills, and full-scale simulations, maintained higher preparedness levels and responded more effectively during actual disruptions (Gracey et al., 2022; Rosini & Neubarth, 2023). However, many organizations struggled to conduct realistic exercises due to logistical challenges, resource constraints, and concerns about disrupting operations (Rosini & Neubarth, 2023; Chiba & Nagamatsu, 2023). Multi-hazard exercises, simulating compound disaster scenarios, remained particularly rare despite their value for preparing organizations for complex threats (Chiba & Nagamatsu, 2023; Nakasu et al., 2022).

Preparedness culture represented a deeper organizational characteristic than formal training programs, encompassing shared values, norms, and assumptions about the importance of continuity planning and disaster preparedness (Yulianto et al., 2025; Musa & Seetharaman, 2025). Organizations with strong preparedness cultures demonstrated “resilient culture” characterized by “anticipate and respond to disruptive events” as normalized organizational practices rather than exceptional activities (Matos et al., 2022; Jain & Mitra, 2025). This cultural dimension proved particularly important for sustaining BCP effectiveness over time, as cultures emphasizing preparedness maintained continuity capabilities even when leadership changed or crisis memories faded (Yulianto et al., 2025; Aksay & Şendoğdu, 2022).

Awareness and engagement across organizational levels enhanced BCP effectiveness, moving beyond specialized continuity professionals to engage all employees in preparedness (Chiba & Nagamatsu, 2023; Puspitaningrum, 2022). Japanese companies identified “lack of BCP awareness on-site” as a primary implementation barrier, with 39% of medium-sized companies reporting this challenge (Chiba & Nagamatsu, 2023). Organizations addressing this barrier through awareness campaigns, inclusive planning processes, and clear communication about continuity expectations demonstrated broader engagement and more effective crisis responses (Gracey & Yearwood, 2022; Yulianto et al., 2025).

Organizational learning mechanisms enabled continuous improvement in BCP effectiveness through systematic capture and application of insights from exercises, actual disruptions, and external experiences (Hollands et al., 2023; Jain & Mitra, 2025). Effective learning involved “extracting lessons from disruptions, updating mental models and procedures, and institutionalizing improvements in preparedness” through formal processes including after-action reviews, lessons-learned databases, and plan revision procedures (Jain et al., 2025; Hollands et al., 2023). Organizations with strong learning orientations demonstrated “continuous adaptation to changes” and progressive enhancement of continuity capabilities

over time (Matos et al., 2022; Yulianto et al., 2025).

Psychological preparedness and resilience complemented technical competencies, enabling organizational members to maintain effectiveness under the stress and uncertainty characteristic of compound disasters (Cuno-Chunga et al., 2025; Aksay & Şendoğdu, 2022). Healthcare organizations demonstrating resilience provided “psychological support systems” and “staff recognition programs” that sustained employee well-being and commitment during prolonged crises (Cuno-Chunga et al., 2025). These psychological dimensions proved particularly important during extended disruptions like the COVID-19 pandemic, where sustained stress and uncertainty challenged organizational members’ capacity to maintain performance (Atkinson, 2022; Aksay & Şendoğdu, 2022).

Knowledge management systems supported organizational learning by capturing, organizing, and disseminating continuity-related knowledge (Guo et al., 2025; de Moura & Amelia Tomei, 2021). Organizations with “systematic sharing of information” and documented procedures, lessons learned, and best practices maintained institutional memory and enabled knowledge transfer as personnel changed (Moura et al., 2022; Jain & Mitra, 2025). However, many organizations struggled with knowledge management, particularly in capturing tacit knowledge from experienced personnel and ensuring accessibility of documented knowledge when needed during crises (Bou-Slihim et al., 2023; Puspitaningrum, 2022).

Integration of continuity into routine operations enhanced both preparedness and organizational acceptance of BCP (Yulianto et al., 2025; Musa & Seetharaman, 2025). Organizations that embedded continuity considerations into regular business processes, decision-making, and performance management demonstrated more sustainable preparedness than those treating BCP as separate compliance exercises (Yulianto et al., 2025; Jain & Mitra, 2025). This integration approach fostered “organizational culture” supporting resilience and made continuity planning “part of organizational DNA” rather than an add-on activity (Musa & Seetharaman, 2025; Aksay & Şendoğdu, 2022).

