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Organizational Resource, Agility Maturity, Supply Chain and Risk Management of Manufacturing Industry in Caraga Region: A Causal Model on Business Resiliency

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Abstract
This study aimed to develop a best fit resiliency model for manufacturing industry in the Caraga Region, Philippines by examining the influence of organizational resources, agility maturity, supply chain management, and risk management on business resiliency. Guided by Dynamic Capabilities Theory and related organizational theories, the study utilized a quantitative non-experimental research design. Data were collected from 308 managers and supervisors from large manufacturing companies using adapted and validated survey questionnaires. Pearson Product Moment Correlation, multiple regression analysis, and Structural Equation Modelling were used in analyzing the data. Findings revealed that all predictor variables were significantly associated with business resiliency. The best fit structural model demonstrated that agility maturity emerged as the strongest predictor of business resiliency, while organizational resources did not show a significant direct effect in the final structural model. It is therefore concluded that the resiliency of large manufacturing industry is largely strengthened through adaptive and agility driven organizational capabilities, supporting Dynamic Capabilities Theory. The developed model may serve as a basis for strengthening management strategies and practices, government programs and initiatives and future research endeavors or expansions about resiliency frameworks.

Keywords: business management, business resiliency, agility maturity, organizational resources, supply chain management, risk management, manufacturing industry, structural equation modeling, Philippines

SDG Indicators: #8 Decent Work and Economic Growth, #9 Industry, Innovation and Infrastructure

1. INTRODUCTION

The growing intensity of disruptive uncertain events faced by companies across industries in the Philippines has become a major concern, as it heightens vulnerability to operational interruptions. This situation is mainly fueled by frequent natural disasters, (Enerlan, 2023; CPD-Caraga, 2024), shifts in political priorities (Jan et al., 2022), inconsistent regulatory frameworks and complex social pressures. These exposures are critical in the Caraga Region, where the geographic profile and the environment-sensitive nature (Taer & Taer, 2024) of its manufacturing sector increases the susceptibility to business continuity incidents (NEDA, 2023). This heightened risk is linked to the industry's structure, which is

largely driven by food processing (PSA, 2022), wood products (Limbaro et al., 2025), agro-based industries (Taer & Taer, 2024; Gagula et al., 2024), and processing of metallic and non-metallic materials. Given this perspective, the sector's relative contribution to the regional economy will be affected, where in normal conditions it drives growth in Gross Regional Domestic Product (Lopez, 2025), in employment generation (Tamayo & Padillo, 2025) and in investors' confidence.

Moreover, recent disruptive incidents such as the COVID-19 pandemic, the tropical storm that struck Surigao area and nearby provinces (Bolanio et al., 2022) and the frequent seismic activities (Llamas et al., 2024) have contributed widespread slowdowns (Climate Change Commission, 2024) across the industry's operating networks. In February 2024, the CPD-Caraga (2024) reported more than 81 disruption triggers across the provinces, cities and municipalities including 14 local government units declaring a state of calamity. Additionally, the presence of identity or tribal induced conflicts (Lara & Franco, 2022), threats of waylaying groups (Balanay et al., 2022), and inconsistent implementation regulatory frameworks (Dimapilis, 2025) have been found to make disruption incidents to be a more complicated area of concern. These incidents has impacted supply chain activities (Grzybowska & Tubis, 2022; Gao et al., 2021; Shahed et al., 2021), organizational resource allocations and agility due to infrastructure damage (Fernandez et al., 2024), reduced raw materials and labor mobility and availability (Nicoletti et al., 2023; Yamamoto et al., 2018; Cartenì et al., 2020; Yu et al., 2022), financial consequences (Hu et al., 2022; Tamayo & Montenegro, 2025), and regulatory restrictions or health risks prevention mandates (Qi et al., 2025). This highlights the importance of agile adaptation ability (Zahoor et al., 2022) and the firm's risk management orientation (Naveed et al. 2026) in responding to disruptions.

In line with this, Fatica et al. (2024) and Antonioli et al. (2022) explained that while disasters weaken the firm's performance, adaptation measures will play a key role in building resilience. In the Philippine setting, Cutillas et al. (2022) introduced resiliency factors to include institutional control, planning and preparedness, philosophy and integrity, external support and linkages and communication and media. Complementing this, Aparecio and Torrejas (2024) and Charisma et al. (2025), both emphasized the idea of strong leadership, planning, communication, and knowledge management as enhancing factors of business resilience during crises. This was reinforced by Madi et al. (2023), who highlighted transformational leadership in fostering an adaptive culture that will help firms survive disruptive and impactful crises like COVID-19.

Process simplification, as explained by Kusiak (2020), enhances agility and adaptability, which are essential components of business resilience. Similarly, Shaheen et al. (2025) explained that firms with greater interconnectedness through cross-border linkages and embeddedness in well-connected regions exhibit higher resilience to structural and economic shocks. In enhancing resilience capabilities, Kotsios (2023) and Zhang et al. (2025) explained the importance of human and organizational capabilities. In addition, organizational philosophy supports resiliency by ensuring that newly generated knowledge is guided by integrity, preventing misuse by individuals that could harm the organization's values and overall reputation (Horaguchi, 2025). Generally, these views show that strong leadership, adaptability, and people's capabilities are key to helping businesses bounce back from crises.

Exploring the association of variables, independent studies such as in the studies of Do et al. (2022) and Beninger and Francis (2022), they have clearly explained the strong link between organizational resources and business resilience when strategically managed. These resources are the assets and capabilities a company can draw on to stand out, perform well, and create lasting value (Barney, 1991). From a Resource-Based View (RBV), these resources are considered valuable, rare, inimitable, and non-

substitutable (VRIN), providing the foundation for developing distinctive competencies that differentiate an organization in its environment. Wilden et al. (2022) similarly defined organizational resources as tangible and intangible assets, capabilities and processes that an organization will employ to adapt and respond to unpredictable changes in the external environment. The type of organizational resources and its availability as highlighted by both Jang et al. (2022) and Farkash et al. (2022), play a crucial role in enhancing resilience and supporting effective crisis adaptation. Similarly, Albrecht et al. (2018) explained that organizational resources comprises the areas of perceived human resource practices, strategic alignment, senior leadership, clarity of organizational goals, organizational support for autonomy, and organizational adaptivity and openness to change.

Looking at the influence over goal alignment, Balzano (2023) explained that employees may be less aligned with managers' goals, but those who strongly identify with their leaders stay aligned. As a core organizational resource, human resource management helps build resilience and sustain operation during crises (Ngoc et al., 2021), and aligning its strategic practices with organizational culture further strengthens this resilience as emphasized by Georgescu et al. (2024), enabling organizations to adapt and succeed amid uncertainty.

Beyond human resource practices, Auger et al. (2022) highlighted organizational communication, training, and evaluation as critical resources that share employees' understanding of and engagement with corporate and environmental strategies. Complementing this, senior leaders play a crucial role in guiding their teams through uncertainty by modeling clear, honest, and empathetic communication (Gigliotti & Alvarez-Robinson, 2025), which helps reinforce these organizational efforts. Moreover, Slemp et al. (2021) noted that interventions supporting employees' autonomy, competence, and relatedness can enhance motivation, although their effects tend to be more pronounced at the leader level than at the individual employee level.

