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Leadership and technology innovation: Practices in Cotabato city division

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Abstract: Digital literacy is a fundamental technical skill integrated into the K-12 curriculum through an intensified ICT (Information and Communications Technology) program. To support schools with both online and offline instructional resources, various sectors have initiated programs to adapt to technological changes. The sustainability of policies involving ICT innovation in schools is influenced by adherence to effective leadership practices. Although public schools provide programs with ICT resources, technological advancement remains a significant educational challenge affecting sustainability, including initiatives, practices, and their association with leadership. Consequently, the researcher aims to examine leadership practices in public elementary schools within the Cotabato City Division that have implemented and sustained technological innovations. A descriptive correlational research design was employed, utilizing survey questionnaires for data collection. Total enumeration was used to determine the sample size. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS). The study found that elementary school heads and ICT coordinators demonstrate a satisfactory level of ICT leadership and innovation. Areas such as community partnerships, mentoring, technical support, and training for teachers and pupils require ongoing improvement. Lastly, the study revealed no correlation between respondents' demographic profiles and their technology leadership practices.

Keywords: *Digital literacy, Implementation, Innovation, technology, Leadership practices.*

1. Introduction

In today's digital era, education stands at a crossroads between innovation and tradition, highlighting the implementation of technological advancements in the educational sphere. Specifically, in primary education, digital literacy is considered the main foundation for technology development and initiatives. Hence, implementing and intensifying the ICT (Information and Communications Technology) program is essential. A transformational and enabling environment must be considered for the framework to be effective.

Maala and Lagos [1] give emphasis on technological leadership based on innovation, assessment, technology forecasting, management, and technology transfer. It also revealed a remarkable performance wherein school leaders met the quality requirements. Reis-Andersson [2] stated that in order to achieve positive gains in quality school life, digitalization in education creates opportunities when digital technologies are applied correctly.

DO 78 [3] provides procedures and standards on ICT equipment and internet accessibility, prioritizing classroom-aided instruction and administrative purposes. This was made available to attain proper management of the various ICT equipment and internet access from different schools. An advisory on standard minimum specifications of ICT equipment was also issued so that it can be used for procurement purposes. Annual updates on the technical specifications were also provided.

Cantos and Callo [4] opined that even though the DepEd offers programs to equip public schools with the right technology for the teaching-learning process, staff members still require upskilling and familiarity with the latest developments in educational technology, particularly in light of the difficulties

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with distance learning brought on by the pandemic these days. Although there is a provision of ICT equipment by the DepEd Computerization Program (DCP) packages to schools that are governed by certain DepEd School Division Offices, there are several issues that prevent the complete deployment of ICT infrastructure in classrooms and lead to the underutilization of these resources, even if the government has made progress in supplying them.

Further, adherence to leadership practices in school influences the sustainability of policies, particularly programs and innovations associated with technology. With strong compliance to the quality of instruction, school heads must promote the teaching process as facilitators of change. Interconnections among schools, systems, staff, students, and school culture should be recognized by school heads and leaders. With the recent challenges of digitalization, program planning, and leadership being highlighted as concerns that have a high impact on the sustainability of the innovation, there is a limited source for policy formulation. Another concern lies in the inefficiency of coordination between public and private sector efforts, resulting in time and money constraints and a shortage of human capital. If these gaps are insufficiently addressed, ICT can have an "insignificant impact on teaching and learning in Philippine schools," Cantos and Callo [4]. Baldera et al. [5] also discussed the significant association of leadership behaviors, strategies, and outcomes with effective technology adoption.

If digital technologies are used properly, the potential created by digitalization in education could have great outcomes. However, improper usage of digital technologies can lead to unfavorable outcomes. For instance, a lack of digital competency might lower willingness to use digital technologies in the classroom and increase workload because of software's unfriendly user interfaces. School leaders play a critical role in digitalizing education since teachers need "access to digital technologies and competency" in relation to educational concerns that affect "equality within and among K–12 schools" [2].

Hence, the researcher seeks to examine leadership practices in different schools in Cotabato City Division, focusing on the analysis of elementary public schools that have implemented and sustained technology innovations. It examines the role of leadership practices in supporting school leaders in sustaining ICT modernization.

1.1. Conceptual Framework of the Study

The conceptual model of the study is shown in Figure 1.

The independent variable considered in the study is leadership practices in technology innovation; the dependent variable is the determinants of technology innovation; and the moderating variable is the respondents' demographic profile.