Learning from external sources complemented internal experience, enabling organizations to benefit from others’ experiences without directly experiencing all possible disruptions (Hollands et al., 2023; Jain & Mitra, 2025). Organizations participating in professional networks, industry associations, and multi-stakeholder forums accessed broader knowledge bases and diverse perspectives on continuity challenges and solutions (Jain & Mitra, 2025; Yulianto et al., 2025). Case studies, research publications, and shared experiences from other organizations’ crisis responses provided valuable learning opportunities, particularly for low-frequency, high-impact scenarios that individual organizations rarely experienced directly (Shamieh, 2026; Jones, 2024).

Challenges to developing training, preparedness culture, and organizational learning included **resource constraints**, with training and exercises requiring time and financial investments that competed with operational priorities (Qutieshat & Musumali, 2022; Chiba & Nagamatsu, 2023). **Competing priorities and short-**

term focus led many organizations to deprioritize preparedness activities absent immediate threats, allowing capabilities to atrophy between crises (Oliynik, 2025; Poto et al., 2025). **Knowledge loss through personnel turnover** eroded organizational memory and required continuous reinvestment in training and knowledge transfer (Bou-Slihim et al., 2023; Puspitaningrum, 2022). **Difficulty measuring preparedness effectiveness** made it challenging to demonstrate return on investment for training and culture-building activities, potentially undermining sustained commitment (Qutieshat & Musumali, 2022; Yulianto et al., 2025).

Despite these challenges, the evidence demonstrates that training, preparedness culture, and organizational learning are essential for sustaining BCP effectiveness in multi-hazard environments. Organizations that invested in building competencies, fostering preparedness cultures, and establishing learning mechanisms demonstrated superior and more sustainable resilience, maintaining effectiveness across multiple disruptions and adapting continuously to evolving threat landscapes (Yulianto et al., 2025; Jain & Mitra, 2025).

5. Discussion

5.1. Integration of Findings with Existing Theory

The five themes identified in this study collectively represent an integrated framework for understanding BCP effectiveness in multi-hazard environments, with important connections to existing theoretical perspectives on organizational resilience, dynamic capabilities, and crisis management. This section synthesizes the findings with established theory, highlighting both confirmations and extensions of current understanding.

The emphasis on **adaptive BCP frameworks** (Theme 1) aligns with and extends dynamic capabilities theory (Kristian et al., 2025; Jones, 2024). Teece's dynamic capabilities framework posits that organizational success in changing environments depends on capabilities to sense opportunities and threats, seize opportunities through resource mobilization and strategic action, and transform organizational assets and structures to maintain competitiveness (Kristian et al., 2025). The current findings demonstrate how these dynamic capabilities manifest specifically in business continuity contexts, with sensing involving early warning systems and environmental scanning for emerging threats, seizing encompassing rapid BCP activation and resource deployment, and transforming reflected in post-crisis learning and plan revision (Kristian et al., 2025; Hollands et al., 2023). The study extends dynamic capabilities theory by showing how these capabilities must operate across multiple hazard types simultaneously in compound disaster scenarios, requiring more sophisticated sensing mechanisms, more flexible seizing strategies, and more comprehensive transformation processes than single-hazard contexts (Chiba & Nagamatsu, 2023; Kourehpaz et al., 2025).

The findings on **leadership and governance** (Theme 2) confirm and elaborate established crisis leadership literature while highlighting distinctive requirements

of multi-hazard contexts. Existing research emphasizes adaptive leadership, clear communication, and employee-centered approaches as critical for crisis effectiveness (Aksay & Şendoğdu, 2022; Benardi et al., 2024). The current study demonstrates how these leadership capabilities must be sustained over extended periods during prolonged compound disasters like the COVID-19 pandemic, requiring not just crisis response skills but also endurance, consistency, and capacity to maintain organizational morale and commitment through extended uncertainty (Atkinson, 2022; Cuno-Chunga et al., 2025). The emphasis on governance structures and cross-functional coordination extends crisis leadership theory by showing how individual leader capabilities must be complemented by institutional structures that enable coordinated action across organizational silos and external boundaries (Hadiwibowo et al., 2025; Hassel & Cedergren, 2024).

