

Digital Resiliency and School Environment on the Technology Management Operations Capacity of School Heads

¹Jessie S. Acosta; ²Dr. James L. Paglinawan (ORCID:0000-0003-1337-9622)

¹Master Teacher 1, Division of Valencia City

²Faculty, Central Mindanao University

Abstract:- In recent years, integrating technology into educational settings has significantly transformed schools into intelligent learning environments that enhance teaching, learning, and administrative functions. This digital shift, while promising, presents challenges that require effective leadership and governance. School heads are pivotal in navigating these challenges, leveraging technology to improve educational outcomes and foster a culture of innovation and adaptability. Despite the growing importance of technology in education, there is a notable gap in research concerning the specific factors that influence school heads' capacity to manage technology effectively. Existing studies have primarily focused on technology adoption and integration, leaving a gap in understanding the operational capabilities necessary for effective technology management. This study explores the relationship between digital resiliency, the school environment, and school heads' technology management operations capacity and identifies how these factors interact to enhance technology management practices. Employing a quantitative research design with a descriptive-correlational approach, the study involves 100 school heads from diverse educational settings. Data is collected through structured questionnaires assessing digital resiliency, school environment, and technology management capacity. Statistical analyses, including Pearson correlation and regression analysis, are used to explore these relationships. The findings indicate that school heads exhibit high digital resiliency and technology management capacity, supported by a highly effective school environment. Strong positive correlations are observed between digital resiliency, school environment, and technology management capacity, underscoring the importance of individual competencies and supportive environments. The study highlights the critical role of collaborative Culture, administrative support, and digital skills in enhancing technology management capacity. It recommends targeted professional development and strategic planning to strengthen these areas. Future research should investigate these dynamics and explore innovative strategies to optimize technology management in educational settings, ultimately leading to more effective and resilient schools. This research provides valuable insights for educational leaders aiming to navigate the complexities of technology management and improve academic outcomes.

Keywords:- Digital Resiliency, School Environment, Technology Management Capacity.

I. INTRODUCTION

Over the last couple of years, there has been a significant transformation in how we have made technology an integral part of educational settings – it is driven by schools that turn into innovative learning spaces, and content delivery gets more advanced. The use of digital tools in higher education has disrupted teaching, learning, and administrative work, which makes universities more efficient and delivers fast outcomes to the students and staff. While such digital disruption heralds a new era, it is not without its issues and challenges, which must be

It was addressed through exemplary leadership and governance. Principals, or headteachers as they are sometimes called, figure prominently in how schools tackle these hurdles. Even those who are more administrators still set the vision and use technology across their schools both as a part of instruction and with the school process. This brings us back to the role of leadership in creating a culture that promotes technology-enabled innovation and continuous improvement.

Digital Resiliency as a Critical Factor that Impacts School Heads Ability to Operationalize Technology. Resilience for digital is the capability of people and organizations to weather shifts, recover from adversity against those shifts, and rebound fast when disruption hits. Within the vision for educational leadership, digital resiliency combines hard and soft skills necessary to lead change through technology deployment and manage systemic issues like security. In particular, school leaders with high digital resiliency are more able to pilot their schools within the hazards of a digital transformation, ensuring that technology serves as an enabler for better educational outcomes and operational efficiency.

A second important factor is a technology-involved group or system; this element includes who (e.g., students, teachers) and what happens when technologies are introduced into a local context such as a school that would be considered inaccurate implementation. School heads other than the capacity of technology management operations through a supportive school environment. School Environment: The

following high-impact components are administrative support, a culture of collaboration, and student technology use.

Administrative support is the backbone of resources and policy that enable technology integration to be successful. A collaborative culture is how best practices are shared, and together, they try to solve the same challenges that need solving for technology adoption. Additionally, the more that students appear to be using technology (i.e., what we define as student engagement with technology), the more tech integration is happening in the learning process. This makes up a significant proportion of the school's overall strategy for tech use.

The technology management operation capability of the school heads defines their capacity to plan, develop, and manage technology programs/policies in higher education. This is about strategic planning, resource deployment, skills development, and ongoing assessment of the use of technology. Good technology management ensures that technological investments are productive and positively impact the school's learning goals. Administrators with robust tech-management skills and capacity can provide a solid digital infrastructure and ongoing professional development for staff—the seamless integration of technology into instruction.

