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Digital Service Delivery of Camarines Norte State College: An Evaluation of Readiness and Implementation Barriers

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Abstract

Digital service delivery has become essential to institutional modernization in Philippine higher education, yet provincial state universities face persistent challenges in implementation. This study evaluated the readiness and implementation barriers of digital service delivery at Camarines Norte State College (CNSC) to provide an evidence-based foundation for strategic digital transformation. Using a descriptive-correlational design, data were collected from 105 office heads and staff across six campuses through a validated questionnaire (CVI=5.0, Cronbach's alpha=0.980). Findings reveal that CNSC demonstrates high readiness across infrastructure, ICT expertise, and organizational support, with digital platforms widely utilized, accepted, and effective. However, readiness is not fully optimized due to limitations in system capacity, continuous training, and financial support. Cross-office inconsistencies and gaps in user confidence reveal uneven implementation. Financial constraints, technological limitations, and human resource capacity significantly hinder digital transformation, with institutional challenges extending beyond infrastructure. Infrastructure alone does not address these challenges, while ICT expertise and organizational support show significant relationships with barriers, heightening awareness of financial, technological, and human resource issues. CNSC should strengthen digital infrastructure by improving system capacity, upgrading servers, and enhancing bandwidth while implementing continuous ICT training programs. Standardizing digital practices across offices, enhancing user support mechanisms, and conducting regular system evaluation are essential. A holistic approach aligning infrastructure development, human resource capacity, and financial investment, with comprehensive financial planning exploring alternative funding sources, will ensure sustainable digital service delivery.

Keywords: digital service delivery, institutional readiness, implementation barriers, provincial higher education, digital transformation, resource-based view

1. Introduction

Digital service delivery has become essential to institutional modernization in Philippine higher education. National policies such as the Ease of Doing Business Act (RA 11032), the Data Privacy Act, and the DICT Cloud First Policy mandate state universities and colleges to implement secure, efficient, and interoperable digital platforms (Republic of the Philippines, 2018) [1]. These frameworks align with Sustainable Development Goal 9, which promotes resilient infrastructure and inclusive innovation (United Nations, 2015) [2].

Camarines Norte State College (CNSC) has initiated digitalization through systems including the Student

Information and Accounting System, Document Tracking System, Human Resource Management Information System, and Learning Management System. However, significant barriers persist, including budgetary constraints, limited ICT personnel, and inadequate infrastructure, which result in partial stakeholder engagement and continued reliance on manual processes.

Digital technologies have been introduced into the educational system more rapidly because of the increased demands of flexible education, data-driven administration, and the ability to provide education access fairly. Schuetze et al. (2024) assumed that digitalization has an impact on pedagogical provision, institutional structures, equity, and governance [3]. Khan (2025) argued that digital transformation is no longer a matter of feasibility but of velocity, as institutions must adapt to evolving student expectations and global disruptions [4].

More schools are using AI, cloud computing, and data analytics to make learning more personal, automate administrative tasks, and improve student support services (International Association of Universities [IAU], 2022) [5]. These technologies help universities better meet the needs of different types of students, make their operations run more smoothly, and make the school more flexible. China has made digital transformation a strategic priority in its higher education sector in East Asia. Rosin et al. (2023) noted that top universities have included digital initiatives in their five-year development plans to improve their global competitiveness and efficiency [6]. National investments in smart campus infrastructure, research digitization, and faculty development back these efforts. In Southeast Asia, on the other hand, countries like Indonesia and Vietnam have created national digital education roadmaps to fix problems with access and quality that have been going on for a long time (Nguyen, et al., 2023; Putra & Santoso, 2022) [7] [8].

Institutional readiness is still a key factor in the success of digital transformation. Tan and Santos (2021) asserted that although digitalization presents strategic benefits, its efficacy is contingent upon the synchronization of institutional capacity, leadership, and stakeholder endorsement [9]. Hashim et al. (2022) emphasized that effective digitalization requires reconfiguration of the entire learning ecosystem, not merely technology adoption [10]. Gong and Ribiere (2021) noted that sustainable transformation depends on leadership, governance, and cultural alignment, while Bates (2024) cautioned against blanket adoption of global models without local contextualization [11] [12].

The Philippine higher education sector has prioritized digital transformation through policies such as CHED Memorandum Order No. 15 (2021), which promotes flexible learning and digital governance, and the DICT National ICT Roadmap, which supports smart campus development (DICT, 2022) [13]. Despite these efforts, provincial colleges face weak ICT infrastructure, fragmented policy implementation, and insufficient digital literacy among educators (Dela Cruz & Ramos, 2023; Reyes & Tan, 2023) [14, 15]. Apales (2024) reported that low-income students and under-resourced institutions experienced serious challenges during remote learning transitions, exacerbating educational inequalities [16].

CNSC reflects many challenges faced by provincial public colleges. Macale and Abanto (2024) found that provincial education offices allocate less than one percent of budgets to ICT, indicating insufficient prioritization of digital transformation [17]. Dacer et al. (2025) identified outdated systems and lack of interagency coordination as structural barriers in Camarines Norte institutions [18]. Verano and Rubio (2024) observed that while CNSC demonstrates organizational readiness, technological infrastructure and staff training remain inadequate, limiting sustained adoption of digital tools [19].

