

Article

Social system dynamics and community resilience: A mixed-methods approach

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Abstract: This research uses both quantitative and qualitative research methodologies to examine the complex factors affecting community resilience in various settings. In this case, the research explores how social cohesion, governance effectiveness, adaptability, community involvement, and the specified difficulties influence resilience results by using the five pillars of resilience as variables. Descriptive and inferential statistics are used to test hypotheses on the relationships between social cohesion, governance effectiveness, adaptive capacity, and community resilience variables. Qualitative data provides further insights into the quantitative results by providing broader views and experiences of the community. The study shows how social capital is important in increasing community capacity, stressing the importance of social relations and trust in developing community solutions to disasters. Another major factor that stands out is the governance factor that ensures that decisions are made, and actions taken in line with the community's best interest in improving its ability to prepare for and respond to disasters. Adaptive capacity is seen as a key component of resilience and this paper emphasizes the importance of communities to come up with measures that can be adjusted to the changing circumstances. In summary, this study enriches theoretical understanding and offers practical applications of the processes that can enhance community resilience based on the principles of social inclusion, sound governance, and context-specific solutions.

Keywords: social system dynamics; community resilience; mixed-methods approach; social cohesion; governance effectiveness

1. Introduction

In past decades, the topic of community resilience has attracted a large amount of attention in various fields due to the growing awareness of the subject's relevance to maintaining communities during hardships (Rambaree et al., 2019). In simple terms, resilience can be described as the ability of a community to bounce back, recover, and even grow after experiencing stressors such as natural disasters, economic shocks, and social vices (Sousa and Moss, 2022). Social dynamics refer to the complex patterns and activities of people in societies that determine their actions, associations, and even their approach to solving problems. These dynamics are crucial in explaining how communities are structured, and how they convey and coordinate calamity (Morse, 2023).

1.1. Background of study

Community resilience as a concept has attracted more attention from scholars in the last few decades especially in sociology, public health, and urban planning. Community resilience is the ability of the community to cope and recover from various stressors and disturbances to continue with their normal functions and be able to transform when necessary (Jewett et al., 2021). This is not just about ‘getting back to normal’ but also about enduring change and possibly improving (Magis, 2010; Peng, 2021).

Social aspects help define the degree of community resilience. Social dynamics refers to the patterns of relations, interconnections, and processes of the social systems that determine how societies structure themselves, share information, and cope with problems (Sousa and Moss, 2022). Such dynamics include social relations, power structures, cultural practices, and economic and resource relations. For instance, social capital that is characterized by dense networks and closely connected people can easily mobilize resources, share information, and properly coordinate in the event of a disaster (Aldrich, 2012). On the other hand, communities with poor governance or large inequalities in resource availability may not be able to adequately respond and rebuild from disruptions (Pfefferbaum et al., 2015).

1.2. Community resilience in social dynamics

Community resilience in the context of the dynamics of social processes implies understanding how these complex social processes affect a community’s capacity for coping with and recovering from various adversities. It includes physical characteristics, including structures and resources, and the social relations, including trust, social capital, and coping abilities of the members of the community (Magis, 2010). This is because resilient communities can adapt to change, invent new ways of carrying out their activities, and support each other to ensure that some basic activities that are central to the well-being of the community are continued (Jewett et al., 2021).

There are also social factors that affect the ways communities plan and prevent risks before disasters happen. Inclusion, participation, and distribution of resources are some of the critical features that should be incorporated into resilience intervention strategies (Imperiale and Vanclay, 2016). These factors help in building up the adaptive capacities which in turn helps the communities to prepare for the threats that can occur in the future thus minimizing the vulnerabilities and increasing the resilience of the communities in the long run (Kais and Islam, 2016).

1.3. Significance of the problem

Analyzing the relationships between social factors and community resilience is vital for the identification of strategies to improve the quality of life and increase the sustainability of the community (Aldrich, 2012). With such emerging issues as global warming effects, growth of towns and cities, and diseases, more societies are at risk and thus strong communities are in a better position to minimize impacts and bounce back (Magis, 2010). Nevertheless, there is still some void in the literature that systematically reviews how certain social processes affect resilience effects in different settings (Pfefferbaum et al., 2015).