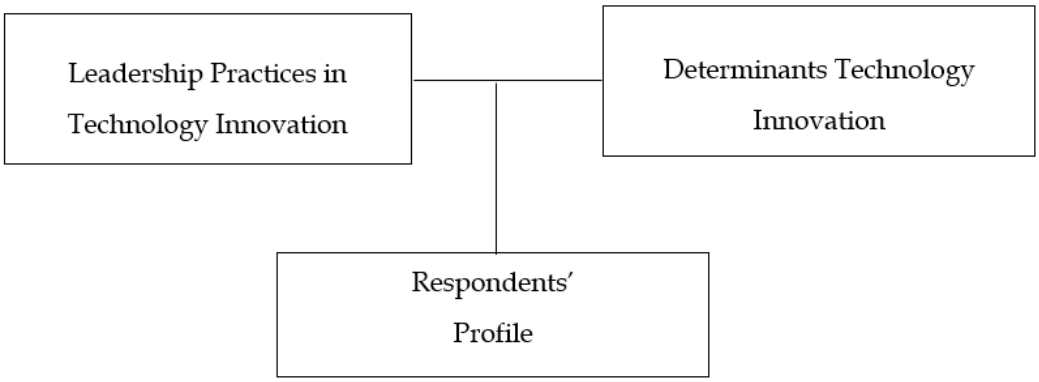

Figure 1.
Conceptual Framework on Leadership Practices in Technology Innovation.

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1.2. Statement of the Problem

This study aims to evaluate the practices in leadership and innovations in technology in Cotabato City Division.

Specifically, this sought to answer the following questions:

1. What is the respondents' profile in terms of age, sex, and marital status?
2. What is the extent of leadership practices in technology innovation?
3. What are the determinants of the implementation of leadership practices in technology innovation?
4. Do the respondents' profiles differ significantly in the level of leadership practices in technology innovations?

1.3. Hypothesis

Ho1. There is no significant relationship between respondents' profiles and the level of leadership practices in technology innovations.

1.4. Review of Related Literature and Studies

1.4.1. Practices in Information Communication Technology Among School Leaders

Tanucan et al. [6] asserted in their study that in the Philippine educational system, to maintain adaptability and competitiveness in a fast-changing digital world, school leaders who guide the schools toward digital transformation must attain at least a satisfactory level. Their study also highlighted that teachers, during the pandemic, accompanied by instructional bottlenecks, continue to manage and adjust to the educational paradigm shift and still achieve satisfactory results. Finally, Tanucan et al. [6] posited that job satisfaction among teachers is significantly predicted by the digital leadership of school heads. Meaning, teachers have a greater sense of fulfillment in their workstations when school heads demonstrate expertise in digitalization; thus, serving as models to their subordinates. Consequently, increasing the level of teachers' job satisfaction associated with Information and Communication Technology (ICT) requires training initiatives to be part of the inclusive educational framework.

Alayan [7] found in his study that a "high level of leadership practices" among leaders and regular "integration of ICT" in their "teaching-learning" process. It is also made evident that there is no discernible difference between technological leadership and teachers' frequency of embedding ICT in education in terms of school size. There is a notable variation in the congressional districts. Alayan [7] also mentioned that there is a positive but weak "correlation between school heads' technological leadership and teachers' ICT integration in pedagogical practice". Hence, the researcher created suggestions to improve the role of school heads, including ICT coordinators in digitalization, and to inspire teachers, proposing an ICT training initiative for school heads and teachers. Given the significant relationship between the frequency of teachers' ICT integration and technological leadership, consistent actualization of technological leadership is highly recommended to boost teachers' digital competence and job satisfaction.

According to the study conducted by Noceto [8], instructional leadership for ICT was commonly utilized in the area of cooperation, although it was fully implemented in terms of digital practice, ICT maturity, assessment, and roles with ICT. There was a statistically significant difference in the scope of instructional leadership techniques for ICT. This excludes evaluation and jobs involving ICT. Regarding the level of instructional leadership practices for ICT, it revealed a strong and positive correlation with the transformational leadership style conducted in the Division of Pasig. Nonetheless, these positive outcomes still show observable challenges, specifically limited funds to ensure reliable internet access, insufficient relevant and effective training programs for ICT utilization, and a shortage of ICT learning resources. Best practices highlighted in addressing these concerns include the formation of ICT teams to provide technical assistance and share responsibilities, as well as collaborative efforts in leading, sharing, and enhancing ICT expertise through Learning Action Cell (LAC) sessions and the conduct of actual training initiatives. There is a need for a strategic plan emphasizing the key areas of maximizing instructional leadership for ICT.

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Maala and Lagos [1] made evident that, as to the "technological leadership" in the areas of "technology innovation, assessment, forecasting, management, and transfer," school leaders demonstrated a high level. Based also on the results, the technological leadership met the standard requirement of effective technology leaders. Additionally, using the z-test and t-test to compare teachers' perspectives on technology integration, it is found that both groups shared similar views regarding the level of school heads' technological leadership. These serve as the basis for the training program development in addressing the needs of both school heads and teachers in strengthening technological leadership and ICT integration.

