



Strategic Resilience Models for Enterprises in the Age of Continuous Disruption

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Abstract— Enterprises today operate in an environment characterized by continuous disruption arising from cyber threats, supply chain instability, geopolitical uncertainty, climate-related events, and rapid technological change. Existing organizational resilience models primarily address isolated disruption domains or emphasize post-event recovery, with limited integration of proactive disruption sensing, adaptive decision-making, dynamic resource allocation, and continuous organizational learning into a unified strategic framework. This study addresses these gaps by proposing a Strategic Enterprise Resilience Framework (SERF) that enables organizations to anticipate, respond to, recover from, and continuously adapt to recurring disruptions. The proposed framework is developed using a Design Science Research (DSR) methodology and comprises five interconnected layers: disruption detection, risk assessment, adaptive decision-making, operational recovery, and continuous learning. A simulation-based evaluation was conducted across multiple enterprise disruption scenarios, including supply chain failures, cybersecurity incidents, cloud infrastructure outages, workforce shortages, market volatility, and cascading disruptions. Experimental results demonstrate that the proposed framework significantly improves enterprise resilience by reducing recovery time and decision response latency while increasing operational continuity, resource utilization efficiency, organizational adaptability, and the overall Enterprise Resilience Score compared with a conventional enterprise risk management approach. The findings indicate that integrating strategic resilience capabilities with adaptive governance and

continuous learning provides organizations with a scalable and systematic approach for sustaining business performance under persistent uncertainty. The proposed framework contributes to enterprise resilience research by offering a holistic architecture that unifies strategic, operational, and technological resilience capabilities into a single decision-support model suitable for modern digital enterprises.

Keywords— Enterprise resilience, strategic resilience, continuous disruption, dynamic capabilities, business continuity, adaptive decision-making, organizational resilience

INTRODUCTION

The modern business environment is increasingly characterized by continuous disruption driven by rapid technological evolution, cyber-security threats, geopolitical conflicts, climate-related events, global pandemics, supply chain instability, and fluctuating market conditions. These interconnected disruptions have exposed the limitations of traditional enterprise risk management and business continuity strategies, which primarily focus on responding to isolated incidents and restoring operations after disruptions occur. As organizations become more digitally connected and globally distributed, resilience has emerged as a strategic capability that



enables enterprises not only to withstand disruptions but also to adapt, innovate, and sustain competitive advantage in uncertain environments.

Strategic resilience extends beyond operational recovery by emphasizing proactive preparedness, adaptive decision-making, continuous learning, and organizational transformation. Recent advances in digital technologies—including artificial intelligence (AI), cloud computing, big data analytics, Internet of Things (IoT), and intelligent automation—have created new opportunities for enterprises to monitor operational risks, predict potential disruptions, and optimize resource allocation in real time. Despite these technological advancements, many existing resilience frameworks address individual dimensions such as supply chain resilience, cybersecurity resilience, or organizational continuity independently, resulting in fragmented approaches that lack enterprise-wide integration. Furthermore, several existing models remain reactive, offering limited support for continuous adaptation in environments where multiple disruptions may occur simultaneously or in rapid succession.

maintaining operational continuity and strategic agility directly influences long-term sustainability and competitiveness.

To address these research gaps, this paper proposes a **Strategic Enterprise Resilience Framework (SERF)** that combines disruption detection, risk assessment, adaptive decision-making, operational recovery, and continuous organizational learning within a unified resilience architecture. The proposed framework is developed using a Design Science Research (DSR) methodology and evaluated through simulation-based experiments involving representative enterprise disruption scenarios, including supply chain failures, cybersecurity incidents, cloud infrastructure outages, workforce shortages, market volatility, and cascading disruptions. The evaluation assesses framework performance using multiple resilience indicators, including recovery time, operational continuity, decision response time, resource utilization efficiency, organizational adaptability, and an overall Enterprise Resilience Score.

