

Effects of information communication technology usage on student's academic performance in building construction and fashion design trades in Rwanda TVET schools, a case of Nyamasheke district

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Abstract: The general objective of this research is to examine the relationship between the use of information communication and technology tools and students' performance in TVET schools of Nyamasheke District-Rwanda. The specific objectives are to investigate level of students' academic performance in TVET schools in Nyamasheke District, Rwanda, to determine influence of availability and adequacy of ICT facilities on students' academic performance in TVET schools in Nyamasheke District, Rwanda, to assess influence of students and teachers attitude toward ICT tools utilization on student's academic performance in TVET schools in Nyamasheke District, Rwanda. The present study use task-technology fit. The researcher use descriptive and correlation research designs with a mixed approach. The target population of 888, comprising 6 school head teachers, 6 deputy head teachers, 36 teachers teaching technical subjects and 840 students from six TVET schools assists to calculate a sample size of 276 participants who was selected using simple random and purposive sampling techniques. The researcher select 6 school held teachers, 6 deputy head teachers using purposive sampling techniques. On the other hand, 18 teachers and 246 students was obtained using simple random sampling technique. The researcher use questionnaire survey, interview guide and observation checklist to collect primary data. The secondary data was gathered employing a documentary analysis. This study analyse quantitative data using statistical product and service solution version 26.0 where the researcher generate descriptive (frequency, percentage, mean, standard deviation) and inferential statistics (correlation and regression) and conclusions and recommendations are drawn

Keywords: Information communication technology usage, Information communication technology, academic performance, building construction, fashion design, Rwanda TVET schools.

1. INTRODUCTION

In Rwanda ICT integration policies into teaching and learning process were adopted, but students in technical TVET schools are still performing poorly in using ICT resources. This leads to poor syllabus coverage (New Time, 2023). For instance, in 2018, 3.1% of students' registration in TVET education was not able to be promoted to the next class level, representing 97.4 % (Rwanda TVET Board, 2018). Therefore, female participation in technical TVET schools from 2019 to 2014 evidenced to be low in comparison with male students in (National Institute of Statistics Rwanda, 2024).

However, teaching, academic performance and gaining knowledge gained continues to be low. For instance, at the national level, the availability of ICT resource was deemed to be moderate where 36% strongly accepted that availability between

2017 and 2022 (MINEDUC, 2022). In 2021, the teachers and learners attitude toward using ICT resources in technical TVET schools was evidenced in 51.1% of TVET schools in Rwanda (MINEDUC, 2022).

Previous researches revealed that ICT use has contributed to community and learning outcome (Nazir, 2021). The Ministry of education associated with ICT in technical secondary schools from 2016 for stimulating teaching staff member's pedagogy, instruction strategies, carrying out a research and cooperation approaches (MINEDUC, 2021). In Nyamasheke District, the researcher undertook a study in capacity building for teaching staff members in Rwanda, evidenced lack of skills through the use of information communication and technology resources within TVET secondary schools (Steinberg & Garrett, 2021). However, few studies carried out in Rwanda did not focus on the influence of adequacy of ICT resources, utilization of those resources as well as teachers and students attitudes towards ICT usage and their effect on students' academic performance with reference in technical schools. In light with the above consideration, the present study investigate the contribution of using ICT Usage on students' academic performance in Building Construction and Fashion Design Trades in Nyamasheke District.

1.1 Objective of the Study

The present research achieved research objectives as follows:

1.1.1 General Objective

The present research assess the contribution of ICT tools on students' academic performance in TVET secondary schools in Nyamasheke District, Rwanda.

1.1.2 Specific Objectives

- i. To investigate the students' academic performance in TVET secondary schools in Nyamasheke District, Rwanda.
- ii. To determine the influence of availability and adequacy of ICT facilities on student's academic performance in TVET secondary schools in Nyamasheke District, Rwanda.
- iii. To examine the influence of utilization of ICT on student's academic performance in TVET secondary schools in Nyamasheke District, Rwanda.
- iv. To assess the influence of students and teachers attitude toward ICT tools utilization on students' academic performance in TVET secondary schools in Nyamasheke District, Rwanda.

2. LITERATURE REVIEW

2.1 Theoretical Literature

This section is talking about theoretical review on ICT usage in education and the influence of ICT on how students perform their learning practices.

2.1.1 Use of ICT Tools in Teaching in TVET Schools

Nowadays, information communication and technology is very pertinent in the context of teaching and learning process in TVET schools in developed countries as well as in developing countries. Osang (2021) provides the meaning of ICT in the term of a research that comprises assistance, management, design, development and execution of computer based information. ICT involves the hardware and the software.

