

Cloud Computing Accessibility Evaluation Tool: A Comprehensive Approach to Assessing Accessibility in Primary Schools

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Abstract- This paper presents the Cloud Computing Accessibility Evaluation Tool (CCAET), a robust system designed to assess the accessibility of cloud computing in primary schools. The tool incorporates a range of metrics and parameters to comprehensively evaluate the accessibility landscape. This paper outlines the design and components of the CCAET tool, discusses the validation testing process, and highlights its functionalities. The CCAET tool offers a user-friendly interface, enabling users to input metrics, capture parameters and sub-parameters, manage institutions, collect respondent feedback, and generate analysis reports. By promoting a systematic and data-driven approach, the CCAET tool facilitates informed decision-making and identifies areas for improvement in cloud computing accessibility in primary schools.

I. INTRODUCTION

The integration of cloud computing in primary schools has the potential to revolutionize education, but ensuring its accessibility to all students is crucial. This paper introduces the Cloud Computing Accessibility Evaluation Tool (CCAET), developed to assess and enhance the accessibility of cloud computing in primary school environments. The CCAET tool aims to provide a comprehensive evaluation by incorporating various metrics and parameters that capture the diverse aspects of accessibility. By offering an intuitive and user-friendly interface, the tool enables users to input metrics, define parameters and sub-parameters, manage institutional details, collect feedback from respondents, and generate detailed analysis reports. The CCAET tool empowers decision-makers to make informed choices regarding cloud computing accessibility improvements and promotes inclusive education practices.

II. ACCESSIBILITY METRICS

The accessibility metrics used in this context were derived from the values in the ICCEM (Integrated Cloud Computing Environment Model) framework. The goal was to measure the level of accessibility of ICT (Information and Communication Technology) integration in primary school education. The accessibility equation used to calculate the accessibility value was as follows:

$$\text{Accessibility} = \text{HC} (.1599) + \text{ICT} (.2399) + \text{I} (.3603)$$

In this equation, HC represents human capacity, ICT represents ICT integration technologies, and I represents the presence of Internet connection. Each variable is either available (1) or not (0).

To define the continuum scale of accessibility, the minimum accessibility value was considered to be zero (0), indicating no accessibility, while the maximum value was considered to be one (1), indicating maximum accessibility.

For the case of no accessibility (HC=ICT=I=0), the accessibility value can be computed as:

$$\text{Accessibility} = 0 + 0 + 0 = 0$$

This implies that in the absence of technologies and human capacity for ICT integration, there is no accessibility, which is considered the minimum level.

On the other hand, for the maximum accessibility case (HC=ICT=I=1), the calculation is as follows:

$$\text{Maximum Accessibility} = 1(.1599) + 1(.2399) + 1(.3603) = 0.1599 + 0.2399 + 0.3603 = 1$$

This indicates that when all the metrics, including human capacity, ICT integration technologies, and Internet connectivity, are present, the maximum level of accessibility is achieved.

It is important to note that the accessibility level towards ICT integration in primary education varies when any of the metrics change. This variation can be expressed as a percentage on a continuum scale ranging from 0% to 100%.

To measure the accessibility level, a cloud computing environment accessibility evaluation tool (CCAET) was designed. This tool takes into account the availability of human capacity skills, ICT integration technologies, Internet connection speed, and the use of cloud computing technologies. By using this tool, the accessibility level can be assessed in different primary schools, as it may vary depending on the specific conditions and resources available in each school.

III. CHOICE OF THE TOOL

The Cloud Computing Accessibility Evaluation Tool (CCAET) was developed based on the findings of a study that identified four metrics and their corresponding parameters, which are crucial in assessing the level of accessibility in ICT integration in primary schools. The tool aims to provide a comprehensive assessment of the affordability and readiness of primary schools to adopt cloud computing technology in their educational practices.

The education sector has recognized the numerous benefits and applications of ICT in enhancing teaching and learning processes. As a result, governments and primary schools have made efforts to acquire resources that support ICT integration in their institutions. However, the high cost associated with acquiring these resources poses a significant challenge for most primary schools. Cloud computing technology offers a solution to this problem by providing cost-effective services and reducing the financial burden of acquiring expensive hardware and software.