The experimental results demonstrate that the proposed framework consistently enhances enterprise resilience compared with conventional enterprise management approaches by improving operational continuity, accelerating recovery, increasing adaptive capacity, and optimizing resource utilization across diverse disruption scenarios. These findings indicate that integrating strategic resilience capabilities with continuous learning and adaptive governance provides organizations with a practical mechanism for sustaining business performance under conditions of persistent uncertainty.

The primary contributions of this research are threefold. First, it presents a holistic enterprise resilience framework that integrates strategic, operational, and technological resilience capabilities into a unified architecture. Second, it introduces a simulation-based evaluation methodology for assessing resilience performance under multiple disruption scenarios using quantitative performance metrics. Third, it provides empirical evidence demonstrating the effectiveness of adaptive decision-making and continuous organizational learning in strengthening enterprise resilience. The proposed framework offers researchers and practitioners a scalable foundation for developing resilient enterprises capable of navigating continuous disruption while maintaining long-term operational sustainability and competitive advantage.

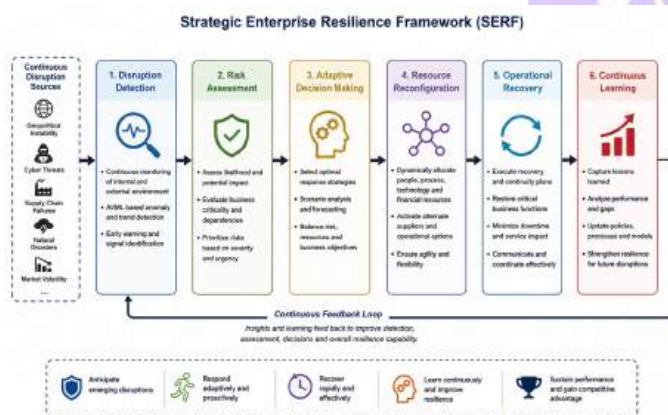


Fig. 1. Proposed Strategic Enterprise Resilience Framework (SERF).

The growing complexity of modern enterprise ecosystems therefore necessitates a comprehensive resilience framework capable of integrating strategic planning, adaptive governance, operational flexibility, and continuous organizational learning into a unified decision-support architecture. Such a framework should enable organizations to detect emerging disruptions proactively, assess organizational risks dynamically, allocate resources efficiently, and continuously improve resilience capabilities based on operational feedback. Developing integrated resilience models is particularly important for organizations operating in highly dynamic sectors where

LITERATURE REVIEW

The frequency and intensity of global disruptions, including pandemics, geopolitical conflicts, cyberattacks, supply chain failures, climate-related disasters, and economic uncertainty, have transformed organizational resilience from an operational concern into a strategic imperative. Traditional risk management approaches, which primarily emphasize prevention and recovery, are increasingly inadequate in environments characterized by persistent volatility. Consequently, researchers have proposed strategic resilience models that integrate adaptive capabilities, organizational learning, digital transformation, and dynamic decision-making to ensure long-term competitiveness rather than merely restoring pre-disruption performance.

Early research on organizational resilience focused on the ability of firms to withstand shocks and recover from unexpected disturbances. A landmark contribution by Kathleen M. Sutcliffe and Timothy J. Vogus conceptualized resilience as the maintenance of positive adjustment under challenging conditions, emphasizing preparedness, mindfulness, and adaptive learning as essential organizational characteristics [1]. Similarly, Annarelli and Nonino synthesized resilience literature and highlighted that resilient organizations combine anticipation, resistance, adaptation, and recovery into an integrated capability rather than treating these functions independently [2]. Their review established resilience as a multidimensional construct spanning strategic, operational, and organizational domains.

The theoretical foundation of many contemporary resilience models originates from the Dynamic Capabilities Theory proposed by David J. Teece, Gary Pisano, and Amy Shuen. They argued that firms sustain competitive advantage by continuously integrating, building, and reconfiguring internal and external competencies in rapidly changing environments [3]. This perspective was further refined by Teece, who introduced the sensing–seizing–transforming framework, explaining how organizations identify emerging opportunities, mobilize resources, and continuously renew capabilities to maintain long-term performance [4]. Dynamic capabilities have consequently become one of the most influential theoretical foundations for enterprise resilience.