This study lies in the need to systematically assess the effectiveness of digital service delivery at CNSC within the context of limited resources common to provincial public higher education institutions. As digitalization becomes essential to institutional operations, unassessed gaps in infrastructure, funding, and

human resource capacity may hinder service efficiency and accessibility. Without systematic evaluation, digital initiatives risk being underutilized or unsustainable. This study provides a research-based foundation for informed decision-making and strategic digital transformation at CNSC.

1.1 Objectives of the Study

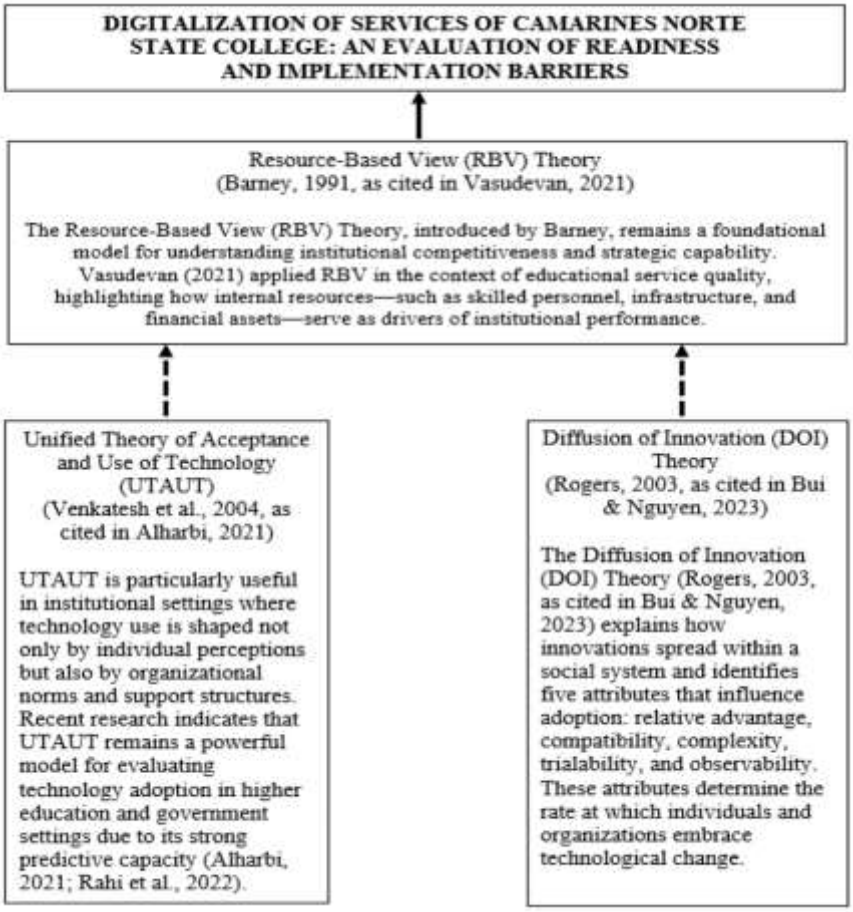
This study aimed to evaluate the readiness and implementation barriers of digital service delivery at Camarines Norte State College. Specifically, it aimed to achieve the following objectives:

1. To evaluate the institutional readiness for digital service delivery along with the availability of infrastructure, ICT expertise, and organizational support.
2. To describe the level of digital services delivery in terms of the extent of utilization, user acceptability, and service efficiency.
3. To identify implementation barriers in terms of financial constraints, technological limitations, and human resource capacity.
4. To examine the relationship of readiness on the level of digital service delivery and implementation barriers.
5. To develop an action plan for an enhanced implementation of digitalization initiative.

1.2 Theoretical Framework of the Study

Figure 1 shows three complementary theories used in this study, specifically, Resource-Based View (RBV), Unified Theory of Acceptance and Use of Technology (UTAUT), and Diffusion of Innovation (DOI), to provide a multidimensional analysis of digital service delivery at CNSC.

Figure 1 Theoretical Paradigm



Resource-Based View (RBV) Theory, introduced by Barney, posits that organizational success depends on the availability, management, and effective utilization of valuable internal resources, including infrastructure, financial assets, technological systems, and human competencies (Vasudevan, 2021) [20]. This theory served as the primary framework for the study because it directly explains how institutional resources and organizational capabilities influence the readiness, implementation, and sustainability of digital service delivery at CNSC. The study variables aligned with RBV principles: institutional readiness (infrastructure, ICT expertise, organizational support) reflected internal capabilities necessary for digital transformation, while implementation barriers (financial constraints, technological limitations, human resource capacity) represented resource-related challenges affecting service effectiveness. RBV Theory also supported examination of digital service delivery outcomes, utilization, user acceptability, and service efficiency, which depend on adequate technological resources, skilled personnel, and administrative support.

