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Digital Transformation in Educational Assessment: Methodological Innovations and Enhanced Learning Outcomes in Ethiopian Higher Education Institutions

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ABSTRACT

Technology is offering innovative and powerful tools for educators and learners, Digital transformation in educational sector is revolutionizing the way of learning. Ethiopian higher education faces particular challenges in utilizing digital tools to improve assessment outcomes and challenges that include lack of infrastructure, limited digital literacy and support from educators and students, and related inadequate policies. This Research presents the digital transformation of educational assessment to improve learning outcomes in higher education institutions in developing regions like Ethiopia. Data were gathered through a mixed-methods approach to evaluate existing frameworks by capturing the voices of faculty members and students across multiple institutions in Ethiopian and to identify gaps in the adoption of digital human modeling. findings suggest that digital assessment tools can improve students' engagement and transparency as well as enhance the teacher's real-time feedback efficiency. Despite these challenges, a shortage of digital infrastructure, low digital literacy and resistance to change have so far prevented mass adoption of services and products. A strategic framework is proposed in this research for Ethiopian higher education institutions, capacity building initiatives, and for scaling digital solutions. It is then the contribution of the study to the global discourse of digital education to provide insights into local educational needs and international standards in the alignment of digital assessment practices.

Keywords: Digital Transformation, Educational Assessment, Higher Education, Learning Outcomes.

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1. INTRODUCTION

Traditional assessment practice as well as technology integration in educational assessment of Ethiopian higher education institutions have not yet been fully investigated. This study aims to add to the growing conversation about digital transformation in education with a diagnosis of practices, obstacles, distinguishing the challenges, and possible solutions to digital transformation in education. The hope of this research is that the results of this work will be actionable for educators, policy makers, and stakeholders, who may then use digital tools to create more positive learning outcomes and work toward systems change.

Simultaneously, Ethiopian higher education has certain challenges of employing digital tools for the improvement of assessment outcomes, including problems in infrastructure provision for it, lack of digital literacy among educators and students, lack of support from both educators and students, and insufficient policy frameworks. Ensuring the development of a system of equitable and balanced education requires the resolution of these challenges.

1.1 Background of Research

The last decade has seen tremendous changes to the world of higher education resulting from the revolutionary effect of new digital technologies. In particular, the area of educational assessment has felt the greatest impact from these new technologies; while digital technologies are increasingly popular as efficient, accessible, and responsive alternatives to traditional assessment methods (paper based exams and face-to-face grading), the impact of these digital technologies may not be as relevant to many developing countries, including Ethiopia. For example, Ethiopian Higher Education Institutions (HEIs) are facing numerous unique challenges when attempting to provide quality education to a rapidly expanding student population.

The number of universities and colleges across Ethiopia has expanded dramatically over the last three decades. However, despite the phenomenal expansion of the sector in terms of numbers, the sector's assessment practices have aged, classroom spaces are crowded, resources are limited, and the body of faculty members in Ethiopia is undertrained. Therefore, this research seeks to explore the extent to which digital transformation can assist HEIs in Ethiopia to address their educational assessment needs. Specifically, it will assess the level of digitalization of assessment practices, the obstacles to using digital technologies in the assessment process, and the opportunities for improving learning outcomes through the use of digital technologies.

1.3 Justification of the Study

The integration of digital tools into assessment activities in the field of education will offer an unprecedented opportunity for developing countries (like Ethiopia) in comparison to the traditional assessment methods used in the past. Although the sector for higher education has been growing in recent years in Ethiopia, the current assessment frameworks used in this sector are out-dated and have problems relating to the infrastructure of technology and limited use of information technology to support new teaching methodologies. Therefore, the present research is both timely and important as its objective is to fill in some of the voids of knowledge regarding the process of digital change in assessment practices and student outcomes in Higher Education Institutions in Ethiopia.