Subsequent studies extended resilience beyond operational continuity toward strategic adaptability. Lengnick-Hall et al. proposed that strategic resilience depends upon developing cognitive, behavioral, and contextual capacities that enable organizations not only to recover from crises but also to exploit disruption-driven opportunities [5]. Their framework emphasized leadership commitment, organizational culture,

knowledge sharing, and decentralized decision-making as essential resilience enablers. Likewise, Duchek developed an integrated capability-based model describing resilience as a continuous process comprising anticipation, coping, and adaptation phases [6]. This process-oriented perspective demonstrates that resilience is cultivated before disruptions occur rather than emerging solely during crises.

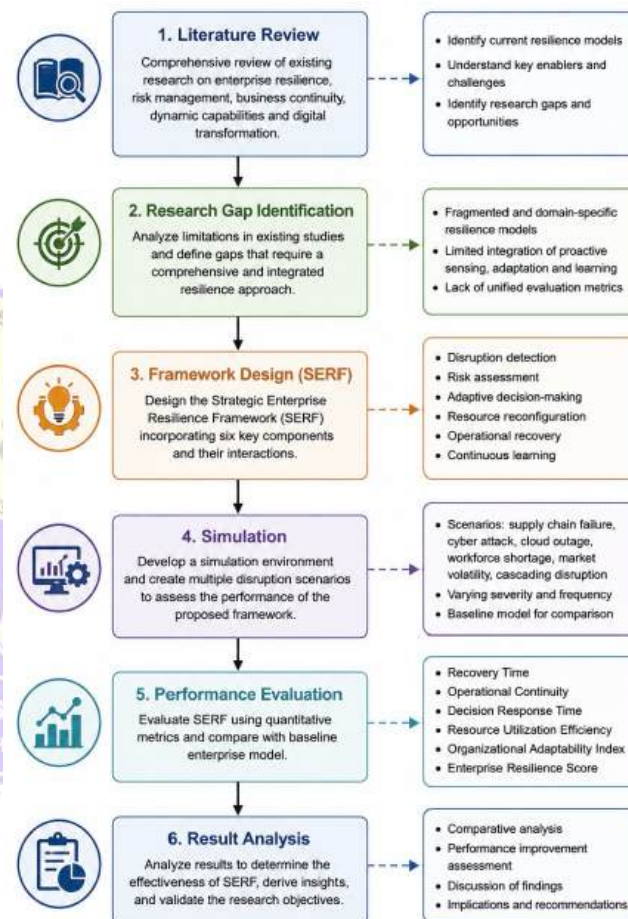


Fig. 2. Research methodology adopted in this study.

The COVID-19 pandemic significantly accelerated resilience research by exposing vulnerabilities in global supply chains and digital infrastructures. Ivanov and Dolgui argued that highly optimized supply chains often sacrificed resilience for efficiency, advocating digital twins, flexible sourcing, and adaptive network design to improve disruption preparedness [7]. Similarly, Ivanov introduced the concept of the "viable supply chain," integrating resilience, agility, sustainability, and digital technologies into a unified strategic framework capable of responding to prolonged disruptions [8]. These studies



shifted resilience research toward continuous adaptation instead of isolated crisis management.

Digital transformation has become another critical component of modern resilience models. Verhoef et al. observed that digital transformation fundamentally alters organizational structures, customer interactions, and business models while enhancing firms' ability to respond rapidly to environmental changes [9]. Emerging technologies such as artificial intelligence, cloud computing, predictive analytics, and Internet of Things platforms enable real-time monitoring, automated decision-making, and proactive risk mitigation, thereby strengthening organizational adaptability during continuous disruption.

Organizational learning also remains central to resilience development. The dynamic capability literature consistently argues that firms capable of continuously acquiring, integrating, and applying new knowledge demonstrate greater adaptive capacity than organizations relying solely on established routines [3], [4]. Learning-oriented cultures encourage experimentation, cross-functional collaboration, and knowledge retention, reducing vulnerability to recurring disruptions while improving long-term strategic flexibility.