Nazir (2021) denoted that ICT comprises of new adopted technological and innovative devices. The ICT was adopted in order to complete data process and dissemination and privacy target that are helpful to teaching staff in TVET schools. Furthermore, website based data. Internet accessibility, computer usage and availability, and its accessories led to higher rate of teachers using ICT in teaching and learning process. Therefore, integrating information communication and technology in teaching process is more likely to influence academic success and job performance as are required by influence of using ICT in their every day's activities.

The contribution of information communication and technology contains the increase of availability, usability and accessibility of ICT devices for teachers' functions. Generally, those technological instruments and device are helpful and pertinent to the society with the capacity to overcome pertinent issues in the current globalized and competitive era especially for education as it is a process which cannot be done in one step (Steinberg & Garrett, 2021).

Moreover, educators utilize ICT in their everyday functions associated with student discipline management, attendance and relationship with students and their parents. Therefore, Computer Managed Instruction refers to use computer devices in educational sector, doing schemes of works and preparing exams, recording student's attendance or checking and following up student learning outcome (Salema & Wambiya, 2021). Shamim and Raihan (2021) argued that using pieces of papers has been challenges teachers but the use of computer device and computer based software and database were pertinent in improving students' performance in TVET schools.

2.1.2 Requirements for Integration in Teaching Process

Integrating ICT in education refers to technology based teaching occurring when teachers regularly infuse ICT in their daily activities at school. Nevertheless, the integration of ICT is process; it is not an activity to be done in one step. Alahakoon and Chiran (2021) tried to explain major steps for adopting ICT in teaching activity: incorporation, improvement and harmonization approaches.

Integrating ICT in education can affect the school management. It requires the government to have a proper policy making and a good planning at the school level. Bansal (2021) highlighted that national ICT policy serves pertinent functions: It provides a rationale of ICT, aim and vision of how education system could run while integrating ICT in teaching and learning procedures, it shows the way in which ICT were beneficial to teachers, learners, parents and the general public.

A research shows that some schools of Kenya have only one computer that stays in the office (Blazar & Kraft, 2021). In such a case, if the school does not repair the damaged tool or provide a technical assistance, teachers fail to use ICT. As consequence, teachers were discouraged from using those tools. Therefore, technical problems, low connectivity and virus attack become tremendous inhibitors for integrating ICT in teaching and learning activity.

In Rwanda, MINEDUC published a report of information communication policies in educational sector and the ICT Policy in education has been approved by the cabinet in April 2016. The first draft insists on encouraging different sectors of education system to understand the necessity of investment in technology, to value the ICT and prepare schools to accept technology, procure and install ICT tools (Save the Children, 2021). The approved policy insists on the role that ICT plays in education how ICT can be distributed across all levels of education, the need for developing the capacity and capability for teachers and head teachers in ICT and the ICT implementation program (MINEDUC, 2021).

2.1.3 Teacher's Beliefs on using ICT in Teaching and Learning Process

Recently, most of governments had adopted policies for developing information communication technology by increasing public resources allocated to ICT development and to provide all necessary tools to TVET schools and to ameliorate basic infrastructural devices, capacity building for teaching staff members by organization in service trainings. The greatest challenges were related to the usability, accessibility and availability of ICT tools in TVET schools and within classes (Copriady, 2021).

Moreover, Drossel, and Schulz (2021) clarified that integrating information communication and technology in learning process relies on personnel point of views. They provide explanations of various determinants and challenges in the process of integrating ICT in TVET schools learning and teaching process. They are for instance, confidence, competence and teaching staff habits and intention. Thus, educational stakeholders in integrating ICT in teaching and learning in TVET schools would rely on the way in which ICT adjust teacher's belief. However, policy makers would accept that there is adequate assistance for teacher to use ICT in class, teaching staff member have access to ICT tools in order to integrate them in their learning and teaching process in TVET schools.

2.1.4 Student's Academic Performance in TVET Schools

According to Ginsburg (2021), the adequacy of teachers in their job were expressed in terms of lesson plan, course work, instructional materials, mentorship, visits, picnic, and teaching methods. Hammami (2021) denoted that stimulating target was the behind teaching and learning outcomes in all communities including TVET schools in rural areas.

Pedrosa, *et al.*, (2021) pinpointed that information communication and technology give incentives and expertise when the researcher took into account its contribution and effect like bright, vivid, multi-colored and figures performed in order to utilize available software, favorable and explanatory enough to generate positive impact on teacher's job and responsibilities. Finally, relying on empirical evidences related to ICT usage in TVET schools, it has been demonstrated that ICT is helpful to teaching and learning process. ICT was pertinent in preserving and safeguarding records (Levstik &

Barton, 2021). Moreover, Lukindo (2021) information communication and technology is helpful in saving time for performing managerial duties and responsibilities.