Digital assessment tools can assist in removing the inefficiencies found in the use of traditional

methods of assessment through their ability to provide increased transparency, immediate real time feedback, and the potential for students to receive a customized learning experience. However, the transition to digital assessments faces numerous challenges including: inadequate infrastructure, lack of technological familiarity, digital illiteracy, etc. These challenges will be outlined in this study, along with proposed solutions for each of the challenges identified above. The purpose of outlining these challenges and proposing solutions for each challenge is to provide an example of how to facilitate the digital transformation of assessment in Ethiopia and to provide common ground for policy makers, educators and institutional administrators working towards the promotion of digital assessment practices in Ethiopia.

1.4 General Objective

The purpose of this study is to analyze digital assessment methodologies used inside institutions of higher education in Ethiopia in order to find out their effectiveness, challenges and their potential effect on learning outcomes.

1.5 Specific objectives:

1. To review the existing educational assessment methodologies and determine the gaps of their effectiveness in Ethiopian institutions of higher education.

2. To analyse the role that digital tools and technologies play in the transparency, efficiency and reliability of assessment processes.

3. To develop a strategic framework for implementation of digital assessment practices that are consistent with global and local needs.

2 LITERATURE REVIEW

Digital transformation in educational assessment is the use of technology to make, or in some cases, replace conventional assessment methods (Siemens, 2013). Spector (2014) and Jisc (2017) tried to study and suggests how to acquire the digital transformation in this digital era.The transformational innovations including e-assessments, digital portfolios, and learning management systems (LMS), not only facilitate real time evaluation, personalised feedback, and enhanced involvement of students (El-Masri & Tarhini, 2017).

Despite these barriers, the potential rewards improved efficiency, accuracy, and access—have become more commonly recognised by educators and policymakers (Zawdie & Woldemariam, 2020). However, even in Ethiopia, there is a growing shift towards digital assessments, but the shift is not easy, and comes with many challenges including lack of infrastructure, low digital literacy and resistance to change (Abdulkadir & Tsegaye, 2021). Garcia et al., (2021). Using meta data analysis tries to attract student and engaging them through digital assessment tools. Hennessy et.al., (2022) in their paper tried to explore the development of digital literacy for effective teaching and learning in higher education. Kim et.al., (2023) and Patel & Singh (2023) tried to link the digital divide and gives suggestion to Improve the digital literacy for assessments in higher education.

2.1 Methodological Innovations in Assessment

As digital tools are becoming more common, the educational assessment methodologies have gone through much innovation. These innovations can be categorized into two major areas:

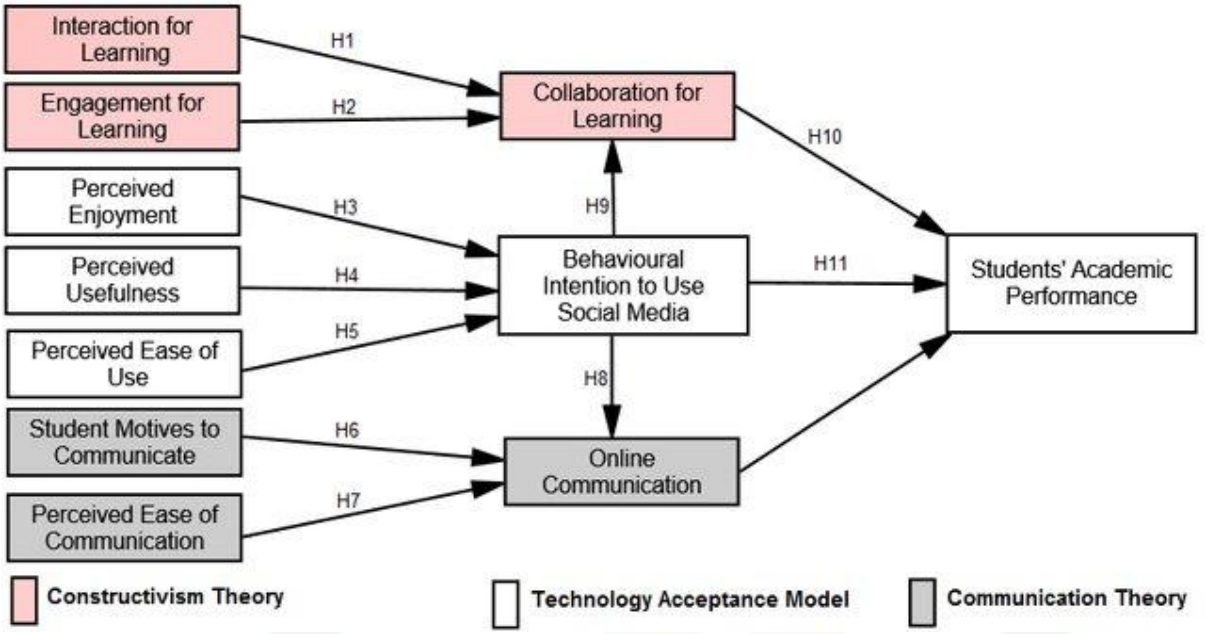
- Automated Assessment Tools: Assessments are being conducted using systems that are artificially intelligent, or AI driven. For example, with AI technologies we can automatically grade essays and get instant feedback (Chiriac & Lindström, 2020). They also provide personalised learning pathways that adjust assessments on a learner's progression.
- E-Assessment Platforms: Online assessments can be done through websites like Moodle, Blackboard and Turnitin by extensive use of multiple-choice questions (MCQs) along with a proper complexity of assignments that needs a peer review. With these platforms, educators are able to administer, grade and monitor assessments remotely with much improved access and flexibility (Conole, 2013).

