

# Developing a Hybrid Model for Analyzing Students' Academic Performance using ICT Integration in Higher Learning Institutions: A Case Study of IPRC-HUYE, RWANDA

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**Abstract:-** The integration and use of ICT tools, resources and systems in different aspects of the educational process is the aim of this study on the integration of ICT into higher education institutions. In order to improve the performance of students in their studies, successful integration with ICT at higher education institutions has become more and more crucial. However, there's a shortage of comprehensiveness. Research on the specific impact of ICT integration on students' performance indicators such as academic success, involvement and critical thinking skills. In addition, it is necessary to identify the factors that contribute to or hinder the effective integration of ICT into higher education institutions and to understand how these factors affect the results of students' studies. This research study examined how the incorporation of ICT tools and resources influences students' academic performance, engagement levels, and critical thinking skills. The study also examined the challenges and obstacles to effective integration of ICT in learning, as well as explored students' perceptions and attitudes towards using information and communication technologies. In order to assess the impact of ICT integration, this researcher used an analytical approach by using surveys, questionnaires and interviews to gather students and trainers' perspectives on ICT integration and its influence on their engagement. The targeted population was the students enrolled at the IPRC (Integrated Polytechnic Regional College) Huye and their trainers, which is the specific case study institution. Statistical Analysis including correlation and regression under python programming language will be employed to analyze the collected data.

**Keywords:-** ICT, High Learning Institutions, Students, Teacher, ICT Integration, Student's Performance, Hybrid Model.

## I. INTRODUCTION

The integration of ICT into academic institutions has been increasing over the last few years. Educational institutions have been encouraged to move towards ICT as a means of enhancing education and training, given the rapidly developing technology and its impact on different aspects of society. The analysis of the extent to which ICT has been incorporated into higher education institutions is covered by this issue to provide analysis of the extent to which ICT has been integrated into high learning institutions, exploring its benefits, challenges, and potential future developments.

In order to facilitate and support educational activities, the integration of information and communication technologies into higher education institutions refers to the use and application of digital technologies such as computers, software applications, Internet connectivity and online resources. This integration is inclusive of a wide range of areas such as classroom instruction, research, student services, administration and communication channels. Improving the quality and efficiency of high learning institutions. By incorporating ICT tools and strategies.

However, there are also challenges to be addressed with regard to the integration of ICT into higher education institutions. The digital divide, where students from disadvantaged backgrounds are less likely to have access to technology and the Internet which leads to unequal opportunities for education, is one of these challenges. The seamless integration of information and communication technologies may also be hampered by technical problems such as system failures, network disruption or compatibility issues.

Looking ahead, analysis of ICT integration in higher learning institutions should consider potential future developments and emerging trends. This includes exploring the impact of artificial intelligence (AI), virtual and augmented reality (VR/AR), cloud computing, and big data analytics on educational practices. Understanding the potential benefits and challenges associated with these technologies can guide institutions in their decision-making

processes and resource allocation, ensuring they stay at the forefront of educational innovation.

#### A. ICT

ICT stands for information and communication technology. It applies to the creation, storage, processing, transmission and retrieval of information through technologies such as computers, software applications, networks or the Internet. ICT includes a wide range of technologies and tools enabling the collection, processing, and dissemination of information and communication in different forms, such as text, images, audio and video.

#### B. ICT Integration

ICT integration aims to leverage the potential of technology to enhance and support various aspects of education and institutional functioning. It involves using technology tools and resources such as computers, software applications, internet connectivity, digital devices, online platforms, and multimedia resources to facilitate and improve the learning experience, administrative efficiency, research capabilities, and communication within the institution.

#### C. Digital Content

Digital content means any information, media or data that is created, stored and disseminated in a digital format. It includes a variety of types of multimedia content such as text, images, audio, video, animation and interactive elements. Electronic devices such as computers, smartphones, tablets and other digital platforms are able to access, share or manipulate the content.

#### D. Student's Performance

Performance The achievement of students in different academic fields is measured by academic performance. In most cases, classroom performance, graduation rates and results of standardized tests are used by teachers and education officials to measure success. Student's performance.