To implement cloud computing effectively, several components need to be in place, including Cloud Computing Technology itself, ICT Human Capacity,

ICT Integration Technologies, and a reliable Internet connection. The CCAET serves as a tool to assess the affordability level of cloud computing for primary schools. By using this tool, schools can understand their current level of readiness and identify areas that require further development in order to effectively plan for the integration of cloud computing in education.

The beneficiaries of the CCAET include various stakeholders such as the government, primary school management and staff, and hardware and software manufacturers. The government can utilize the tool to gain insights into the readiness of primary schools and plan appropriate policies and initiatives to support cloud computing adoption. School management and staff can identify areas for improvement and allocate resources effectively to enhance their ICT infrastructure. Hardware and software manufacturers can use the tool to understand the specific needs and demands of primary schools and tailor their products and services accordingly.

IV. OBJECTIVES OF CCAET TOOL

The Cloud Computing Accessibility Evaluation Tool (CCAET) was designed with the following objectives in mind:

1. Determine Cloud Computing Accessibility Metrics: The tool aims to provide a platform for determining the cloud computing accessibility metrics, along with their parameters and associated sub-parameters. By defining these metrics, the tool helps establish a standardized framework for assessing the accessibility of cloud computing environments in primary schools.
2. Enable Feedback from Respondents: The CCAET allows respondents to provide their feedback and input regarding the accessibility of cloud computing environments, regardless of their geographical locations. This ensures that a diverse range of perspectives and experiences are incorporated into the evaluation process, promoting inclusivity and comprehensive assessment.

3. Display Results to Respondents: The tool is designed to generate and display results to respondents, showcasing the level of accessibility of the cloud computing environment based on various metrics. This feedback mechanism helps primary schools understand their current accessibility status and identify areas that require improvement or further development.

By achieving these objectives, the CCAET facilitates data-driven decision-making and supports primary schools in planning and implementing cloud computing technologies effectively. The tool empowers stakeholders to assess and enhance the accessibility of cloud computing environments, leading to improved educational practices and outcomes in the context of ICT integration.

V. CCEAT COMPONENT DESIGN

The Cloud Computing Accessibility Evaluation Tool (CCAET) comprises eight main components: Login, Detail Insertion, Detail Update, Detail Deletion, Detail Search, Response Capture, and Analysis Reports. The Login component handles user authentication, while Detail Insertion allows for adding information to the system database. Detail Update enables editing of existing values, and Detail Deletion removes selected details. Detail Search retrieves information based on user criteria. The Response Capture module manages respondents' input, and Analysis Reports analyze the captured responses, generating meaningful reports. Together, these components provide a comprehensive system for assessing and improving the accessibility of cloud computing environments in primary schools.

VI. VALIDATION TESTING

To validate the CCAET tool against user requirements, a walkthrough approach was employed, involving the developer, project supervisor, and project coordinator. The selected test data was utilized to assess whether the system aligned with the users' needs. After conducting the validation process, it was concluded that the tool met all user requirements and accurately represented their desired functionalities. As a result, the CCAET tool was accepted as a true representation of the users' requirements, ensuring its suitability and effectiveness in assessing cloud computing accessibility in primary schools.

VII. CCAET TOOL

The CCAET tool provides a user-friendly interface that starts with the Login page when accessed by the user. This page displays various links to different functionalities within the system. Upon successful authentication, users can access these functionalities by selecting them from the horizontal and vertical menus. The horizontal menu includes options such as Home, which takes the user to the system's main page, Response, which allows respondents to submit their feedback, Analysis, which displays analyzed data, Contact Us, and Help. The vertical menu offers additional options, including Metric for entering new metrics, Parameters for capturing parameters associated with each metric, Sub Parameter for capturing sub-parameters related to each parameter, Institution for capturing details of new institutions, and User for managing user details. A screenshot of the Login window is provided in Figure 1, providing users with a visual reference for accessing the system.