The relationship between digital resilience, the school's atmosphere, and the ability of technology management operations to handle capacity is intricate and varied. Digital resilience gives school leaders the necessary skills and attitudes to adjust to technological shifts and tackle obstacles. It allows them to implement successful strategies for managing technology and react to interruptions in advance. At the same time, a nurturing and cooperative school setting sets the stage for applying these strategies, boosting the capacity of school leaders to oversee technology operations efficiently.

This research intends to bridge the current void in the literature by in-depth analysis of these connections. By investigating the intricate relationship among digital resilience, the school surroundings, and the operations of managing technology, the goal is to offer practical advice for principals eager to enhance their tech management practices. This study adds to the current understanding by providing direction for educational leaders looking to deal with the intricacies of managing technology within schools, thereby creating an ideal academic setting for learners and educators.

Despite the increasing significance of technology in education, there remains a significant void in the existing research concerning the particular elements that affect the ability of school principals to effectively manage technology. Although many studies have looked into adopting and integrating technology within educational institutions (Anderson & Dexter, 2005; [9] Hew & Brush, 2018), very few have concentrated on the operational capabilities of school leaders in handling these technologies efficiently. Flanagan and Jacobsen (2003) point out that there is a scarcity of in-depth research on how school principals develop and apply strategies for technology management across various

educational environments. Moreover, as digital technologies continue to advance, there is an urgent need to comprehend how school principals can enhance their digital adaptability to cope with these advancements [11] (Howard, 2019).

Digital resilience is about adapting, recovering, and surviving crises and changes. For school administrators, digital resilience includes embracing new technologies, implementing cybersecurity practices, and continually improving digital skills. This variable is important because it determines the ability of school leaders to navigate the challenges of technological progress and integrate them into school operations. Research shows that digital flexibility is essential to leadership in the digital age because leaders can create an environment for innovation and continuous improvement [3] (Buchanan et al., 2016).

The school environment plays a vital role in shaping the ability of school principals to manage technology. It covers various areas, including organizational support, collaborative Culture, and student engagement with technology. Organizational support provides the necessary resources and political framework for effective technology management (Schiller, 2003). A collaborative culture that encourages sharing best practices and joint problem-solving is critical to successful technology integration [7] (Fullan, 2017). In addition, student engagement with technology reflects how digital tools are integrated into the curriculum, affecting the school's overall technology strategy [17] (Lee, 2017).

Technology management capacity refers to the ability of school administrators to plan, implement, and monitor technology programs in their institutions. This capability includes strategic planning, resource allocation, professional development, and ongoing evaluation of technology use. Effective technology management is essential to improving educational outcomes and ensuring technology investments deliver the desired benefits [15] (Kuzma, 2015). The relationship between digital literacy, school environment, and technology governance is critical because it determines how much school administrators use technology to achieve educational goals.

The relationship between digital capability, the school environment, and technology management is multifaceted. Digital literacy gives school leaders the skills and mindset to adapt to technological change and overcome challenges. They can implement effective technical management strategies and respond quickly to problems. On the other hand, the school environment provides the context for implementing these strategies. A supportive and collaborative school environment improves the ability of school leaders to manage technology by promoting a culture of creativity and problem-solving. The relationship between these variables is essential to understand how school administrators can optimize their technology management practices. By building digital capacity and creating a supportive school environment, educational leaders can increase their ability to effectively manage technology. This study aims to fill the current research gap by examining these relationships and providing meaningful insights for

school administrators seeking to improve their technology capabilities.

Studying the digital capabilities and environment of the school is essential for the technology management capabilities of today's school principals. As educational institutions continue to integrate technology into their operations, it is necessary to understand the factors that influence the effectiveness of technology management. By examining the dynamic relationship between digital literacy, the school environment, and organizational capacity for technology management, this study contributes to the current body of knowledge. It ultimately guides school administrators to navigate the complexities of technology management in education.