#### E. Hybrid Model

A hybrid computer is a device designed to provide functions and features in both analogue and electronic computers. The aim of developing a combined or hybrid computer model is to create a functional device that incorporates the most beneficial aspects of both computer systems. Analog components of the device are in charge of effectively processing differential equations, whereas computational parts of the computer address logic operations associated with the system. Hybrid Model Integration: Combine the student performance analysis and ICT integration assessment components into a unified hybrid model. This could involve assigning weights to different aspects based on their importance, or creating a visualization dashboard that presents the results in a user-friendly manner.

#### F. Higher Learning Institution

A higher education institution is an educational institution providing post-secondary education. Universities, colleges and other educational institutions offering an academic degree or diploma shall be included. By providing people with knowledge and skills they need to succeed in the labor market as well as contributing to their own communities, High Level Initiatives are playing a significant role in society.

Higher learning institutions offer a wide range of programmes, including bachelor's and master's degrees in a variety of fields, such as the arts and humanities, business, education, engineering, health sciences, law and science.

HLLs also offer professional programs that prepare students for careers in specific fields, such as accounting, nursing, and teaching.

In addition to providing academic programs, HLLs also offer a variety of other services to their students, such as housing, dining, student health services, and career counseling. HLLs also play an important role in research and development.

Here are some examples of higher learning institutions: Universities, Colleges, Polytechnics, Institutes of technology, Teacher training schools, Community colleges

Professional schools: example, law school, medical school, business college.

HLLs are typically accredited by a recognized accrediting agency. This means that they have met certain standards of quality and their degrees are recognized by employers and other educational institutions.

#### G. Significance

A study will make a significant contribution by identifying gaps The study's significance lies in its ability to showcase how ICT integration in high learning institutions positively impacts learning outcomes, provides equitable access to high learning institution, enhances teaching practices, develops future-ready skills, informs policy decisions, and promotes knowledge sharing and collaboration.

## II. EMPIRICAL REVIEW

Because it explains how the study research project connects to earlier studies, the literature review is important. It illustrates the specialness and significance of the research question, as well as how this study is different from others (Long, 2017).

This section deals with studies relevant to the research objectives. For everyone involved in the IT industry, the knowledge and skills of ICT are only a few that are essential. The overall field of information and communication technology has numerous concepts and themes that any academic staff in each department should be able to master or

at least have a basic understanding of. IT officer help desk, digital content officer, and application developers are some examples of IT in IPRC-Huye. Information and communication technology will better manage best teaching methodology, best learning methodology and accessing all information related to the courses, (Alexander, 2017; A, 2017).

As it was written from a variety of sources, including textbooks, references, research papers, encyclopedias, and the internet, it was based on the opinions of authors and researchers with regard to the study.

There is a case for integrating information and communication technologies into higher education institutions. Teachers need to be more creative in adapting and customizing their own teaching materials and strategies as a result of its use, not only changing traditional teaching methods, but also requiring them to be more creative in adapting and customizing their own teaching strategies.

The most widely used teaching strategies to address the challenges of ICT use are among all education methods and strategies, collaborative learning, problem-based learning or constructivist approach.

This is in line with the suggestion of Palak and Walls, as well as Tciez, that technology integration will not achieve its desired effect without a student-centered approach to learning. Consequently, it is not possible to integrate ICT into education on its own. Learning outcomes may be more successful when applied in combination with a variety of teaching methods and approaches, particularly the constructionists approach. (Whelan, 2018)

To improve teachers' professional development in the use of ICT, schools are also strongly recommended to offer workshops or training courses for teaching staff so that they can enhance their information and communication technology skills while facing any possible difficulties.

Previous research has indicated that both external and internal factors influence ICT use in education (Al-Ruz and Khasawneh 2011; Lin, Wang and Lin 2012; Sang et al. 2011; Tezci 2011a). Access to computers and software, lack of time for course planning or technical deficiencies and administrative support are among the most common external factors. AlRuz and Khasawneh 2011).

The research appears to have identified all possible external and internal factors influencing ICT use (Al-Ruz 2021); however, there has been meager research into the possible relationships between external and internal variables, and how these relationships differ according to the variables involved in ICT integration. It would not only help teachers and students to understand the challenges of ICT usage better by examining these relationships. It has shown that when introducing technology into the classroom, there is no correlation between teachers' beliefs and their actual practice. While the influence of teachers' attitudes and beliefs on real practice has been a focus of many prior studies. The

reciprocal relationship between teachers' attitudes and beliefs and their practice has rarely been investigated in any study. The question of whether the relationship between preservice teachers and int'l service teachers is different could be explored further. How do they feel about their beliefs and how do they practice the integration of information and communication technologies? In assessing this perspective, comparable studies will be particularly useful.