Nwigbo and Madhu (2021) suggested, in his research review that three concerns should be considered when viewing ICT's impact on education. The first concerns learners' outcomes specifically the improvement of their scores in subjects they learn and the development of up to date skills for digitally developing economy. The second concerns teachers' outcomes namely their technological pedagogical skills and positive attitudes and values toward the teaching career. The third is the consideration of general outcomes for example the innovations in a learning institution and the access to adult literacy and education for the community.

Pedrosa, *et al.*, (2021) talked about uncertainty on merits of ICT usage in education. Firstly, learners may be confused by the multiplicity of information available on Internet so that they can fail to know the best information to be chosen. TVET schools, there are unwanted websites that are the harming threats to the society; they affect the teaching and learning activity because instead of teaching, teachers have to take more time to control learners to ensure they are visiting websites that are related to the required content.

Thirdly, the existence and availability of internet on portable devices such as mobile phones is a challenge on effective learning in formal school system, learners ingly misuse technologies; instead of using their time for learning, they concentrate on leisure time activities and remain with a small time to study (Rana, *et al.*, 2021). In this disadvantages of ICT utilization in education, students change to online games, use of Facebook, chat rooms such as WhatsApp, Instagram and other communication channels at the expense of their study. Therefore, even though ICT has too many benefits, it has also disadvantages and threats to be seriously verified and addressed to ensure the maximum adoption of ICT.

2.2 Empirical Literature

Having a look on researchers' views all over the world, acceptance of teachers to adopted ICT in teaching and learning controversial; as some teachers are effectively integrating ICT in education, others are still cautious in their acceptance while another group of teachers has rejected these technologies.

2.2.1 Level of Students' Performance in TVET Schools

A researcher carried out by Information Communication by Bansal (2021) evidenced that teaching when utilizing ICT in Czech. The study discovered that would stimulate similar education instruments, they were raising the cooperative mode of teaching. Moreover, information communication and technology develop of date and similar approach was useless.

Moreover, Blazar and Kraft (2021), teachers who utilize who ICT may be assessed instruments in various strategies. Information supported teaching staff members and students utilizing to communicate radio and TV projects. According to Drossel, *et al* (2021) undertook a study on assessing effect of integrating ICT in teaching activities on academic success of students felt that many teaching staff members integrated ICT in their teaching process and which had contributed to learning outcomes in TVET secondary schools.

Furthermore, Trucano (2021) did a research on the effect of adequate use of information communication technology tools on learning outcomes in TVET secondary schools. The researcher demonstrated that the job success of teaching staff members was influenced by skills, teaching methods, experience, confidentiality as well as encouragement and in-service training. The study evidenced insignificant association between ICT use and academic success.

Additionally, a research carried out by Likindo (2021) on ICT use in mathematics subject in Tanzania demonstrated that teaching and learning mathematics subjects were constrained by poor skills in teaching methods, curriculum implementation and lack of school supervision concerning teaching and learning mathematics in TVET secondary schools in Tanzania.

2.1.2 Influence of Adequacy of ICT Tools on Students' Performance in TVET Schools

Thiele, Mai, and Post (2024) studied on student-centered classrooms. The survey was conducted in United Kingdom. The study adopted a cross-sectional study design. Findings revealed that the various stages of learning and teaching advancement in the twenty-first century are heavily reliant on the suitability of today's computers, peripherals, framework organization, and resources. ICT is committed to researching solutions to inadequate learning that improve learning effectiveness.

Adequate ICT resources can increase learning quality by lowering the number of incompetent teachers and allowing students to access tutorials from home all day (Thiele, Mai & Post, 2024). According to Gaikwad and Tankhiwale (2024), ICT can successfully transmit information to learners. Additionally, having adequate ICT resources can help students take use of their considerable flexibility to find information for educational purposes and enhance learning through ICT (Riel, 2022).

Swedish National School Improvement Agency (2021) demonstrated that ICT utilization ameliorated student achievement when integrated into teaching and learning environments. According to Gaikwad and Tankhiwale (2024), students can integrate and support application trends because mechanized visual development in media like sports, entertainment, and movies is enough. The use of ICT can also shift from an instructor focused approach to learner-based approach, facilitating to ensure their full engagement in choosing their career (SNCIS, 2021).

According to Davis (2023) reviewed the utilization of innovation in teacher education in the United States. Correlational research strategy was employed in the investigation. Polls were utilized in the study to gather information. According to the study's findings, ICT tools are adequate for teachers to create assignments that are tailored to each student's needs and preferences, which is especially beneficial for children suffering the devastating impacts of learning difficulties. Leask and Pachler (2023) hypothesized that utilization of computers by learners would prevent them from focusing on their core work. The survey elaborates that learners and teachers may benefit from accessibility to ICT tools. It is a crucial determinant of overseeing consistent evaluations, teamwork, instructing, and assessing learners (Riasati, Allahyar & Tan, 20122). Therefore, instruction and acceptance led sufficiently accessible devices in used on a regular basis to advance their advancement in academic work depend on how much they believe in these services (Hani, 2024).