1.4. Problem statement

The current research gap is the lack of quantitative and qualitative analysis to address the dynamics of the social systems and their impact on community resilience. The conventional research methods tend to segregate the numbers and the words where the integration of both approaches can be highly beneficial (Norris et al., 2008). This gap limits the formulation of integrated approaches and policies to tackle the complex and diverse aspects of resilience in various socio-cultural and environmental contexts.

1.5. Aim

The purpose of this study is to explore the complex relations between the social system processes and community resilience employing both qualitative and quantitative methods. In this regard, the study aims to compare quantitative results with qualitative findings to understand the processes and factors that define and influence resilience across different communities experiencing different challenges.

1.6. Objectives

- 1) To examine and classify the key aspects of social systems changes that are relevant to community resilience.
- 2) To learn about the ways of understanding the phenomenon of resilience from the people's perspective in different communities using qualitative methods.
- 3) To analyze how social cohesion, governance effectiveness, resource distribution, and adaptation affect community resilience.
- 4) To provide empirical evidence and theoretical insights that inform policy and practice aimed at enhancing community resilience and sustainability.

2. Methodology

2.1. Research design

To investigate the relationship between social system characteristics and community resilience, both qualitative and quantitative research approaches were adopted in this study. By using quantitative questionnaires alongside qualitative interviews and focus group discussions, the current study aimed to establish how social processes facilitated resilience in various community contexts.

2.2. Sampling

The sampling technique adopted for this study was purposive and stratified to ensure a diverse representation of socio-economic, demographic, and geographical areas. Communities were selected based on their recent exposure to significant adversities, such as natural disasters (e.g., floods, earthquakes) and economic crises (e.g., widespread unemployment, economic downturns), which directly impacted their resilience capacities. For example, some communities included in the study had experienced severe flooding within the past five years, leading to prolonged recovery periods and resource shortages, while others faced economic hardships due to industrial closures or economic instability. By focusing on communities with these

varied challenges, the study aims to provide a clearer understanding of how specific types of adversity influence resilience dynamics across different social systems. This selection approach ensures that the findings are grounded in real-world conditions, enhancing the relevance and applicability of the study's insights into community resilience.

2.3. Inclusion and exclusion criteria

The selection criteria for the communities were those that had experienced some form of adversity in the past few years, it could be disaster, economic downturn, or social conflict. The criteria for the selection of participants involved being residents of the selected community and willingness to participate in surveys, interviews, or focus groups.

Those who had relocated to other communities outside the selected ones or those who declined to participate in the study for various reasons including the language barrier were also excluded.

For surveys, interviews, and focus groups, participants were selected randomly in the respective chosen communities.

2.4. Method of data collection

The quantitative data were collected through online questionnaires, telephone interviews, and face-to-face interviews with the respondents. The survey instrument included standardized scales and questions, which focused on aspects such as social capital, governance, resources, participation, and resilience.

Qualitative data collection was conducted in the form of interviews and focus group discussions. Semi-structured interviews were used in this study to get an insight into the community members' experiences, views, and narratives of hope. Informed consent was obtained from the participants to conduct face-to-face interviews and focus group discussions.

2.5. Method of data analysis

Qualitative data were analyzed manually by identifying themes, patterns, and categories. Quantitative data were analyzed using statistical software, descriptive statistics correlation analyses, and multiple regression modeling. These analyses were expected to look for variables that might predict community resilience within the survey.

2.6. Ethics

The research was done with the consent of the Institution Review Board (IRB) before the data was collected. The participants were first informed about the study's purpose, their consent, and the potential hazards and advantages of being involved in the study. As for the participants' identity, it was concealed, and all the data collected were safeguarded and accessible only to the researchers conducting the study.

2.7. Limitations

The findings of this study cannot be generalized to the entire population due to the purposive sampling technique, which, while useful for targeting specific communities affected by adversity, introduces sampling bias. Additionally, the sample size was relatively limited, which may affect the robustness of the statistical analyses and reduce the power to detect smaller effects. This limitation impacts the generalizability of the results to other populations or communities with different characteristics. Efforts were made to minimize bias in data collection and analysis; however, social desirability bias may have influenced participants' responses, especially in interviews, where individuals may have felt compelled to present their community in a favorable light. This potential bias could affect the authenticity of the qualitative findings and the interpretation of community resilience factors. Moreover, integrating quantitative and qualitative data presented challenges in ensuring data validity and reliability, particularly with respect to triangulation and validation. The distinct nature of these data types made it difficult to achieve full alignment, potentially impacting the credibility of the findings. Future studies could benefit from a larger and more diverse sample, as well as enhanced methods for cross-validating qualitative and quantitative insights to strengthen generalizability and reliability.