Building from the role of organizational resources, agility maturity becomes an important factor in understanding how company respond to uncertainty and sustain business resiliency. Miceli et al. (2021) and Suryani and Dwiputra (2025) has emphasized the link between agility maturity as directly associated with business resiliency. Organizational agility refers to an organization's ability to swiftly respond to market demands by sensing, renewing, adapting, and succeeding in a dynamic and often turbulent environment (Motwani and Karatria, 2024). This adaptability allows organizations to adjust criteria and sub-criteria according to specific business activities and available resources. Agility maturity views differ across roles and Hernaus et al. (2020) emphasized that this includes the areas of leadership and management, innovation, strategy, culture, learning and change, and structure. Recent studies emphasize the role of supply chain maturity in enhancing organizational agility, with ambidexterity and collaboration as key enablers (Alamsjah & Yunus, 2022). Mature integration across internal, supplier, and customer processes strengthens efficiency, innovation, and responsiveness. This enables organizations to be more effective and timely in their responses in dynamic environments (Anwar et al., 2025; Pejić Bach et al., 2023).

On the other hand, leadership agility enables organizations to adapt and thrive in dynamic environments because it upholds a supportive organizational culture and employee motivation positively (Arifin & Purwanti, 2023). Porkodi (2024) added and explained that agile leadership strengthens organizational agility, boosting performance, innovation, and team effectiveness, particularly in operational areas. Other than that, Marjerison (2022) said that knowledge sharing and adaptability will also enhance organizational agility because it promotes a collaborative and innovative culture, regardless of organizational sector. But, Naveed et al. (2022) discusses that agility and effectiveness can be enhanced by integrating innovation in

its strong organizational culture where acceptance to change by employees are strengthened.

In response to shifting technological directions and evolving customer behaviors, businesses must cultivate agility, flexibility, and dynamism (Juliana et al., 2023). Organizational agility and learning works together (Saha et al., 2020), to help firms quickly adapt to technological disruptions, strengthen innovation, and stay competitive. Cho et al. (2022) emphasized that organizations often struggle with agility due to challenges in acquiring and assimilating knowledge, which can lead to misperceptions of business environment changes and missed opportunities. It is finally highlighted by Franco et al. (2022) the multifaceted nature of organizational agility, linking it closely with factors like organizational culture and technology adoption. This approach enables organizations to assess their current agility levels and strategically plan for future improvements.

Extending this discussion on agility, Supply Chain Management also plays a critical role because companies need coordinated internal and external processes to remain responsive during disruptions. Moreso, both Ngo et al. (2024) and Tufan et al. (2024) highlighted the strong link of an agile supply chain management to business resilience, emphasizing how firms respond and sustain operation amidst environmental disruptions. Supply chain management is defined as planning, managing, and connecting every step of sourcing, production, and delivery while working closely with suppliers, partners, and customers to keep everything running smoothly (Council of Supply Chain Management Professionals, 2017). This perspective was further elaborated by Baqleh (2023) that companies will need to share clear and accurate information because relationships between suppliers and with customers alone does not give competitive advantage. In improving manufacturing firms' economic, environmental and social sustainability, Amentae (2024) explained that supply chain management covers the areas of supply chain internal practices, integration with suppliers and integration with customers.

In reducing reputational and operational damage during crises, Azadegan et al. (2020) highlighted that there is a need to align supply chain management with business continuity practices. This is elaborated by Wieland (2020) which emphasized the necessity of adaptive and robust resilience strategies, technical innovations, and sustainable practices to achieve long term success. In the recent studies of Yamin et al. (2024) and Guntuka et al. (2024), effective supply chain management and among others are crucial aspects for enhancing the firms' resilience, operational continuity and sustainable value creation. Similarly, Napoleone et al. (2022) found that the strategic use of reconfigurable manufacturing systems (RMSs) also enhances supply chain resilience and sustainability by improving flexibility, collaboration, and crisis response. To sum it all, building strong and flexible supply chain strategies helps organizations stay resilient, respond faster to crises, and sustain long-term success.

Managing uncertainties as discussed by both De Lima et al. (2022) and Wang and Jei (2020) impacts the circular supply chain and improves resilience. This is added by Enz et al. (2023) which highlights the business resiliency being boosted by service supply chains through improving customer and supplier connections and teamworks. Added further, Shao et al. (2021) shared that Industry 4.0 strengthens business resilience and enables organizations to adapt and thrive amid disruptions through building an agile and connected supply chain. In this perspective, strengthening supply chain connections and embracing new technologies will help businesses stay resilient and quickly adapt to uncertainties.

Following this view on supply chain, risk management orientation also becomes essential in providing firms with structured ways to identify, assess, and respond to uncertainties affecting supply chain operations. Additionally, a study by Al-Swidi et al. (2026) shows a causal path where risk management orientation positively impacts supply chain resilience, both directly and indirectly, with agility also

exerting a significant positive effect on supply chain resilience. However, Frimpong et al. (2024) emphasize that strong supply chain management enhances organizational resources, which in turn enable firms to better manage supply chain disruptions, as noted by Bygballe et al. (2023). Risk management is the coordinated process of directing, controlling, and engaging relevant stakeholders to identify, assess, and treat risks that may affect the achievement of organizational objectives (ISO 31000, 2018).

At its core, Kulinich et al. (2023) explain that risk management seeks to protect organizational value, while also enabling strategic, value driven risk programs under conditions of uncertainty (Bukhari et al 2021). In this contemporary view, Ansyari (2024) conceptualizes risk management as a dynamic barometer that measures an organization's level of uncertainty and disruption, not merely as a signal of potential loss. By translating uncertainty into measurable and manageable terms, Sunaryo et al (2025) emphasized that risk management provides decision-makers with actionable insights for prioritizing threats and formulating effective mitigation strategies. Additionally, Parast and Subramanian (2021) identify several domains of risks, namely demand risk, supply risk, process risk and environmental risks.

Among the various dimensions of organizational risk, demand-related concerns are particularly important as a critical external factor (Foli et al., 2022). Arora et al. (2025) further emphasizes that intensifying demand risk necessitates more disruption-sensitive forecasting approaches to strengthen organizational resilience. Sun et al. (2024) demonstrates that emergency events trigger short-term but extreme surges in irrational demand, thereby amplifying instability. Similarly, Ampofo and Baffoe (2025) explains that demand risk originates from evolving customer behavior patterns, market volatility, and unstable revenue streams.

Lu et al., 2021 argue that transmission and source errors can minimish or even reverse the value of demand information sharing, thereby increasing demand risk in data-constrained environments. Moreover, Kaya (2024) and Esenduran et al. (2022) noted that customer delayed payments create financial uncertainty and risk exposure, while frequent requests for expedited production strain cash flow and disrupt operational stability. Hence, Marc and Berlec (2023) demonstrate that incorporating customer buying behavior into inventory models strengthens demand risk management by enabling firms to anticipate demand fluctuations and associated cost risks.

Within the supply risk dimension, Santos et al. (2025) show that logistics failures increase supply risk, and Thi et al. (2025) and Burkhart and Bode (2024) further explain how these issues spread across the supply chain and weaken performance. Also, Polater (2025) highlights that substandard supplies and quality failures harm operational performance, while Ghadir et al. (2022) identify supply shortages and supplier closures as major risks that disrupt supply chain continuity (Gurtu & Johny, 2021). However, Ersahin et al. (2024) find that firms with globally dispersed and concentrated supplier networks face higher supply chain risk, and they respond by shifting toward closer, domestic, and more reliable suppliers or through vertical integration.

Process risk, as another dimension of organizational risk, arises from failures within internal operations and systems that can cascade across functions, disrupt workflows, and threaten overall organizational stability (Zhu et al., 2026). Upadhay and Bawa (2025) examines how internal and external factors influence operational risk in manufacturing firms, applying a risk flow model and simulation techniques to assess how changes in key parameters affect overall risk exposure. Benhanifia et al. (2025) further emphasized that predictive maintenance improves machine reliability and reduces operational disruptions through Artificial Intelligence (AI) and Internet of Things (IoT) integration. Moreover, Kozien (2020) explains how technical irregularities can lead to production inefficiencies and stoppages and proposes risk

assessment tools to prevent them.