According to Cantos and Callo [4], they opined that given the fact that the Department of Education (DepEd) provides programs to equip public schools with appropriate technologies for the teaching-learning process, the personnel still need upskilling and familiarity with recent trends in educational technology, especially nowadays when the world is facing the challenges of distance learning brought about by the pandemic. They also stressed that there is no significant difference between the perceptions of elementary and secondary teachers regarding technology innovations. These insights indicate that good leadership and vision by leaders result in teachers' ability to use ICT effectively. Quidasol [9] highlighted that the distribution of DepEd Computerization Program (DCP) packages is already regulated by some schools in certain divisions. They also stressed that there are still challenges encountered in the implementation and utilization of ICT equipment and facilities, affecting technology leadership.

Based on the study conducted by Morales [10], he discussed the role of administrators and ICT leaders in schools, who serve as key players. Emphasis on the development of innovative leadership practices is actualizing professional development opportunities, resources, and support in order to attain educational success. Teachers can improve instructional strategies through continuous training and concerted efforts. Moreover, students as end receivers of the program benefit from this through creating a culture that appreciates invention, teamwork, and lifelong learning, which provides room for creativity in teaching methodologies.

According to Morales [10], as to the relationship between administrators and teachers on innovative leadership practices, a perception gap exists. Although administrators believed they always practiced such initiatives, teachers, on the other hand, perceived that these practices were less frequently utilized. This discrepancy reflects an organizational culture that is either resistant to or slow in adopting innovative leadership practices, as well as a lack of shared understanding between the two groups. Similarly, divergent perceptions emerged concerning teachers' 21st-century skills: teachers rated their skills as very high, while administrators assessed them as low. These conflicting views suggest a misalignment in assessing and appreciating teachers' actual skill levels and professional needs. Morales [10] also revealed in his study that a "significant difference between administrators' and teachers' perceptions of innovative leadership practices and assessments" of teachers' 21st-century skills. Nevertheless, both groups consistently identified interpersonal skills as the most dominant facet, while strategic thinking was considered the least dominant. This highlights the value placed on relational leadership aspects but also indicates a potential neglect of strategic foresight, which is essential for organizational resilience in an evolving educational landscape. Morales suggested that future research adopt a longitudinal approach to examine how leadership practices evolve and influence sustained teacher development. Likewise, focusing on specific leadership styles, school culture, teacher motivation, and professional development needs would offer richer insights into how innovative leadership effectively supports 21st-century teaching competencies.

Simpal and Pidor [11] stated that the results revealed that the "status of technological leadership behavior," "technological formation," and "education competency determination of educators" were rated high. Moreover, technological leadership behavior and technological formation significantly influenced the determination of education competency. Further, facing limitations in pedagogical and conceptual competencies related to encountering inadequacy of resources, engaging in ICT upskilling and technology capacity-building activities, and becoming a proactive teacher were themes generated

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from the lived experiences of educators. From the experiences that shaped their attitude, the highlighted themes are resiliency, keeping a spirit of positivity, and embodying appropriate values. Along with this, the themes that surfaced from the experiences that shaped the commitment of teachers involved envisioning knowledgeable students and manifesting a passion for teaching.

1.5. Determinants of Technology Innovation

Reis-Andersson [2] stressed that when digital technologies are applied properly, digitalization promotes opportunities resulting in the attainment of school goals. Nevertheless, the inappropriate application of digital systems can erroneously activate adverse development, wherein teachers are burdened by a heavy workload and reduced motivation as a result of a lack of digital literacy. Teachers require access to digital technologies and digital competence in addressing issues in K–12 schools, thus making school leaders' roles crucial in digitalizing instruction. He also emphasized that school leaders describe the digitalization process through teachers' digital competence, access to technology, and a shared culture. However, the lack of support and resources is an impeding factor of this program.

Abella and Dela Rosa [12] asserted that "teachers with less than ten years of experience" exhibited higher levels of digital literacy compared to their more experienced counterparts. Their study further revealed a significant relationship between pre-service education, access to ICT resources, and teachers' positive attitudes toward ICT use. These findings validate the importance of 21st-century education, which equips educators to critically engage with emerging technologies and effectively incorporate them into digital pedagogy.

Further, Macatangay and Callo [13] pointed out in their study that "self-efficacy" was meaningfully "predicted by systematic development when it comes to preparedness of technology leadership, while promotion of technology leadership, self-efficacy was significantly predicted by technology infrastructure and support, vision, planning, and management". Technology advancement among teachers is one of the initiatives by school leaders as one way of supporting teachers' professional development in terms of technology-enhanced pedagogy through learning action cells or in-service training; thus, vital in the current trend of learning.

Gardose and Gardose [14] emphasized that despite demographic differences, school heads display very satisfactory leadership skills across all indicators, showcasing consistency regardless of factors like sex, educational background, or length of service. Conversely, while teachers generally demonstrate proficiency in technology, they require further development in areas such as productivity, professional practice, and addressing social, legal, and human issues. Nevertheless, their technological competence remains consistent across different demographic profiles, indicating comparable proficiency. Assessments of both office and learners' performances range from very satisfactory to outstanding. Interestingly, there is no direct correlation observed between the leadership skills of school heads, the technological competence of teachers, and overall school performance, suggesting a complex interplay of factors influencing educational outcomes.