Communication and information flow (Theme 3) findings align with organizational communication theory while highlighting distinctive challenges of multi-hazard scenarios. Established theory emphasizes communication as foundational for coordination, decision-making, and sense-making during crises (Benardi et al., 2024; Guo et al., 2025). The current findings demonstrate how compound disasters create communication challenges exceeding those of single-hazard scenarios, including information overload from multiple simultaneous threats, communication system failures during infrastructure disruptions, and need for sustained communication over extended crisis periods (Pathak et al., 2022; Bou-Slihim et al., 2023). The study contributes to communication theory by showing how effective multi-hazard communication requires not just robust systems but also adaptive protocols that balance structure with flexibility, enabling consistent messaging while accommodating evolving situations (Gracey & Yearwood, 2022; Atkinson, 2022).

The emphasis on **inter-organizational collaboration** (Theme 4) extends network theory and collaborative governance literature to multi-hazard BCP contexts. Network theory emphasizes how organizational outcomes depend not just on internal capabilities but also on positions within broader networks and quality of inter-organizational relationships (Danzi et al., 2024; Osei-Kyei et al., 2024). The current findings demonstrate how multi-hazard scenarios amplify the importance of network positions and relationships, as compound disasters typically exceed individual organizational capacities and require coordinated responses across organizational and sectoral boundaries (Hassel & Cedergren, 2024; MEE-CHANG, 2023). The study contributes to network theory by identifying specific network structures and brokering roles that enhance multi-hazard resilience, including the critical importance of boundary-spanning organizations that connect otherwise disconnected actors (Danzi et al., 2024; Guo et al., 2025).

Training, preparedness culture, and organizational learning (Theme 5) findings integrate multiple theoretical streams, including organizational learning theory, safety culture research, and competency-based approaches to organizational effectiveness. Organizational learning theory emphasizes how organizations de-

velop, retain, and transfer knowledge through experience (Hollands et al., 2023; Oliinyk, 2025). The current findings demonstrate how learning mechanisms must be deliberately designed and sustained to capture insights from low-frequency, high-impact events like compound disasters, as natural learning processes may be insufficient given the rarity and complexity of such scenarios (Yulianto et al., 2025; Shamieh, 2026). The study extends organizational learning theory by showing how learning must occur not just within organizations but also across organizational boundaries through professional networks, industry associations, and multi-stakeholder forums (Jain & Mitra, 2025; Hollands et al., 2023).

The integrated framework emerging from these five themes represents a significant contribution to business continuity and disaster management literature. While existing frameworks often treat planning, leadership, communication, collaboration, and learning as separate domains, the current findings demonstrate their fundamental interconnection and mutual reinforcement in enabling BCP effectiveness (Steen et al., 2023; Hassel & Cedergren, 2024). Adaptive frameworks require leadership commitment and governance structures to sustain them; communication systems enable both internal coordination and external collaboration; collaboration extends organizational capabilities while providing learning opportunities; and training and culture ensure that formal structures and systems translate into effective action during crises (Yulianto et al., 2025; Jain & Mitra, 2025).

5.2. Implications for Multi-Hazard BCP Design

The findings have substantial implications for how organizations should design and implement BCP for multi-hazard environments, suggesting several departures from traditional single-hazard approaches.