### III. METHODOLOGY

#### A. Data Collection

A questionnaire as a research tool shall be used by the researcher in this study to collect secondary data. Approaching people with questions is said to be an obvious way of collecting data from them, both quantitatively as well as qualitatively. In this study, the survey method is used in order to collect data

#### B. Research Design

The research design has been defined differently by different scholars, Welman and Kruger, 2017. In the context of this study, a research design will simply understand as a roadmap or a plan used by the researcher to access the research participants and collect information that helped to explore the research problem under investigation (John, 2013).

#### C. Study Population and Sample Size

In order to make a generalization of the population as a whole, Odera and Okenyi (2018) argue that this sample should be defined as one group which has been chosen from larger groups for study purposes. For the purposes of the study of the representativeness of a precisely defined population, the sample shall consist of a group of subjects selected from the population with the purpose of making inferences about the overall population Shukla, 2020 This study utilized it in the following ways:

$$n = N / (1 + Ne^2)$$

Whereas:

n = No. of Samples

N = Total Population

e = Error Margin / Margin of Error

#### D. Data Analysis

##### ➤ Description of Descriptive Statistics

Kenton, (2019), said that, descriptive statistics are brief descriptive coefficients that summarize a given data set, which can be either a representation of the entire or a sample of a population. Descriptive statistics are broken down into measures of central tendency and measures of variability (spread). Measures of central tendency include the mean, median, and mode, while measures of variability include the standard deviation, variance, the minimum and maximum variables, and the kurtosis and skewness.

Descriptive statistics or frequencies will be used to summarize the data. The researcher will evaluate the mean by using these equivalences, which are found in the table illustrated below. These equivalences of mean will help to know the perception of each group about the sub-variables.

**IV. RESULTS AND FINDINGS**

**A. Which ICT Tools or Platforms do you use Most Frequently for your Academic Tasks (e.g., Online Learning Platforms, Virtual Classrooms, Digital Libraries)?**

The statistical analysis revealed that the rate of EBM users among VAT payers was on **71.3%** in the fiscal year of 2015/2016. Due to the efforts made by the government of Rwanda, the number of EBM users among VAT payers increased to **98%** which means that the VAT payers have successfully adopted the government’s wish of using electronic billing machine.