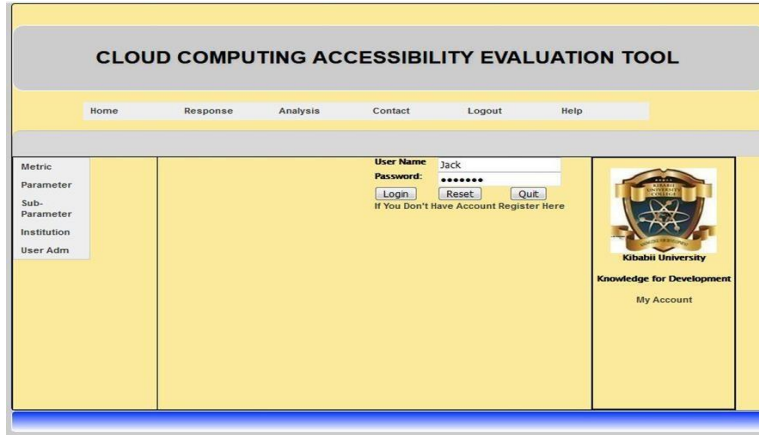


Figure 1: Login Page

In the CCAET tool, it is important to note that all users, including system administrators, clerks, institution representatives, and respondents, undergo an authentication process before being granted access to the system's functionalities. If a respondent is not registered, they can click on a specific link provided on the Login page. This action will open a new registration window where the respondent can enter their details. After completing the registration, the respondent will need to wait for the system administrator to activate their account. Authentication of the respondent's identity is necessary before the account activation process can take place, ensuring secure and authorized access to the system.

Once a user successfully authenticates into the system, they gain access to all the functionalities it offers. The initial menu presented to the user is a vertical menu that includes submenus such as Metric, Parameter, Sub Parameter, and Institution. By selecting the Metric submenu, users can enter new metrics into the tool and update existing metrics as depicted in Figure 2. This functionality empowers users to manage and customize the metrics utilized in the system, ensuring flexibility and adaptability to specific requirements and evolving needs.

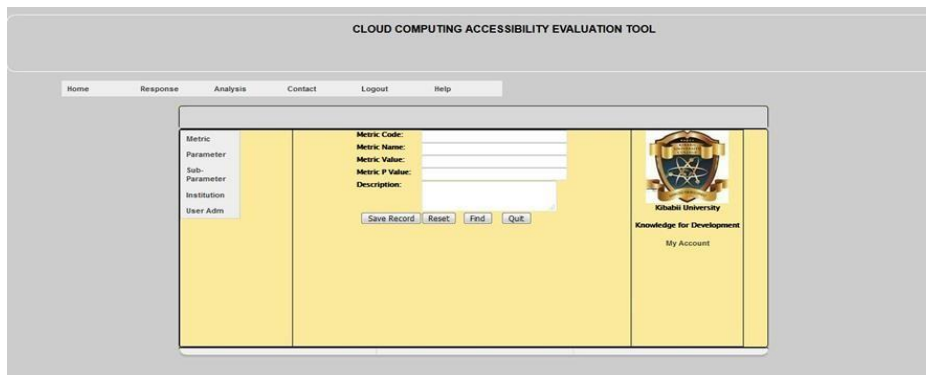


Figure 2: Metric Window

Another crucial submenu within the CCAET tool is the Parameter menu, which allows users to design parameters that are associated with each metric. These parameters are utilized to measure and evaluate the

specific aspects of each metric. Each parameter is linked to a particular metric and requires a unique metric code for identification, as indicated in the provided Figure. The Parameter window, depicted in

Figure 3, provides users with an interface to define and manage these parameters, enabling a comprehensive and tailored assessment of cloud computing

accessibility based on specific criteria and requirements.