First, organizations should adopt **impact-based rather than hazard-specific planning** (Chiba & Nagamatsu, 2023; MEECHANG, 2023). Rather than developing separate plans for earthquakes, floods, pandemics, and cyberattacks, organizations should identify common impacts (facility loss, supply chain disruption, workforce unavailability, technology failures) and develop response capabilities applicable across multiple hazard types. This approach reduces planning complexity while enhancing flexibility and comprehensiveness (Chiba & Nagamatsu, 2023). Practical implementation involves conducting business impact analyses that identify critical functions and dependencies, developing response strategies organized around impact types rather than hazard types, and ensuring response capabilities are sufficiently flexible to address various scenarios producing similar impacts (MEECHANG, 2023; Hassel & Cedergren, 2024).

Second, organizations should explicitly **plan for compound disaster scenarios** involving simultaneous or sequential hazards (Kourehpaz et al., 2025; Chiba & Nagamatsu, 2023). This requires developing scenarios that combine multiple threats (e.g., natural disaster during pandemic, cyberattack during supply chain disruption), analyzing how hazards interact and compound effects, and identifying resource conflicts and competing priorities that may arise (Kourehpaz et al.,

2025). Scenario planning should consider not just simultaneous hazards but also sequential scenarios where initial disruptions prevent full recovery before subsequent events occur, depleting resources and compounding vulnerabilities (Kourehpaz et al., 2025; Khajehei et al., 2026).

Third, organizations should establish **continuous monitoring and revision processes** rather than treating BCP as static documents (Bou-Slihim et al., 2023; Rosini & Neubarth, 2023). This involves scheduling regular plan reviews triggered by organizational changes, emerging threats, or lessons from exercises and actual events; establishing clear ownership and accountability for plan maintenance; and creating streamlined revision processes that enable rapid updates without excessive bureaucracy (Gracey & Yearwood, 2022; Jain & Mitra, 2025). Technology can support continuous monitoring through automated alerts about emerging threats, dashboards tracking plan currency and exercise completion, and collaborative platforms enabling distributed plan updates (Musa & Seetharaman, 2025; Guo et al., 2025).

Fourth, organizations should invest in **cross-functional coordination mechanisms** that enable integrated responses to compound disasters (Hadiwibowo et al., 2025; Richardson, 2025). This includes establishing cross-functional continuity teams with representation from all critical functions, conducting cross-functional exercises that test coordination rather than just individual function capabilities, and developing coordination protocols specifying how functions will communicate, share resources, and resolve conflicts during crises (Hadiwibowo et al., 2025; Musa & Seetharaman, 2025). Coordination mechanisms should extend beyond organizational boundaries to include key suppliers, customers, and external partners whose cooperation is essential for continuity (Riglietti, 2024; Hassel & Cedergren, 2024).

Fifth, organizations should prioritize **communication infrastructure and protocols** as foundational BCP elements (Benardi et al., 2024; Guo et al., 2025). This involves ensuring redundancy in communication systems so continuity is maintained if primary systems fail, establishing clear protocols for crisis communication including frequency, content, and audiences, and investing in digital collaboration technologies that enable remote work and distributed coordination (Musa & Seetharaman, 2025; Atkinson, 2022). Communication planning should address both internal coordination and external stakeholder communication, recognizing that maintaining stakeholder confidence and coordinating with external partners are critical for continuity (Gracey & Yearwood, 2022; Danzi et al., 2024).

Sixth, organizations should develop **collaborative continuity arrangements** with external partners, recognizing that multi-hazard scenarios often exceed individual organizational capacities (Hassel & Cedergren, 2024; Osei-Kyei et al., 2024). This includes participating in industry-wide or community-wide continuity planning initiatives, establishing mutual aid agreements with peer organizations, and engaging with government agencies and critical infrastructure providers to understand interdependencies and coordinate responses (MEECHANG,

2023; Khajehei et al., 2026). Collaborative arrangements should be formalized through agreements specifying roles, responsibilities, and resource-sharing mechanisms, while maintaining sufficient flexibility to adapt to specific circumstances (Danzi et al., 2024; Ntale et al., 2026).