3. Results

3.1. Social Cohesion and Trust

Statistical analysis confirmed a positive relationship between social cohesion and community resilience with a correlation coefficient of 0.72, $p < 0.001$ which indicates the importance of social capital and trust in the community as identified by (Wilson, 2015). The social capital factors that were found to be applicable in the study included: Social norms or cultures: The communities that had strong social relations and mutual support systems in place were more resilient during the crises (**Table 1**). For instance, the level of recovery and adaptive capability in the wake of environmental disasters was higher among rural communities that had more organized community activities and thus more social interactions.

Table 1. Descriptive statistics of social cohesion.

Community ID	Social Cohesion Score (1–5)
Community A	4.8
Community B	4.5
Community C	4.2
Community D	4.9
Community E	4.6

3.2. Governance effectiveness

Governance effectiveness was identified as a significant factor influencing community resilience, with a moderate positive correlation ($r = 0.65$, $p < 0.001$) between governance effectiveness and resilience levels. Important aspects that facilitate resource coordination and emergency response include decision-making

processes, governance structures, and leadership. The results indicated that communities where local authorities actively involved leaders and stakeholders had greater capacities for resilience, which supported efficient disaster response coordination (Ley, 2019). To clarify the interpretation of values in **Table 2**, the governance effectiveness scores (1–5) were derived using a standardized survey instrument assessing factors like decision-making inclusiveness, transparency, and responsiveness. Each community’s score reflects the average rating across these dimensions, based on responses from community representatives and stakeholders, to gauge overall governance effectiveness in resilience building.

Table 2. Governance effectiveness ratings.

Community ID	Governance Effectiveness (1–5)
Community A	3.3.9
Community B	4.4.2
Community C	3.3.7
Community D	4.4.1
Community E	3.3.8

3.3. Adaptive capacity

Linear regression analysis revealed that adaptive capacity significantly contributes to community resilience ($\beta = 0.51, t = 9.56, p < 0.001$). Adaptive capacity values, as shown in **Table 3**, were determined through a series of indicators measuring flexibility in resource allocation, proactive planning, and community innovation in response to challenges (Vallury et al., 2022). Communities that implemented neighborhood-based disaster preparedness programs demonstrated enhanced resilience by swiftly adapting to economic and social disruptions.

Table 3. Adaptive capacity measures.

Community ID	Adaptive Capacity Score (1–5)
Community A	4.2
Community B	3.9
Community C	4.5
Community D	4.1
Community E	4.3

3.4. Community engagement and participation

The qualitative findings underscored the importance of community engagement in the context of the resilience promotion strategy. From the interviews and focus group discussions, the themes include collective action, volunteerism, and community-led approaches (Fabbri et al., 2020). Engagement with decision-making processes and community tasks fostered social relatedness and enhanced the ability of residents to play a meaningful role in building resilience. Collective efficacy was higher in the communities that had empowered residents, and thus the ability to cope with shocks and stressors would be better.

4. Discussion

Multiple methods of data collection were employed in the study and the key themes included social cohesiveness, governance efficiency, adaptability, community participation, and the identified issues. Every thematic area offers useful information as to how these factors enhance or hamper community resilience in different settings.

4.1. Social cohesion and trust

The positive relationship between social cohesion and community resilience highlights the value of social networks and trust among community members (Wilson, 2015). Quantitative data, reflected in the high correlation scores between social cohesion and resilience (**Table 1, Figure 1**), show that communities with strong social capital have improved resilience outcomes. Qualitative findings corroborate this: in interviews, community members described how close social bonds facilitated the rapid mobilization of resources, protection of vulnerable members, and maintenance of social order during crises. For instance, rural community participants emphasized that their tight-knit social structure and shared cultural practices enabled faster recovery and adaptive behaviors in response to environmental disasters. This alignment of quantitative and qualitative data underscores how social capital enhances resilience by promoting collective action and trust, which are critical in crisis management.