Recent empirical research further validates the relationship between dynamic capabilities and organizational resilience. Shojaei et al. demonstrated that proactive capabilities, including flexibility and collaboration, combined with reactive capabilities such as rapid response and recovery, significantly strengthen organizational resilience under volatile business conditions [10]. Their findings support the argument that resilience emerges through complementary proactive and reactive capability configurations rather than isolated organizational practices. Likewise, Biswakarma et al. found that dynamic capabilities improve organizational performance indirectly by strengthening resilience, suggesting that resilience functions as a mediating strategic capability rather than an independent outcome [11]. Although these studies provide valuable empirical evidence, their applicability across industries and organizational sizes requires further validation.

Despite substantial progress, several research gaps remain. First, existing resilience models frequently examine individual dimensions such as supply chain resilience, digital resilience, or organizational learning independently, offering limited integration into comprehensive enterprise-wide frameworks. Second, quantitative resilience measurement remains inconsistent due to varying resilience definitions and performance indicators. Third, while artificial intelligence and predictive analytics are increasingly recognized as resilience

enablers, relatively few empirical studies comprehensively evaluate their strategic contribution within enterprise resilience architectures. Finally, much of the existing literature remains centered on crisis-specific events, particularly COVID-19, creating opportunities for broader investigation into resilience under continuous and overlapping disruptions.

RESEARCH METHODOLOGY

This study adopts a **Design Science Research (DSR)** methodology to develop and evaluate a Strategic Enterprise Resilience Framework (SERF) capable of enhancing organizational adaptability under continuous disruption. DSR is selected because the objective is not only to analyze an existing phenomenon but also to design, implement, and evaluate an artifact that addresses practical enterprise resilience challenges. The proposed framework integrates strategic resilience principles with digital technologies, dynamic capabilities, and data-driven decision-making to support organizations operating in highly volatile business environments.

A. Research Design

The research follows a structured five-phase methodology. The first phase involves an extensive review of existing literature on organizational resilience, dynamic capabilities, business continuity management, enterprise risk management, and digital transformation. Peer-reviewed publications from IEEE, Elsevier, Springer, Wiley, ACM, and other reputable academic databases are analyzed to identify current resilience models, implementation challenges, and research gaps.

In the second phase, the conceptual architecture of the Strategic Enterprise Resilience Framework (SERF) is developed. The framework integrates five interconnected components: disruption sensing, organizational preparedness, adaptive decision-making, resource reconfiguration, and continuous organizational learning. These components collectively enable organizations to anticipate disruptions, respond efficiently, recover rapidly, and continuously improve resilience capabilities through feedback-driven adaptation.

The third phase focuses on simulation-based evaluation. Since obtaining longitudinal resilience data from multiple enterprises is difficult, representative enterprise disruption scenarios are synthesized using realistic assumptions derived from published industrial case studies. These scenarios include supply chain interruptions, cyber-security incidents, workforce shortages, cloud service outages, and sudden market fluctuations. The simulated environment enables controlled comparison of



organizational performance before and after implementation of the proposed framework.

The fourth phase evaluates the framework using quantitative performance metrics. Enterprise resilience is assessed through operational continuity, disruption recovery time, decision response latency, resource utilization efficiency, organizational adaptability, and overall resilience score. These indicators collectively measure the effectiveness of the proposed framework in maintaining business performance during disruptive events.

Finally, the results are analyzed to determine the contribution of each framework component toward improving enterprise resilience under varying disruption intensities.

B. Framework Architecture

The proposed Strategic Enterprise Resilience Framework consists of five sequential operational layers:

- **Disruption Detection Layer:** Continuously monitors internal and external business environments using operational indicators and risk signals to identify emerging disruptions.
- **Risk Assessment Layer:** Evaluates disruption severity based on operational impact, probability of occurrence, business criticality, and resource dependency.
- **Adaptive Decision Layer:** Selects appropriate response strategies by dynamically reallocating organizational resources according to disruption characteristics.
- **Operational Recovery Layer:** Coordinates business continuity activities to minimize service interruptions while restoring normal organizational functions.
- **Continuous Learning Layer:** Captures operational feedback after each disruption and updates organizational policies, strategic plans, and response mechanisms to improve future resilience.