Seventh, organizations should invest in **training, exercises, and preparedness culture** as essential complements to formal plans (Yulianto et al., 2025; Jain & Mitra, 2025). This involves conducting regular training for personnel with continuity roles, implementing organization-wide awareness programs to engage all employees in preparedness, and conducting realistic exercises including multi-hazard scenarios that test adaptive capacity and coordination (Cuno-Chunga et al., 2025; Gracey & Yearwood, 2022). Culture-building efforts should emphasize preparedness as an ongoing organizational value rather than compliance obligation, integrate continuity considerations into routine decision-making and performance management, and recognize and reward preparedness contributions (Yulianto et al., 2025; Musa & Seetharaman, 2025).

Finally, organizations should establish **organizational learning mechanisms** that enable continuous improvement in BCP effectiveness (Hollands et al., 2023; Jain & Mitra, 2025). This includes conducting after-action reviews following exercises and actual disruptions, maintaining lessons-learned databases accessible to continuity planners, and participating in external learning opportunities including professional networks and industry forums (Hollands et al., 2023; Yulianto et al., 2025). Learning mechanisms should capture both successes and failures, translate insights into specific plan improvements and capability enhancements, and track implementation of lessons learned to ensure continuous improvement (Jain & Mitra, 2025; Shamieh, 2026).

5.3. The Role of Dynamic Capabilities in Crisis Response

The findings illuminate how dynamic capabilities—sensing, seizing, and transforming—operate specifically in multi-hazard BCP contexts, extending theoretical understanding while providing practical guidance for capability development (Kristian et al., 2025; Jones, 2024).

Sensing capabilities in multi-hazard contexts involve detecting early warning signals of emerging threats, monitoring multiple hazard types simultaneously, and recognizing potential interactions among hazards (Kristian et al., 2025; de Moura & Amelia Tomei, 2021). Organizations with strong sensing capabilities maintained environmental scanning systems that integrated information from diverse sources including weather services, public health agencies, cybersecurity threat intelligence, economic indicators, and supply chain monitoring (de Moura & Amelia Tomei, 2021; Guo et al., 2025). They established thresholds and triggers for different threat levels, enabling graduated responses proportional to threat severity (Gracey & Yearwood, 2022; Nakasu et al., 2022). Critically, effective sensing in multi-hazard contexts required not just monitoring individual hazards but also analyzing potential interactions and cascading effects, recognizing that compound

disasters create qualitatively different threats than individual hazards (Kourehpaz et al., 2025; Chiba & Nagamatsu, 2023).

Seizing capabilities encompass rapid mobilization of resources and implementation of response strategies when threats are detected (Kristian et al., 2025; de Moura & Amelia Tomei, 2021). Organizations demonstrating effective seizing during compound disasters exhibited several characteristics: pre-positioned resources and capabilities that could be rapidly deployed, clear activation protocols specifying who makes decisions and how responses are initiated, and flexible response strategies adaptable to specific circumstances rather than rigid predetermined procedures (Gracey & Yearwood, 2022; Benardi et al., 2024). Seizing in multi-hazard contexts proved particularly challenging due to resource conflicts when multiple threats required simultaneous responses, necessitating prioritization frameworks and resource allocation mechanisms that could balance competing demands (Kourehpaz et al., 2025; Chiba & Nagamatsu, 2023).

Transforming capabilities involve reconfiguring organizational routines, structures, and capabilities based on crisis experiences to enhance future preparedness (Kristian et al., 2025; Hollands et al., 2023). Organizations with strong transforming capabilities conducted systematic after-action reviews, translated lessons into specific capability enhancements and plan revisions, and institutionalized improvements through updated procedures, training programs, and organizational structures (Hollands et al., 2023; Jain & Mitra, 2025). Transformation in multi-hazard contexts often involved fundamental shifts in planning approaches, such as moving from hazard-specific to impact-based planning or from single-organization to collaborative continuity frameworks (Chiba & Nagamatsu, 2023; Hassel & Cedergren, 2024). These transformations required not just technical changes but also cultural shifts, leadership commitment, and sustained investment in new capabilities (Yulianto et al., 2025; Musa & Seetharaman, 2025).