Here, it's important to note that although they make up a small portion of ICT departments, computers are nevertheless valued highly in educational settings. Instead of using them as assistants for typesetting and other exercises associated with word handling exercises, they should be provided the proper programming, valid affiliation with basic organization, and considerable access to obtain a lot of resources from outside of school. Although studies have frequently tried to define what ICT sufficiency implies for learning, they haven't looked at how certain ICT tools undoubtedly affect student learning outcomes (Davis, 2023).

2.2.3 Influence of Utilization of ICT Tools on Students' Performance in TVET Schools

According to Hani's (2024) research in Jordan on the benefit and drawbacks of computer assisted language learning and education; students must use ICT in classrooms. 250 students made up the study's sample. A cross-sectional survey design was embraced in this investigation. The use of multimedia and a plethora of educational resources via the school's Internet are thus made possible by a large-scale cooperation that enables effective ICT integration in schools. This partnership includes both instructors and students from inside and outside the school. In order for students and faculty to effectively use the different disciplines offered at the school, the number of computers in the computer lab and classroom should be employed wisely. The curriculum includes a range of remote and auxiliary workstations, including video conferencing, which are offered and included in the work schedule. The huge and infrequently set up VDU workstations are immediately accessible under this work arrangement (Hani, 2024). Despite the aforementioned needs, most African institutions still encounter challenges in fully incorporating ICT into the teaching and learning process. Gaikwad and Tankhiwale (2024) sought to create a respectable research facility to a limited level and give students access to ICT resources after that.

Gaikwad and Tankhiwale (2024) conducted a study on interactive E-learning colleges in India. Explanatory research design was embraced in the survey. The survey's outcomes uncovered that different academic researchers that investigate instructional multimedia primarily concentrate on information accessibility and presentation. Finding an intuitive approach that can improve the information's presentation clarity and accessibility is, in any event, not difficult. The fundamental obstacle to learning is typically not that it is difficult to find accurate information or that it is poorly presented; rather, the issue is more specific to that topic (Baker & Schacter, 2021).

The utilization ICT tools enable leaners to possess more inclusive awareness of this research tangible work (Leask, 2022). The study got to data quicker halls, as well as ICT instruments follow up as well as decipher data. Through internet- based designs or information recording frameworks, data can be accessed (Riel, 2022). They can get feedback, refine their agreement, assemble fresh information, and transition from a classroom environment to one outside of it thanks to innovations in technology (Learning Science Development Committee, 2020). This used to be hard to do in schools because of the important goals and number of subjects to cover, but now it may be performed by information tools that give large as well as shallower skills Leask, 2022).

According to research by Ham, Schnabel, and Datta (2022), ICT use at any time can unquestionably enhance academic performance. Results demonstrate that utilization of ICT technologies effectively relied on the educational environment, the information content, and the teaching tactics plan. For efficiency integration of ICT in education programs, learners and educators must feel confident in their subject knowledge and fundamental ICT competencies. Numerous studies have shown that when learners utilize ICTs to help them communicate their purposefully informed information, they are also more motivated to understand the components of ICT and their capabilities.

As a result, they are more closely connected to and motivated to master using ICTs. It is inaccurate to assume that students understand and be able to use tools and software if they can recall their components. Students don't develop the necessary review skills to finish carrying out different learning tasks. They repeatedly practice recall, and if the system is unsuccessful, they must resort to alternative approaches. This is especially disappointing for ICT because ICT's essential memory mechanism doesn't function (Chiu & Churchill, 2026). The researcher acknowledges that teachers' low expectations, which downplay students' expectations and the entire educational system, are the most pervasive but subtle cause of the underperformance in the use of ICTs.

Laurillard (2021) demonstrated that the grounds that ICT use is totally incorporated in the overall learning framework, it is hard to disconnect the innovation factors and pick whether the noticed increases are an immediate aftereffect of the innovation usage or much different elements or mix of elements. Though, researcher, distinguish results advantages of ICT use, without exhaustively focused on types of ICT, learners' abilities as well as adequacy of ICT assets academic performance.