Moving forward, environmental risk is another important component of risk management. In the study of López et al. (2025) and Chang et al. (2025), they identified geopolitical risks such as wars and political tensions as sources of operational disruption and uncertainty that require strategies such as collaboration, resilience, and financial management. Khan et al. (2018) found that terrorist attacks disrupt infrastructure and increase operational uncertainty, while Golan et al. (2020) show that pandemics expose network vulnerabilities and highlight the need for stronger resilience strategies.

Finally, Fernando and Masman (2024) and Jidda et al. (2025) concluded that business risk management has a strong influence on business resilience. But, this connection however is being challenged by the conclusion of Chen et al. (2026) that discusses manufacturers' reliance on supply chain collaboration and organizational resource reconfiguration, rather than internal risk control, to quickly absorb shocks. These varying findings show that business resilience maybe explained through the combined roles of organizational resources, agility maturity, supply chain and risk management.

This study is mainly guided by the Dynamic Capabilities Theory (DCT) developed by Teece, Pisano, and Shuen in 1997 and later expanded in 2014. The theory explains that resilience does not come from fixed resources, but from a firm's ability to sense environmental changes, seizing opportunities to quickly make smart decisions, and transform resources to stay competitive (Nayernia, 2025). In this study, DCT is used to establish the fundamental characteristics of a resilient manufacturing organization in the Caraga Region. It calls for a strategic framing of independent variables as key drivers to establish the ability of sensing, seizing and transforming organization to remain afloat, competitive and sustainable despite disruptions.

Supporting the main theory is the Resource-Based View (RBV) proposed by Jay Barney in 1991. This theory assumes that a firm's lasting competitive advantage comes from its ability to identify, develop, protect, and use valuable, rare, inimitable, and non-substitutable (VRIN) resources. In this study, RBV highlights the importance of internally developing unique resources and capabilities to strengthen the adaptive capabilities, remain flexible and competitive performance amidst volatile and uncertain environments of a manufacturing company.

Lawrence and Lorsch's (1967) Contingency Theory supports this study by emphasizing that there is no single best way to manage an organization. Its effectiveness depends on how well processes and strategies align with the external environment. This idea strengthens the study's view that the impact of organizational resources and agility maturity relies on how they fit with changing conditions and supply chain demands. By applying Contingency Theory, the study explains business resiliency as a matter of alignment, where the proper use of resources, agile systems, and responsive linkages help sustain performance even amid uncertainty and change.

The Open Systems theory of Katz and Khan (1978) strengthens the foundation of this study by viewing the organization as a dynamic system that constantly interacts with its external environment. The theory emphasizes the importance of feedback and adaptation, explaining that resilient organizations maintain their performance by continuously adjusting their resources and processes as conditions change. Through this lens, the study presents business resiliency as an outcome of an organization's ability to balance its internal strengths with external demands, allowing it to remain stable and responsive within a volatile and uncertain environment.

Finally, this study is further supported by the High Reliability Organization (HRO) Theory (1980) as originally developed by LaPorte, Rochlin, and Schulman and later expanded by Weick and Sutcliffe in late 1990s. This theory explains how organizations operating in complex and high risk environments

maintain reliable performance by constantly anticipating potential failures, closely monitoring operations, and responding quicky to emerging threats. In line with these views, risk management serves as a continuous monitoring processes that helps organizations identify risk, take preventive actions and respond effectively to operational and environmental obstacles to continuity and sustainability.

The research paradigm as shown in Figure 1 introduces a structural model that reflects the effects of independent variables to the dependent variable. The model will be tested in terms of associations between variables, namely the organizational resource, agility maturity, supply chain management and business resiliency. Albrecht, Breidahl, and Marty (2018) mentioned that the 6 factors to measure organizational resource are perceived human resource practices which refers to employee perception regarding human resource practices supporting them, senior leadership which refers to perception of top/senior leadership's behavior, strategic alignment which refers to employee awareness of and alignment with organizational strategy, clarity of organizational goals which refers to the clarity and shared understanding of realistic, well-communicated organizational goals, and organizational adaptability and openness to change refers to the organization's capacity to anticipate and adapt to change through flexibility and innovation, while allowing employees sufficient autonomy and decision-making freedom in managing their work.

Organizational agility maturity was originally developed by Wendler (2014) and used in this study. It discusses 6 dimensions, namely: leadership and management, innovation, strategy, culture, learning and change and structure. Leadership and management refers to the role of leadership in driving agility, direction, and support for change, Innovation which refers to the organization's capacity for strategic foresight, innovation, and aligning strategy to agility, strategy which refers to the shared values, norms, practices, and organizational climate that support agility, culture which refers to the shared values, norms, practices, and organizational climate that support agility, learning and change which refers to the processes by which the organization learns, adapts, and changes over time, and structure which refers to the organizational architecture and formal systems that can enable or hinder agility.

Moreover, supply chain management shall be evaluated through internal practices, supplier integration and customer integrations as emphasized by Tadesse et. al (2025). The supply chain internal practices cover how well the firm's own internal departments/functions are linked, integration of supplies which refers to how the organization works with its suppliers, and integration with customers refers to how the firm interacts with its customers.

Risk management functions as a critical organizational mechanism that continuously identifies, measures, and evaluates potential risks from various risk areas, providing decision makers with timely information about the level of uncertainty and possible disruptions. Parast and Subramanian (2021) identified four key components of risk management, namely demand risk, supply risk, process risk, and environmental risk. Demand, supply, and environmental risks arise from volatile or unexpected external conditions that may disrupt operational continuity, while process risk refers to internal challenges within organizational operations that may lead to disruptions or performance failures.

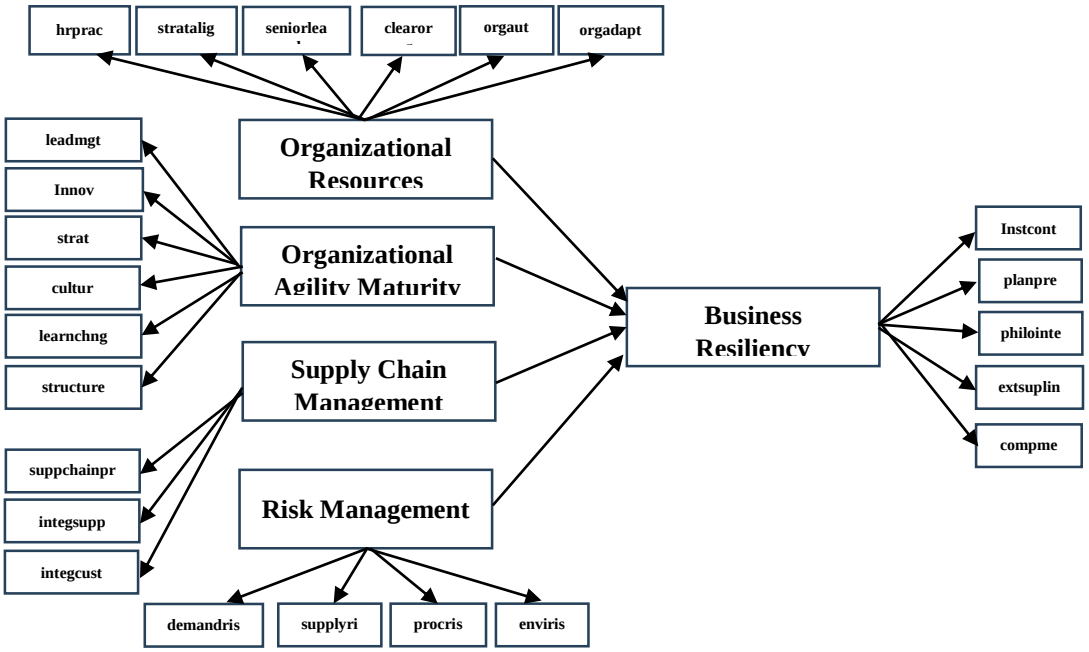

Figure 1. A Causal Model of Business Resiliency with Organizational Resource, Agility Maturity, Supply Chain and Risk Management as Predictors