2.2 Theoretical Framework

To help contextualise how digital transformation affects educational assessment, this study utilizes the TAM asserts that educators and students will adopt digital assessment tools when they see benefit and this is easy to use and hence, produce better learning outcomes.

As well, Constructivist Learning Theory (Vygotsky, 1978) is important to understanding effective use of digital tools in assessments. Active learning, continuous feedback and self-reflection as well as knowledge construction are all important elements of the theory and digital assessments can emphasise these elements.

Figure 1: Conceptual Framework for Digital Transformation in Educational Assessment



2.3 Learning Outcomes and Digital Assessment

Digital assessments can vastly improve learning outcomes, so states have been conducting focused research over the last decade. For example, recent studies by Jisc (2017) and Spector (2014) properly highlight that by immediate feedback, tailored assessments, an increase in student engagement, e-assessments improve performance outcomes. However, the research is limited in the case of Ethiopia, especially to understand how these technologies can be successfully integrated into the existing educational frameworks.

It is widely acknowledged that assessment for higher education systems across the globe has to undergo a digital transformation. This transformation utilises digital technology to promote transparency, efficiency and student engagement. Studies conducted recently tend towards viewing new digital tools as a bridge between previous methods of assessing and elevated modern educational standards (Anderson & Adams, 2022).

2.4 Digital Literacy and Its Role in Assessment

The successful implementation of digital transformation to assessment in education is critically based on digital literacy. The outcome of digital assessment methodologies is highly dependent on educator and student capability to use digital tools effectively. For instance, Hennessy et al (2022) demonstrate that improving digital literacy in academic staff results in greater use of digital channels for feedback and evaluation systems. However, low digital literacy can be an inhibitor to adoption in areas where technology training is not so wide spread.

In addition, findings show that students can also build their confidence to engage in digital assessments if they are equipped with targeted digital literacy programmes (Kim et al., 2023). Accordingly, digital literacy training needs to be

built into the regular professional development of educators and orientation programmes for students. While educational institutions in Ethiopia to transition to digital assessment practises, addressing the digital literacy gap is critical for equitable learning and learning outcome.

2.4.1 Impact of Digital Tools on Student Engagement

Digital tools have been widely embraced in assessment and, accordingly, have affected student engagement and the dimensions of student learning outcomes. Online quizzes, interactive platforms, and real time feedback systems make assessments interesting for students (Garcia et al., 2021).