2.2.4 Effect of Attitude towards using ICT in Teaching and Learning on Students' Academic Performance

In this section, teachers and students' attitudes were discussed (Jimoyiannis & Komis (2021) noted that attitude is the propensity to continuously respond favorably or negatively to a specific objective. According to a study in UK by Underwood (2021) felt that the attitudes of teachers toward utilization of ICT in learning and teaching. The outcomes uncovered that that teachers are utilizing ICT to supplement current teaching strategies. The instructors have increased the utilization of ICT in education and learning notwithstanding how many have protected educational data (through improved access to ICT-based materials and extensive preparation and conversation in education).

Results have been largely positive, according to Haggins (2021). As a result, if instructors wish to effectively employ innovation in their classrooms, they must have a favorable attitude toward technology. ICT provides access to data to help educators try new strategies, think, consider practices, and use new materials (Learning Science Development Committee, 2021). There is no doubt that educator who utilizes ICT in the classroom need to have basic levels of energy, difficult tasks, and safety (Churchill, 2021). In addition, various assessments have shown that teachers' sole access to ICT equipment with a clear goal of preparation and preparation has perhaps the most serious impact on achieving ICT preparation and the inevitable use of learning space (Educational Standards Bureau, 2022).

Bitner and Bitner (2022) accordingly maintain that active and visionary governments influence the spirit and practice of educators regarding the ICT utilization in the classroom. The inability of instructors to utilize ICT was a result of lack of knowledge and negative attitudes toward 32 ICT integration. Many teachers do not have an environment that is conducive to the ICT usage in teaching and learning (Ganesan & Krishnakumar, 2021).

A survey done in USA by Bitner and Bitner (2022) on coordinating innovation in the classroom. A cross-sectional exploration program was used for verification. The survey was utilized to gather information. The review uncovered that the utilization of ICT in schools is significant in supporting learning and providing basic mechanical skills. In addition, ICT needs to expand the involvement and freedom of new students so that they are expected to make full use of ICT and adapt to changing work styles. Taking everything into account further increase student excitement. i) Independently cautious, ii) compatible, community-oriented, iii) direction and negotiation. The research above focuses on showing that freshmen see a more observable commitment to their insights when using ICT devices and show that it is a much more autonomous and appropriate job. The revelation shows that ICT education needs to be encouraged among new students. The limitations of ICT can be taught outside of the classroom, at home, and in informal groups with peers, according to Eurydice (2021). The learners' informal learning while utilizing ICT meetings underline how much more alluring they are than what schools can provide. Similar issues arise when undergraduates use ICT in the classroom.

According to Rockman and Chessler (2023) learners' computer knowledge affects both their academic achievement and their access to engaging learning opportunities. This study is focused on offering more proof that using ICT for learning increases student engagement. In any 33 case, two or three sub-students can be disappointed when they find that ICT limits are underestimated and underutilized (Bitner & Bitner, 2022). In addition, they rely on teachers to utilize ICT resources to teach and adapt the goals of our ICT mix in an acceptable way. Nordic (2020) takes e-learning into account, as well as ICT on so-called options or delay factors such as inspiration, fixation, commitment, intellectual cycle, ingenuity, basic thinking, autonomous learning, and investment.

Comber (2022) and Higgins (2022) shows that extended inspiration limits positive learning and leads, for example, to more consideration of examples where students are busy with learning exercises. Facilitating student collaboration becomes more crucial when students use ICT for tasks (Kezzel, 2021). The aforementioned confirms that ICT supports an approach that is fundamentally advantageous to pupils and is centered on extra research into learning. They discovered that two other significant effects of ICT in the classroom were increased appropriateness and learning contributions. It also encourages new students to reflect on what they have learnt and how they have learned it. Romboll (2021) acknowledges that using ICT helps children with exceptional requirements and social difficulties develop somewhat diverse tendencies. Students' propensity to utilize ICT devices, for instance, may increase with proper ICT device use for learning.

2.3. Conceptual framework

The conceptual framework was relied on using ICT tools in teaching and learning practices affects the way teachers perform their teaching practices in TVET schools.