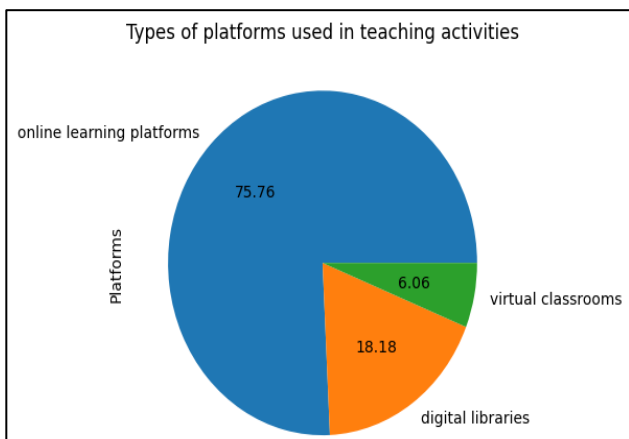


Fig 1: Types of Platforms

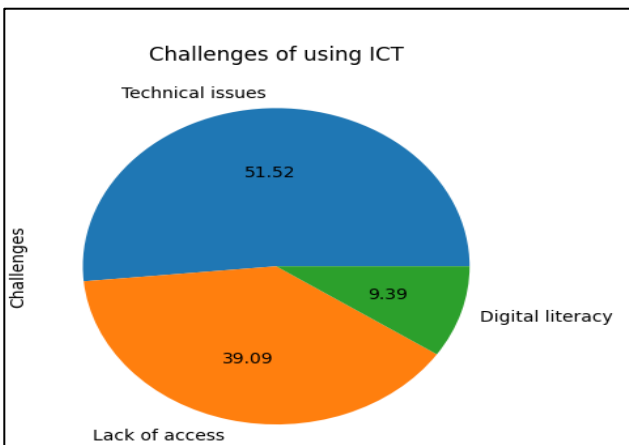


Fig 2: Challenges of ICT

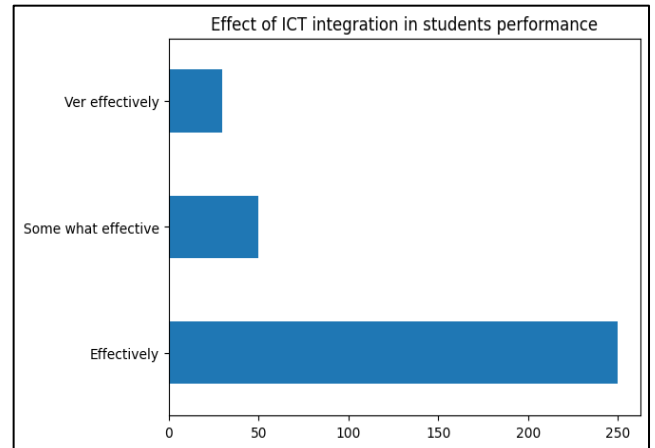


Fig 3: Impact of ICT Tools

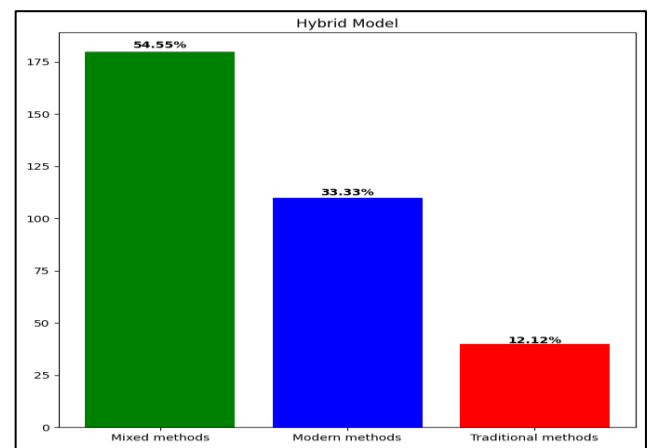


Fig 4: Hybrid Method

**B. Hybrid Model Development**

Hybrid model development is a newer approach to teaching and learning that combines elements of both traditional face-to-face and modern online teaching methodologies. In a hybrid model, students spend some time learning in a physical classroom and some time learning online. The teacher may use a variety of tools and technologies to deliver the material, and students may be expected to complete both online and offline assignments.

C. Comparison of the Three Methodologies

Table1: Comparison of Three Methodologies

<b>Traditional teaching and learning methods, such as face to face education</b>	<b>Modern teaching and learning methodology by mean of the internet</b>	<b>Hybrid model development</b>
Students and teachers meet in a physical classroom to learn and interact.	Students and teachers interact and learn through an online platform.	Students spend some time learning in a physical classroom and some time learning online.
The teacher is responsible for delivering the material, and students are expected to listen, take notes, and ask questions.	Students have more flexibility in terms of when and where they learn, but they are still expected to meet deadlines and complete assignments.	To present the content, a teacher may apply different tools and technology while students are required to complete their assignments on paper or in person.
Students can benefit from the teacher's immediate feedback and the opportunity to interact with their classmates in person.	The flexibility of online learning and the ability to learn at your own pace can benefit students.	Students can benefit from the best of both worlds by combining elements of Traditional teaching and learning methods, such as face to face education
In a classroom setting, some students may not be able to concentrate and others will need more time for learning beyond what is allowed in the standard class schedule.	Online learning can be isolating for some students, and it can be difficult to get help from the teacher if needed.	Hybrid models can be complex to develop and implement, and it can be difficult to find the right balance between traditional face-to-face and online learning.