Still, there are obstacles to getting access and being inclusive. Patel and Singh (2023) have demonstrated that digital tools may help advance engagement, however, their use can unintentionally marginalise children who lack consistent access to reliable internet or digital devices. Consequently, educational institutions need to account for inclusive strategies, e.g. offline compatible tools or subsidised access programmes, in order to make use of those digital assessment benefits.

2.4.2 Trends in Digital Transformation in Educational Assessment in Ethiopia

With the rapid progress of the digital transformation of educational assessment in Ethiopia being fuelled by both global technological trends, and the country's increasing emphasis on improving its higher education sector, there is an urgent need to acquire and transfer a wide range of skills and competences in the relevant disciplines. One of the key trends shaping the landscape of digital assessment in Ethiopian higher education is the introduction of newer technologies, methods and platforms to enhance practises of assessment and learning outcomes of students.

1. E-Assessments and Online Testing Platforms.

The Ethiopian higher education institutions for adapting to the mandate of ICT in the education sector. These platforms enhance online testing, real–time grading, and leaning, to address physical barriers and reduce cost of reaching students in remote areas.

2.Real Cutting Edges: Feed back Mechanism.

There is a trend in digital transformation towards using real time feedback mechanisms instead of the traditional final assessment / module exit. The immediate feedback that is provided through digital platforms upon completion of assignments, quizzes or examinations gives learners immediate knowledge of their strengths and weaknesses; therefore, the feedback can be updated at any point in time. In Ethiopia, this type of real time feedback mechanism is believed to help improve student learning outcomes by enabling students to adjust their study behaviours in a timely manner.

3.Data Analytics

Beginning with the analysis of student performance data, data analytics in the area of education assessment provide actionable information upon which to base actions for the benefit of students. Data analyses allow instructors to analyze student performance trends, monitor student progress over time, and to use student performance data to inform their instructional strategies and assessment methods. Using data to inform instruction helps improve the effectiveness of assessment systems; thereby enhancing student achievement.

4. Digital assessment tools for collaboration

With more advancement technology is bringing about, students can now work collaboratively on assessments and can share feedback on Google Docs and Microsoft Teams. Collaborative tools also provide opportunity for peer learning and teaching other good communication skills that

are necessary to build teamwork capabilities. Collaborative assessments are becoming a more common part of Ethiopian higher education institution curricula to increase student engagement and problem-solving skills.

5. Focus on Faculty Training and Digital Literacy

As digital assessment tools have become more ubiquitous in the assessment process, so too has an emphasis on faculty training and digital literacy. Ethiopian institutions are acknowledging that educators need to be prepared to use digital assessment tool to use in their teaching practises. For teachers to benefit from the available digital tools and thereby the general quality of education, faculty development programmes are essential.

Hence the current paper follows the following structure:- Introduction, study background, justification, theoretical framework, objectives, impact and trend is presented in Section 1. Section 2 presents the Research methodology and data analysis of the study. Finally the findings, conclusion and Policy suggestions are presented in Section 3.

3. RESEARCH METHODOLOGY

3.1 Data Collection

The data was collected through online survey targeting students and faculty members from Ethiopian universities. The survey included a mix of demographic questions, Likert-scale items, and responses to assess awareness, satisfaction, challenges, and recommendations related to Digital Transformation of Educational Assessment in Ethiopia.

3.2 Statistical Analysis

To analyze the collected data, the following statistical methods were employed: Simple graph, Data visualization technique, Descriptive Statistics, percentage method and chi-Square analysis was used to verify the above objectives.

3.3 Primary analysis

To check the objectives of the study, primary data in form of questioner has been collected from 210 respondents . Most of the questions are closed ended questions which measures the response to each statement (Items). 14 questions (with few sub-divisions) were asked to the 210 respondents[1]. Data collected is tabulated, classified and the factors contributing to Current Assessment Practices, Impact of Digital Transformation and Barriers Identification are analyzed. Table 1 below reveals the view of the respondents based on the questions asked.