Additionally, one of the fundamental elements that has a major impact on the quality of the teaching and learning processes at every stage of the educational system is the quality of school administrators. The competencies of practical school leaders are regarded as the most significant aspects of a school leader's profile in the four indicated realms of the management domain. The capacity to formulate motivational strategies in accordance with the school's shared principles, the capacity to establish and nurture an effective learning atmosphere for students, the capacity to precisely delineate and assign responsibilities and authority, and the capacity to guide and oversee colleagues are essential. Studies on school leader competencies emphasize the significance of particular skills and areas of expertise. The necessity of skills in strategy development, school development, human resource management, and teaching process administration is emphasized [14].

Baldera et al. [5] opined that school leadership behaviors, strategies, and outcomes are linked with effective technology adoption, emphasizing visionary principals and school leaders like ICT coordinators. They play an essential role as catalysts in the promotion of digital literacy, addressing

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issues on infrastructure, contributing to the development of policies by providing a leadership outline, guiding future leaders and policymakers in crafting strategic involvement. They also recommended increased investment in ICT, continuous professional development for teachers, and plans for accessibility. UNESCO [15] highlighted that these competencies include "encouraging teachers" to align national "priorities in national ICT in Education policies, how ICT can support the curriculum, assessment, pedagogy, school management, and ongoing professional growth".

Delos Reyes and Paglinawan [16] found that under the category of "Highly Practiced," administrators reveal an increased work compliance service, particularly in "problem-solving," "flexibility," and "learning orientation." The results of the study also displayed robust leadership ability in supportive, decision-making, and visionary dimensions, reflecting their capacity to effectively navigate the changing educational landscape and integrate technology into school operations. Their digital fluency was described as "Fluent," signifying expertise in technology integration and utilization to enhance pedagogy and learning outcomes. They also accentuated the crucial role of problem-solving abilities in enabling administrators to address challenges and leverage technology effectively. At the same time, the prominence of supportive leadership underscores the importance of fostering a collaborative, resource-rich environment that facilitates the adoption and integration of digital tools and practices.

Yang et al. [17] emphasized that with a definite vision, appropriate resources, utilization of modeling technology, and organizing career advancement play a fundamental part in facilitating ICT integration in leadership practices. They further noted that capacity-building mechanisms, including teachers' technological self-efficacy, pedagogical beliefs, and engagement in collaborative cultures, facilitate the link between leadership and ICT integration. Investing in robust ICT support platforms that foster teacher collaboration and knowledge sharing, while also establishing feedback mechanisms that enhance teachers' motivation to adopt new technologies, was highly accentuated. At the policy level, multi-tiered evaluation systems have been recommended to assess both leadership performance and the effectiveness of ICT integration at the school level, ensuring that educational technology resources are deployed sustainably and equitably.

2. Methodology

2.1. Research Design

A descriptive-correlational method of research was employed as it is aimed at the evaluation of the level of leadership practices and technology innovations in the public elementary schools in the Division of Cotabato City.

2.2. Participants and Sampling Technique

The study included all public elementary school leaders (school heads and ICT coordinators) in the Cotabato City division.

This study utilized total enumeration in identifying the schools in the Division of Cotabato City. The entire population of ICT coordinators and school heads will be used as the sample.

2.3. Research Instrument

A survey questionnaire was used to identify the determinants of ICT implementation. The set of questionnaires was structured using a five-point response scale. A five-point scale was used to evaluate the level of leadership practices in technology innovation, with qualitative verbal descriptions and numerical ratings. Below are the designated quantifications used in the questionnaire:

Score	Description
5	Strongly Agree (SA)
4	Agree (A)
3	Neither Agree nor Disagree (NAD)
2	Disagree (D)

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1	Strongly Disagree (SD)

Another questionnaire is used, which contains information on the determinants of ICT implementation. In this type of questionnaire, the respondents were also given five response choices with qualitative verbal descriptions and numerical ratings. Below are the designated quantifications.

Score	Description
5	Excellent (E)
4	Very Good (VG)
3	Good (G)
2	Poor (P)
1	Extremely (EP)

2.4. Data Gathering Procedure

The study was administered to all identified public elementary school ICT coordinators and school principals in the Division of Cotabato City. Coordination with the Schools Division Superintendent was done first through written communication forwarded to the different District Heads. The respondents were gathered in a particular room conducive to the administration of the survey questionnaire, and some surveys were distributed to the school heads.

2.5. Data Analysis Procedure

The gathered data were tallied, categorized, and subjected to descriptive and inferential statistical analyses.