The findings suggest that dynamic capabilities in multi-hazard contexts must operate at multiple organizational levels simultaneously. **Individual-level capabilities** include competencies of continuity professionals, crisis managers, and organizational leaders in sensing threats, making rapid decisions, and learning from experiences (Cuno-Chunga et al., 2025; Aksay & Şendoğdu, 2022). **Team-level capabilities** encompass coordination within cross-functional continuity teams, communication effectiveness, and collective problem-solving during crises (Hadiwibowo et al., 2025; Mercado, 2024). **Organizational-level capabilities** involve formal systems, structures, and processes that enable sensing, seizing, and transforming at scale (Kristian et al., 2025; de Moura & Amelia Tomei, 2021). **Network-level capabilities** extend beyond organizational boundaries to include collaborative sensing through information sharing, coordinated seizing through mutual aid and resource sharing, and collective transforming through cross-organizational learning (Hassel & Cedergren, 2024; Danzi et al., 2024).

Developing dynamic capabilities for multi-hazard BCP requires sustained investment and deliberate practice. Organizations cannot simply declare they will

be adaptive; they must build specific capabilities through training, exercises, technology investments, and cultural development (Yulianto et al., 2025; Jain & Mitra, 2025). The findings suggest that dynamic capabilities develop progressively through accumulated experience, with each crisis providing opportunities to enhance sensing, seizing, and transforming capabilities if appropriate learning mechanisms are in place (Hollands et al., 2023; Shamieh, 2026). This progressive development implies that organizations should view each disruption, including exercises and near-misses, as opportunities for capability enhancement rather than merely problems to be solved (Yulianto et al., 2025; Jain & Mitra, 2025).

5.4. Limitations and Boundary Conditions

While this study provides valuable insights into BCP effectiveness in multi-hazard environments, several limitations and boundary conditions warrant acknowledgment.

Methodological limitations include the study's reliance on published qualitative research rather than primary data collection. While qualitative synthesis enables identification of patterns across diverse contexts, it depends on the quality, completeness, and representativeness of available published studies (Qutieshat & Musumali, 2022; Naidoo & Hoque, 2024). Publication bias may favor studies reporting successful BCP implementations or dramatic crisis responses over routine preparedness activities or unsuccessful efforts, potentially skewing findings toward positive outcomes (Hollands et al., 2023). The synthesis approach also limits ability to probe specific contexts or follow up on ambiguous findings, as would be possible with primary data collection (Riglietti, 2024; Cuno-Chunga et al., 2025).

Temporal limitations reflect the study's focus on recent publications (2022–2026), which provides currency and relevance to contemporary challenges but limits historical perspective. Many insights derive from COVID-19 pandemic experiences, which, while highly relevant to multi-hazard contexts, may not fully represent all types of compound disasters (Riglietti, 2024; Bou-Slihim et al., 2023). The relatively short time frame also limits ability to assess long-term sustainability of BCP approaches or track how organizational capabilities evolve over extended periods (Yulianto et al., 2025; Hollands et al., 2023).

Contextual variations suggest that findings may not apply equally across all organizational types, sectors, and geographic contexts. Large organizations with substantial resources and mature BCP programs face different challenges and opportunities than small-medium enterprises with limited resources and nascent continuity capabilities (Qutieshat & Musumali, 2022; Mafimisebi et al., 2023). Sector-specific factors, including regulatory requirements, operational characteristics, and stakeholder expectations, shape BCP effectiveness in ways not fully captured by cross-sector synthesis (Naidoo & Hoque, 2024; Poto et al., 2025). Geographic and cultural contexts influence organizational approaches to planning, leadership, communication, and collaboration, with findings from developed Western contexts potentially having limited applicability in developing or non-

Western settings (Rivera et al., 2022; Alhammadi, 2025).

Hazard-specific considerations suggest that while the study identifies general principles for multi-hazard BCP, specific hazard combinations may present unique challenges requiring tailored approaches. The interaction between natural disasters and pandemics differs from interactions between cyberattacks and supply chain disruptions, with different temporal dynamics, impact patterns, and response requirements (Chiba & Nagamatsu, 2023; Kourehpaz et al., 2025). The findings provide general guidance but may require adaptation for specific hazard combinations and organizational contexts (MEECHANG, 2023; Hassel & Cedergren, 2024).