Unified Theory of Acceptance and Use of Technology (UTAUT) integrate performance expectancy, effort expectancy, social influence, and facilitating conditions to explain technology adoption in organizational settings (Venkatesh et al., 2003, as cited in Alharbi, 2021) [21, 22]. Performance expectancy assesses whether users believe digital systems improve work effectiveness, while effort expectancy refers to ease of use. Social influence captures the role of leadership encouragement, peer influence, and institutional culture in shaping adoption. Facilitating conditions, such as training, IT support, and resource availability, directly affect system integration into daily tasks. UTAUT strengthened the behavioral component of this analysis by capturing institutional pressures, support systems, and workplace culture that shape user acceptance in higher education contexts (Alharbi, 2021; Rahi et al., 2022) [22, 23].

Diffusion of Innovation (DOI) Theory explains how innovations spread within social systems through five attributes: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003, as cited in Bui & Nguyen, 2023) [24, 25]. Digital platforms demonstrating clear advantages over manual processes and compatibility with existing workflows are more likely to be accepted, while overly complex systems lacking trial opportunities may encounter resistance. DOI Theory situated digital adoption within cultural, social, and experiential dimensions particularly relevant in multi-campus institutions where readiness, resource constraints, and organizational support vary across contexts.

2. Methodology

This study employed a descriptive-correlational design to investigate how resource challenges influenced digital service delivery at CNSC. The descriptive method was used to systematically assess the resource challenges faced by CNSC in implementing digital services. The correlational approach was utilized to explore the statistical association between identified resource challenges and the level of digitalization services at CNSC. By applying Pearson's correlation, the study determined whether financial constraints, technological limitations, and human resource capacity significantly related to the extent of digital service utilization, efficiency, and user acceptability.

Participants comprised 105 office heads and staff from CNSC Main and Satellite Campuses. Respondents were selected based on direct experience with digital platforms and institutional knowledge demonstrated by at least five years of continuous service at CNSC. Purposive sampling was employed to identify individuals directly involved with digital systems, ensuring relevant and contextually grounded data. Moreover, it allowed the researcher to deliberately select participants who possessed the specific knowledge and experience needed. The respondent distribution across six campuses (A–F) included 12

office heads and 38 staff from Campus A, 10 heads and 6 staff from Campus B, 6 staff from Campus C, 10 heads and 4 staff from Campus D, 8 heads and 1 staff from Campus E, and 8 heads and 1 staff from Campus F. Offices represented included Accounting, Budget Office, Cashier's Office, General Services Office, Guidance Testing and Admission Office, Human Resource Management Office, Information Technology Services Office, Library, Medical and Dental Services, Registrar's Office, and Supply and Property Management Office.

A validated questionnaire with three parts was administered via printed hard copies and Google Forms. Part 1 assessed institutional readiness (infrastructure availability, ICT expertise, organizational support); Part 2 evaluated digital service delivery (extent of utilization, user acceptability, service efficiency); and Part 3 identified implementation barriers (financial constraints, technological limitations, human resource capacity). The questionnaire was subjected to validation by experts and achieved very high validity (CVI = 5.0) and reliability (Cronbach's alpha = 0.980). A five-point Likert scale was used to quantify the responses of the participants.

Data collection commenced after securing institutional permits from CNSC administration. Following expert validation and dry-run testing, the instrument was finalized and prepared for distribution in both printed and electronic formats. Printed questionnaires with cover letters explaining the study's purpose and response deadlines were personally distributed to designated offices at the Main and Abaño Campuses, while Google Forms links with corresponding instructions were sent electronically to identified participants from the satellite campuses. Completed questionnaires were retrieved on scheduled dates, with printed copies collected from office heads and online responses accessed through Google Forms platform. Printed questionnaires were securely stored while digital files were maintained in protected storage to preserve data integrity and confidentiality. The gathered data was subsequently organized and tabulated using appropriate statistical tools to ensure accurate analysis.

Informed consent was obtained from the institution and participants prior to data gathering. Participation was voluntary, and respondents were informed of the study's purpose and significance. Anonymity and confidentiality were strictly maintained in accordance with data privacy protocols, with printed and digital files securely stored and accessible only to the researcher. Participants were selected based on organizational function regardless of personal characteristics, promoting inclusivity. The study avoided language that could jeopardize professional relationships. An AI-powered language tool was used exclusively for manuscript drafting to enhance clarity, without accessing or analyzing participant data.

Weighted means were used to determine readiness levels, describe digital service delivery, and identify implementation barriers. This approach is appropriate for perception-based survey instruments measuring institutional readiness and technological preparedness (Tungpantong et al., 2022; Budiyanto et al., 2022; Farias-Gaytan et al., 2023; Cruz & Cruz, 2020) [26, 27, 28, 29]. Spearman Rho Correlation Coefficient assessed the relationship between resource challenges and digitalization levels, as this non-parametric measure is suitable for ordinal Likert-scale data and effectively links institutional constraints to digitalization outcomes (Gkrimpizi et al., 2023; Singh, 2025; Mhlanga & Moloi, 2020; Cruz & Cruz, 2020) [30, 31, 32, 29]. The Modified ADDIE Model translated findings into practical interventions through analysis, design, development, implementation, and evaluation phases, systematically converting readiness assessments into strategic interventions addressing identified barriers (Ahmad et al., 2023; Dela Cruz & Santos, 2021; Nguyen & Pham, 2022) [33, 34, 35].