To evaluate the level of ICT leadership practices as well as determinants of ICT innovations among public elementary school teachers at the Division of Cotabato, the following statistical formulas will be used:

a. Percentage, mean, and standard deviation. This will be used to identify the level of ICT implementation, leadership practices, and technology innovations by the respondents.
b. The t-test was used to analyze the data in computing the significant difference of the respondents' profiles and levels of ICT leadership practices and innovations.

2.6. Ethical Considerations

Participants' rights were safeguarded through informed consent, voluntary participation, and strict confidentiality of all data collected.

3. Results and Discussion

This includes the presentation of data in a tabular system, analysis and interpretation of the results of the data gathered in the study, and the answers to the statement of the problems.

3.1. Profile of Respondents

The profile of the respondents consists of age, sex, and marital status. The data are presented in Table 1.

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Table 1.
Distribution of Respondents' Profile by Age, Sex, and Marital Status.

Profile	Frequency	Percentage
Age		
21–30	3	5.4
31–40	24	42.9
41–50	22	39.3
51–60	7	12.5
Mean Age: 40.36		
Sex		
Male	18	32.1
Female	38	67.9
Marital Status		
Single	12	21.4
Married	37	66.1
Separated	5	8.9
Widowed	2	3.6

Table 1 shows that in terms of age, respondents in the 31-40 age bracket constitute the highest population with 24 teachers and school heads, or 42.9 percent, while the 21-30 age bracket has the lowest with three respondents, or 5.4 percent. This indicates that respondents in the middle age of adulthood are predominantly assigned to ICT tasks or leadership roles, whereas younger teacher-school heads are less represented. The school heads and coordinators are evidently middle-aged professionals.

Regarding the sex distribution, the majority were females. Eighteen of the respondents, or 32.1 percent, are males, and 38, or 67.9 percent, are females. This indicates a predominance of women as school leaders and coordinators in the implementation of Information and Communications Technology in their respective schools. It also suggests that women are more inclined to undertake ICT tasks compared to men. In other words, the role is predominantly occupied by female teachers and school heads.

As to marital status, 37 respondents or 66.1 percent are married, which is the highest frequency, while there are only 2 widowed respondents, who are listed as having the lowest frequency with 3.6 percent. This indicates that the majority of the ICT coordinators and school heads are individuals with family responsibilities.

Abella and Dela Rosa [12] underscored that teachers with less than ten years of experience exhibited higher levels of digital literacy compared to their more experienced counterparts. Their study further revealed a significant relationship between pre-service education, access to ICT resources, and teachers' positive attitudes toward ICT use. These findings validate the importance of 21st-century education, which equips educators to critically engage with emerging technologies and effectively incorporate them into digital pedagogy.

Gardose and Gardose [14] emphasized that despite demographic differences, school heads display very satisfactory leadership skills across all indicators, showcasing consistency regardless of factors like sex, educational background, or length of service.

3.2. Extent of ICT Leadership Practices in Technology Innovations

This section presents respondents' level of ICT leadership practices in technology innovations. Data are presented in Table 2.

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Table 2.
Extent of ICT Leadership Practices in Technology Innovations.

Statement	Mean	SD	Description
1. Visionary leadership and strategic planning of ICT in schools are clearly implemented.	3.70	0.68	Very Good
2. ICT programs and activities are properly coordinated.	3.72	0.62	Very Good
3. Provision of ICT infrastructure is given emphasis.	3.56	0.73	Very Good
4. Short-term and long-term strategic plans are well initiated.	3.58	0.57	Very Good
5. ICT opportunities are considered along with other elements of school planning.	3.74	0.72	Very Good
6. The cost, staff skills, the availability of electricity, and the sustainability of ICT implementation are considered.	3.65	0.64	Very Good
7. Create a vision that empowers the school to work synergically towards institutional goals.	3.63	0.82	Very good
8. School leadership involves appropriate tasking done communally by all members that strengthens the school, increases commitment, and collective responsibility.	3.49	0.87	Good
9. Concerns with providing adequate and relevant school ICT infrastructure.	3.58	0.96	Very Good
10. The school leaders perform their duties effectively, inspiring the school community.	3.65	1.03	Very Good
11. Capacity building – ICT training for teachers is conducted yearly.	3.77	1.12	Very Good
12. Technical assistance or mentoring skills in ICT are present in the school.	3.75	1.27	Very Good
13. Recognition of innovations in utilizing ICT in teaching and learning is actualized.	3.84	1.35	Very Good
14. Provide efficient ICT governance and operations to the teachers and other stakeholders.	4.04	1.51	Very Good
15. Encourage creativity, problem solving, and adaptability.	3.95	1.62	Very Good
Overall Mean	**3.71**	**0.97**	**Very Good**

Note: Legend:

Scale	Mean	Description
1	1.00 – 1.49	Extremely Poor (EP)
2	1.50 – 2.49	Poor (P)
3	2.50 – 3.49	Good (G)
4	3.50 – 4.49	Very Good (VG)
5	4.50 – 5.00	Excellent (E)

Table 2 shows the level of ICT leadership practices and innovations of school heads and coordinators, with an overall mean of 3.71, described as "Very Good." This result underscores why their leadership in ICT integration is commendable, reflecting effective practices and initiatives that support teaching and learning. According to Cantos and Callo [4] highlighted the social, legal, and ethical issues, and the leadership and vision are considered as predictors of the school heads' and ICT coordinators' technology leadership standards in digital literacy. This implies that the teachers' capacity for ICT utilization in the classroom is the result of good leadership and vision.