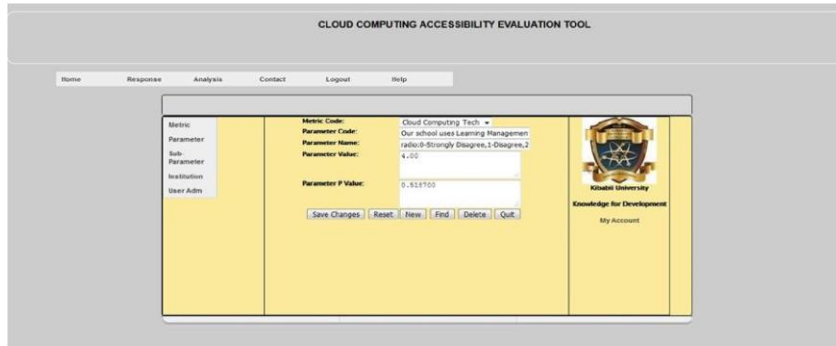


Figure 3: Parameter Window

The Sub Parameter functionality within the CCAET tool allows users to capture sub parameters that are associated with each parameter. This feature enables a more granular and detailed assessment of the various aspects and dimensions of cloud computing accessibility. By selecting the Sub Parameter submenu, users can access the Sub Parameter window, as depicted in Figure 4. This window provides a user-

friendly interface for entering and managing the sub parameters, allowing for a comprehensive evaluation of the metrics and parameters defined within the system. It ensures that all relevant factors and considerations are taken into account, enhancing the accuracy and effectiveness of the accessibility assessment process.

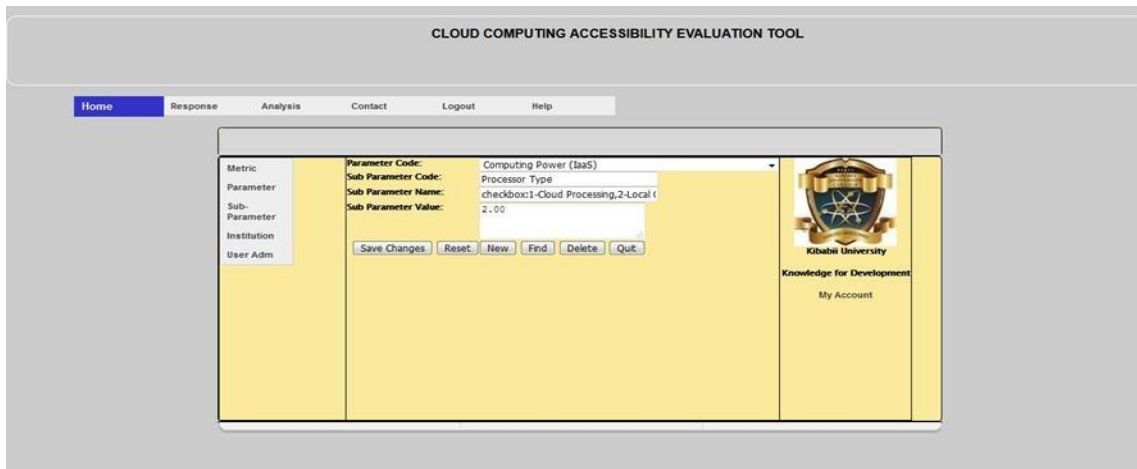


Figure 4: Sub Parameter Window

The Institution menu is a significant functionality provided by the CCAET system. This submenu allows users to capture and store all the relevant details about the primary school for which the cloud computing affordability level will be measured. By selecting the Institution submenu, users can access the Institution

window, as depicted in Figure 5. This window provides a user-friendly interface for entering and managing the specific information related to the primary school, such as its name, location, contact details, and other relevant data. This functionality ensures that the system has accurate and up-to-date

information about the institutions being assessed, facilitating a comprehensive evaluation of cloud computing accessibility in primary schools.