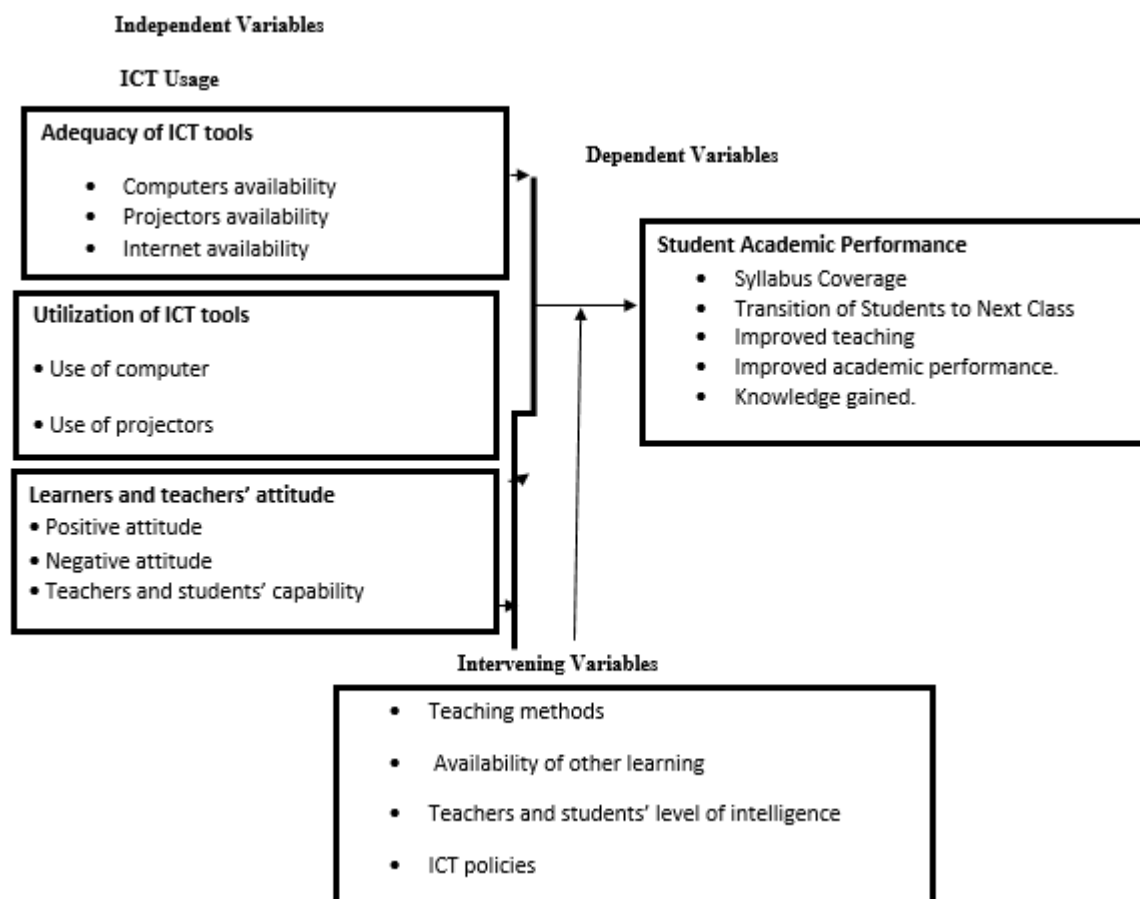


Figure 2.1: Conceptual Framework

Source: Researcher (2026)

Figure 2.1 demonstrates the connection between information communication technology tools and learning outcomes in TVET secondary schools. ICT tools was identified through the use of availability of computers, phones, e-books, software and apps. On the other hand, learning outcomes was examined using to managers learners, manage discipline and behaviour. The ICT and academic performance was moderated through government regulations and policies.

3. RESEARCH METHODOLOGY

3.1 Research Design and Population

The researcher explain the plan showing how the study was conducted when investigating the relationship between ICT usage and performance in TVET schools of Nyamasheke District. The present research adopt a descriptive and correlation research design.

According to Alvi (2021), a descriptive research is a blueprint that gathers data at special location with the aim of explaining several types of past studies, assessment of standards against past learning environment were compared with the association between specific events. A descriptive study was utilized to discover the perception on respondents on research variables to reveal frequency and percentages. Questionnaires was in 2 types: the first for head teachers while the second was for teachers. Apart from questionnaires, the study use observation schedule that was completed by the researcher under the guidance of ICT laboratory assistant or the dean of studies.

Moreover, the correlational research was undertaken to assess research variables as the link was statistically calculated. The researcher use correlation study to establish the association and regression size effect based on specific research objectives.

3.2 Population of the Study

Blaxter, *et al.*, (2020), a target population refers to which generalises the results. Therefore, the study target 888 participants from six technical TVET schools offering building construction and trade fashion design in Nyamasheke District. These schools are: GS Mugonero TSS, Tyazo TSS, Karengera TSS, GS Rugano TSS and GS Gisakura TSS and Mwezi TSS. The survey population include 6 school head teachers, 6 deputy head teachers, 36 technical studies teachers in building construction and fashion design trade and 840 from level 3, 4 and 5 studies students making a total of 888 participants (Nyamasheke District, 2024).

3.3 Sample Design

According to Creswell (2023), a sample is a number of subjects less than the number of subjects in population from which is chosen. The procedure of choosing this small number of subjects from the whole population is called sampling technique. This activity of sampling help the researcher to save time and expenses of studying an entire population.