[1] Table 1

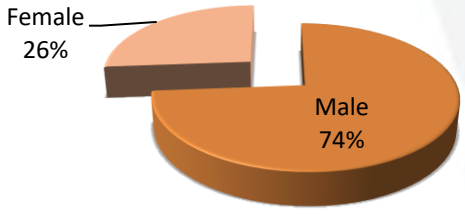
Table 1 :Analysis and interpretation of the questioner (Total Sample 210)

Sl. No.	*Statement*	*Indicators and scores*			
1.	Gender	Male 155	Female 55		
2.	Age	<25 :125	25-35:43	36-45:41	>45:1
3.	Profession	Faculty: 51	Students: 159		
4.	Educational Background	Degree:150	Masters: 45	Ph.D.,: 15	
5.	Area	Urban : 157		Rural: 53	
6.	Do you believe that Ethiopia has the necessary infrastructure to support digital assessments	Yes: 90		No: 120	
7.	Have you ever used any form of digital tools provided below:	online Exam : 90	Assignments 57	Grading system:50	Others 10

Source: computed from Primary data

The pie chart (figure 2) shows the distribution of males and female for the given population. About 73.7% of the respondents are Male and 26.3% of the respondents are female.

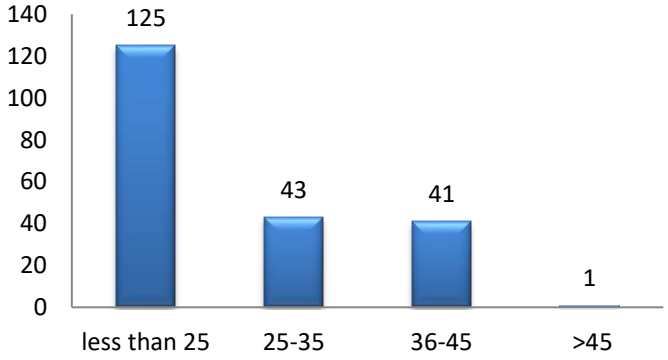
Figure 2: Gender distribution



The bar chart of figure 3 shows the distribution of respondents across different age categories. The largest group consists of respondents aged "less than 25," with a total of 125 individuals.

The number of respondents decreases with increasing age. There are 43 respondents in the 25-35 age group, 41 in the 36-45 age group, and only 1 respondent in the age group above 45. The chart suggests that the sample population is heavily skewed towards younger individuals.

Figure 3: Age Category



The pie chart of figure 4 shows the distribution of respondents based on their area of residence, urban or rural. About 75% of the respondents live in urban areas and 25% of the respondents live in rural areas. The chart indicates a significant

urban bias in the sample population.

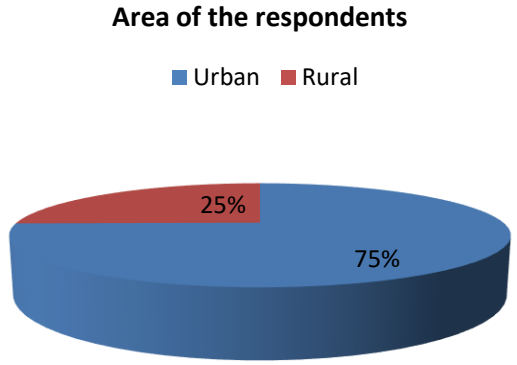


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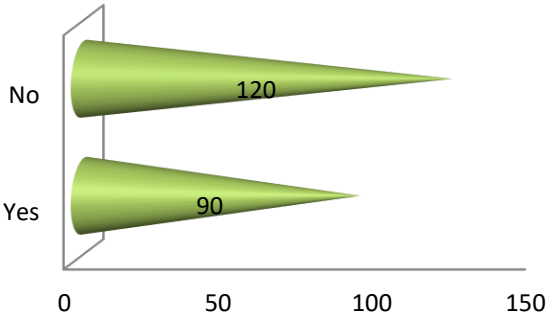
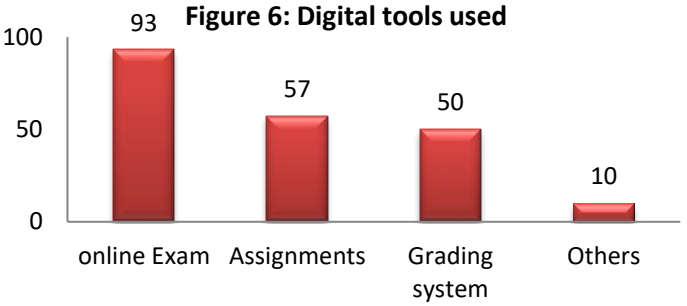
Figure 5: Do Ethiopia have the necessary infrastructure to support digital assessments