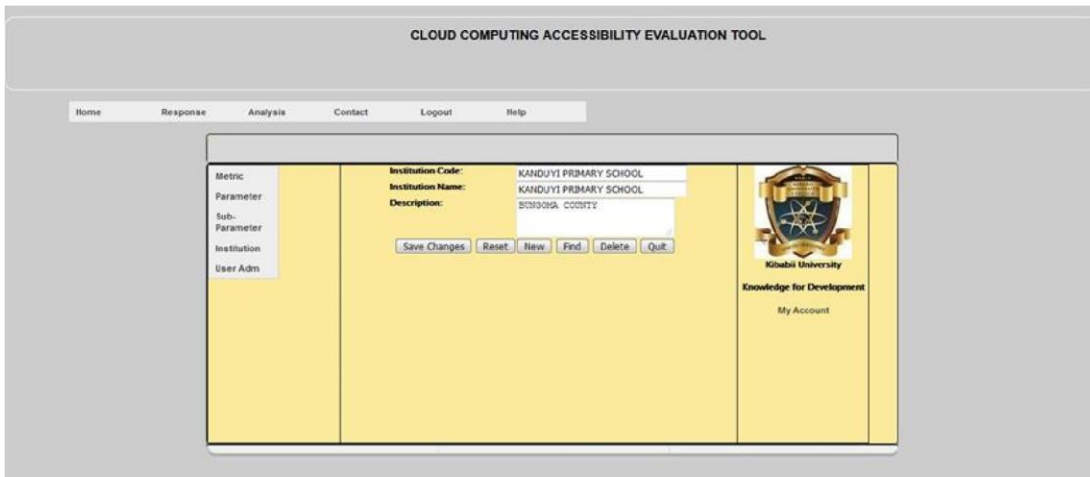


Figure 5: Institution Window

The Analysis menu within the CCAET tool encompasses two essential submenus: Response and Analysis. The Response submenu provides users with an interface to gather feedback from respondents regarding the parameters and sub-parameters associated with each metric. Users can save the responses, effectively registering the feedback provided. Within the Response submenu, users will find a series of questions that require responses from

the respondents. Depending on the question, some responses may require a single option selection, while others may necessitate multiple responses, as illustrated in Figure 6. This functionality enables the systematic collection of feedback, facilitating a comprehensive evaluation of cloud computing accessibility based on the input received from the respondents.

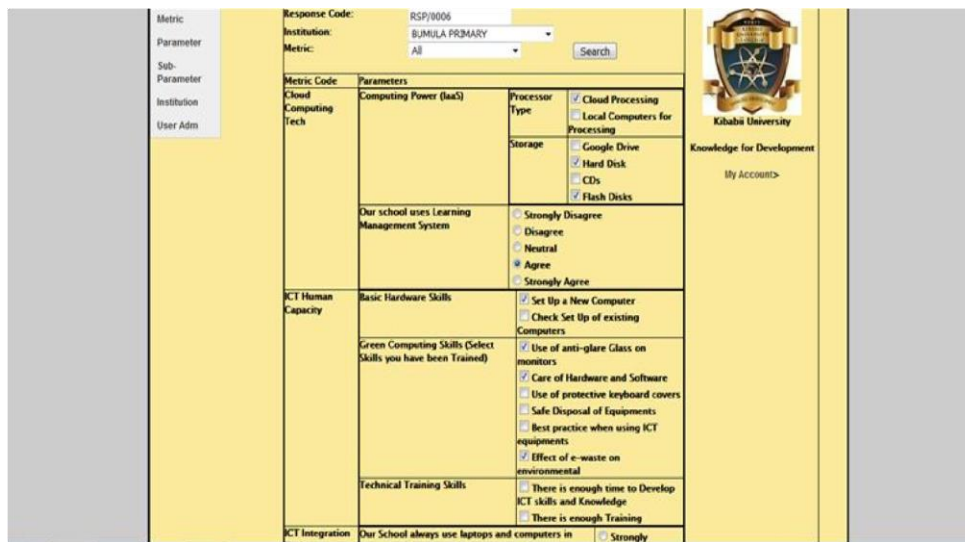


Figure 6: Response window

The Analysis option within the CCAET tool provides users with an Analysis Report window, enabling them to generate reports based on the analyzed responses. This window displays consolidated metrics values, including the actual figures and the average, allowing users to gain insights into the accessibility level of cloud computing in a given primary school. Additionally, the Analysis Report window offers a graphical representation of the metrics values, both for the specific primary school being assessed (in this

case, Bungoma D.E.B as shown in Figure 7) and for all primary schools within the system. This graphical representation enhances the visualization of the accessibility data, making it easier to interpret and compare the metrics across different schools. The Analysis Report functionality empowers users to derive meaningful insights and make informed decisions regarding cloud computing accessibility in primary schools based on the analyzed data.