➤ *Objectives of the Study*

This study will determine the Digital Resiliency and School Environment on the Technology Management Operations Capacity of School Heads. Precisely, this will aim to:

- *Describe the level of Digital Resiliency for the following components:*

- ✓ Adaptability to Technological Change,
- ✓ Cybersecurity Awareness,
- ✓ Digital Skills Proficiency.

- *Determine the level of School Environment in terms of:*

- ✓ Administrative Support,
- ✓ Collaborative Culture,
- ✓ Student Engagement with Technology.

- *Ascertain the Technology Management Operations Capacity of School Heads based on the following factors:*

- ✓ Technology Planning and Implementation,
- ✓ Professional Development.

- *Assess the relationship between the technology Management Operations Capacity of School Heads, Digital Resiliency, and School Environment.*

- *Identify variable/s singly or in combination to best predict the Technology Management Operations Capacity of School Heads.*

II. METHODOLOGY

➤ *Research Design*

This study will employ a quantitative research design using a descriptive-correlational approach. The goal is to assess the relationship between digital resiliency and school heads' technology management operations capacity within various school environments.

➤ *Research Setting*

The research will be conducted in a diverse range of schools, including urban, suburban, and rural educational settings, across multiple districts. This variety aims to capture a broad spectrum of school environments and the digital resiliency levels of school heads.

➤ *Participants of the Study*

The teachers responsible for technology management operations in their respective schools will be the participants. The study will aim to include approximately 100 school heads to ensure a representative sample from various school environments.

➤ *Sampling Procedure*

The study will use a random sampling technique to ensure representation from different school environments. Schools will be categorized based on their environment, and then participants will be randomly selected from each category to ensure proportional representation.

➤ *Data Gathering Procedure*

A structured questionnaire will be developed, consisting of sections on digital resiliency and technology management operations capacity. The questionnaire will be pilot-tested with a small group of school teachers to ensure clarity and reliability. The finalized questionnaire will be distributed to the selected participants via email or an online survey platform. Participants will be given two weeks to complete the survey. To maximize response rates, reminder emails will be sent to non-respondents one week after the initial distribution.

➤ *Data Analysis*

The data will be analyzed using descriptive statistics to summarize the levels of digital resiliency and technology management operations capacity. Pearson correlation coefficients will be calculated to determine the relationship between digital resiliency and technology management operations capacity. Multiple regression analysis will be conducted to explore the predictive power of digital resiliency on technology management operations capacity, controlling for school environment and other demographic variables. All data analysis will be performed using statistical software such as SPSS or R to ensure the accuracy and reliability of the results.

III. RESULT AND DISCUSSION

The data in Table 1 reveals that school heads exhibit a high level of digital resiliency across all indicators. Each component, including adaptability to technological change, cybersecurity awareness, and digital skills proficiency, is rated as "Highly Resilient," with mean scores ranging from 3.838 to 4.419. The overall digital resiliency mean is 4.039, reinforcing the conclusion that school heads are well-prepared to manage digital challenges.

Table 1 The Summary Average Means of Digital Resiliency

Indicator	Mean	Qualitative Description
Adaptability to Technological Change	4.419	Highly Resilient
Cybersecurity Awareness	3.860	Highly Resilient
Digital Skills Proficiency	3.838	Highly Resilient
Total Mean	4.039	Highly Resilient

Legend:

4.51- 5.00	Strongly Agree	Very Highly Resilient
3.51- 4.50	Agree	Highly Resilient
2.51- 3.50	Neutral	Resilient
1.51- 2.50	Disagree	Low Resilient
1.00- 1.50	Strongly Disagree	Very Low Resilient

The high level of digital resiliency among school heads implies they are capable leaders in navigating the digital transformation in education. Their ability to adapt to technological changes ensures schools integrate new technologies smoothly, enhancing teaching and learning processes. High cybersecurity awareness is crucial in safeguarding school data and infrastructure, while proficient digital skills enable effective management and utilization of digital tools.

This resiliency supports the advancement of digital literacy among staff and students, fostering an environment that embraces innovation. It also suggests a preparedness to implement digital strategies that align with educational goals, potentially leading to improved academic outcomes and operational efficiency.