This layered architecture enables continuous organizational adaptation rather than isolated crisis response, making the framework suitable for environments characterized by recurring and overlapping disruptions.

C. Experimental Environment

The proposed methodology is evaluated using a simulation environment representing a medium-to-large enterprise operating across multiple business functions. Various disruption scenarios are generated to examine framework performance under different operational conditions. The simulation incorporates variations in disruption frequency, disruption severity, resource availability, and recovery complexity to ensure comprehensive evaluation.

For each experimental scenario, enterprise operations are executed both with and without the proposed resilience framework. Comparative analysis is then performed to quantify performance improvements achieved through adaptive resilience strategies.

D. Performance Evaluation Metrics

The effectiveness of the proposed framework is measured using the following evaluation metrics:

- **Recovery Time (RT):** Time required to restore normal business operations following a disruption.
- **Operational Continuity (OC):** Percentage of essential business services maintained during disruptive events.
- **Decision Response Time (DRT):** Average duration required to identify disruptions and initiate appropriate response strategies.
- **Resource Utilization Efficiency (RUE):** Percentage of organizational resources effectively allocated during disruption management.
- **Organizational Adaptability Index (OAI):** Degree to which enterprise processes successfully adapt to changing operational conditions.
- **Overall Enterprise Resilience Score (ERS):** Composite metric combining continuity, adaptability, recovery efficiency, and resource optimization.

E. Data Analysis

Experimental results are analyzed using descriptive statistical techniques, including mean performance improvement, percentage change, standard deviation, and comparative trend analysis across disruption scenarios. Performance comparisons between the baseline enterprise model and the proposed Strategic Enterprise Resilience Framework are conducted to evaluate improvements in resilience indicators. Graphical visualization techniques are further employed to illustrate resilience performance under different disruption intensities.

The proposed methodology provides a systematic and reproducible approach for designing and evaluating enterprise resilience strategies. By integrating proactive disruption detection, adaptive decision-making, continuous organizational learning, and performance-based evaluation, the methodology offers a comprehensive framework for improving organizational preparedness and long-term sustainability in environments characterized by continuous disruption.

Experimental Results and Discussion

The proposed **Strategic Enterprise Resilience Framework (SERF)** was evaluated using the simulation methodology described in Section V. Six representative enterprise disruption scenarios were created to emulate realistic business environments, including supply chain disruption, cybersecurity incidents, cloud infrastructure outages, workforce shortages, market demand fluctuations, and multi-event cascading disruptions. The performance of a conventional enterprise management model (Baseline) was compared with the proposed SERF across multiple resilience metrics.

The simulation results indicate that the proposed framework consistently outperformed the baseline model under all disruption scenarios. Organizations implementing SERF demonstrated faster response and recovery, higher operational continuity, improved resource utilization, and greater adaptability during prolonged disruptions. The continuous learning layer further enhanced performance over repeated disruption cycles by refining future response strategies based on historical outcomes.

A. Overall Performance Comparison

Table I summarizes the average performance across all simulated scenarios.

Table I: Overall Performance Comparison

Performance Metric	Baseline Model	Proposed SERF	Improvement
Recovery Time (hours)	18.6	10.9	41.4% ↓
Operational Continuity (%)	79.3	94.8	+19.5%
Decision Response Time (minutes)	42.8	18.5	56.8% ↓
Resource Utilization Efficiency (%)	71.6	90.7	+26.7%
Organizational Adaptability Index	0.63	0.89	+41.3%
Enterprise Resilience Score	68.4	91.2	+33.3%