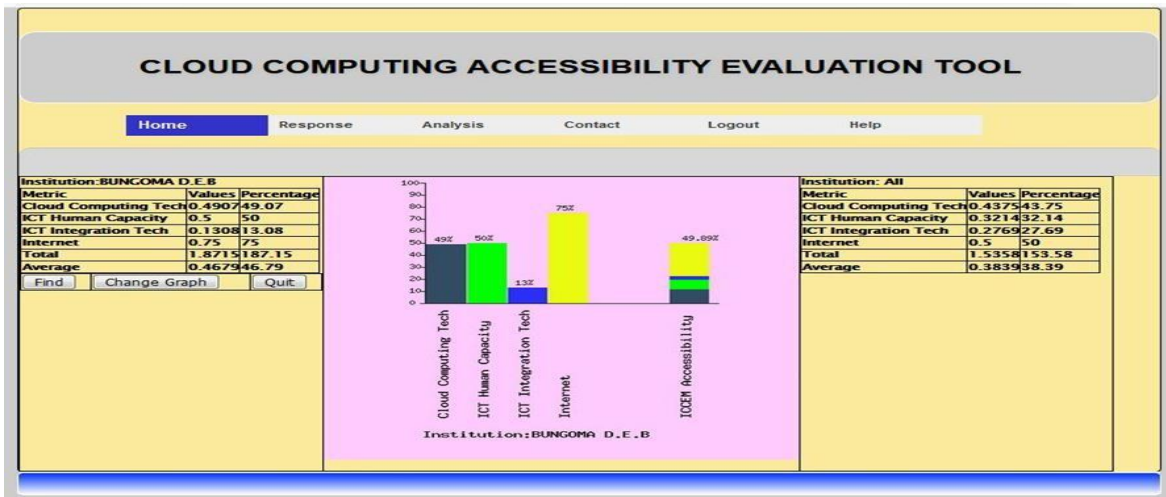


Figure 7: Analysis Window

The Analysis window in the CCAET tool provides users with a graphical representation of the cloud computing affordability level for all primary schools, as depicted in the figure. This graph illustrates the accessibility levels of various aspects, including Cloud Computing Technology, ICT Human Capacity, ICT Integration Technology, and Internet. The graph enables users to visually compare and analyze the affordability levels across different primary schools, facilitating a comprehensive understanding of the overall accessibility landscape. Furthermore, the

Analysis window also presents a consolidated representation of the cloud computing level for a selected primary school, as shown in Figure 8. This consolidated representation allows users to assess and evaluate the accessibility level of the chosen school in a concise and informative manner. By providing both a broader view of accessibility across all schools and a specific analysis of individual institutions, the Analysis window assists users in making data-driven decisions and identifying areas for improvement in cloud computing accessibility.

