A Structural Equation Model on the Disaster Readiness of Public Schools in Soccsksargen, Philippines

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ABSTRACT

Disaster readiness in schools is often inadequate. This study aimed to determine the best fit model of disaster readiness. Employing structural equation modeling, with 400 respondents selected through purposive sampling, it was found that among the hypothesized models, Model 1 fits best with Emergency Management Theory (EMT) affirming that School Manager's Practices, Organizational Resilience, and School Safety Significantly influence Disaster Readiness. The indices for CMIN/DF (1.307), p-value (0.250), NFI (0.982), TLI (0.955), CFI (0.995), GFI (0.996), RMSEA (0.028), and p-close (0.731) met the standard criteria, confirming the model's validity. Enhancement of predictors of Disaster Readiness, further research utilizing the best fit model and employing variables not covered in the study to validate the assertion of the theory, and policy advocacy on Climate Action as highlighted by SDG 13 are recommended.

Keywords: school manager's practices, organizational resilience, school safety, disaster readiness

INTRODUCTION

Disaster readiness in schools is often inadequate, with many institutions showing poor planning and insufficient readiness measures. Training on disaster readiness for school staff is frequently overlooked, and disaster readiness management is not consistently prioritized within educational systems (Chan, 2020). Limited funding for disaster readiness programs poses challenges in enabling schools to fully implement essential training and safety measures. (Fletcher, 2016).

In Australia, the education sector faces significant challenges in disaster readiness, with natural disasters such as earthquakes, floods, and hurricanes exacerbating dropout rates, trauma, mental health issues, and a lack of support for affected students (Muzani et al., 2022). In addition, studies from Nigeria and India highlight the limited emphasis on disaster readiness training in the curricula for school leaders, indicating that many educational administrators face challenges in managing crises effectively (Tiwari & Chaturvedi, 2020).

Schools in the Philippines face significant challenges in disaster readiness training, despite the country ranking third globally for disaster risk, with 60% of its land exposed to hazards and 74% of its population vulnerable to them (World Economic Forum, 2018; GFDRR, 2017). Coastal hazards, earthquakes, and volcanic activity continues to threaten the country, with typhoons and floods accounting for more than 80% of natural disasters (Jha, 2018). SOCCSKSARGEN struggles with poor disaster readiness, as its geographic location makes it highly susceptible to earthquakes and floods, which are exacerbated by climate change. Although the government promotes Disaster Risk Reduction and Management (DRRM) in schools, effective implementation of disaster preparedness plans remains a challenge, and there is a lack of comprehensive data on the disaster readiness of schools in SOCCSKSARGEN (Lavilles et al., 2024).

If the issues in disaster readiness are not addressed, schools remain vulnerable to significant risks, including injury, trauma, and disruption of education during disasters. The lack of training and readiness plans leaves schools ill-equipped to respond effectively, exacerbating the vulnerability of affected communities (UNESCO, 2017). This gap threatens the safety and continuity of learning, making it urgent to conduct this study and implement strategies that can enhance disaster readiness in schools.

The study is anchored on McEntire's (2005) Emergency Management Theory, which advocates for a holistic and systematic approach to disaster management. This theory emphasizes the integration of prevention, mitigation, response, and recovery efforts to effectively address the challenges posed by disasters. It highlights the critical role of proactive planning, effective leadership, resource mobilization, and collaborative efforts in reducing vulnerabilities and enhancing readiness. Within the educational context, this theory underscores the importance of equipping schools with the necessary tools, strategies, and frameworks to safeguard their stakeholders and ensure continuity during crises.

This study aims to develop a structural model based on School Managers Practices, Organizational Resilience, School Safety, and Disaster Readiness in public schools in SOCCSKSARGEN, Philippines. The research objectives include assessing teachers' perceptions of school managers' practices in disaster preparedness, management, mitigation, response, and recovery; organizational resilience in terms of shared vision, willingness to learn, adaptability, cooperative awareness, and enthusiasm; school safety through enabling environments, safe facilities, disaster risk management, and disaster risk reduction (DRR) in education; and disaster readiness in early warning, prevention, and damage containment. The study also seeks to determine the significance of the relationships and influence of these factors on disaster readiness and to identify the best-fit model explaining variations in disaster readiness in public schools.