The chart of figure 5 presents the responses to the question: "Do you believe that Ethiopia has the necessary infrastructure to support digital assessments?" A majority of respondents (55.9%) believe that Ethiopia does not have an adequate infrastructure could pose a major challenge to the successful implementation of digital education and assessment systems in Ethiopia. Only 44.1% of respondents believe that Ethiopia does have the necessary infrastructure.

This chart of figure 6 presents the frequency of usage of different digital tools in a particular context This is the most frequently used digital tool, with 93 instances of usage was through Online Exam. signment a mode of digital tool is used 57 times. The overall frequency of usage across all categories indicates that digital tools play a significant role.



For the question regarding technical difficulties, about 80% of the respondents has opted for Internet connectivity issues, the respondents multiple responses for the given choices are presented in table 2 below.

Table 2: Technical difficulties Faced

Options	Percent
Internet connection issues	50.4
Internet connection issues, login problems	4.2
Internet connection issues, login problems, Others	0.9
Internet connection issues, login problems, poor power supply	8.5
Internet connection issues, login problems, poor power supply, Others	4.3
Internet connection issues, Others	1.7
Internet connection issues, poor power supply	10.3
Internet connection issues, poor power supply, Others	0.9
login problems	3.4
login problems, poor power supply	0.9
Poor power supply	8.5
Others	6.0
Total	100

The level of awareness regarding availability of digital tools at their College, potential benefits

and the government policies that supports digital transformation in educational assessment was collected from the respondents and the responses are presented in table 3. Majority of respondents are "Aware" of the digital tools available at their college, "Aware" is significantly higher than the other two categories.

Table 3: Level of Awareness

Level of Awareness	Aware (75%)	Neutral (15%)	Not aware (10%)
Are you aware about the Digital tools available at your College?			
How aware are you regarding the Potential Benefits of Digital Transformation?			
How aware are you about the current policies and initiatives by the government to support digital transformation in educational assessment?			

Digital tools satisfactory level was gathered by the respondents which is based on a survey where respondents were asked several questions related to their satisfaction with digital tools. Table 4 presents the level of satisfaction with digital tools across different aspects. It is clear from the table where users are less satisfied with the accessibility of assessments and the current Education System.

Table 4: Digital tools Satisfactory level

Digital tools Satisfactory level	Satisfied	Neutral	Dissatisfied
How satisfied are you with the Digital Literacy in Ethiopia	44	45	28
How satisfied are you with the accessibility of educational assessments for students in rural or urban areas of Ethiopia?	39	35	43
How satisfied are you with the availability and quality of digital tools for educational assessment in Ethiopia?	39	39	38
How accurately do digital assessments reflect your understanding of the subject?	60	42	15
Are you Satisfied with the current Education System?	39	36	41

Figure 7 presents the respondents opinion regarding the level of Digital tool challenges. Majority of respondents agree that digital assessments are aligned with course objectives, with the bar for "Agree" being the highest for this

question. A smaller proportion of respondents agree that automated grading systems are fair in evaluation compared to their agreement with the alignment of digital assessments. The results suggest that respondents have concerns about the fairness of automated grading systems and online exams compared to traditional methods. There might be a need for greater transparency and clarity regarding the algorithms and processes used in automated grading systems.