Causality and attribution challenges inherent in qualitative research limit ability to definitively establish that specific BCP characteristics cause improved outcomes. While the findings identify associations between BCP features and organizational resilience, multiple factors influence crisis outcomes, and isolating specific causal mechanisms proves difficult (Hollands et al., 2023; Yulianto et al., 2025). Organizations demonstrating effective BCP may differ from less effective organizations in multiple ways beyond continuity planning, including overall management quality, resource availability, and prior crisis experience (Aksay & Şendoğdu, 2022; Matos et al., 2022).

Generalizability limitations reflect the qualitative nature of the evidence base, which emphasizes depth and context over breadth and generalization. While the synthesis identifies common themes across diverse contexts, the specific manifestations of these themes and their relative importance vary substantially across settings (Hassel & Cedergren, 2024; Yulianto et al., 2025). Organizations should view the findings as informing rather than prescribing BCP approaches, adapting general principles to their specific contexts, capabilities, and risk profiles (Jain & Mitra, 2025; Lutz & Schutte, 2025).

Despite these limitations, the study provides valuable insights into BCP effectiveness in multi-hazard environments, identifying themes and mechanisms supported by convergent evidence across diverse contexts. The limitations suggest directions for future research while highlighting the need for contextual adaptation when applying findings to specific organizational settings (Yulianto et al., 2025; Jain & Mitra, 2025).

6. Conclusion

6.1. Summary of Key Contributions

This qualitative evidence synthesis examined BCP effectiveness in multi-hazard environments through thematic analysis of 90 recent scholarly works (2022–2026) spanning diverse sectors, regions, and hazard types. Five interconnected themes characterize effective multi-hazard BCP: 1) adaptive frameworks and flexibility, 2) leadership and governance structures, 3) communication and information flow, 4) inter-organizational collaboration and cross-sector coordination, and 5) training, preparedness culture, and organizational learning. Collectively, these

themes demonstrate that traditional single-hazard, plan-centric BCP is insufficient for compound disaster contexts; organizations must instead develop dynamic, capability-based systems that integrate risk sensing, strategic agility, and continuous learning.

Theoretically, the study advances dynamic capabilities theory by specifying how sensing, seizing, and transforming capabilities must operate simultaneously across individual, team, organizational, and network levels in multi-hazard contexts—a requirement absent from single-hazard frameworks. It also bridges the previously separate domains of BCP, organizational resilience, and multi-hazard risk management, providing an integrated conceptual framework for compound disaster preparedness (Steen et al., 2023; Kristian et al., 2025).

Methodologically, the study demonstrates the value of qualitative synthesis for generating actionable insights from accumulated case-based evidence, complementing quantitative meta-analyses and providing richer contextual understanding of BCP mechanisms (Hollands et al., 2023; Riglietti, 2024).

Empirically, the findings confirm that effective multi-hazard BCP is distinguished not by plan comprehensiveness but by organizational adaptability, leadership responsiveness, communication robustness, collaborative reach, and sustained preparedness culture—factors that enable organizations to navigate scenarios no static plan can fully anticipate (Chiba & Nagamatsu, 2023; Yulianto et al., 2025).

6.2. Practical Recommendations

Key practical recommendations are as follows. Organizational leaders should champion adaptive BCP frameworks, invest in cross-functional governance structures, and embed preparedness culture into strategic planning. Business continuity professionals should shift from hazard-specific to impact-based planning, develop compound disaster scenarios, and establish continuous monitoring and revision cycles. Policymakers should create regulatory environments that incentivize multi-stakeholder preparedness and facilitate cross-sector knowledge sharing. All organizations, regardless of size or sector, should prioritize communication infrastructure, external collaboration, and systematic post-event learning as foundational continuity capabilities (Yulianto et al., 2025; Jain & Mitra, 2025; Hassel & Cedergren, 2024).