Also, item (14. Provide efficient governance and operations to the teachers and other stakeholders) received the highest mean of 4.04 under ICT innovations and was described as "Very Good". This indicates that the respondents predominantly perceived these items positively, considering them as their highest level of leadership practices and innovations. It also suggests that school heads and coordinators emphasize the use of ICT to streamline governance and operational processes, ensuring that services for teachers and stakeholders are carried out efficiently. This result is supported by Tanucan et al. [6], who asserted in their study that in the Philippine educational system, to maintain adaptability and competitiveness in a fast-changing digital world, school leaders who guide the schools toward digital transformation must attain at least a satisfactory level. Their study also highlighted that teachers during the pandemic, accompanied by instructional bottlenecks, continue to cope and adapt to the educational paradigm shift and still have a satisfactory level of job satisfaction. Finally, Tanucan et al. [6] posited that job satisfaction among teachers is significantly predicted by the digital leadership of school heads. Meaning, teachers have a greater sense of fulfillment in their workplace when school heads demonstrate expertise in digitalization; thus, serving as role models to their subordinates.

Moreover, based on the study conducted by Morales [10], "administrators are key players in the effective functioning of educational institutions. This highlights the value placed on relational leadership aspects but also indicates a potential neglect of strategic foresight, which is essential for organizational resilience in an evolving educational landscape. Maala and Lagos [1] further opined that as to the

"technological leadership" in the "areas of technology innovation", "assessment", "forecasting", "management", and "transfer", school heads demonstrated a "high level". These serve as the basis for the training program development in addressing the needs of both school heads and teachers in strengthening technological leadership and ICT integration. UNESCO [15] highlighted that "the competencies range from encouraging teachers to understanding national priorities as identified in national ICT in Education policies", how ICT can support the curriculum, assessment strategies, pedagogy, school and class organization, administration, as well as ongoing professional development. Baldera et al. [5] asserted that the school principals play a significant role in promoting digitalization, technological innovation, and addressing infrastructure concerns. It contributes to policy development. Additionally, Gardose and Gardose [14] stressed that one of the fundamental elements that has a major impact on the caliber of the teaching and learning processes is the caliber of school administrators. The competencies of practical school leaders are regarded as the most significant aspects of a school leader's profile in the four indicated realms of the management domain. The capacity to formulate motivational strategies in accordance with the school's shared principles, the capacity to establish and nurture an efficient learning atmosphere for students, the capacity to precisely delineate and assign responsibilities and authority, and the capacity to guide and oversee colleagues.

On the other hand, item (8). School leadership involves appropriate tasking done communally by all members that strengthens the school, increases a sense of commitment and collective responsibility. It has the lowest mean of 3.49 and is interpreted as "Good". This indicates that the said item was less practiced and utilized by the respondents. While communal tasking and shared responsibility are recognized, they are less constantly practiced, which suggests a need to further reinforce synergistic leadership methods. This finding is associated with Alayan [7], highlighting in his study that there is no discernible difference between technological leadership and teachers' frequency of ICT integration in terms of school sizes. Besides, a positive but weak correlation between the level of practice of school heads' technological leadership and the level of frequency of teachers' ICT integration in instruction was highlighted. Similarly, Noceto [8] positive outcomes in leadership practices in technology innovation still show observable challenges, specifically limited funds to ensure reliable internet access, insufficient relevant and effective training programs for ICT utilization, and a shortage of ICT learning resources. Best practices were highlighted in addressing these concerns, such as the formation of ICT teams to provide technical assistance and share responsibilities, as well as collaborative efforts in leading through training, sharing skills, and enhancing ICT expertise through Learning Action Cell (LAC) sessions. There is a need to have a strategic plan emphasizing the key areas of maximizing instructional leadership for ICT.

Morales [10] underscored that leadership practices are dynamic, based on research results as a long-term process, influencing the sustainability of teachers' professional development. He also highlighted that styles, culture, teacher impetus, and career advancement in the leadership aspect provide substantial visions to efficiently actualize innovative leadership in 21st-century education.