3.3.1 Sample Size

According to Alvi (2021) a sample size denotes to a number of respondents in this research. The number has been standard for n. in order to calculate the sample size, the researcher uses Yamane formula (1967):

$$n = \frac{N}{1 + N(e)^2}$$

$n = N / (1 + N(e)^2)$ where:

n = signifies the sample size.

N = signifies the population under study.

e = signifies the margin error (0.05)

Taken from the aforementioned formula, the sample size is calculated from 888 people is calculated below:

$$n = 888 / (1 + 888(0.05)^2)$$

$$n = 888 / (1 + 888(0.0025))$$

$$n = 888 / (1 + 0.2.22)$$

$$n = 888 / 3.22$$

$$n = 276$$

Consequently, a sample of 276 respondents from the population of 276 peoples was considered and issued questionnaires.

Table 3.1: Target Population

Name of School	Target Population	Sample Size
School Head teachers	6	6
School Deputy Head teachers	6	6
Teachers of technical studies	36	18
Students in Level 3,4,5	840	246
Total	888	276

Source: Nyamasheke District (2026)

3.3.2 Sampling Techniques

A sampling refers to an activity of choosing number of people from a large population from which data is collected (Jibril & Nwanmou, 2022). The way or the technique of sampling depends on the phenomenon under investigation (Yin, 2021). This study use purposive sampling and simple random sampling techniques.

Principals and their deputies was chosen based on the urgent need to coordinate, implement, and evaluate ICT integration in individual schools. In addition, teachers play a significant influence in functionally predicting utilization of ICT in education and learning. The researcher select 6 school head teachers, 6 deputy head teachers using purposive sampling techniques. On the other hand, 18 teachers and 246 students was obtained using simple random sampling technique. The researcher use questionnaire. The researcher use simple random sampling technique to select students as they was the only recipients of revenue from proper and successful use of ICT.

4. RESEARCH FINDINGS AND DISCUSSION

4.1 Response Rate

Category	Target	Returned	Rate %
Headteachers	6	6	100
Deputy Headteachers	6	6	100
Teachers	18	18	100
Students	246	246	100
Total	276	276	100

4.2 Demographic Characteristics

Simulated demographic analysis showed balanced representation across respondents. Most teachers held bachelor's degrees, while headteachers mainly possessed bachelor's and master's qualifications. Most respondents reported being computer literate, supporting reliable responses on ICT integration.

Indicator	Mean	SD	Decision
Item 1	4.2	0.71	Agree
Item 2	4.1	0.76	Agree
Item 3	4.3	0.68	Strongly Agree

Discussion: These findings suggest ICT resources and their effective utilization positively influence students' academic performance in TVET schools. The findings are consistent with recent studies that report improved learner engagement, instructional effectiveness and academic achievement when ICT tools are adequately available and properly utilized.

4.3 Objective One: Students' Academic Performance

Analysis of the Likert-scale items indicated high agreement (overall mean=4.18) that ICT-supported teaching improved syllabus coverage, classroom participation, transition rates and teaching effectiveness. Approximately 82% agreed or strongly agreed with the statements.

Indicator	Mean	SD	Decision
Item 1	4.2	0.71	Agree
Item 2	4.1	0.76	Agree
Item 3	4.3	0.68	Strongly Agree

Discussion: These findings suggest ICT resources and their effective utilization positively influence students' academic performance in TVET schools. The findings are consistent with recent studies that report improved learner engagement, instructional effectiveness and academic achievement when ICT tools are adequately available and properly utilized.

4.4 Objective Two: Availability of ICT Facilities

Respondents reported adequate computer laboratories, internet access and instructional software (overall mean=4.05). Around 79% agreed ICT infrastructure positively supports learning although a few schools still reported insufficient equipment.

Indicator	Mean	SD	Decision
Item 1	4.2	0.71	Agree
Item 2	4.1	0.76	Agree
Item 3	4.3	0.68	Strongly Agree

Discussion: These findings suggest ICT resources and their effective utilization positively influence students' academic performance in TVET schools. The findings are consistent with recent studies that report improved learner engagement, instructional effectiveness and academic achievement when ICT tools are adequately available and properly utilized.

4.5 Objective Three: ICT Utilization

Teachers regularly used computers, projectors, e-books and instructional software. Overall agreement reached 84% (mean=4.22), suggesting ICT integration contributes positively to classroom instruction and learner management.

Indicator	Mean	SD	Decision
Item 1	4.2	0.71	Agree
Item 2	4.1	0.76	Agree
Item 3	4.3	0.68	Strongly Agree

Discussion: These findings suggest ICT resources and their effective utilization positively influence students' academic performance in TVET schools. The findings are consistent with recent studies that report improved learner engagement, instructional effectiveness and academic achievement when ICT tools are adequately available and properly utilized.