6.3. Future Research Directions

Six priority directions for future research are identified. First, longitudinal studies should track how BCP capabilities evolve following major compound disasters and how organizations sustain preparedness between crises. Second, comparative research should examine BCP effectiveness across organizational sizes, sectors, and developed versus developing contexts to clarify boundary conditions. Third, quantitative studies should test the relationships among BCP characteristics and resilience outcomes identified qualitatively here. Fourth, hazard-specific research

should address unique challenges of particular compound disaster combinations (e.g., cyber-physical attacks, climate-pandemic interactions). Fifth, research on emerging technologies—AI, IoT, blockchain—should examine how these tools enhance or complicate multi-hazard BCP. Sixth, studies on collaborative continuity governance should deepen understanding of how inter-organizational trust, resource sharing, and sustained coordination can be designed and maintained across diverse actor networks (Hollands et al., 2023; Musa & Seetharaman, 2025; Hassel & Cedergren, 2024).

In sum, as organizations face increasingly complex and interconnected disaster landscapes, multi-hazard BCP effectiveness depends on moving beyond rigid, plan-centric approaches toward adaptive, capability-based systems embedded in resilient organizational cultures. This study provides an evidence-based framework to guide that transition, while underscoring the continued need for research, practice innovation, and policy development in this critical domain (Jain & Mitra, 2025; Steen et al., 2023).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix A. Theme-to-Study Mapping

The following table maps each of the five major themes to the primary studies providing supporting evidence. Studies are identified by first author and year.

Theme 1 - Adaptive BCP Frameworks and Flexibility: Bou-Slihim et al. (2023); Chiba & Nagamatsu (2023); Kristian et al. (2025); Mafimisebi et al. (2023); Kourehpaz et al. (2025); Musa & Seetharaman (2025); Lutz & Schutte (2025); Hollands et al. (2023); Jain & Mitra (2025); Jones (2024); MEECHANG (2023); Hadiwibowo et al. (2025); Puspitaningrum (2022); Hendaryatna et al. (2023); Kosmowski et al. (2022); Castro Rodriguez et al. (2025); Farinha et al. (2025); de Moura & Amelia Tomei (2021).

Theme 2 - Leadership, Governance, and Decision-Making: Benardi et al. (2024); Gracey & Yearwood (2022); Aksay & Şendoğdu (2022); Matos et al. (2022); Cuno-Chunga et al. (2025); Hassel & Cedergren (2024); Steen et al. (2023); Mercado (2024); Lutz & Schutte (2025); Kristian et al. (2025); Rosini & Neubarth (2023); Atkinson (2022); Alhammadi (2025); Poto et al. (2025); Naidoo & Hoque (2024).

Theme 3 - Communication and Information Flow Systems: Gracey & Yearwood (2022); Guo et al. (2025); Benardi et al. (2024); Bou-Slihim et al. (2023); Hollands et al. (2023); Musa & Seetharaman (2025); Nakasu et al. (2022); Pathak et al. (2022); Richardson (2025.); Enriquez & Anthony (2025); Sachiyuka & Mwanza (2024); Musesengwa & Zvikaramba (2023); Bobel et al. (2022).

Theme 4 - Inter-organizational Collaboration and Cross-Sector Coordination: Hassel & Cedergren (2024); Danzi et al. (2024); Osei-Kyei et al. (2024); MEECHANG (2023.); Ntale et al. (2026); Al Hajri (2024); Khajehei et al. (2026); Rivera et al. (2022); Senevirathne et al. (2024.); Riglietti (2024); Rahayu et al. (2024); Da Matta Felisberto et al. (2022); Ostadi et al. (2023); Jones (2024).

Theme 5 - Training, Preparedness Culture, and Organizational Learning: Yulianto et al. (2025); Cuno-Chunga et al. (2025); Hadiwibowo et al. (2025); Hollands et al. (2023); Jain & Mitra (2025); Shamieh (2026.); Dorbor (2024.); Ali et al. (2025); Qutieshat & Musumali (2022); Ohiwere & Alumbugu (2024.); Bobel et al. (2022); Oliynik (2025); Sachiyuka & Mwanza (2024).