3. Results and Discussion

3.1 Institutional Readiness for Digital Service Delivery in terms of Infrastructure, ICT Expertise and Organizational Support

3.1.1 Infrastructure

As shown in Table 1, CNSC demonstrated high infrastructure readiness with an average weighted mean of 3.72. Platform accessibility to intended users received the highest rating (m=3.92), while system capacity to handle simultaneous user volume received the lowest rating (m=3.63), though both fell within the high readiness range. The high accessibility rating indicates that CNSC has established a reliable and user-oriented digital environment with minimal barriers to engagement. However, the lower system capacity rating suggests infrastructure limitations during peak demand periods, indicating that infrastructure is more effective in providing access than sustaining optimal performance under high concurrent usage.

These findings align with the Resource-Based View (RBV) Theory, which emphasizes that institutional readiness depends on the availability and effective utilization of internal technological resources. While CNSC has established a strong foundation in accessibility, the World Bank (2022) identified inadequate bandwidth and server capacity as significant barriers to efficient digital service delivery in provincial institutions [36]. UNESCO (2023) similarly noted that despite improved platform access, scalability and reliability challenges persist in higher education [37]. Dela Cruz and Ramos (2023) found that fragmented ICT infrastructure and limited capacity constrain full digital implementation in state colleges. Enhancing system capacity and optimizing infrastructure performance would strengthen CNSC's readiness for efficient and sustainable digital service delivery [14].

Parameters - Infrastructure	**Mean**	**Rank**	**Int.**
CNSC has adequate computers and digital equipment to support online services.	3.70	2	High Readiness
Internet connectivity in CNSC is reliable for digital transactions.	3.68	3	High Readiness
Existing systems and platforms are suitable for digital service delivery.	3.67	4	High Readiness
Digital platforms used by CNSC are accessible to intended users.	3.92	1	High Readiness
CNSC has functional system to handle the volume of users accessing digital services simultaneously.	3.63	5	High Readiness
Overall Mean - Infrastructure	3.72		High Readiness
Parameters – ICT Expertise	**Mean**	**Rank**	**Int.**
CNSC has a pool of personnel who are experts in digital systems.	3.89	1	High Readiness
Technical support is readily available when system issues arise.	3.66	4	High Readiness
CNSC provides regular ICT-related training to support digital service delivery.	3.31	5	Moderate Readiness
ICT staff are competent in maintaining and upgrading digital platforms.	3.80	2	High Readiness
CNSC personnel can independently troubleshoot basic issues in digital systems.	3.69	3	High Readiness
Overall Mean – ICT Expertise	3.67		High Readiness

Parameters – Organizational Support	Mean	Rank	Int.
Top management demonstrates leadership in planning and prioritizing digital service delivery.	3.72	1	High Readiness
Policies and guidelines for digital services are in place and communicated.	3.57	3	High Readiness
There is a clear direction for digital transformation in CNSC.	3.61	2	High Readiness
Roles and responsibilities related to digital service delivery are clearly defined.	3.56	4	High Readiness
An adequate budget to support digital services is included in the CNSC Strategic Plan.	3.35	5	Moderate Readiness
Overall Mean – Organizational Support	3.56		High Readiness

Table 1: Institutional Readiness for Digital Service Delivery in terms of Infrastructure, ICT Expertise and Organizational Support

Note. 1.00–1.80 Very Low Readiness; 1.81–2.60 Low Readiness; 2.61–3.40 Moderate Readiness; 3.41–4.20 High Readiness; 4.21–5.00 Very High Readiness

3.1.2 ICT Expertise

As shown in Table 1, CNSC demonstrated high readiness in ICT expertise with an average weighted mean of 3.67. The presence of expert personnel received the highest rating (m=3.89), while provision of regular ICT training received the lowest rating (m=3.31, moderate readiness). The high rating for expert personnel indicates a competent ICT workforce capable of managing and supporting digital systems effectively. However, the lower training rating suggests that ICT capability depends more on existing expertise than on sustained capacity-building initiatives for emerging technologies.

CNSC demonstrates strength in current ICT competence but shows gaps in continuous learning and skill enhancement is essential in rapidly evolving digital environments. This reliance on existing expertise rather than systematic development is problematic, as Bongato (2022) emphasized that institutional readiness depends not only on having skilled personnel but on sustaining their capability to support evolving digital systems [38]. Complementing this view, Reyes and Tan (2023) highlighted that continuous professional development is essential for enhancing digital literacy and adaptability, particularly as technologies and user expectations change [15]. The challenge at CNSC reflects a broader pattern observed by Verano and Rubio (2024), who found that while state college personnel are receptive to digital tools, the absence of structured training programs limits long-term adoption and innovation [39].

3.1.3 Organizational Support

As shown in Table 1, CNSC demonstrated high readiness in organizational support with an average weighted mean of 3.56. Top management leadership in planning and prioritizing digital service delivery received the highest rating (m=3.72), while budget allocation in the strategic plan received the lowest rating (m=3.35, moderate readiness). Strong leadership support indicates active management commitment to integrating digital service delivery into institutional planning and priorities, fostering a culture that supports innovation and clear policy implementation. However, the lower budget rating suggests that organizational support is stronger in strategic direction than financial investment.