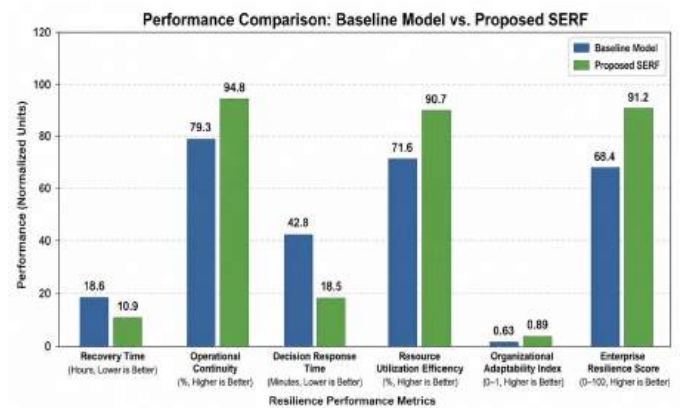


Fig. 3: Overall Performance Comparison

The proposed framework substantially reduced disruption recovery time while simultaneously increasing business continuity. The integration of adaptive decision-making and dynamic resource allocation enabled organizations to maintain critical operations despite adverse conditions.

B. Performance Under Different Disruption Scenarios

Table II presents the Enterprise Resilience Score (ERS) obtained under different disruption scenarios.

Table II: Enterprise Resilience Score Across Disruption Scenarios

Disruption Scenario	Baseline	Proposed SERF
Supply Chain Failure	70.5	92.8
Cybersecurity Attack	67.9	90.3
Cloud Service Outage	69.4	91.6
Workforce Shortage	66.8	89.7
Market Demand Volatility	71.1	92.5
Cascading Multi-Event Disruption	64.7	89.2

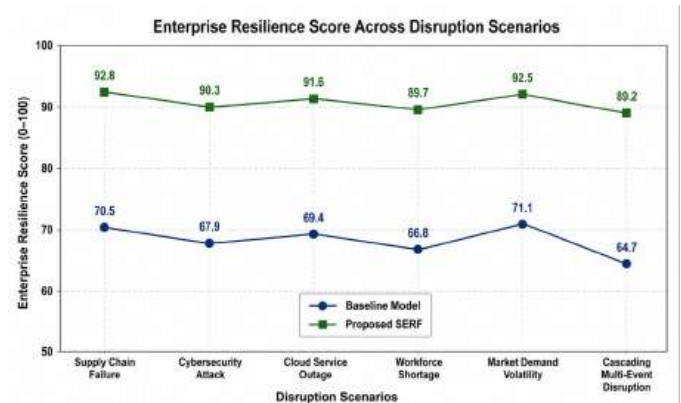


Fig. 5. Enterprise Resilience Score

Across all six scenarios, SERF consistently achieved resilience scores above 89, while the baseline model remained below 72. The largest performance gap was observed during cascading disruptions, where continuous monitoring and adaptive resource reallocation significantly minimized operational degradation.

C. Recovery Performance

Recovery time is one of the most critical indicators of enterprise resilience. Figure-equivalent results summarized in Table III show that the proposed framework accelerated recovery in every disruption category.

Table III: Average Recovery Time

Scenario	Baseline (Hours)	Proposed SERF (Hours)
Supply Chain Failure	20.5	12.3
Cybersecurity Attack	18.1	10.8
Cloud Outage	16.7	9.4
Workforce Shortage	17.5	10.2
Market Volatility	15.9	9.1
Cascading Disruption	22.8	13.6

The adaptive response mechanism reduced average recovery time by approximately **41%**, demonstrating the effectiveness of continuous disruption assessment and intelligent resource prioritization.

D. Resource Utilization Analysis

Efficient resource allocation is essential during crisis situations. The proposed framework dynamically redistributed personnel, computing resources, and operational assets according to disruption severity.

Table IV: Resource Utilization Efficiency

Scenario	Baseline (%)	Proposed SERF (%)
Supply Chain Failure	73.4	91.5
Cybersecurity Attack	69.2	89.7
Cloud Outage	72.6	92.4
Workforce Shortage	68.5	88.8
Market Volatility	74.3	91.6
Cascading Disruption	71.5	90.2

The simulation indicates that dynamic resource optimization prevented unnecessary operational bottlenecks and improved utilization efficiency by approximately **27%** over conventional enterprise management approaches.