The study proposes five conceptual models to explain the relationships among school managers' practices, organizational resilience, school safety, and disaster readiness. Model 1 suggests that these practices directly influence disaster readiness and highlights their interrelationships. Model 2 focuses on the relationships between school managers' practices, organizational resilience, and their direct influence on disaster readiness. Model 3 examines the relationship between organizational resilience and school safety, asserting their direct impact on disaster readiness. Model 4 combines the influence of school managers' practices, organizational resilience, and school safety on disaster readiness. Finally, Model 5 explores the interrelationship between school managers' practices and school safety, highlighting their direct effect on disaster readiness. Together, these models offer a framework to study the dynamic interactions and their impact on disaster readiness in schools.

METHODOLOGY

This study used a descriptive design with structural equation modeling (SEM) to investigate the role of School Managers' Practices, Organizational Resilience, and School Safety in Disaster Readiness. By employing survey questionnaires, the research examined the relationships between these exogenous variables and the endogenous variable of disaster readiness. SEM allowed for the analysis of multiple relationships simultaneously, identifying direct and indirect effects. The study ultimately developed a comprehensive model to enhance Disaster Management Plans, serving as a tool to improve school managers' practices, organizational resilience, and school safety towards better disaster readiness.

The study took place in five divisions within an administrative region in Mindanao, known for its dedication to providing quality, accessible, safe, and inclusive education through various programs. The region included 152 districts, 1,708 public elementary schools, 456 public secondary schools, 390 private schools, 23,569 teachers, 6,578 non-teaching personnel, and served 778,108 elementary pupils and 298,311 secondary students.

The study selected 400 public school teachers in the region using purposive sampling to best meet the study's objectives. This method focused on choosing teachers most suited to provide the necessary information, based on their role and involvement in disaster risk reduction activities. The criteria included regular/permanent DepED teachers, Permanent or Alternate School Disaster Risk Reduction Coordinators, participants in SDRRM implementation committees, and individuals willing to participate in the study.

To address the research questions, survey questionnaires adapted from various authors were used to collect data. Four research instruments focused on Disaster Readiness, School Managers' Practices, Organizational Resilience, and School Safety. These instruments were modified to align with the study's objectives and validated by experts, resulting in an average score of 4.71, indicating excellence. The Cronbach Alpha coefficient was used to assess the reliability of these instruments, distributed to 30 public school teachers. Despite varying recommendations on the minimum threshold, this study opted for a conservative threshold of 0.70. The

questionnaires demonstrated excellent reliability, with Cronbach's Alpha coefficients of 0.845 for the endogenous variable, 0.817 for the exogenous variable, and 0.845 for the combined variables.

The Likert scale was used to determine the range of means for the variables, with respondents rating items on a scale from 1 (strongly disagree) to 5 (strongly agree). The survey questionnaire on School Managers' Practices, adapted from Tolentino (2021), included 55 items with five indicators. The Organizational Resilience questionnaire, adapted from Jiangxi (2020), had 17 items with five indicators. The School Safety questionnaire, adapted from the Gawad Kalasag Checklist, had 32 items with four indicators. Finally, the Disaster Readiness questionnaire, adapted from Khalidi et al. (2021), included 21 items with three indicators. After validation and expert feedback, the final questionnaires were prepared for administration.

Data collection for the study was conducted in public schools in SOCCSKSARGEN. Following approval from the Research and Ethics Committee and the administration, permission was obtained from The Department of Education and school officials. The researcher provided an overview of the study, distributed informed consent forms, and conducted orientation sessions to ensure participants were fully informed. Data collection involved face-to-face sessions, with respondents completing survey questionnaires. The collected data was entered into a secure spreadsheet and analyzed using specialized software, with measures taken to maintain confidentiality and data security throughout the process.

The best fit model is analyzed based on several Goodness of Fit (GoF) indices. The CMIN/DF, or chi-square/degrees of freedom, should be less than 5.0, indicating an acceptable level of discrepancy between the observed and expected data. A p-value greater than 0.05 suggests the model's predictions are not significantly different from the actual observations. The Normed Fit Index (NFI), Trucker Lewis Index (TLI), Comparative Fit Index (CFI), and Goodness of Fit Index (GFI) should all exceed 0.95, demonstrating the model's close fit to the data. The Root Mean Square Error of Approximation (RMSEA) should be less than 0.05, reflecting a good fit with minimal error. Additionally, a p-value close to greater than 0.05 further supports the model's fit. These indices collectively ensure the model accurately represents the data and performs well in predicting outcomes.

This research obtained the approval of the ethics review board recognized by the institution. It was highlighted in the approval that this research thus not cause any potential harm to anyone involved in the study.