According to Cantos and Callo [4], they opined that although there is provision of ICT equipment by the Department of Education (DepEd) in the public school system, professional upskilling and instructional upgrades among teachers in digital literacy are the current bottlenecks worldwide. According to Quidasol [9], the distribution of the DepEd Computerization Program (DCP) Packages at the division level is regulated and monitored. However, several challenges are still encountered in the utilization of technology, thus obstructing ICT implementation. As a result, this affects practices in technology leadership.

Moreover, Macatangay and Callo [13] discussed that the systematic development of preparedness of technology leadership is considered a significant predictor of self-efficacy. Meanwhile, technology infrastructure and support, vision, planning, and management are significant predictors of the advancement of technology leadership. Meaning, collaboration and reflection activities among peers are beneficial for the improvement of self-evaluation of teaching performance; thus, assessing good points and areas of improvement among teachers.

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3.3. Determinants of ICT Implementation

This section presents respondents' perceptions of the determinants of ICT implementation in their school. Data are presented in Table 3.

Table 3.
Determinants of ICT Implementation.

Statement	Mean	SD	Description
1. Training needs of the teachers and pupils.	4.58	0.68	Strongly Agree
2. ICT programs' impact on the school.	4.49	0.60	Strongly Agree
3. Teaching methodology for learning outcomes.	4.54	0.54	Strongly Agree
4. Access to online resources and systems for access to curriculum and communication.	4.46	0.63	Agree
5. Access to online tutoring and assessment.	4.51	0.63	Strongly Agree
6. Interaction with instruction for learning outcomes.	4.42	0.71	Agree
7. Provision of support, equipment, and training.	4.23	0.89	Agree
8. Administrative concerns such as management, funding, and maintenance.	3.93	1.13	Agree
9. Delivery of resources.	3.88	1.17	Agree
10. Facilitating interactions, organization, and collection of data.	4.04	1.16	Agree
11. Internet quality that includes functionality and interactivity of the system.	4.26	1.14	Agree
12. Equipment accessibility.	4.28	1.25	Agree
13. Well-designed courses and curriculum.	4.19	1.39	Agree
14. E-learning materials that facilitate meaningful learning experiences.	4.28	1.50	Agree
15. Data's accuracy, relevance, consistency, and timeliness.	4.30	1.59	Agree
Overall Mean	**4.29**	**1.00**	**Agree**

Note: Legend:

Scale	Mean	Description
1	1.00 – 1.49	Strongly Disagree (SD)
2	1.50 – 2.49	Disagree (D)
3	2.50 – 3.49	Neither Agree nor Disagree (NAD)
4	3.50 – 4.49	Agree (A)
5	4.50 – 5.00	Strongly Agree (SA)

As shown in Table 3, it has an overall mean of 4.29 with a description of "Agree". This indicates that the factors affecting ICT implementation have a usual impact. This suggests that the identified factors consistently influence the success of ICT initiatives in schools.

Item (1. Training needs of teachers and pupils) gained the highest mean of 4.58 and was described as "Strongly Agree." This indicates that respondents predominantly observe this regarding ICT implementation. Yang et al. [17] give emphasis on the vital role of enunciating a definite vision, allotting resources, modeling technology utilization, and establishing professional growth. These functions are actualized by principals' leadership behaviors in relation to ICT integration in the school. In arbitrating the link between leadership and ICT integration, they also highlighted teachers' capacity-building mechanisms, particularly technological competence, educational beliefs, and synergy. Active support in ICT that promotes teacher collaboration and knowledge sharing is emphasized, along with creating feedback mechanisms. These processes enhance teachers' motivation to embrace digitalization. Policy makers are suggested to use the multi-tiered evaluation systems assessing both leadership performance and the effectiveness of ICT integration at the school level, which ensures sustainability and equity in educational technology resources. Further, Macatangay and Callo [13] pointed out in their study that "self-efficacy" was meaningfully predicted by systematic development when it comes to the preparedness of technology leadership, while the promotion of technology leadership was significantly predicted by technology infrastructure and support, vision, planning, and management. Technology advancement among teachers is one of the initiatives by school leaders as a way of supporting teachers' professional development in terms of technology-enhanced pedagogy through learning action cells or in-service training; thus, it is vital in the current trend of learning.

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Nevertheless, item (9. Delivery of resources) received the lowest mean score of 3.88 and was described as "Agree." This indicates that, according to the respondents, it is perceived as the least influential factor affecting ICT implementation in the school. Simpal and Pidor [11] stated that the results revealed that the facing limitations in the pedagogical and conceptual competencies related to education, schools are encountering inadequacy of resources, engaging in ICT upskilling and technology capacity-building activities, and becoming proactive teachers were the themes generated from the lived experiences of educators. Reis-Andersson [2] opined that when used properly, digitalization generates opportunities in the educational system, leading to positive results. However, this can erroneously trigger negative developments. For instance, a lack of competency in the use of digital technologies and an increasing workload due to unfriendly user interfaces might reduce the sense of motivation among educators.