Reference [20] Smith & Anderson (2022) argue that school leaders who demonstrate high digital resiliency are better equipped to face the challenges of integrating technology into educational settings. They also play a pivotal

role in fostering a culture of continuous learning and innovation.

[14] Jones et al. (2023) emphasize that cybersecurity awareness is critical to digital leadership. School heads prioritizing cybersecurity are more likely to protect their schools from digital threats, ensuring a safe learning environment.

The development of digital skills is crucial for effective technology management. [2] Brown & Lee (2021) argue that proficient digital skills among school leaders lead to more efficient use of educational technologies, enhancing administrative processes and classroom experiences.

The high digital resiliency observed among school heads aligns with existing literature that underscores the significance of these competencies in successfully managing technology in schools. This positions them as influential leaders in the digital age, capable of driving positive change and innovation in education.

The Table 2 summary of the school environment data reveals a highly effective educational setting across several key indicators. With mean scores ranging from 3.931 to 4.118, the school environment is consistently rated as "Highly Effective" in fostering a collaborative culture, engaging students with technology, and providing administrative support. The overall mean of 4.037 underscores the robust nature of this environment in supporting educational goals.

Table 2 The Summary Average Means of School Environment

Indicator	Mean	Qualitative Interpretation
Collaborative Culture	4.118	Highly Effective
Student Engagement with Technology	4.063	Highly Effective
Administrative Support	3.931	Highly Effective
School Environment	4.037	Highly Effective

Legend:

4.51- 5.00	Strongly Agree	Very Highly Effective
3.51- 4.50	Agree	Highly Effective
2.51- 3.50	Neutral	Effective
1.51- 2.50	Disagree	Not Effective
1.00- 1.50	Strongly Disagree	Very Ineffective

The high rating for collaborative Culture indicates that the school effectively promotes teamwork and communication among teachers, students, and staff, which are crucial for building a thriving educational community. Similarly, the high student engagement with technology reflects the successful integration of digital tools into the learning process, enriching student experiences and outcomes. Moreover, the solid

administrative support shows that school leaders are committed to providing the necessary resources and guidance to sustain innovative educational practices.

These findings imply that the school environment is well-equipped to support and enhance educational initiatives, particularly those involving technology. A highly effective collaborative culture ensures the school community works together towards common goals, facilitating innovation and problem-solving. High student engagement with technology suggests that students benefit from interactive and technology-rich learning experiences, preparing them for future challenges. Additionally, robust administrative support indicates a commitment to sustaining these efforts, likely leading to improved educational outcomes and a positive school climate.

Supporting literature highlights the importance of a robust school environment in achieving educational success. [23] Johnson and Stevens (2022) found that a collaborative culture within schools is linked to increased teacher satisfaction and student achievement, promoting shared responsibility and collective efficacy. [14] Smith and Brown (2023) emphasize that student engagement with technology is crucial for enhancing learning outcomes, with effective integration leading to improved student motivation and performance. [5] Davis and Lee (2021) stress the role of administrative support in successful school operations, noting

that effective leadership is critical to implementing and sustaining educational innovations.

The analysis of technology management operations capacity among school heads in Table 3 reveals a "Highly Capable" rating across critical indicators. With a mean score of 4.098 for professional development and 3.896 for technology planning and implementation, the overall mean of 3.997 highlights a strong proficiency in managing technology initiatives within the school environment. This suggests that school heads can effectively lead and sustain technology-related operations.

Table 3 The Summary Average Means of Technology Management Operations Capacity

Indicator	Mean	Qualitative Description
Professional Development	4.098	Highly Capable
Technology Planning and Implementation	3.896	Highly Capable
Technology Management Operations Capacity	3.997	Highly Capable

Legend:

4.51- 5.00	Strongly Agree	Very Highly Capable
3.51- 4.50	Agree	Highly Capable
2.51- 3.50	Neutral	Capable
1.51- 2.50	Disagree	Not Capable
1.00- 1.50	Strongly Disagree	Very Incapable

The high rating for professional development indicates a strong focus on continuous growth in technological skills and knowledge, ensuring that educators are up-to-date with the latest advancements. This commitment to professional development is essential for effectively integrating technology into educational practices and enhancing teaching and learning experiences. Similarly, the high capability in technology planning and implementation reflects strategic and effective resource allocation, enabling schools to incorporate digital tools efficiently and effectively to support educational outcomes.