Legend:
Organizational Resources
Organizational Agility Maturity
hrprac – Perceived Human Resource Practices
leadmgt – Leadership and Management
stratalign – Strategic Alignment
Innov – Innovation
seniorlead – Senior Leadership
Strat – Strategy
clearorg – Clarity of Organizational Goals
cultur – Culture
orgauto – Organizational Support for Autonomy
learnchng – Learning and Change
orgadapt – Organizational Adaptivity and Openness to Change
structure – Structure
Supply Chain Management
Business Resiliency
suppchainprac – Supply Chain Internal Practices
instcont – Institutional Control
integsupp – Integration with Suppliers
planprep – Planning and Preparedness
integcust – Integration with Customers
philointeg – Philosophy and Integrity
extsuplink – External Support Linkage
Risk Management

compmed – Communication and Media
demanrisk – Demand Risk
supplyrisk – Supply Risk
procrisk – Process Risk
envirisk – Environmental Risk

Finally, Cutillas et. al (2022) found 5 significant causal factors that comprise the resiliency and recovery frameworks. These factors include *institutional control*, *planning and preparedness*, *philosophy and integrity*, *external support and linkages* and *communication and media*. *Institutional control* refers to the governance and decision authority, *planning and preparedness* refers to crisis readiness and continuity planning, *philosophy and integrity* refers to ethical culture and organizational values, *external support and linkages* which refers to collaborative networks and stakeholder partnership, and *communication and media* which refers to crisis communication and information dissemination.

Moreover, despite the extensive review, there is very limited research on how organizational resources, agility maturity, supply chain and risk management influence the business resiliency of the manufacturing industry. Most of the existing studies only look at each variable separately, focusing on how they individually affect another or two variables when faced with disruptions or uncertain situations. By far, there seems to be no study that connects all five variables in one framework and specifically studied in the Caraga Region's operational perspective. As Chong et al. (2025) note, each region faces unique vulnerabilities that require context-specific resilience strategies. Hence, the researcher conducted a study that combines all five variables and produced a fitted equation to hypothetically establish the resiliency model for manufacturing firms in the Caraga Region.

This study aimed to fill-in the research gap by developing a causal model for business resiliency among manufacturing firms in the Caraga Region. Specifically, it seeks to answer the following objectives: first, to determine the status of implementation of business *resiliency*, *agility maturity*, *supply chain* and *risk management*. Second, to determine the significant relationship between the five main constructs. Third, to uncover which independent variable/s significantly causes business resiliency. Finally, to develop a best-fit resiliency model for the manufacturing industry in the Caraga Region.

The null hypotheses tested at 0.05 level of significance are: first, there is no significant relationship among the study variables, namely *organizational resources, agility maturity, supply chain, risk management and business resiliency*. Second, *organizational resource, agility maturity, supply chain and risk management* do not significantly influence *business resiliency*. Finally, there is no best-fit casual model for business resiliency.

This study supports the United Nations Sustainable Development Goals (SDGs), especially SDG 8 on decent work and economic growth. This will help companies maintain steady growth, provide stable jobs, and improve inclusive productivity. By focusing on organizational adaptability and agility, the study also supports SDG 9, industry, innovation and infrastructure, by encouraging innovation and the creation of systems that can withstand and recover from economic or environmental challenges. Ma et al. (2025) highlighted that intelligent development can make manufacturing firms more resilient by reducing disruptions, while Garrido-Moreno et al. (2024) noted that innovation and resilience are key for businesses to stay competitive in uncertain times. Moreso, the social relevance of the study is seen in in its potential and ability to continue operations, protect employees from unstable work conditions, guide government agencies in crafting responsive support programs, and assist local development institutions in promoting sustainable regional economic growth.

Additionally, this study will provide evidence-based insights to guide manufacturing industry of the Caraga Region in framing sustainability mechanisms and initiatives toward achieving the desired level of business resiliency. Holgado et al. (2024) emphasized resilience as a key driver of organizational excellence, highlighting resilient practices will help mitigate risks while fostering long-term stability and adaptability in changing environments. Hence, the resulting model may also assist regional policy makers, local government units, and development councils in creating programs that improve industrial resilience, disruption response and investor confidence.

Furthermore, this study will contribute to the academic community by contextualizing business resiliency within manufacturing organizations in the Caraga Region, where empirical evidence linking organizational resources, agility maturity, supply chain, risk management and business resiliency remains limited. Therefore, the study is timely and relevant, addressing the urgency and the growing need to strengthen resiliency among manufacturing firms, taking into account the increasing occurrence of unpredictable events in the regional environment.

2. METHODS

This section presents the methods and procedures used in the study. It includes the research design, research locale, respondents, research instrument, data gathering procedures and statistical used to analyze the data and determine the best fitting model of business resiliency among manufacturing firms in the Caraga Region.

Research Respondents

The respondents of this study were top and middle management level employees of large manufacturing corporations in the Caraga Region, including managers, directors, operations heads and senior and junior supervisors. The were considered individually as respondents since the study gathered their direct assessment of organization resources, supply chain, agility, risk management and resiliency practices or implementations. As noted by Boers and Brozović (2025), individuals occupying decision making and managerial roles are central to the implementation of effective resilience strategies.

The study gathered data from 308 qualified respondents from large manufacturing corporations in the Caraga Region. The classification of these corporations was determined according to asset size category using the classification standard used by the Philippine Statistics Authority (PSA). The focus category was chosen, adopting the conclusion of Hashmi et al. (2020), which explains that organizational assets have strong indication of performance. Hence, this study specifically included manufacturing companies classified as large corporations, defined as those with assets ranging from Php100,000,001 and above.

Based on the total population of 27,856 employees across 50 large manufacturing corporations in the Caraga Region (PSA, 2025), the initial minimum sample size of 379 respondents was computed using the Raosoft sample size calculator. However, due to organizational access limitations, varying participation levels, and the specialized inclusion criteria of the study, the final actual data gathered yielded 308 qualified respondents. The obtained respondents were considered adequate for Structural Equation Modeling (SEM), as Hair et al. (2022) emphasized that SEM commonly requires approximately 300 to 400 cases for robust model estimation, while Kline (2016) noted that sample sizes exceeding 200 are generally acceptable for SEM applications. An additional 30 respondents were selected for pilot testing to assess the reliability of the survey instrument.

Accordingly, the study employed random sampling in selecting qualified respondents who satisfy the inclusion criteria. Participating organizations were likewise allowed to identify appropriate managerial

and supervisory personnel based on organizational availability, operational considerations, and internal approval. From the identified list of qualified personnel, the respondents were randomly selected. This method ensured that each qualified respondent had an equal chance of being selected and helped reduce selection bias in the data gathering process.

Organizations that did not meet the large corporation asset classification were excluded from the study, particularly small and medium sized enterprises (SMEs), as their operational scale, resources, and risk exposure differed from those of large manufacturing firms. Employees who were not directly involved in managerial, supervisory, or decision-making functions, such as rank-and-file personnel or staff limited to routine operational tasks, were also excluded. Furthermore, companies not engaged in manufacturing activities, as well as respondents who lacked sufficient familiarity with the organization's resources, supply chain, agility, or risk management practices, were excluded from the study.