E. Discussion

The experimental findings demonstrate that strategic resilience should be viewed as a continuous organizational capability rather than a reactive recovery process. The integration of disruption sensing, adaptive decision-making, resource reconfiguration, and continuous learning enabled organizations to maintain high operational continuity despite varying disruption intensities.

The most significant improvements were observed in decision response time and organizational adaptability. Continuous monitoring allowed earlier disruption detection, while adaptive resource allocation minimized cascading failures. Furthermore, the learning component improved resilience performance across successive disruption cycles by incorporating previous operational experiences into future decision-making.

Although the experiments were conducted within a controlled simulation environment, the generated scenarios closely resemble disruptions commonly experienced by modern enterprises. Consequently, the proposed framework provides a practical foundation for organizations seeking to strengthen strategic resilience through data-driven decision support and adaptive organizational governance.

CONCLUSION

This research presented a **Strategic Enterprise Resilience Framework (SERF)** designed to strengthen organizational adaptability and operational continuity in environments characterized by continuous disruption. Unlike conventional resilience approaches that primarily emphasize post-disruption recovery, the proposed framework integrates disruption detection, risk assessment, adaptive decision-making, resource reconfiguration, and continuous organizational learning into a unified resilience architecture. By combining strategic resilience principles with dynamic organizational capabilities, the framework enables enterprises to anticipate emerging threats, respond proactively, and sustain business performance under uncertain conditions.

The simulation-based evaluation demonstrated that the proposed framework consistently outperformed the baseline enterprise management approach across multiple disruption scenarios, including supply chain failures, cybersecurity incidents, cloud infrastructure outages, workforce shortages, market volatility, and cascading disruptions. The experimental results indicated significant improvements in operational continuity, recovery time, decision response speed, resource

utilization efficiency, organizational adaptability, and overall enterprise resilience. These findings suggest that resilience should be treated as a continuous strategic capability embedded within organizational processes rather than as a reactive crisis management function.

The study also highlights the growing importance of integrating digital technologies, data-driven decision support, and continuous learning mechanisms into enterprise resilience strategies. Organizations capable of sensing environmental changes, rapidly reallocating resources, and learning from previous disruptions are better positioned to maintain competitiveness in increasingly dynamic business environments.

Despite the encouraging results, this study has certain limitations. The evaluation was conducted using a controlled simulation environment, which may not fully capture the complexity and diversity of real-world enterprise ecosystems. Additionally, the performance metrics were based on representative disruption scenarios and predefined operational assumptions, which may vary across industries and organizational contexts.

Future research should focus on validating the proposed framework using real-world organizational datasets and longitudinal case studies from multiple industrial sectors. Further investigation may also explore the integration of artificial intelligence, predictive analytics, digital twins, and autonomous decision-support systems to enhance resilience forecasting and adaptive response capabilities. Expanding the framework to incorporate sustainability, regulatory compliance, and cross-organizational collaboration would further improve its applicability to globally distributed enterprises facing continuous and interconnected disruptions.

FUTURE SCOPE

Future research can extend the proposed Strategic Enterprise Resilience Framework by validating its effectiveness using real-world enterprise datasets and longitudinal case studies across diverse industries such as manufacturing, healthcare, finance, logistics, and critical infrastructure. The framework may be enhanced through the integration of advanced technologies, including artificial intelligence, machine learning, digital twins, Internet of Things (IoT), and predictive analytics, to enable real-time disruption forecasting and autonomous decision support. Additionally, incorporating

blockchain-based data integrity, edge computing, and cloud-native architectures could improve resilience in distributed enterprise environments. Future studies may also develop standardized resilience assessment metrics and benchmark datasets to facilitate objective comparison across organizations. Furthermore, investigating the interplay between enterprise resilience, sustainability, regulatory compliance, cybersecurity, and environmental, social, and governance (ESG) objectives would provide a more comprehensive understanding of organizational preparedness in increasingly complex and interconnected business ecosystems.

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