These results imply that school heads can manage and execute technology operations competently, fostering an environment conducive to innovation and adaptation. The emphasis on professional development ensures educators are

prepared to meet the demands of a rapidly evolving digital landscape. At the same time, effective planning and implementation facilitate the integration of technology into the school's educational framework.

Supporting literature reinforces the importance of technology management operations capacity in education. [24] Thompson and Garcia (2022) emphasize that technological professional development equips educators with essential skills for integrating digital tools and enhancing student engagement and learning outcomes. Additionally, [19] Roberts and Evans (2023) highlight that strategic technology planning and implementation are crucial for leveraging technology to drive educational innovation and improve institutional effectiveness.

➤ Relationship between Technology Management Operations Capacity of School Heads, Digital Resiliency, and School Environment

Pearson product correlation was used to assess the degree of relationship between continuous variables explored. Pearson r was mainly run to determine the relationship between the dependent variable, the Technology Management Operation of school Heads, and the independent variables, Digital Resiliency and School Environment.

Table 4 Correlation Analysis between the independent Variable and Technology Management Operation Capacity of School Heads

Indicators	Correlation Coefficient (r)	Probability (p)
Digital Resiliency	0.743	0.000**
Adaptability to Technology Change	0.531	0.000**
Cybersecurity Awareness	0.698	0.000**
Digital Skills Proficiency	0.752	0.000**
School Environment	0.868	0.000**
Administrative Support	0.819	0.000**
Collaborative Culture	0.828	0.000**
Student Engagement with Technology	0.774	0.000**

** Correlation is significant at the 0.01 level (2-tailed).

b. listwise N=105

The correlation analysis between the independent variables and school heads' technology management operation capacity reveals strong positive relationships across all indicators. Notably, the school environment shows the highest correlation coefficient ($r = 0.868$), underscoring its critical role in supporting effective technology management. Among the digital resiliency factors, digital skills proficiency ($r = 0.752$) and digital resiliency ($r = 0.743$) exhibit the most robust correlations, highlighting their importance in enhancing management capacity.

These findings imply that individual competencies, such as digital resiliency, and external factors, like the school environment, are essential for improving the technology management capacities of school heads. Specifically, the data suggests that school heads with strong digital skills and cybersecurity awareness are better equipped to manage technology operations successfully. This implies a need for targeted professional development programs that enhance these competencies.

The significant correlation with the school environment indicates that administrative support and a collaborative culture are crucial for successful technology management. Schools should prioritize creating supportive environments that foster collaboration and provide robust administrative support to optimize technology integration.

Reference [21] Research by Smith et al. (2022) emphasizes the importance of digital skills for school leaders to effectively navigate educational technology, aligning with the high correlation observed in this study. Similarly, [13] Johnson and Lee (2021) highlight that a supportive school environment with strong administrative support and a collaborative culture significantly enhances technology adoption and management. This finding is consistent with the strong correlations between school environment factors and technology management capacity. Additionally, [26] Williams (2023) points out the growing importance of cybersecurity awareness for school leaders to protect digital assets and ensure smooth technology operations, supporting the significant correlation found in this study.

Table 5 Regression analysis Technology Management Operation Capacity of School Heads

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(constant)	0.425	0.208		2.039	0.044
Collaborative Culture	0.325	0.095	0.331	3.442	0.001
Administrative Support	0.211	0.083	0.250	2.540	0.013
Digital Skill Proficiency	0.170	0.066	0.197	2.589	0.011
Student Engagement Technology	0.183	0.081	0.187	2.251	0.027
R= 0.878 R ² = 0.772 F-Value = 84.497 Sig.= 0.000					

Regression Equation Model

$$Y = 0.425 + 0.325X_1 + 0.211X_2 + 0.170X_3 + 0.183X_4$$

Where;

Y = Technology Management Operation Capacity for School Heads

X₁ = Collaborative Culture

X₂ = Administrative Support

X₃ = Digital Skill Proficiency

X₄ = Student Engagement Technology

Regression analysis, with a value of 0.772, indicates that the model explains a substantial proportion of the variance in school heads' technology management operation capacity. This suggests that approximately 77.2% of the variability in technology management capacity can be attributed to the predictors included in the model. The F-value of 84.497 with a significance level 0.000 confirms that the overall model is statistically significant.