This study was conducted in Region XIII (Caraga Region), located in the northeastern part of Mindanao, Philippines. The region is composed of five provinces: Agusan del Norte, Agusan del Sur, Surigao del Norte, Surigao del Sur, and Dinagat Islands and several key cities that serve as major economic hubs in the area. The region was chosen as the research locale because Caraga has been identified as the second fastest growing regional economy in the country with a growth rate of 4.9, 6.9, and 5.7 percent in 2023, 2024, and 2025, respectively (Philippine Statistics Authority – Caraga, 2024). However, Madrigal et al. (2025) highlighted that, among other factors, conflict conditions in Mindanao can create an unfavorable investment climate, limiting the inflow of external investors in regions including Caraga. Moreover, environmental hazards, as well as the regions' social and political orientation present additional challenges for manufacturing industry in optimize their operations. These conditions make Caraga a fitting choice for this study because they offer a real and meaningful way to understand how organizations in growing regional economies keep their operations strong and adapt to challenges.

Materials and Instrument

In gathering primary data, the study utilized a structured questionnaire adapted from different authors, which were carefully reviewed, processed, and modified to fit the context of the study. The instrument likewise underwent content validation by professionals who are experts in the relevant industry to ensure that all items are meaningful and updated. Content adjustments were also made to ensure that the language and scales were relevant and easily understood by the respondents. The instrument obtained an overall mean validation score of 4.71, interpreted as excellent validity.

Also, a pilot test was conducted among thirty (30) respondents prior to the actual data gathering to assess the reliability of the adapted research instrument. During data processing, only twenty seven (27) responses were considered valid for reliability analysis due to incomplete responses in some questionnaires. Cronbach's alpha coefficient was utilized to determine the internal consistency of the instrument. The reliability statistics revealed a Cronbach's alpha coefficient of 0.991 across 156 items, indicating excellent internal consistency and reliability.

The questionnaire was divided into 5 parts which correspond to each of the study variables: business resiliency, organizational resource, agility maturity, supply chain and risk management. All items in the instrument were measurable using a five-point Likert scale which will range from "the measure indicated is always manifested/observed" to "the measure indicated is never manifested/observed". The instruments were developed to facilitate the efficient data collection from participants, ensuring that responses has reflected interpretable ideas about how organizations build and maintain organizational resilience strategies.

The first part of the tool used a standard resiliency questionnaire adapted from the study of Cutillas et al (2022). Each item were reviewed and adjusted to match the setting of this study. It included indicators in the areas of: institutional control, planning and preparedness, philosophy and integrity, external support and linkages, and communication media. The items included in this part of the questionnaire were checked using Cronbach's alpha coefficient to ensure reliability of each item.

The second part of the instrument is about organizational resource which was adapted from the study of Albrecht et al (2018). It contained 6 indicators, namely: perceived human resource practices, strategic alignment, senior leadership, clarity of organizational goals, organizational support for autonomy, and organizational adaptivity and openness to change. Similarly, each item was reviewed and adjusted to align within the context of this study. This part was also tested using cronbach's alpha coefficient to ensure its reliability.

The third part of the instrument utilized a standard questionnaire on agility maturity which was adapted from Hernaus et al (2020). Each item of this part was reviewed and adjusted to ensure alignment with the study perspective. The 6 indicators of this variable are: leadership and management, innovation, strategy, culture, learning and change, and structure. A test using cronbach's alpha coefficient was also employed to ensure reliability of each item.

The fourth part of the tool was also a standardized supply chain management questionnaire which was adapted from Amentae et al (2024). This part has 3 indicators, namely: supply chain internal practices, integration with suppliers, and integration with customers. Like with other parts, each item was reviewed and adjusted to match with the study context and to ensure reliability of each item, it was tested using cronbach's alpha coefficient.

Finally, the fifth part of the instrument was adapted from the study of Parast and Subramanian (2021). This section measured the different dimensions of risk, namely demand risk, supply risk, process risk, and environmental risk. Similar to the other sections of the instrument, this part has also undergone an expert validation and reliability testing to ensure the consistency and credibility of the measurement.

Design and Procedure

This study adopted a quantitative research approach and utilized a descriptive-predictive research design. A quantitative approach was appropriate because the study generated measurable data, identified patterns and relationships among variables, and allowed broader interpretation regarding business resiliency among manufacturing firms. The study was descriptive in nature because it described the extent to which organizational practices and capabilities in terms of business resiliency, organizational resources, agility maturity, supply chain and risk management were evident within the participating organizations. It was also predictive because it examined the influence of the key variables in generating causal pathways toward business resiliency through Structural Equation Modeling (SEM). Through this approach, the study identified patterns, associations, and trends that provided a bases for further analysis and model development.

The data gathering procedures were conducted within an estimated two-month period and generally underwent three phases or stages. Phase 1 involved activities related to instrument preparation, content validation, reliability testing, pilot testing, and securing data gathering approvals. Phase 2 covered the actual conduct of data collection, while Phase 3 involved the collation, analysis, and interpretation of the gathered data.

In the data gathering phase, the researcher first secured approval from the Dean of the Professional School at the University of Mindanao to ensure the credibility of the activity and the instrument used in the study.

The study also complied with the requirements of the University of Mindanao Ethics Review Committee (UMERC) and secured a certification of approval with protocol number UMERC-2026-291, prior to the actual conduct of data gathering. Request letters addressed to participating organizations were endorsed and signed by the research adviser and the Dean of the Professional School before being formally transmitted to the identified corporations.

The researcher facilitated the submission of communications and request letters through both email correspondence and personal coordination with participating organizations. In several cases, the researcher personally visited organizational offices and directly coordinated with managers, heads, and supervisory personnel to initially discuss the nature, objectives, inclusion and exclusion criteria, and requirements of the study. Participating organizations were likewise allowed to identify qualified respondents based on the established inclusion criteria, organizational availability, and internal approval considerations.

After retrieval but prior to statistical analysis, the gathered data underwent coding, cleaning, and screening procedures to identify incomplete responses, missing values, and inconsistencies in the dataset. Only qualified and sufficiently completed responses were included in the final statistical analysis. Descriptive statistics such as mean and standard deviation were utilized to determine the level of Business Resiliency, Organizational Resources, Agility Maturity, Supply Chain Management, and Risk Management among manufacturing firms in the Caraga Region. To determine the significant relationships among the study variables, Pearson Product-Moment Correlation Coefficient (Pearson r) was employed. The correlation analysis identified the strength and direction of relationships among the major constructs of the study.

The interpretation of the mean scores was based on a five-point scale. A mean range of 4.20 to 5.00 was described as “Always”, which means that the measure indicated was always manifested or observed. A mean range of 3.40 to 4.19 was described as “Often”, indicating that the measure was often manifested or observed. A mean range of 2.60 to 3.39 was described as “Sometimes”, which means that the measure was sometimes manifested or observed. A mean range of 1.80 to 2.59 was described as “Seldom”, indicating that the measure was seldom manifested or observed. Lastly, a mean range of 1.00 to 1.79 was described as “Never”, which means that the measure indicated was never manifested or observed.

In evaluating the Structural Equation Models, several goodness-of-fit indices and criterion were utilized to determine model adequacy and identify the best-fit structural model. The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) were interpreted using the conventional threshold value of 0.90 and above as indicators of acceptable or adequate model fit. The Root Mean Square Error of Approximation (RMSEA) was interpreted using the conventional threshold of below 0.08 as indicative of acceptable approximation error, while lower Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values were considered indicators of better comparative model fit.