CNSC demonstrates strength in leadership and policy support critical for guiding digital transformation, but gaps in budget allocation may affect long-term sustainability and scalability. This pattern aligns with findings by Manalo and Javier (2023), who identified leadership and organizational culture as key drivers

shaping institutional priorities and adoption, yet noted that strategic intent alone cannot compensate for resource deficits [40]. The budget constraint observed at CNSC reflects a systemic issue documented by Macale and Abanto (2024), who found that limited ICT budget allocation remains a significant barrier to sustained digital development in provincial colleges across the Philippines [17]. These challenges underscore the perspective of Tan and Santos (2021), who emphasized that successful digital transformation requires alignment among leadership, resources, and institutional capacity, elements that must work in concert rather than in isolation [41].

3.2 Level of Digital Service Delivery in Terms of Extent Utilization, User Acceptability and Service Delivery

3.2.1 Extent Utilization

Table 2 shows CNSC's high digital service utilization with an average weighted mean of 3.89. Specifically, regular use of digital platforms for transactions (m=4.00, high utilization) received the highest rating, indicating strong integration into routine institutional processes, while consistency of digital platform use across offices (m=3.73) received the lowest rating, though still within the high utilization range. The high rating for regular use suggests that stakeholders have embraced digital tools for enrollment, communication, and documentation, reflecting their perceived convenience and effectiveness. However, the lower consistency rating indicates uneven adoption across units, with some offices still relying on traditional processes.

While digital platform adoption succeeded in many areas, cross-office inconsistencies reveal uneven implementation. Khan (2025) noted that demand for technology-enabled services drives digital integration in higher education, and the International Association of Universities (2022) emphasized that digital tools enhance institutional efficiency [4] [5]. However, the inconsistency observed mirrors fragmented implementation across provincial institutions documented by Dela Cruz and Ramos (2023), underscoring Tan and Santos' (2021) assertion that digital transformation success requires coordinated adoption across organizational units [14] [41]. Strengthening institutional coordination and standardizing digital practices are essential to maximize digitalization benefits.

3.2.2 User Acceptability

High user acceptability was evident with an average weighted mean of 3.83 as shown in Table 2. Preference for digital services over manual processes (m=4.02) received the highest rating, indicating strong user inclination toward technology-driven service delivery, while user confidence in using digital platforms (m=3.72) received the lowest rating, though still within high acceptability. The strong preference suggests users perceive digital platforms as more convenient, efficient, and accessible than traditional processes, reflecting successful alignment with user expectations. However, the lower confidence rating indicates that while users accept digital systems, some encounter difficulties in navigating or fully utilizing platforms independently.

High acceptability demonstrates that digital services are well-received, but gaps in user confidence suggest need for additional support. UNESCO (2022) identified user acceptance as critical for digital initiative success, while the confidence gap reflects digital literacy deficits and limited training documented by Reyes and Tan (2023) and Santos (2022) [42] [5]. Hashim et al. (2022) emphasized that continuous user engagement and support mechanisms are essential for sustaining digital adoption. Enhancing user training, system usability, and technical support is necessary to improve confidence and ensure more effective digital service delivery [43].

Table 2: Level of Digital Service Delivery in Terms of Extent Utilization, User Acceptability and Service Delivery

*Parameters - Extent of Utilization	Mean	Rank	Int.
Digital platforms are regularly used for academic or administrative transactions.	4.00	1	High Utilization
Most of the services needed are available through digital platforms (e.g. enrollment, finance, and student records).	3.89	4	High Utilization
Digital services reduce the need for face-to-face transactions.	3.92	2	High Utilization
Digital systems are integrated into daily CNSC operations.	3.90	3	High Utilization
Digital platforms are consistently used across different offices and units in CNSC.	3.73	5	High Utilization
Overall Mean - Extent of Utilization	3.89		High Utilization
****Parameters – User Acceptability**	**Mean**	**Rank**	**Int.**
Digital services are easy to use.	3.98	2	High Acceptability
Users are satisfied with the functionality of CNSC's digital services.	3.73	4	High Acceptability
Users demonstrate confidence in using CNSC's digital platforms.	3.72	5	High Acceptability
Digital services are preferred over manual processes.	4.02	1	High Acceptability
Users are willing to recommend CNSC's digital services to other users.	3.84	3	High Acceptability
Overall Mean – User Acceptability	3.83		High Acceptability
*****Parameters – Service Efficiency**	**Mean**	**Rank**	**Int.**
Digital services reduce the turnaround time for completing transactions.	4.03	2	High Service Efficiency
Errors are minimized when using digital systems.	3.91	3	High Service Efficiency
Digital service processes are consistent and standardized across offices.	3.78	5	High Service Efficiency
Digital systems reduce the need for repeated submissions or follow-ups.	3.86	4	High Service Efficiency
Digital service delivery enables faster response to client inquiries and requests.	4.04	1	High Service Efficiency
Overall Mean – Service Efficiency	3.92		High Service Efficiency

**Note*. 1.00–1.80 Very Low Utilization; 1.81–2.60 Low Utilization; 2.61–3.40 Moderate Utilization; 3.41–4.20 High Utilization; 4.21–5.00 Very High Utilization

**1.00–1.80 Very Low Acceptability; 1.81–2.60 Low Acceptability; 2.61–3.40 Moderate Acceptability; 3.41–4.20 High Acceptability; 4.21–5.00 Very High Acceptability