Among the predictors, Collaborative Culture has the highest standardized coefficient (Beta = 0.331), indicating its

strong impact on technology management capacity. This is followed by Administrative Support (Beta = 0.250), Digital Skill Proficiency (Beta = 0.197), and Student Engagement with Technology (Beta = 0.187). All predictors are statistically significant, with p-values below 0.05, suggesting that each contributes meaningfully to the model.

The regression analysis highlights the significant impact of collaborative Culture on the technology management capacity of school heads, suggesting that fostering teamwork and collaboration within schools is crucial. Schools should actively promote practices that encourage a collaborative environment, as this can significantly enhance technology management. Additionally, the importance of administrative support is underscored, indicating that school leaders must provide the necessary resources and backing to facilitate effective technology management. This support is essential for creating an environment where technology can seamlessly integrate.

The positive relationship between digital skill proficiency and management capacity suggests that improving digital skills among school heads can lead to better technology management outcomes. This finding highlights the need for ongoing professional development focused on enhancing digital competencies. Furthermore, the significance of student engagement with technology indicates that encouraging

student interaction with technology can also bolster schools' overall technology management capacity.

The findings suggest that organizational Culture and individual competencies are vital for effective school technology management. A collaborative culture and solid administrative support are particularly influential, emphasizing the need for schools to create environments that nurture these elements. Schools can improve their technology management capabilities by focusing on these areas and better supporting educational outcomes.

The results of this regression analysis are supported by existing literature. [13] Research by Johnson and Lee (2021) emphasizes the role of collaborative Culture in enhancing technology adoption and management, aligning with the strong impact observed in this study. Additionally, [21] Smith et al. (2022) highlight the importance of administrative support in providing the necessary resources and environment for successful technology integration. Furthermore, [26] Williams (2023) points out the critical role of digital skills in navigating and managing educational technology, supporting the significance of digital skill proficiency in this analysis.

IV. CONCLUSION

Based on the study's results, school heads demonstrate a high level of digital resiliency, characterized by their ability to adapt to technological changes, maintain strong cybersecurity awareness, and possess proficient digital skills. This resiliency positions them as influential leaders in navigating the digital transformation within educational settings. The school environment is also deemed highly effective, fostering a collaborative culture, engaging students with technology, and providing robust administrative support. These factors collectively enhance educational practices and outcomes.

Furthermore, school heads' technology management operations capacity is rated highly capable, underscoring their proficiency in managing technology initiatives through professional development and strategic planning. The correlation analysis reveals strong positive relationships between digital resiliency, school environment, and technology management capacity, highlighting the importance of individual competencies and supportive environments in enhancing technology operations.

The regression analysis further emphasizes the critical role of collaborative Culture, administrative support, digital skill proficiency, and student engagement with technology in influencing technology management capacity. These findings suggest that organizational Culture and individual competencies are pivotal for effective school technology management.

RECOMMENDATIONS

Based on the findings, several recommendations emerge to enhance the capacity of school heads to manage technology operations. Schools should prioritize fostering a collaborative culture by encouraging teamwork and communication among

teachers, students, and staff. This can be achieved through professional development programs emphasizing collaborative practices and leadership skills.

Additionally, enhancing administrative support is essential to provide the necessary resources and guidance for technology integration. School leaders should ensure adequate infrastructure and support systems for successful technology management.

To strengthen digital skills among school heads, ongoing professional development focused on technological competencies should be implemented. This will ensure that educators remain current with advancements and can effectively integrate digital tools into their practices.

Finally, promoting student engagement with technology should be a key focus, as it contributes to overall technology management capacity. Schools should create opportunities for students to interact with and utilize technology meaningfully, preparing them for future challenges.

By addressing these areas, schools can strengthen their technology management operations, enhance educational outcomes, and foster an environment that embraces innovation and continuous improvement.

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