To uphold ethical mandates, the study observed voluntary participation, informed consent, anonymity, confidentiality, and the right of participants to withdraw without penalty or required justification. Questionnaires were administered face to face, with respondents identified and endorsed by the participating organizations to ensure that only qualified participants were included, while their identities and responses remained protected. No personally identifiable information was collected, and all were used solely for academic purposes, consistent with ethical standards for human participants (PHREB, 2022). In compliance with the Data Privacy Act of 2012 and its implementing rules, the study observed transparency, legitimate purpose, proportionality, and secure data handling (RA No. 10173, 2012; NPC, 2016). Hard copies were kept in locked storage, while electronic files and scanned copies were stored in password protected files for at least one year. After the retention period, hard copies were shredded and

electronic files were permanently deleted to prevent unauthorized access, misuse, or disclosure, consistent with ethical statistical practice (ASA, 2022).

3. RESULT AND DISCUSSION

This section presents the descriptive, correlational, and structural equation modeling results of the study examining the relationships among Organizational Resources, Agility Maturity, Supply Chain Management, Risk Management, and Business Resiliency among manufacturing firms in the Caraga Region. The findings are discussed in relation to the study objectives, theoretical foundations, and relevant literature.

Status of implementation of business resiliency, agility maturity, supply chain and risk management

Status of Business Resiliency. Table 1 shows that Business Resiliency obtained an overall mean of 4.11 (SD = 0.51), described as Often. Among the indicators, Planning ang Preparedness recorded the highest mean of 4.23 (SD = 0.59), described as always, while Communication and Media obtained the lowest mean of 3.97 (SD = 0.70), described as Often. This pattern implies that manufacturing firms may continue to strengthen their resiliency by sustaining their planning and preparedness practices while giving more attention to communication and media systems in future operations. Improving these areas may help firms respond more effectively to disruptions and maintain coordination during uncertain conditions.

Status of Organizational Resources. The results shows that manufacturing firms in the Caraga Region generally manifested strong organizational resources, as reflected in the overall mean of 4.22 (SD = 0.48), interpreted as Always. The highest mean was observed in Perceived Human Resource practices at 4.42 (SD = 0.66), indicating that employee related practices were the most consistently observed resource among the firms. Strategic Alignment and Senior leadership both followed with a mean of 4.30 (SD = 0.53), showing that organizational direction and leadership support were also strongly manifested. However, Organizational Adaptability and Openness to Change obtained the lowest mean of 4.08 (SD = 0.68), although still interpreted as Often. This pattern implies that while the firms already have strong human resource practices, leadership and strategic alignment, future efforts may focus on improving adaptability, autonomy and clarity of goals to strengthen their readiness for change, disruptions and long term resiliency.

Status of Agility Maturity. For agility maturity, the manufacturing firms obtained an overall mean of 4.01 (SD = 0.47), interpreted as Often. The pattern of results indicates that Innovation had the highest mean of 4.18 (SD = 0.57), suggesting that the firms often practiced improvement, creativity, and openness to new ways of doing work. This was followed by Learning and Change with a mean of 4.13 (SD = 0.57), which reflects the firms' capacity to adjust and learn from changing conditions. On the other hand, Strategy recorded the lowest mean of 3.75 (SD = 0.70), although still interpreted as Often. This suggests that while the firms were generally agile in terms of innovation and learning, future efforts may give more attention to strengthen strategic direction so that agile practices can be better guided toward long term competitiveness, preparedness and resiliency.

Table 1

Status of implementation of business resiliency, organizational resources, agility maturity, supply chain and risk management

Indicators	SD	Mean	Descriptive Level

Business Resiliency	**0.51**	**4.11**	**Often**
Institutional Control	0.57	4.19	Often
Planning and Preparedness	0.59	4.23	Always
Philosophy and Integrity	0.64	4.15	Often
External Support Linkages	0.66	4.03	Often
Communication and Media	0.70	3.97	Often
Organizational Resource	**0.48**	**4.22**	**Always**
Perceived Human Resource Practices	0.66	4.42	Always
Strategic Alignment	0.69	4.30	Always
Senior Leadership	0.53	4.30	Always
Clarity of Organizational Goals	0.71	4.15	Often
Organizational Support for Autonomy	0.72	4.09	Often
Organizational Adaptability and Openness to Change	0.68	4.08	Often
Agility Maturity	**0.47**	**4.01**	**Often**
Leadership Management	0.61	4.00	Often
Innovation	0.57	4.18	Often
Strategy	0.70	3.75	Often
Culture	0.64	3.98	Often
Learning and Change	0.57	4.13	Often
Structure	0.54	4.01	Often
Supply Chain Management	**0.47**	**4.17**	**Often**
Supply Chain Internal Practices	0.56	4.23	Always
Integration with Suppliers	0.61	4.08	Often
Integration with Customers	0.64	4.21	Always
Risk Management	**0.92**	**3.35**	**Sometimes**
Demand Risk	0.85	3.56	Often
Supply Risk	1.07	3.38	Sometimes
Process Risk	1.21	3.22	Sometimes
Environmental Risk	1.13	3.26	Sometimes

Status of Supply Chain Management. In terms of supply chain management, the manufacturing firms obtained an overall mean of 4.17 (SD = 0.47), interpreted as Often. The results shows that Supply Chain Internal Practices recorded the highest mean of 4.23 (SD = 0.56), interpreted as Always, indicating that internal supply chain processes were the most consistently observed among the indicators. This was followed by Integration with Customers with a mean of 4.21 (SD = 0.64), also interpreted as Always, showing that customer related coordination was strongly manifested. Meanwhile, Integration with Suppliers obtained the lowest mean of 4.08 (SD = 0.61), although still interpreted as Often. This pattern implies that while the firms had strong internal practices and customer integration, future efforts may focus on strengthening supplier coordination to improve continuity, responsiveness, and resiliency of the supply chain during disruptions.

Status of Risk Management. For risk management, the manufacturing firms obtained an overall mean of 3.35 (SD = 0.92), interpreted as Sometimes. Among the indicators, Demand Risk recorded the highest mean of 3.56 (SD = 0.85), interpreted as Often, showing that demand related risk practices were more

frequently manifested compared with the other areas. Supply Risk followed with a mean of 3.38 (SD = 1.07), while Environmental Risk and Process Risk obtained lower means of 3.26 and 3.22, respectively, all interpreted as Sometimes. The lowest result was observed in Process Risk suggesting that this area was the least manifested among the risk management indicators.

The findings affirm the Resource-Based View, as strong organizational resource reflect the role of internal capacity in sustaining firm operations. They also support the Dynamic Capabilities Theory and Open Systems Theory, since the favorable levels of agility maturity and supply chain management suggest that firms can adapt and coordinate within changing business environments. However, the relatively weak result in risk management partly challenges Contingency Theory and High Reliability Organization Theory, which emphasize consistent systems for anticipating, managing, and responding to uncertainty. Thus, resiliency in the Caraga manufacturing context is supported by internal and adaptive strengths but still requires stronger risk management institutionalization.

Correlational Analysis of the Five Main Constructs

Pearson Product-Moment Correlation Coefficients were estimated between all latent variables. The matrix of correlations and their significance levels between organizational resources, agility maturity, supply chain management, risk management, and business resiliency is provided in Table 2.

Table 2

Pearson Correlation Matrix Among Latent Variables

Paired Latent Variables	R - Value
Business Resiliency and Organizational Resources	0.751***
Business Resiliency and Agility Maturity	0.778***
Business Resiliency and Supply Chain Management	0.602***
Business Resiliency and Risk Management	0.330***
Organizational Resources and Agility Maturity	0.749***
Organizational Resources and Supply Chain Management	0.633***
Organizational Resources and Risk Management	0.233***
Agility Maturity and Supply Chain Management	0.712***
Agility Maturity and Risk Management	0.398***
Supply Chain Management and Risk Management	0.364***

Note: Correlation coefficients marked with *** are significant at $p < 0.001$.