***1.00–1.80 Very Low Service Efficiency; 1.81–2.60 Low Service Efficiency; 2.61–3.40 Moderate Service Efficiency; 3.41–4.20 High Service Efficiency; 4.21–5.00 Very High Service Efficiency

3.2.3 Service Efficiency

High service efficiency was demonstrated with an average weighted mean of 3.92 as shown in Table 2. Faster response to client inquiries and requests (m=4.04) received the highest rating, reflecting effective communication and responsiveness through digital platforms, while consistency and standardization of services across offices (m=3.78) received the lowest rating, though still within high efficiency. The strong responsiveness rating indicates that stakeholders benefit from quicker transactions, reduced waiting times, and improved access to services through real-time interactions. However, the lower standardization rating suggests variations in how digital services are implemented among units, leading to inconsistencies in service quality.

Strong performance in speed and responsiveness contrasts with gaps in uniform service delivery across units. This supports the World Bank (2022) principle that digitalization improves service delivery by reducing processing time and increasing efficiency, consistent with the Ease of Doing Business Act mandate [36]. However, the standardization challenge parallels weak system integration and coordination issues identified by Dacer et al. (2025), underscoring Tan and Santos' (2021) emphasis that sustainable digital transformation requires alignment of systems, processes, and institutional practices. Strengthening process standardization and system integration is essential to ensure consistent, efficient, and high-quality services across all units [18, 21].

3.3 Implementation Barriers in terms of Financial Constraints, Technological Limitation, and Human Resource Capacity

3.3.1 Financial Constraints

Financial constraints posed a significant barrier with an average weighted mean of 3.95 as shown in Table 3. Limited financial resources for acquiring updated technologies (m=4.14) received the highest rating, highlighting difficulties in investing in modern digital tools and infrastructure, while budget prioritization for digital initiatives (m=3.70) received the lowest rating, though still within the significant barrier range. The high rating for limited resources suggests substantial challenges in funding acquisition, maintenance, and upgrading of digital systems, potentially resulting in reliance on outdated platforms. The lower prioritization rating implies that while digitalization is recognized in institutional budgets, it may lack sufficient emphasis compared to other operational priorities.

These constraints hinder digital transformation through resource availability and allocation limitations. Macale and Abanto (2024) found that limited ICT budgets restrict provincial institutions' capacity to sustain digital systems, reinforced by the World Bank (2022), which identified financial limitations as major barriers in public institutions [17] [36]. Outdated systems reflect structural constraints documented by Dacer et al. (2025), while prioritization issues align with Dela Cruz and Ramos' (2023) observation that digital initiatives compete with other priorities [18] [14]. As Tan and Santos (2021) emphasized, effective digitalization requires alignment between goals and resource allocation. Strengthening financial planning and exploring alternative funding are essential for sustainability [9].

3.3.2 Technological Limitations

Technological limitations posed a significant barrier with an average weighted mean of 3.88. Unscheduled system downtime (m=41.0) received the highest rating, highlighting concerns about system reliability and operational continuity, while compatibility of digital platforms across devices (m=3.52) received the lowest rating, though still significant. High downtime ratings suggest interruptions that disrupt transactions and reduce user trust, while system performance limitations indicate issues such as slow

response times potentially linked to insufficient infrastructure capacity or inadequate maintenance. The lower compatibility rating suggests generally manageable cross-device access, though some users encounter difficulties.

These limitations impede service delivery through reliability, performance, and compatibility gaps that mirror broader patterns in resource-constrained settings. The ITU (2021) and UNESCO (2022) identified infrastructure gaps as major barriers in developing regions, providing context for why CNSC experiences frequent downtime and performance issues [5] [42]. Verano and Rubio (2024) specifically noted that CNSC's infrastructure requires strengthening to sustain operations [39]. The performance and integration challenges extend beyond CNSC, as Dacer et al. (2025) found similar patterns of outdated systems and weak integration contributing to inefficiencies across Camarines Norte institutions [18]. While compatibility received lower ratings than downtime, UNESCO (2023) cautioned that even moderate compatibility disparities can significantly affect platform usability, particularly for users with limited device options. Improving system reliability, infrastructure capacity, and platform compatibility are essential for stable service delivery [37].

Parameters – Financial Constraints	**Mean**	**Rank**	**Int.**
Allocation of funds for digitalization is not prioritized in the institutional budget.	3.70	5	Significant Barrier
Funding delays affect the timely implementation of digital service projects.	4.04	2	Significant Barrier
Maintenance costs hinder expansion, sustainability, and continuous digitalization.	3.97	3	Significant Barrier
Limited financial resources restrict the acquisition of updated digital technologies.	4.14	1	Significant Barrier
Financial planning for digital initiatives is insufficient to support long-term implementation.	3.91	4	Significant Barrier
Overall Mean - Financial Constraints	3.95		Significant Barrier
Parameters – Technological Limitations	**Mean**	**Rank**	**Int.**
Unscheduled system downtime disrupts the continuity of digital service delivery.	4.10	1	Significant Barrier
Digital platforms are not fully compatible with users' devices.	3.52	5	Significant Barrier
Data security concerns hinder digital service implementation.	3.80	4	Significant Barrier
Limited system integration affects service efficiency.	3.94	3	Significant Barrier
System performance limitations (e.g., slow response time or crashes) affect the usability of digital platforms.	4.06	2	Significant Barrier
Overall Mean – Technological Limitations	3.88		Significant Barrier
Parameters – Human Resource Capacity	**Mean**	**Rank**	**Int.**
The number of personnel assigned to manage digital services is insufficient.	3.92	3	Significant Barrier
Resistance to change affects digitalization efforts.	4.18	1	Significant Barrier