3.4. Difference Between the Respondents' Profiles and Leadership and Practices in Technology Innovations

Table 4 illustrates the differences between respondents' profiles based on age, sex, and marital status, as well as the extent of ICT leadership practices in technology innovations.

Table 4.
Significant Difference Between the Profile and Extent of ICT Leadership Practices and Innovations.

Variable	F	df	p-value	Interpretation	Decision
Age	0.167	4	0.659	Not Significant	Accept H_{01}
Sex	0.109	4	0.367	Not Significant	Accept H_{01}
Marital Status	0.161	2	0.655	Not Significant	Accept H_{01}

Table 4 shows that there is no significant difference between respondents' levels of ICT leadership practices in technology innovations and profiles according to age, sex, and marital status. This implies that regardless of their profile in terms of age, sex, and marital status, the levels of ICT leadership practices and innovations are almost the same. Meaning, demographic factors do not influence how school heads and coordinators practice ICT leadership and innovation, as their levels remain relatively consistent across groups. Therefore, accept Ho1.a (There is no significant difference between respondents' profiles and ICT leadership practices in technology innovation).

Gardose and Gardose [14] emphasized that despite demographic differences, school heads display very satisfactory leadership skills across all indicators, showcasing consistency regardless of factors like sex, educational background, or length of service. According to Morales [10] as to the relationship between administrators and teachers on innovative leadership practices, a perception gap. Although administrators believed they always practiced such practices, teachers, on the other hand, perceived that these practices were less frequently utilized. This discrepancy reflects an organizational culture that is either resistant to or slow in adopting innovative leadership practices, as well as a lack of shared understanding between the two groups. Similarly, divergent perceptions emerged concerning teachers' 21st-century skills: teachers rated their skills as very high, while administrators assessed them as low. Morales [10] affirmed that focusing on specific leadership styles, school culture, teacher motivation, and professional development needs would offer richer insights into how innovative leadership effectively supports 21st-century teaching competencies.

4. Conclusion

Based on the results of the study, it is concluded that the level of ICT leadership practices and innovations by the elementary ICT coordinators and school heads as respondents is well achieved and utilized. However, this rating does not mean that they have excellent leadership practices and innovations in ICT. They have to strive to attain the highest level. Partnership in the community and mentoring and technical assistance regarding ICT are areas of concern that affect the implementation

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process. The training needs of both teachers and pupils are the main factors that greatly affect ICT implementation.

There is no significant difference in respondents' levels of ICT leadership practices and innovations and profiles according to age, sex, and marital status. Meaning, regardless of their profiles, their levels of ICT leadership practices and innovations are the same. Besides, their leadership practices and innovations have nothing to do with their profiles. They can execute their leadership practices in ICT properly as well as innovate without considering their age, sex, or marital status.

4.1. Implications

The face of education is highly changing. It has its various facets to address the needs of the learners; thus, competent teachers and educational leaders play a vital role in attaining so-called quality education and must be able to adapt to change, especially in today's digital era. The birth of Information and Communications Technology (ICT) as part of 21st-century education, particularly digital literacy, guides us to accomplish our schoolwork and tasks immediately. The effectiveness of ICT is no doubt supporting and changing the way of teaching and learning in many subject areas.

Consequently, ICT facilitates the teaching-learning process that promotes creative learning as a product of communication, interaction, and multimedia. That is why there is a need to give much attention to the development of ICT skills for administrators, teachers, and pupils. Regarding ICT leadership practices, school heads are considered frontliners of ICT implementation in their schools. The better the results of ICT leadership practices, the higher the possibilities of achieving ICT skill improvement.

In terms of ICT innovations, initiating interventions and other strategies that promote interactive learning through ICT indeed enrich the curriculum by providing access to a whole host of information and encouraging collaborative working and communication with others. As a result, the pupils become more engaged in their learning. Besides, it expands the learning horizon as the learners journey through their vast arena of life. Hence, intensifying ICT innovations in the school contributes greatly to the benefits of the school.

Factors affecting the implementation of ICT must also be considered. Being aware of the factors influencing ICT implementation helps school administrators, teachers, and learners to focus on particular aspects. It then allows us to identify which areas of learning need a higher level of support.

4.2. Recommendations, Policy Formulation, and Plan of Action

Based on the results and conclusions derived from the study, the proponent would like to make the following recommendations.

1. The policymakers in education must create appropriate strategies and training or seminars as part of curriculum planning for teachers and pupils to intensify the implementation of ICT as part of 21st-century skills digital literacy education, considering its influence on the teaching and learning process.
2. School administrators must provide activities or programs regarding the development of ICT skills of teachers through strengthening technical assistance or mentoring activities; thus, increasing teachers' digital competency.

4.3. Recommendations for Further Studies

1. A further study can be conducted not only in public elementary schools within the division but also in secondary schools.
2. There can be further study on the comparison between the level of teaching performance and the level of ICT innovations among teachers.

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Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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