The table shows that the statistically significant correlations were established for all four predictors with business resiliency (all $p < .001$). Business resiliency had the strongest relationship with agility maturity ($r = .778$), followed closely by organizational resources ($r = .751$) and supply chain management ($r = .602$), which Cohen (2013) considers strong relationships. The relationship between business resiliency and risk management was weak ($r = .330$) but still statistically significant. Thus, the null hypothesis of no statistical relationship between the predictors and business resiliency is rejected.

In addition, relationships among predictors were analyzed to determine whether multicollinearity might be a problem. The strongest correlations between predictors were established between organizational resources and agility maturity ($r = .749$) and between agility maturity and supply chain management ($r = .712$). The relationship between risk management and other predictors appeared to be moderately strong ($r = .233$ to $.398$), indicating that it describes a different phenomenon. The correlation results generally

reveal that all latent variables were significantly and positively related to one another. Business resiliency had strong associations with agility maturity, organizational resources, and supply chain management, while its relationship with risk management was positively but comparatively weaker. This indicates that firms with stronger internal resources, higher agility, and better supply chain practices tend to demonstrate higher business resiliency. However, the weaker association with risk management suggests that although risk-related practices contribute to resiliency, they may not yet be as strongly integrated with the other organizational capabilities.

These findings affirm the Resource-Based View, as organizational resources were strongly related to business resiliency, suggesting that internal capacity remains an important foundation for firm continuity. The strong relationship between agility maturity and business resiliency also supports the Dynamics Capabilities Theory, as adaptive capacity appears closely linked with the ability of firms to respond to changing conditions. Moreover, the positive association of supply chain management with business resiliency supports Open Systems Theory, since firms are influenced by their coordination with internal and external actors. Meanwhile, the weaker but significant relationship involving risk management partly extends Contingency Theory and High Reliability Organization Theory by showing that risk practices are relevant to resiliency but may require stronger institutionalization to become more closely connected with overall organizational reliability.

Significant Predictors of Business Resiliency

Table 3

Multiple Regression Predicting Business Resiliency

Predictor	B	SE	β	t	p	VIF
(Intercept)	0.254	0.165	—	1.54	0.125	—
Organizational Resources	0.409	0.054	0.388	7.56	<.001	2.43
Agility Maturity	0.494	0.063	0.459	7.91	<.001	3.1
Supply Chain Management	0.011	0.052	0.01	0.21	0.83	2.8
Risk Management	0.032	0.022	0.053	1.46	0.147	1.23

Note. $R = .820$; $R^2 = .672$; Adj. $R^2 = .667$; $F(4, 303) = 154.99$, $p < .001$. β = standardized coefficient. VIF = variance inflation factor.

The overall model was found to be significant, $F(4, 303) = 154.99$, $p < .001$, accounting for 67.2% of the variance in business resiliency (Adjusted $R^2 = .667$). In terms of individual predictors, while organizational resources ($\beta = .388$, $p < .001$) and agility maturity ($\beta = .459$, $p < .001$) had significant unique effects on business resiliency, supply chain management ($\beta = .010$, $p = .830$) and risk management ($\beta = .053$, $p = .147$) did not account for significant unique variances. All variance inflation factors were less than 3.5, indicating no multicollinearity issues. The lack of significance of supply chain management and risk management thus reflected real findings rather than multicollinearity problems. Accordingly, the null hypothesis is rejected in terms of the overall regression model; however, at the individual predictor level, it is rejected only for organizational resources and agility maturity and not for supply chain and risk management.

The regression result show that the combined predictors significantly explained business resiliency among manufacturing firms in the Caraga Region, accounting for 67.2% of its variance. Among the predictors, agility maturity emerged as the strongest significant predictor, followed by organizational resources, while

chain management and risk management were not significant when the other variables were considered. This partly agrees with the correlation results, which showed that all predictors were significantly related to business resiliency; however, the regression results further clarify that only agility maturity and organizational resources had unique predictive effects.

This finding implies that business resiliency is mainly driven by firms' adaptive capacity and internal organizational strength. It affirms the Dynamic Capabilities Theory, as agility enables firms to adjust, learn, and respond to uncertainty. It also supports the Resource-Based View, as organizational resources provide the internal foundation for continuity and resilience. Meanwhile, the non-significant effects of supply chain management and risk management suggest that their contribution to resiliency may depend on how consistently they are integrated into the firms' adaptive and resource-based systems.

Structural Equation Model of Business Resiliency

The construction of the best-fit causal model. In line with the two-stage process recommended by Anderson & Gerbing (1988), the measurement model was assessed using confirmatory factor analysis (CFA). Thereafter, the whole structural model was assessed. Three competing models with strong theoretical foundations were identified and compared to determine the best-fitting model. This section presents the results of a comparison between the three models.

Table 4
Summary Comparison of the Four Generated Models

Fit Index	Threshold	Model 1	Model 2	Model 3	Model 4 Best-Fit
χ^2	—	1247.4	945.19	1272.09	249.65
df	—	242	179	244	61
χ^2/df	< 3.0	5.16	5.28	5.21	4.09
CFI	≥ 0.90	0.811	0.84	0.806	0.935
TLI	≥ 0.90	0.784	0.812	0.781	0.902
RMSEA	≤ 0.08	0.116	0.118	0.117	0.1
AIC	lower better	107.9	97.86	103.74	86.38
BIC	Lower better	324.25	291.83	312.63	250.5

Findings showed that trust was the highest mean among the indicators, and loyalty was the The three rival structural equation models evaluated include: Model 1 (Original): The structural model that describes the four predictors as parallel causes of business resiliency in the original conceptual model. Model 2 (Trimmed): This is identical to the above model but without the three less robust measures (hrprac, leadmgt, integcust). Model 3 (Mediated): This model incorporates agility maturity as a mediator between resources and business resiliency, grounded in Dynamic Capabilities Theory (Teece, 2014). The estimation method used for the three models included maximum likelihood. A best-fit model (Model 4) was then developed from Model 2 with added indicator selection and six correlated error terms. Out of the three competing models, Model 2 (Trimmed) performed significantly better than its competitors in six of the eight fit statistics measures, having recorded the highest CFI (.840) and TLI (.812) and lowest AIC (97.86) and BIC (291.83). In all the three competing models, the same structural configuration emerged whereby organizational resources and maturity in agility were significant predictors of business resiliency

(β = .29 to .52, p < .001) whereas supply chain management and risk management were not significant direct predictors (β < .15, p > .05).

Further building on Model 2, the best-fitting model is obtained by dropping variables with consistently poor loadings or large cross-loadings, and by specifying six correlated errors for variables that are closely related in concept. The best-fitting model fulfills all the conventional criteria for CFI and TLI (CFI = 0.935; TLI = 0.902), has the smallest AIC and BIC value compared to all other models analyzed, and accounts for roughly 73% of the variance in business resiliency. While the RMSEA is 0.100, which is close to the conventional threshold of 0.08, this issue is addressed in detail in the challenges of data analysis section. In the best-fitting model, agility maturity emerged as the strongest predictor of business resiliency (β = .51, p < .001), followed by supply chain management (β = .27, p < .001), and risk management (β = .09, p < .05). Organizational resources emerge as non-significant in the trimmed structural model (β = .12, p = .14), implying their relationship with agility maturity after the removal of poorly loading variables.

In table 4, the Model 4 showed the most acceptable fit and was identified as the best-fit model. This finding indicates that the best-fit model provides the most defensible representation of business resiliency among manufacturing firms in the Caraga Region. The strong effect of agility maturity exemplifies the Dynamic Capabilities Theory in the Caraga context by showing that resiliency depends on how well manufacturing firms adjust their operations when disruptions occur. For firms in the region, this may involve revising work processes, responding to changes in demand, addressing supply delays, and learning from previous operational demand, addressing supply delays, and learning from previous operational problems. The finding suggests that firms become more resilient not simply because they have resources, but because they are able to redirect and use these resources, but because they are able to redirect and use these resources quickly when business conditions change.