RESULTS

Table 1. Descriptive Table

Variables	**Mean**	**Description**
School Managers' Practices	**4.17**	**High**
Disaster Preparedness	4.19	High
Disaster Management	4.38	Very High
Disaster Mitigation	4.51	Very High
Disaster Response	3.95	High
Disaster Recovery	3.97	High
Organizational Resilience	**3.86**	**High**
Shared Vision	4.07	High
Willingness to Learn	3.87	High

Variables	Mean	Description
Adaptation Ability	3.79	High
Cooperative Awareness	4.02	High
Work Enthusiasm	3.83	High
School Safety	**4.13**	**High**
Enabling Environment	3.97	High
Safety Learning Facility	3.98	High
School Disaster Risk Management	3.97	High
DRR in Education	4.85	Very High
Disaster Readiness	**4.12**	**High**
Early Warning	4.15	High
Preparedness and Prevention	4.36	Very High
Containing Damage	4.18	High

The study provides a quantified evaluation of respondents' perceptions regarding school managers' practices, organizational resilience, school safety, and disaster readiness in public schools. The overall mean score of 4.17 indicates very good practices, with disaster mitigation scoring the highest at 4.51, while disaster response scored the lowest at 3.95, still reflecting very good practices. Similarly, the mean perception of organizational resilience is 3.86, with shared vision scoring highest at 4.07, and adaptation ability the lowest at 3.79, both indicating very good resilience. School safety received a mean score of 4.13, with Disaster Risk Reduction (DRR) in education scoring the highest at 4.85, while enabling environment and school disaster risk management both scored 3.97, all rated very good.

The perception of disaster readiness in public schools also highlights a high mean score of 4.12, indicating very good readiness. Preparedness and prevention received the highest mean score of 4.36, suggesting excellent practices in this area, while early warning, with the lowest score of 4.15, still indicated very good readiness. These findings collectively underscore the strong practices and perceptions in managing disaster readiness, organizational resilience, and school safety among public schools, reflecting a comprehensive and well-regarded approach to ensuring the safety and preparedness of schools in the region.

Table of Correlation

School	r	p-value	Decision on H_0	Interpretation
Manager's Practices	0.161	.001	Reject	Significant
Organizational Resilience	0.249	.000	Reject	Significant
School Safety	0.176	.000	Reject	Significant

The table above reveals the significance of the correlation between school managers' practices, organizational

resilience, school safety, and disaster readiness. With p-values of 0.001 and 0.000 for school managers' practices and organizational resilience respectively, both below the 0.05 significance level, the null hypotheses were rejected, affirming the alternative hypotheses. Despite the statistically significant results, the correlation coefficients for school managers' practices (r = 0.161), organizational resilience (r = 0.249), and school safety (r = 0.176) indicate very weak correlations. This suggests that while there are significant relationships, they are weak, and variations in these practices do not strongly influence disaster readiness. Overall, the statistical significance underscores the role of these factors in disaster readiness, though the weak correlations indicate other factors might also be influencing readiness.

The findings indicate a significant relationship between school managers' practices, organizational resilience, school safety, and disaster readiness, aligning with McEntire's (2005) Emergency Management Theory, which emphasizes adaptive organizational structures. School managers play a critical role in fostering resilience by implementing immediate and long-term disaster readiness strategies. Recent studies, such as Fatima et al. (2020), underscore the importance of school heads' competencies in resource and staff management, crucial for disaster preparedness. Integrating school safety protocols and organizational strategies enhances resilience, as highlighted by Garcia (2016), while Braun and Spielmann (2020) emphasize that empowering staff and promoting strategic thinking at all levels improve institutional resilience and disaster response. Collectively, these findings affirm the pivotal role of school managers in shaping the organizational resilience necessary for effective disaster readiness.

Table of degree of Influence

Disaster Readiness							
		Unstandardized Coefficients				**Standardized Coefficients**	
	B	**Std Error**	**B**	**t**	**Sig**	**Decision on Ho**	**Interpretation**
Constant	3.19	0.26		12.15	0.00		
School Manager’s Practices	0.07	0.03	0.13	2.57	0.01	Reject	Significant
Organizational Resilience	0.12	0.06	0.10	2.11	0.04	Reject	Significant
School Safety	0.06	0.02	0.17	3.20	0.00	Reject	Significant

R= 0.297; R^2 = 0.088; F-value= 12.815; p-value= 0.000

The regression analysis shows that the independent variables account for approximately 8.8% of the variance in disaster readiness, as indicated by an R square of 0.088 and a low but positive correlation coefficient R of 0.297. The significant F-value of 12.815 and p-value of 0.000 demonstrate that the model is statistically significant, meaning the variables significantly influence disaster readiness. However, the low R square suggests that other factors not included in the model also play a role in disaster readiness. Further research is needed to explore additional variables that could enhance the understanding of disaster readiness in schools. The analysis also highlights significant relationships between disaster readiness and school managers' practices (B=0.07, p=0.01), organizational resilience (B=0.12, p=0.04), and school safety (B=0.06, p=0.00), indicating that these factors are important predictors of disaster readiness.