Figure 7: level of Digital tool challenges

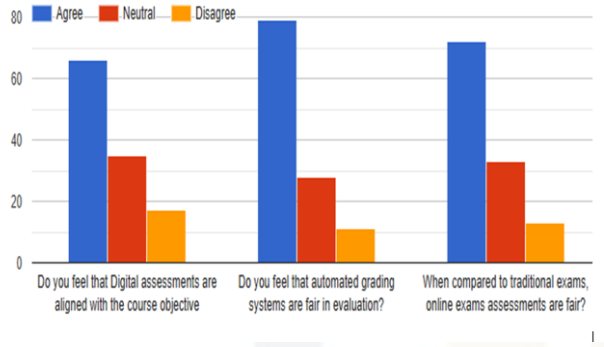
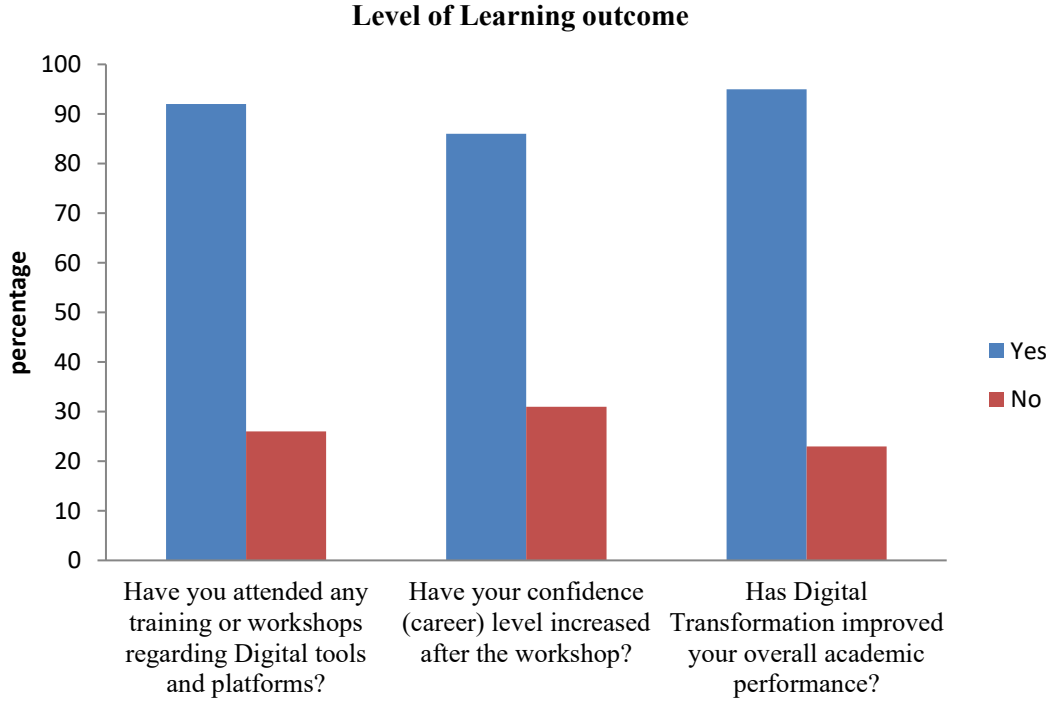
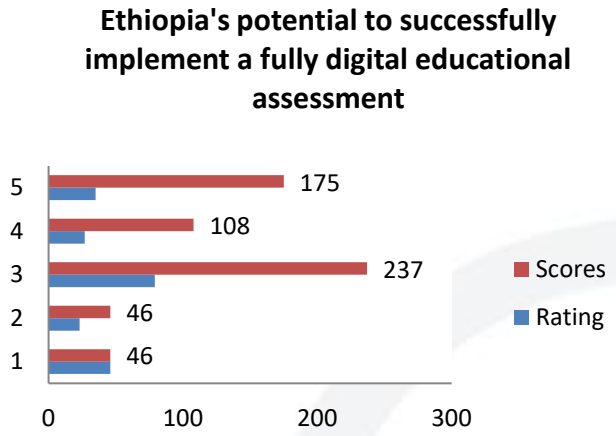


Figure 8 presents the Level of learning outcome related to digital transformation in educational sector of Ethiopia. The result reveals that majority of respondents have attended training or workshops regarding digital tools and platforms, as indicated by the high blue bar. A larger proportion of respondents reported an increase in career confidence after attending the workshops. Also, the educational institutions could address these concerns by the impact of digital transformation and training may vary depending on individual factors such as prior experience, learning style, and motivation.