The best-fit model. This was achieved by implementing two changes into Model 2. Firstly, six variables with consistently low factor loadings or high cross-construct residual correlations were omitted from the final model after an iterative removal process based on the fit statistics at each step. Although the indicators were drawn from established sources, some were more suited to the original setting and did not strongly reflect the constructs in the present study context. This supports the need to reassess adapted scales in the different population or context, as emphasized by Cheung et al. (2024), and shows that the trimming reflected contextual fit rather than indicator invalid.

Secondly, six correlated error terms with theoretical support were added to the model to capture residual covariation among the observed indicators based on conceptual commonalities (e.g., supply risk and proc risk – both indicate internal operations risks; plan prep and instcont are both related to governance). All correlated errors are set among indicators with established conceptual linkages, not solely based on empirical associations.

Table 5
Indicators of the Best-Fit Model

Latent Construct	Indicators	k	λ Range
OR	seniorlead, clearorg, orgauto	3	.66 – .90
AM	innovation, culture, learning	3	.77 – .92
SCM	suppchainorac, integsupp	2	.68 – .92
RM	supplyrisk, procrisk, envirosk	3	.71 – .98

BR (DV)	planprep, philointeg, extsuplink	3	.75 – .89
OR – Organizational Resources, AM – Agility Maturity, SCM – Supply Chain Management, RM – Risk Management, BR – Business Resiliency			

The table shows the retained indicator of the best-fit model, with each construct represented by two to three indicators. The factor loadings range from 0.66 to 0.98, indicating that the indicators adequately measure their respective latent constructs.

In the final best-fit model (Figure 2), the strong effect of agility maturity on business resiliency illustrates the Dynamics Capabilities Theory in the Caraga context, as it shows that firms become more resilient when they are able to adjust operations, learn from disruptions, and redirect resources in response to changing business conditions. This finding is consistent with prior studies in other business settings which found that agile organizations are better able to respond to uncertainty and operational disruption (García-Valenzuela et al., 2023; Yağmur & Myrvang, 2023; Tibon, 2022).

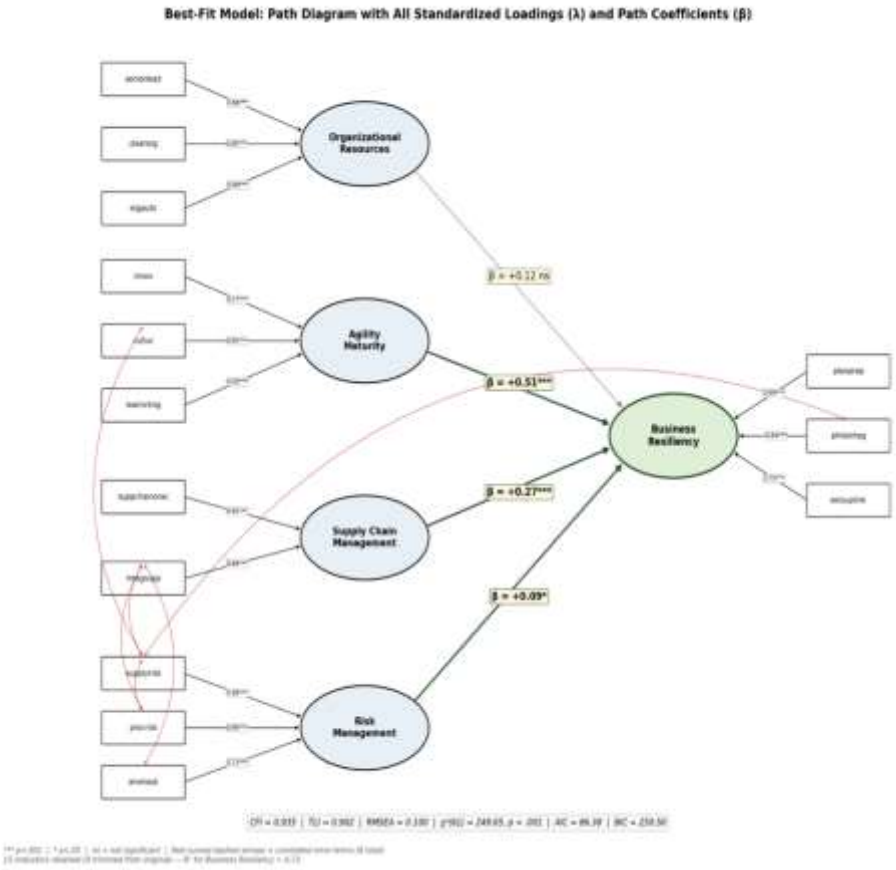

Figure 2. Best-fit Causal Model of Business Resiliency

Legend:

Organizational Resources

Organizational Agility Maturity

seniorlead – Senior Leadership

Innov – Innovation

clearorg – Clarity of Organizational Goals

cultur – Culture
orgauto – Organizational Support for Autonomy
learnchng – Learning and Change
Supply Chain Management
Business Resiliency
suppchainprac – Supply Chain Internal Practices
extsuplink – External Support Linkage
integsupp – Integration with Suppliers
planprep – Planning and Preparedness
philointeg – Philosophy and Integrity
Risk Management
supplyrisk – Supply Risk
procrisk – Process Risk
envirisk – Environmental Risk

However, in the Caraga manufacturing context, this finding becomes more specific because agility is not only reflected in technological or strategic innovation, but also in practical adjustments such as responding to supply delays, changes in demand, production concerns, and local operating constraints. This suggests that while the role of agility in resiliency is supported across different contexts, its application among manufacturing firms in Caraga is shaped by the realities of regional operations.

4. CONCLUSION AND RECOMMENDATION

The study concludes that manufacturing firms in the Caraga Region generally demonstrated strong organizational resources, evident agility maturity, and established supply chain management practices, while risk management was practiced at a more moderate level. These findings indicate that the firms possess important technical capabilities and operational practices that support their ability to continue and adapt during disruptions.

The inferential findings showed that the variables were significantly associated with business resiliency. In the regression analysis, the overall model significantly explained business resiliency, with organizational resources and agility maturity emerging as significant predictors. However, supply chain and risk management did not show significant unique effects when considered together with the other predictors. The SEM results further confirmed a best-fit model composed of retained indicators that adequately represented the major constructs of the study.

Overall, the findings affirm the relevance of Dynamic Capabilities Theory which emphasizes the importance of adaptive capabilities in framing business resiliency. The best-fit model indicate that resiliency is influenced by the combined organizational activities on agility-driven capabilities, coordinated operational systems, and proactive management practices. Furthermore, it offers a context-sensitive framework for understanding business resiliency among manufacturing firms in the Caraga Region, contributing to both organization resiliency literature and practical resiliency management in disruption-prone environments.

In view of these conclusions, manufacturing firms in the Caraga Region should strengthen the areas on risk management practices, strategic agility, organizational adaptability and supplier integration. Firm managers may conduct regular risk assessment, prepare simple disruption response plans, and provide employee training on supply, process, and environmental risks to improve preparedness. They should also

improve strategic planning and openness to change by involving employees in decision-making and communicating organizational more clearly. Regional policymakers, local government units and development councils may support these efforts by providing capacity-building programs, business continuity training, and stronger linkage mechanisms between firms, suppliers and support agencies.
Moreover, the academic community may also use the results as basis for developing research-based training modules and extension programs focused on business resiliency and risk preparedness. Future researchers may expand the study by testing the model in other regions, industries, or business sizes, and by including additional variables that may further encapsulate business resiliency. Finally, business resiliency can be strengthened through improved organizational capabilities, risk preparedness and collaboration among firms, government, academe and future research institutions.

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