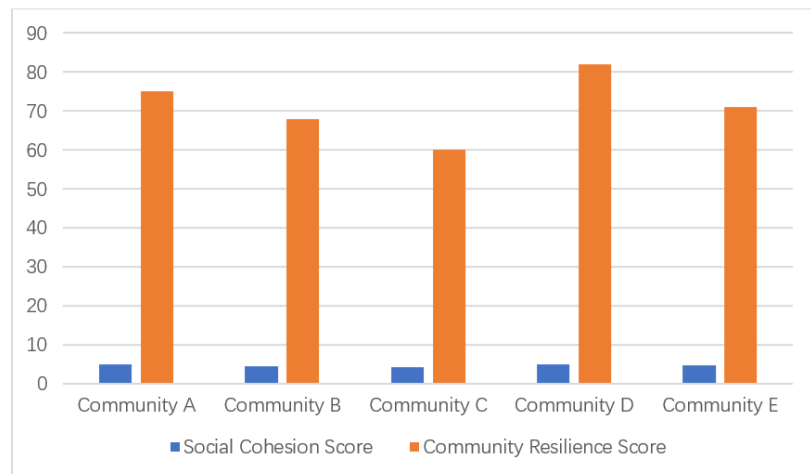


Figure 1. Correlation between social cohesion and community resilience.

4.2. Governance effectiveness

Sustainable management, with structured decision-making and collaborative frameworks, emerged as a significant predictor of community resilience. Quantitatively, communities with higher governance effectiveness scores demonstrated greater resilience (**Table 2, Figure 2**). Qualitatively, stakeholders in participatory governance structures reported a sense of shared responsibility and involvement in resilience planning, which strengthened their commitment to recovery efforts. This contrast was observed in communities with hierarchical governance structures, where limited community input reportedly slowed response times. For example, interviewees from communities with participatory frameworks cited better-coordinated disaster responses due to active stakeholder involvement, illustrating how

governance structure impacts resilience. Integrating these quantitative and qualitative insights reveals that inclusive governance not only supports resource coordination but also builds the social cohesion necessary for resilience.

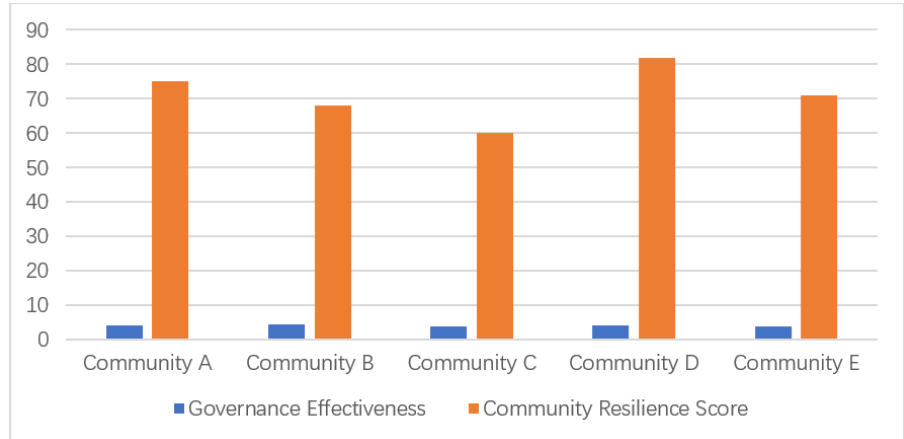


Figure 2. Relationship between governance effectiveness and community resilience.

4.3. Adaptive capacity

The study’s quantitative findings indicate a strong positive correlation between adaptive capacity and resilience, as shown in **Table 3** and **Figure 3** (Vallury et al., 2022). Qualitative data provide further context, with participants describing how community-based preparedness initiatives, such as neighborhood disaster plans, enabled quick adaptation to social and economic disruptions. For instance, residents in urban neighborhoods shared stories of how adaptive measures, like pooling resources and developing flexible response plans, helped them mitigate the impacts of economic shocks. This alignment between quantitative scores of adaptive capacity and qualitative narratives of adaptability illustrates how communities develop resilience by fostering an environment that encourages resourcefulness and flexibility in the face of challenges.