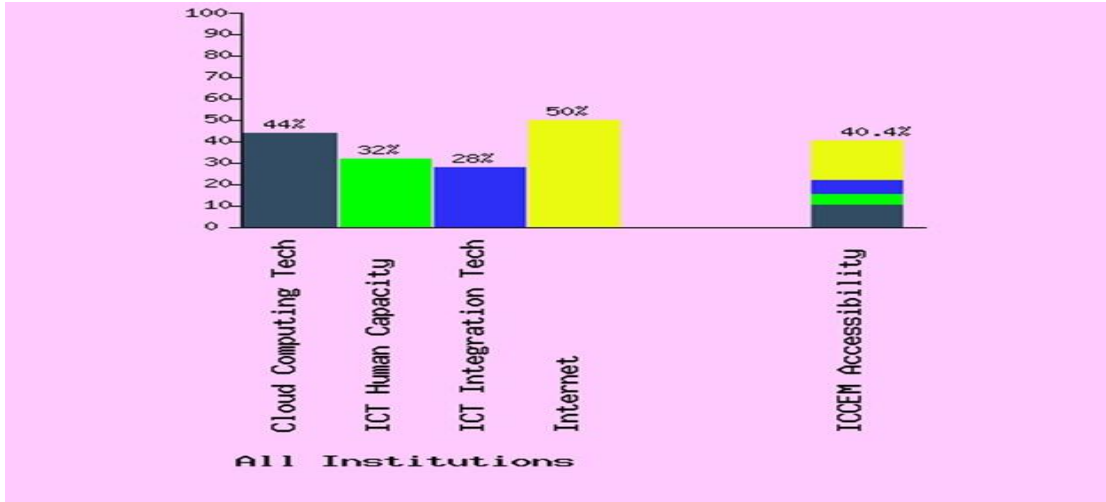


Figure 8: All Institutions Graphics

A sample of the performance of a single primary school is shown in Figure .9:

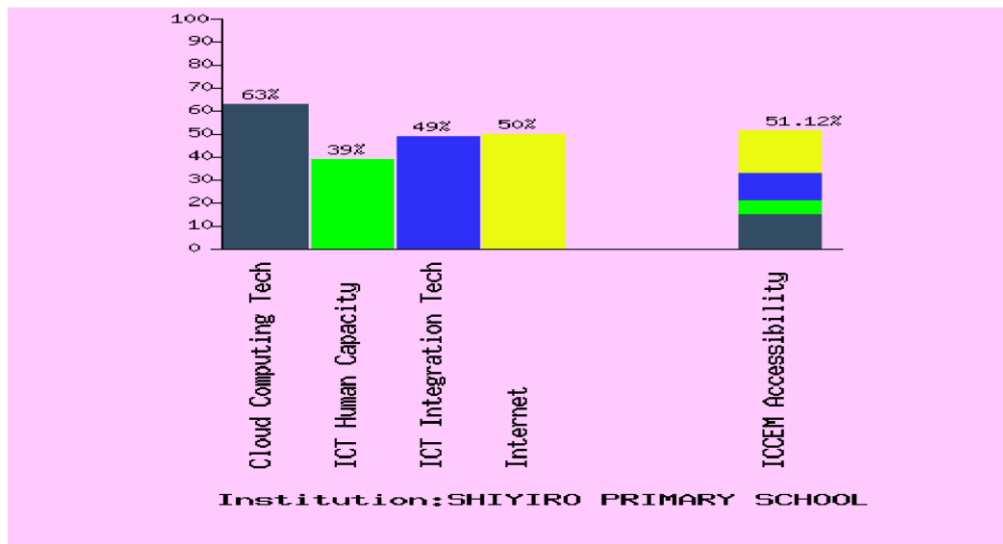


Figure 9: Single Institutions Graphs

The User or Respondent Registration functionality, located under the User menu as depicted in Figure 10, serves as the final aspect to be discussed. This feature enables the entry of new users and respondents into the system. Users can utilize this functionality to add and register individuals who will be accessing and providing feedback through the CCAET tool. By offering an interface for user and respondent registration, the system ensures that all authorized individuals have the necessary access and privileges to utilize the tool effectively. This functionality streamlines the process of onboarding new users and respondents, facilitating their participation in the assessment of cloud computing accessibility within the primary school context.

Figure 10: Respondent Registration

CONCLUSION

The Cloud Computing Accessibility Evaluation Tool (CCAET) presented in this paper offers a comprehensive approach to assess and enhance cloud computing accessibility in primary schools. By incorporating various metrics, parameters, and sub-parameters, the tool enables a thorough evaluation of accessibility levels. The validation testing process confirms the tool's alignment with user requirements, ensuring its effectiveness and suitability for assessing cloud computing accessibility. The CCAET tool's functionalities, including the ability to capture

respondent feedback, generate analysis reports, and manage institutional details, facilitate data-driven decision-making and foster continuous improvement. As cloud computing continues to play a vital role in education, the CCAET tool provides a valuable resource for ensuring inclusive and equitable access for all students in primary schools.

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