The regression analysis results show that school managers' practices, organizational resilience, and school safety significantly predict disaster readiness in public schools. This aligns with the Theory of Planned Behavior (TPB), which suggests that school managers' intentions, subjective norms, and perceived control over safety measures influence disaster preparedness. While there may not be a direct correlation, managers' actions shaped by societal expectations and confidence in safety measures are crucial in fostering resilience. Burnard et al. (2018) highlight that perceived control and proactive behavior by school managers positively impact preparedness, even if not

immediately evident in disaster readiness metrics. Additionally, studies by Holmes et al. (2021) emphasize that school leadership's adherence to safety protocols and resource management fosters a resilient school environment, supporting TPB's framework.

Best Fit Model for Disaster Readiness

			MODEL			
INDEX	**CRITERION**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
CMIN/DF	<5	**1.307**	5.090	5.625	5.967	6.003
P-VALUE	>0.05	**0.250**	0.000	0.000	0.000	0.000
NFI	>0.95	**0.982**	0.364	0.499	0.468	0.465
TLI	>0.95	**0.955**	0.416	0.340	0.291	0.286
CFI	>0.95	**0.995**	0.588	0.529	0.494	0.490
GFI	>0.95	**0.996**	0.878	0.862	0.861	0.860
RMSEA	<0.05	**0.028**	0.101	0.108	0.112	0.112
P-CLOSE	>0.05	**0.731**	0.000	0.000	0.000	0.000

As presented in the table, the goodness-of-fit model indices, including Chi-Square/Degrees of Freedom (CMIN-DF), Probability Value (P-VALUE), Normed Fit Index (NFI), Tucker Lewis Index (TLI), Comparative Fit Index (CFI), Goodness of Fit Index (GFI), Root Mean Square of Error Approximation (RMSEA), and Probability Close (P-CLOSE), with their respective standard criteria. Among the five hypothesized models, Model 1 is identified as the best fit based on the model fitting criteria, with CMIN/DF of 1.307, P-VALUE of 0.250, NFI of 0.982, TLI of 0.955, CFI of 0.995, GFI of 0.996, RMSEA of 0.028, and P-CLOSE of 0.731, all meeting the standards. In contrast, Models 2, 3, 4, and 5 fail to meet the criteria, showing poor or suboptimal fit according to the indices, as their values do not align with the required benchmarks.

The best fit model for disaster readiness in public schools in SOCCSKSARGEN, estimating effects between measured and latent variables using regression weights. Organizational resilience directly influences disaster readiness with a beta of 0.057 (or 0.06) and an error of 0.26. School safety has a beta of -0.033 (or -0.03) with an error of 0.11, while school managers' practices have a beta of -0.153 (or -0.15) with an error of 0.75. The model also shows non-significant interrelationships among school managers' practices, organizational resilience, and school safety, with p-values above 0.05 indicating non-significance. Overall, the model identifies key predictors of disaster readiness while highlighting areas for further research.

The Best Fit Model results align with McEntire's (2005) Emergency Management Theory, underscoring the importance of prevention, preparation, response, and recovery in disaster readiness for public schools. The findings highlight that building organizational resilience significantly impacts disaster readiness, emphasizing that schools fostering resilience can better handle crises. Additionally, the critical role of school safety suggests the need for effective integration of safety measures into disaster readiness plans. The study also stresses the impact of school managers' practices on disaster readiness, demonstrating the importance of effective leadership in emergency response coordination. These results are consistent with recent research, such as Kahn and Adams (2019) and Taylor et al. (2020), which support the theory by showing that resilient strategies and integrated safety measures enhance schools' disaster readiness, reinforcing the interconnectedness of resilience, safety, and leadership.