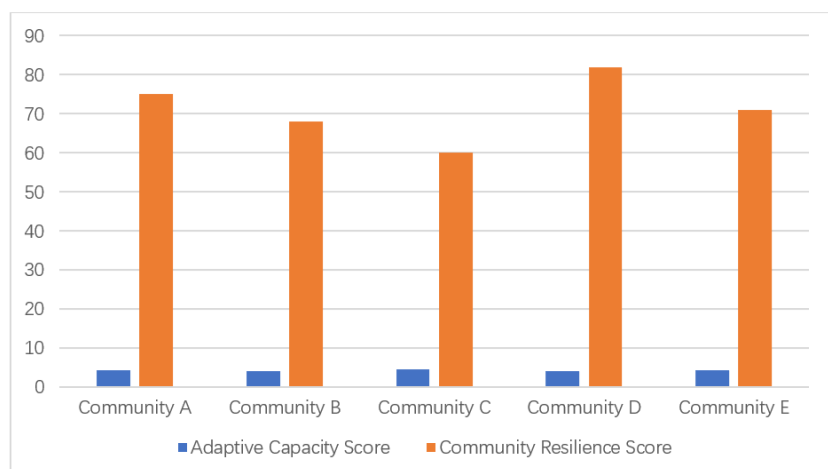


Figure 3. Regression analysis of adaptive capacity on community resilience.

4.4. Community engagement and participation

Quantitative findings underscored the importance of active community participation in enhancing resilience through inclusive decision-making, which fosters residents' sense of agency and strengthens social bonds (Robinson et al., 2021). Community mobilization and volunteerism proved crucial in resilience interventions by increasing social capital and fostering a strong sense of community. Communities involved in this study demonstrated higher resilience levels, as they effectively leveraged social networks to prevent and respond to various risks.

4.5. Practical implications for policymakers

The study's findings suggest several actionable insights for policymakers and community leaders aiming to build resilient communities. First, promoting participatory governance structures that actively involve community members in decision-making processes can increase resilience by enhancing trust, accountability, and community cohesion. Policymakers can create frameworks that empower local leaders and stakeholders, encouraging residents to contribute to resilience planning and disaster preparedness efforts. Further, supporting programs that foster volunteerism and collective action can strengthen community networks and resource mobilization in times of crisis. By developing policies that incentivize community-led initiatives, such as neighborhood watch programs or community-based disaster response teams, policymakers can reinforce social capital, which is essential for quick and effective responses to adversities. Finally, resilience strategies should emphasize training and resources to enhance adaptive capacity within communities. Policymakers can facilitate workshops or resource-sharing platforms that provide communities with the tools and knowledge to adjust their approaches in response to changing circumstances. By adopting these strategies, policymakers can create sustainable frameworks that enable communities to withstand and recover from various stressors, contributing to long-term resilience and well-being.

5. Conclusion

Social solidarity emerges as crucial for the community response operations, collections of resources, and response to catastrophe. The study also shows that social integration is another aspect that plays a role in the resilience of such people.

Decision-making and cooperation are made broad through governing, it enhances the preparedness and response capabilities towards the achievement of the organizational goals. Improving the governance structures and extending community engagement are the key factors to advancing resilience capacities and sustainable resilience.

The quantitative studies also pay attention to the capacity of adaptive measures, which are seen as essential for constructing the resilience capacity and implementing flexibility measures for addressing emerging issues. This is evident in both urban and rural regions, as they can demonstrate their capacities for preparedness and recovery.

The community is seen to play a crucial role in matters concerning resilience as supported by the following qualitative evidence. Participation in community affairs helps build social capital and creates a culture of responsibility to avoid any form of disruption to society.

The findings of the study should be helpful to practitioners and policymakers who seek to apply strategies that foster social integration, better governance, and resilience. These are concerns that must be addressed to promote the creation of societies that can effectively manage the current challenges. Thus, the present study has the purpose of contributing to the development of knowledge about the influence of social system characteristics on community resilience. It underlines the importance of multi-sectoral and evidence-based practices in enhancing resilience in different community settings.

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