How would you rate Ethiopia's potential to successfully implement a fully digital educational assessment system in the near future? 1 (low), 5 (high)



The chart displays the distribution of ratings for Ethiopia's potential to successfully implement a fully digital educational assessment system in the near future. The average rating is 2.90, indicating a reasonable level of confidence in Ethiopia's potential, highest percentage of respondents (38.1%) gave a rating of 3, suggesting a neutral or moderate level of confidence.22% of respondents gave a rating of 1, indicating low confidence in Ethiopia's potential. Respondents giving a rating of 1 indicate that there are significant concerns about Ethiopia's ability to successfully implement such a system, average rating suggests that there are both challenges and opportunities for Ethiopia in implementing a fully digital educational assessment system.

Number of respondents who selected a particular benefit to list out the, “Benefits of Ethiopian current Educational system”. Quality Education is the most cited benefit, with 56 respondents (47.5%) selecting it. Skill Development is the second most cited benefit, with 55 respondents (46.6%) and 45 respondents (38.1%) cited Efficient Assessment as a benefit. Only 8 respondents (6.8%) selected this benefit connects students with their Intelligent Teachers

3.4 Chi-Square Test Report

This Chi-Square Test examines the relationship between levels of learning outcome (Have you attended any training or workshops regarding Digital tools and platforms and Has Digital Transformation improved your overall academic performance)

A chi-square test was performed and a significant relationship between attending training and overall academic performance was found (proved by p-value). This implies that there is a difference between attending workshops regarding Digital tools and improved in overall academic performance

i.e Chi-Square value 17.751 (N = 210) P-value(0.0000).

4. FINDINGS:

- About 73.7% of the respondents are male and 26.3% are female
- The largest group consists of respondents aged "less than 25," with a total sample of 210. The number of respondents decreases with increasing age.
- A significant portion of respondents were students and minority faculty members.
- Participants ranged from degree holders to Ph.D. graduates.
- The majority of respondents were from urban areas, with some representation from rural areas.
- The high number of respondents indicating poor supply of power indicates a possible infrastructural challenge.
- Participants express reservations about the equity of automated grading systems and online examinations with regard to conventional forms of assessment.

- An extensive proportion of respondents reported an augmentation of career confidence after workshop participation.

5. CONCLUSION

In addition to respondents' demonstrating an awareness of the various digital resources available to them, they also demonstrate a limited knowledge of the advantages of the successful execution of digital transformation strategies based on the use of digital tools.
The majority of respondents express concern regarding the limitations of the infrastructure required for the execution of digital assessment within the Ethiopia environment due to concerns of (1) Internet accessibility, (2) Electrical power supply, and (3) Access to the necessary hardware.
A high percent of the respondents have identified education and skill development as being among the most important strengths of the modern educational systems; therefore, the educational training programs have the opportunity to be re-aligned to provide a greater emphasis on hands-on experiences and the development of skills so that they are better prepared for careers and will achieve higher levels of academic success.

Further, a repeat of this finding demonstrates the strength of the quality education and skill development provided by the current educational model. Conversely, a smaller number of respondents identify the benefits of connecting students with excellent educators and providing support for career development, which may suggest that both areas are worthy of some note and/or enhancement.

6. SCOPES AND POLICY SUGGESTIONS:

- Respondents highlight the importance of high-quality education and developing competency, at the same time calling for better internet access and system reliability.
- Training initiatives should focus on real application and competency development to help and build career confidence and improve performance in school.
- Training initiatives should focus on practical application and building competency to build confidence in career and higher performance in academics.
- Further empirical research is needed to understand separate factors regarding technology infrastructure, pedagogical training and data security.

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