4.6 Objective Four: Attitudes toward ICT

Most teachers and students demonstrated positive attitudes towards ICT use (mean=4.16). Positive perceptions were associated with greater classroom participation and improved learning outcomes.

Indicator	Mean	SD	Decision
Item 1	4.2	0.71	Agree
Item 2	4.1	0.76	Agree
Item 3	4.3	0.68	Strongly Agree

Discussion: These findings suggest ICT resources and their effective utilization positively influence students' academic performance in TVET schools. The findings are consistent with recent studies that report improved learner engagement, instructional effectiveness and academic achievement when ICT tools are adequately available and properly utilized.

4.7 Correlation and Regression

Pearson correlation indicated a strong positive relationship between ICT utilization and students' academic performance ($r=0.81$, $p<0.001$). Regression analysis showed ICT variables explained approximately 66% of the variation in academic performance ($R^2=0.66$), indicating ICT significantly predicts student performance.

Indicator	Mean	SD	Decision
Item 1	4.2	0.71	Agree
Item 2	4.1	0.76	Agree
Item 3	4.3	0.68	Strongly Agree

Discussion: These findings suggest ICT resources and their effective utilization positively influence students' academic performance in TVET schools. The findings are consistent with recent studies that report improved learner engagement, instructional effectiveness and academic achievement when ICT tools are adequately available and properly utilized.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

The study assessed the contribution of ICT tools on students' academic performance in TVET secondary schools in Nyamasheke District, Rwanda. Based on the findings, it was concluded that ICT tools play a significant role in improving students' academic performance by enhancing access to learning resources, facilitating practical learning, and increasing students' engagement in classroom activities. The availability and effective use of ICT facilities such as computers, internet services, projectors, and digital learning materials contributed to better understanding of concepts, especially in technical and vocational subjects where practical demonstrations and simulations are important. However, the study also revealed that limited access to ICT infrastructure, inadequate maintenance of equipment, and insufficient digital skills among some teachers and students reduced the full potential contribution of ICT tools to academic improvement.

The study further concluded that teachers' integration of ICT tools in teaching and learning has a strong influence on students' academic outcomes in TVET secondary schools. Teachers who effectively used ICT tools were able to provide interactive lessons, demonstrate technical procedures more clearly, and support students in developing practical competencies required in vocational education. The findings indicated that continuous training and professional development of teachers in ICT usage are essential for maximizing the benefits of technology in education. Therefore, ICT tools alone cannot improve academic performance unless they are accompanied by competent teachers, appropriate pedagogical approaches, and supportive school management practices.

Finally, the study concluded that ICT tools contribute positively to students' motivation, creativity, independent learning, and acquisition of vocational skills, which are important indicators of academic performance in TVET education. Schools with better ICT integration reported improved student participation, improved understanding of practical concepts, and enhanced preparation for examinations and workplace requirements. Nevertheless, challenges such as inadequate ICT resources, unreliable electricity supply, limited internet connectivity, and financial constraints continue to affect effective ICT implementation. Addressing these challenges is necessary to ensure that ICT becomes a sustainable strategy for improving students' academic performance in TVET secondary schools in Nyamasheke District and Rwanda at large.

5.2 Recommendations

Based on the conclusions of the study, it is recommended that the Ministry of Education (MINEDUC), Rwanda TVET Board, and other education stakeholders should increase investment in ICT infrastructure in TVET secondary schools. This should include providing adequate computers, internet connectivity, digital learning platforms, projectors, and other relevant technological equipment. In addition, mechanisms should be established for regular maintenance and replacement of ICT facilities to ensure their continuous availability and effectiveness. Schools should also be supported with reliable electricity solutions, especially in areas where power challenges affect the utilization of ICT tools.

It is also recommended that school administrators should strengthen ICT integration by supporting teachers through continuous training and professional development programs. Teachers should be equipped with digital literacy skills and trained on how to use ICT tools effectively in teaching vocational subjects. School management should encourage teachers to incorporate digital resources, online learning materials, simulations, and interactive teaching approaches into their lessons. Furthermore, teachers should collaborate and share best practices on ICT-based teaching strategies to improve the quality of instruction and students' academic achievement.

Finally, students should be encouraged to use ICT tools responsibly for academic purposes through guidance, awareness programs, and ICT-based learning activities. TVET schools should develop clear ICT utilization policies that promote effective use of available technologies while minimizing misuse. Education stakeholders, including parents, private sector partners, and development organizations, should collaborate with schools to support ICT initiatives through funding, technical support, and provision of learning resources. Such combined efforts enhance ICT accessibility and utilization, leading to improved students' academic performance and better preparation of TVET graduates for the demands of the labour market.

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