Overload of work prevents staff from fully utilizing digital systems.	3.93	2	Significant Barrier
Personnel are not given adequate time to adapt to new digital systems and processes.	3.71	4	Significant Barrier
Assignment of personnel to digital service functions is not appropriate and well-coordinated.	3.48	5	Significant Barrier
Overall Mean – Human Resource Capacity	3.85		Significant Barrier

Table 3: Implementation Barriers in terms of Financial Constraints, Technological Limitation, and Human Resource Capacity

Note. 1.00–1.80 Not a Barrier; 1.81–2.60 Minor Barrier; 2.61–3.40 Moderate Barrier; 3.41–4.20 Significant Barrier; 4.21–5.00 Extreme Barrier

3.3.3 Human Resource Capacity

Human resource capacity posed a significant barrier with an average weighted mean of 3.85. Resistance to change (m=4.18) received the highest rating, highlighting organizational culture's influence on digital transformation, while personnel assignment (m=3.48) received the lowest rating, though still significant. High resistance ratings suggest that employees accustomed to traditional processes hesitate to embrace digital tools, slowing implementation. Results also show that workload and insufficient personnel compromise digital service quality and efficiency. The lower personnel assignment rating indicates that coordination challenges exist but are less critical than behavioral resistance and workload issues.

The resistance to change observed as the highest-rated barrier validates Hashim et al.'s (2022) assertion that human resource readiness is essential for sustaining digital initiatives [43]. This resistance reflects the cultural dimension emphasized by Gong and Ribiere (2021), who argued that transformation requires organizational culture shifts beyond mere technology adoption [11]. The workload and personnel insufficiency identified in this study directly parallel gaps in institutional support documented by Reyes and Tan (2023) [15]. Addressing these interconnected issues requires the empowerment approach advocated by Santos (2022), who found that training and support mechanisms are crucial for overcoming resistance and building capacity [44]. Implementing change management, continuous training, and organizational support is therefore essential to bridge the gap between CNSC's technical capabilities and human resource engagement necessary for digital service delivery success.

3.4 Relationship between the Level of Readiness on Digital Service Delivery and Implementation Barriers

A Shapiro-Wilk normality test yielded p-values less than 0.05 for all variables, indicating significant deviation from normality. Consequently, Spearman's rank-order correlation was employed to assess relationships between institutional readiness dimensions (Infrastructure Readiness, ICT Expertise, Organizational Support) and implementation barriers (Financial Constraints, Technological Limitations, Human Resource Capacity).

Table 4: Test for Significant Relationship between the Level of Readiness on Service Delivery and the Implementation Barriers

Readiness Variables		Financial Constraints	Technological Limitation	Human Resource Capacity
Infrastructure Readiness	Spearman's rho	0.125	0.009	0.093
	p-value	0.203	0.927	0.346
ICT Expertise	Spearman's rho	0.224*	0.174	0.206*
	p-value	0.022	0.076	0.035
Organizational Support	Spearman's rho	0.101	0.309**	0.243*
	p-value	0.307	0.001	0.013

Note: * p < .05, ** p < .01, *** p < .001

Infrastructure Readiness showed no significant relationship with financial constraints (ρ = 0.125, p = 0.203), technological limitations (ρ = 0.009, p = 0.927), or human resource capacity (ρ = 0.093, p = 0.346), suggesting that infrastructure presence alone does not address broader implementation challenges.

ICT Expertise positively correlated significantly with financial constraints (ρ = 0.224, p = 0.022) and human resource capacity (ρ = 0.206, p = 0.035), but not technological limitations (ρ = 0.174, p = 0.076). Higher ICT competence increases awareness of financial and human resource challenges, indicating that skill development helps identify systemic barriers, highlighting need for capacity-building programs coupled with resource investment.

Organizational Support correlated significantly with technological limitations (ρ = 0.309, p = 0.001) and human resource capacity (ρ = 0.243, p = 0.013), but not financial constraints (ρ = 0.101, p = 0.307). Strong leadership and strategic planning enable recognition and addressing of technological and staffing needs.

While infrastructure readiness does not mitigate barriers, ICT expertise and organizational support are critical for recognizing and addressing challenges. This validates Bongato (2022), who emphasized that readiness requires skilled personnel and stakeholder engagement beyond infrastructure [38]. Hashim et al. (2022) explained that transformation requires human involvement alongside technology, clarifying why ICT expertise correlates with barrier awareness rather than reduction [43]. Organizational support correlations reflect Manalo and Javier's (2023) finding that leadership facilitates digital initiatives, extending Dela Cruz and Ramos' (2023) observation that fragmented implementation stems from limited governance capacity [40] [14].