D. Hybrid Model Development Flowchart for Student Analysis Performance

➤ Hybrid Model of Student’s Analysis Performance: ICT Integration

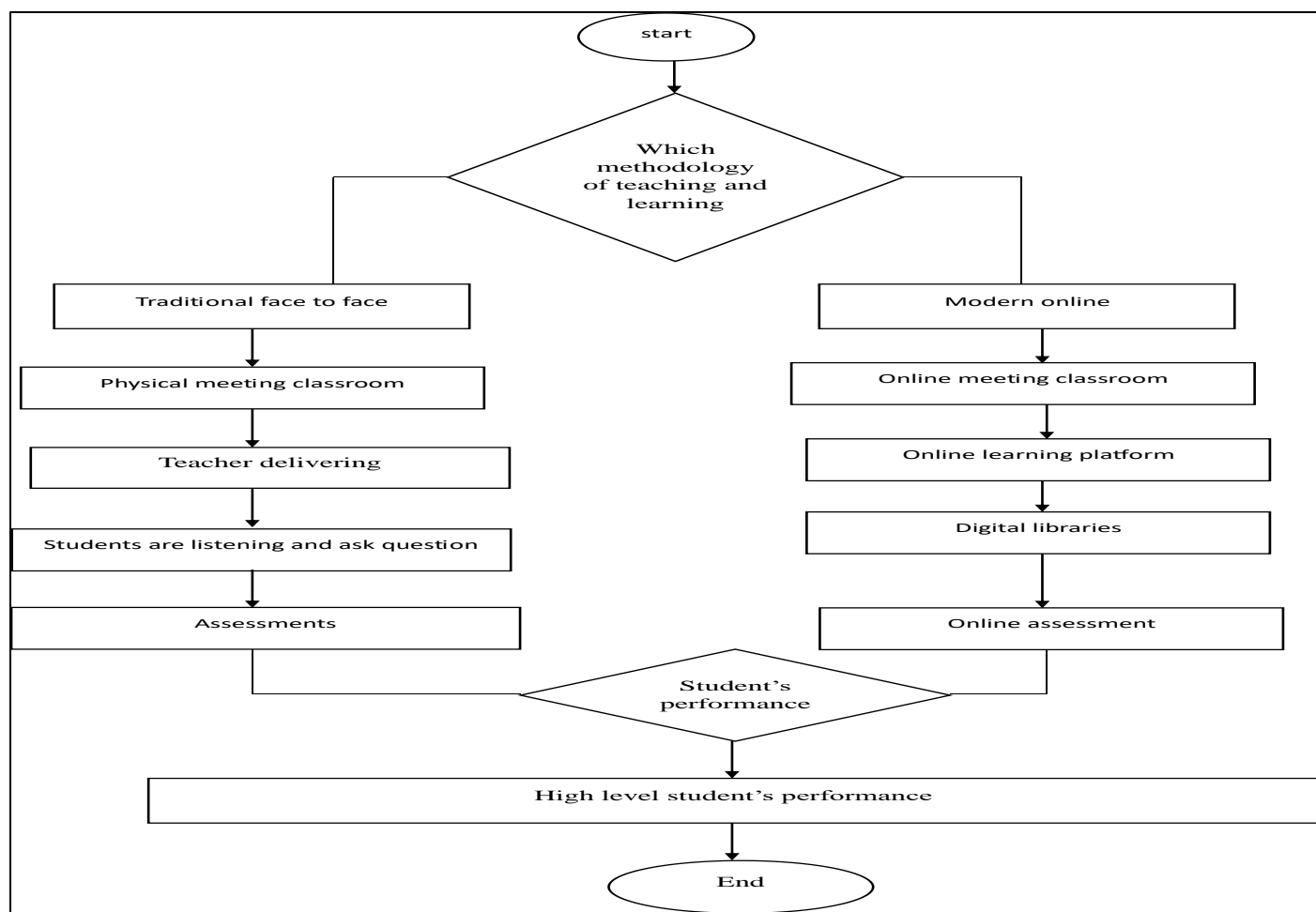


Fig 5: Hybrid Model of Student’s Analysis Performance: ICT Integration

## V. CONCLUSION

Based on our objectives, the creation of a hybrid model for evaluating student performance with a specific emphasis on ICT integration in higher learning institutions has yielded promising outcomes. One of the primary takeaways is the potential for elevating student performance. This improvement can be attributed to various factors, including customized learning experiences, access to online resources, and interactive educational tools.

Another significant discovery is the hybrid model's ability to employ predictive analytics to anticipate student performance. By scrutinizing historical data and diverse indicators such as attendance, completion of coursework, and online engagement, institutions can identify students at risk and intervene proactively to provide additional support.

In conclusion, the creation of a hybrid model for evaluating student performance while emphasizing ICT integration in higher learning institution holds substantial potential. The findings suggest that such integration can lead to improved student performance, personalized learning experiences, and predictive analytics for early intervention. Nonetheless, it also presents challenges related to infrastructure, ethics, and the need for continuous faculty development.

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