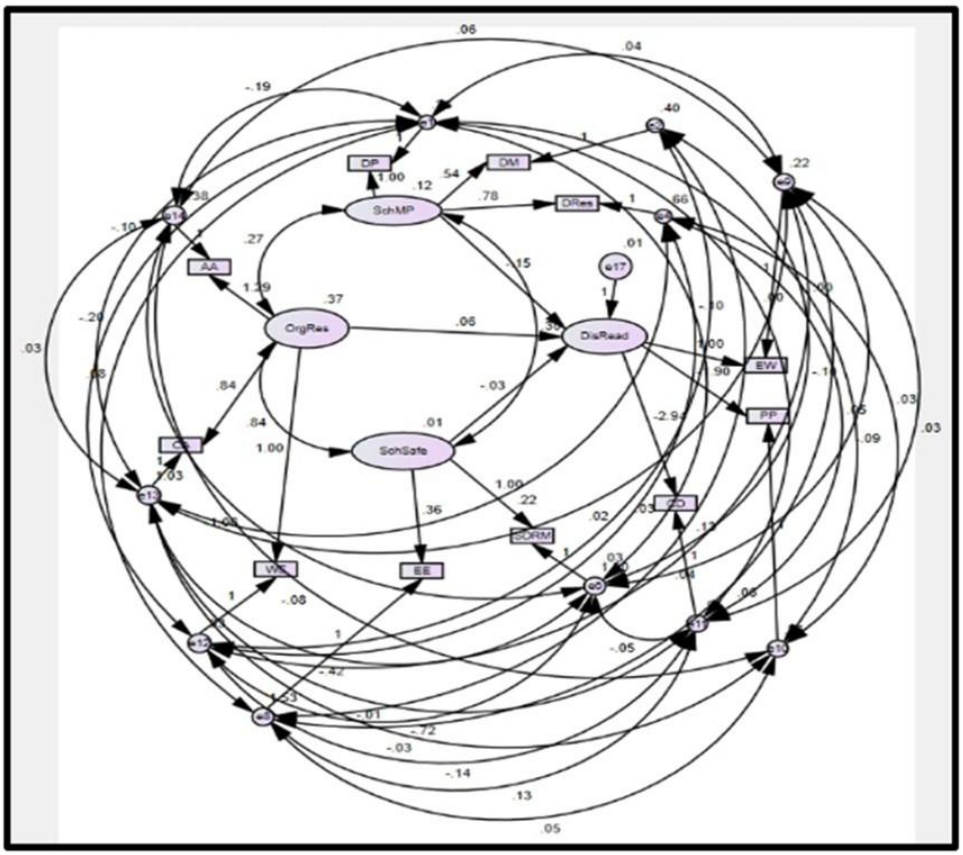

Figure 6. Best Fit Model. A Model Showing the direct influence of school managers' practices, organizational resilience and school safety to the disaster readiness of public schools in SOCCSKSARGEN. Interrelationships between school manager's practices and organizational resilience, and school safety

Legend:

Abbreviation	Meaning	Abbreviation	Meaning
Sch_MP	School Managers' Practices	**Sch_Safe**	School Safety
DP	Disaster Preparedness	**EE**	Enabling Environment
DM	Disaster Management	**SDRM**	School Disaster Risk Management
DRes	Disaster Response	**Dis_Readiness**	Disaster Readiness
Org_Res	Organizational Resilience	**EW**	Early Warning
SV	Shared Vision	**PP**	Preparedness and Prevention
AA	Adaptation Ability	**CD**	Containing Damages
CA	Cooperative Awareness		
WE	Work Enthusiasm		

The study highlights the need for ongoing professional development for school managers to enhance their leadership and disaster preparedness. By participating in workshops, training programs, and exchanges with exemplary schools, managers can refine their approaches to better prepare their institutions for emergencies.

This professional growth fosters a prioritized environment for disaster readiness. Additionally, schools should create detailed preparedness plans, regularly assess resilience, and promote a culture of adaptability and proactive risk management to ensure safety and stability during crises. The study validates its findings, especially the alignment of Model 1 with Emergency Management Theory, and recommends exploring key disaster readiness factors and advocating for international policies aligned with the Sustainable Development Goals on Climate Action. Engaging teachers in the SOCCSKSARGEN region, who already recognize effective practices, will help enhance school resilience and safety continuously. Future researchers should investigate additional factors influencing disaster readiness in schools, such as community involvement, parental support, and student awareness. Conduct longitudinal studies to examine the sustainability of disaster readiness practices over time. Lastly, comparing disaster readiness practices in public and private schools will help identify best practices.

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