These findings support the Resource-Based View (RBV) Theory that infrastructure availability does not automatically address challenges, while human capital, leadership, and governance play more critical roles in recognizing and addressing barriers. Successful digital transformation at CNSC relies on strategically managing human, organizational, and financial resources to sustain digital initiatives.

3.5 Development of a Strategic Action Plan for Enhanced Digital Service Delivery

A Short-Term Strategic Action Plan was developed following a modified ADDIE framework (Analysis, Design, Development) to ensure interventions aligned with empirical findings, institutional feasibility, and identified implementation barriers. Implementation and evaluation phases were beyond the study's scope.

Analysis Phase. The analysis synthesized empirical findings to identify strengths, weaknesses, and constraints. While institutional readiness was high across infrastructure (m=3.72), ICT expertise (m=3.67),

and organizational support (m=3.56), and digital service delivery showed high utilization (m=3.89), user acceptability (m=3.83), and service efficiency (m=3.92), performance gaps emerged in budget allocation and regular training provision. Implementation barriers were significant: financial constraints (m=3.95), technological limitations (m=3.88), and human resource capacity (m=3.85). Correlation analysis revealed that ICT expertise and organizational support significantly relate to barriers, while infrastructure readiness showed no significant relationship, indicating that system availability alone does not ensure effective implementation. The primary issue identified was sustainability, consistency, and resource support rather than system adoption, establishing enhanced institutional capacity, improved resource allocation, and strengthened system reliability as priority intervention areas.

Design Phase. Strategic interventions were designed to address identified barriers through six interconnected areas. To resolve inconsistent utilization across offices, system integration and standardization interventions ensured uniform platform adoption and harmonized workflows. Addressing the most significant barrier, resource optimization strategies tackled financial constraints through prioritized digital investments, phased system upgrades, and external funding exploration via government support and partnerships. Building on the training gap identified in ICT expertise, continuous capacity-building programs incorporated regular ICT training, digital competency development, and institutionalized learning mechanisms. Infrastructure enhancement measures mitigate technological limitations by improving internet connectivity, upgrading system capacity, and adopting scalable solutions to reduce downtime and performance issues. To complement technical improvements, strengthened IT support services addressed human resource capacity challenges through clarified roles, augmented technical personnel, and improved system management structures. Finally, monitoring and feedback mechanisms were integrated across all interventions, incorporating performance tracking, user support systems, and transparency measures to enhance user confidence and ensure sustained adoption.

Development Phase. The plan was structured into five pillars: digital infrastructure optimization, capacity building and human resource development, system integration and standardization, financial sustainability and resource mobilization, and monitoring, evaluation, and governance. Implementation followed a 0–24-month timeline: Phase 1 (0–6 months) prioritized system assessment, critical issue resolution, and training initiation; Phase 2 (6–12 months) focused on system integration and infrastructure enhancement; Phase 3 (12–24 months) emphasized full optimization and policy institutionalization. Performance indicators included increased platform consistency, reduced downtime, improved ICT competency, enhanced user satisfaction, and improved service efficiency. A Digital Transformation Committee oversees implementation and ensures accountability, while risk management strategies address system failures, resistance to change, and funding limitations through contingency planning and stakeholder engagement.

4. Conclusions

Camarines Norte State College demonstrates high readiness for digital service delivery across infrastructure, ICT expertise, and organizational support, with adequate platforms, competent personnel, and supportive leadership. However, limitations in system capacity, continuous training, and financial support indicate that readiness is not fully optimized. Digital service delivery is similarly high, with platforms widely utilized, accepted, and effective in improving efficiency and responsiveness. Nonetheless, cross-office inconsistencies and gaps in user confidence reveal uneven implementation requiring enhancement.

Financial constraints, technological limitations, and human resource capacity significantly hinder digital transformation. Limited funding, system downtime, performance issues, resistance to change, and workforce limitations collectively affect sustainability and effectiveness, indicating that institutional challenges extend beyond infrastructure and require comprehensive strategic intervention. Correlation analysis reveals that infrastructure alone does not address these challenges, while ICT expertise and organizational support show significant relationships with barriers, suggesting that increased competence and leadership involvement heighten awareness of financial, technological, and human resource issues. Digital transformation at CNSC therefore requires an integrated approach aligning infrastructure, human capital, and institutional resources to ensure sustainable and effective digital service delivery.

5. Recommendations

CNSC should strengthen digital infrastructure by improving system capacity, upgrading servers, and enhancing bandwidth while implementing continuous ICT training programs to keep personnel updated with evolving technologies. The institution must standardize digital practices across offices, enhance user support mechanisms through help desks and tutorials, and conduct regular system evaluation to improve service delivery. Increased budget allocation and stronger policy support are essential to sustain institutional readiness and user confidence.

A comprehensive financial plan should prioritize digital transformation and explore alternative funding sources such as government grants and partnerships. Technological improvements must reduce system downtime, enhance integration, and ensure platform compatibility, while human resource challenges should be addressed through additional ICT personnel hiring, workload reduction, and change management strategies. CNSC should adopt a holistic approach aligning infrastructure development, human resource capacity, and financial investment, with strengthened leadership involvement and strategic planning to ensure sustainable digital service delivery.

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