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A RAD-Based Approach to eMonevCLC for Monitoring and Evaluation in Community Learning Center

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ABSTRACT

In the realm of education, Monitoring and Evaluation (Monev) play a pivotal role in enhancing the quality and standards within educational institutions. Monitoring involves collecting data to assess the progress of planned school programs, ensuring alignment with intended goals, and identifying potential implementation obstacles. Conversely, evaluation systematically assesses policy effectiveness, serving as the foundation for decision-making and policy formulation. This study focuses on Community Learning Center (CLC) in Sabah and Sarawak, Malaysia, established to meet the educational needs of Indonesian Migrant Workers' children. However, the geographic dispersion of these CLCs poses significant challenges to traditional paper-based Monev methods, necessitating the development of the mobile and web-based eMonevCLC application using the Rapid Application Development (RAD) method and the AppSheet platform. RAD's emphasis on rapid and dependable development cycles, combined with AppSheet's low-code capabilities, facilitates offline functionality and collaborative development. User feedback underscores the application's functionality, effectiveness, and benefit, while also highlighting the need for improved stability in areas with unreliable internet connections. The eMonevCLC application streamlines monitoring and evaluation processes, contributing to enhanced educational quality and transparency in CLC, with ongoing potential for refinements based on user insights. This research offers a comprehensive understanding of the development process and the application's impact on educational institutions, highlighting the importance of adapting to technology-driven solutions in the education sector.

1. Introduction

In the field of education, Monitoring and Evaluation (Monev) represent actions and processes aimed at enhancing the quality and standards within an educational institution, ultimately geared towards improving decision-making [1]. Fundamentally, monitoring involves the collection of data and the measurement of the progress of planned school programs. Through monitoring, we can

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observe whether the execution of these planned programs in educational institutions aligns with the intended goals, thus enabling us to identify and address potential obstacles that may arise during implementation [2,3].

On the other hand, evaluation is a systematic activity conducted to assess the extent to which policies have been effectively implemented, achieved through an investigation of program effectiveness. Evaluation typically measures something against predefined standards or objectives, as stated by Sianipar *et al.,* [4] that its results can serve as a basis for making decisions and policies regarding the institution under evaluation.

Therefore, it can be inferred that the objective of Monev is to gauge the success of the learning environment's implementation and provide a foundation for monitoring the progress of educational programs. This, in turn, contributes to the efforts aimed at enhancing the quality and standards of educational institutions.

At the Community Learning Center (CLC), the implementation of Monitoring and Evaluation is a crucial activity, considering that CLC is an educational institution with a significant presence in various locations in Sabah and Sarawak, Malaysia. As of the end of 2022, there were a total of 156 CLCs, comprising 45 junior high schools and 111 elementary schools [5].

CLC is a formal educational institution under the auspices of the Ministry of Education, Research, and Technology of Indonesia, with the Indonesian School of Kota Kinabalu (SIKK) serving as the coordinating center and flagship school. The locations of CLCs are under the jurisdiction of three Indonesian representation offices in Sabah and Sarawak - the Consulate General of the Republic of Indonesia (KJRI) in Kota Kinabalu, the Consulate General of the Republic of Indonesia (KJRI) in Kuching, and the Consulate of the Republic of Indonesia (KRI) in Tawau. CLC was established to meet the educational needs of the children of Indonesian Migrant Workers (PMI) in Sabah and Sarawak, Malaysia. The establishment of CLC is in accordance with the implementation of the Republic of Indonesia Law Number 20 of 2003, Article 6, paragraph (1), regarding the national education system, which states that every Indonesian citizen aged 7 to 15 years, both domestically and abroad, is obliged to attend basic education at an educational institution [6]. Thus, the existence of CLC ensures that the educational rights of Indonesian Migrant Workers' (PMI) children in Sabah and Sarawak, Malaysia, are served and fulfilled.

The implementation of Monitoring and Evaluation (Monev) at CLC across the three Indonesian representation regions presents a formidable challenge due to the substantial distances between each CLC. This geographical dispersion becomes a significant hurdle, particularly when relying on traditional paper-based assessment methods, leading to a considerable investment of time and effort. Furthermore, the abundant use of paper not only leads to paper waste or Municipal Solid Waste (MSW) [7], despite its potential for recycling and diverse applications [8], but also fails to promote sustainable energy practices. This is significant because energy plays a crucial role as a substantial power source for humans in their daily endeavors [9]. Acknowledging these challenges underscores the necessity for an application system to streamline the Monev process. This technological solution is imperative not only to address the geographical constraints but also to enhance efficiency and overcome the limitations associated with paper-based methodologies.

In the contemporary age of technology and information, the rapid growth of science and technology is evident [10], making it imperative to adapt and utilize beneficial and effective applications. Utilizing an application for Monev activities is considered more effective than traditional paper-based methods. This viewpoint is taken from the previous study [11] that utilizing applications for monitoring and evaluation offers speed, effectiveness, and efficiency.

While the Internet revolution has led to a rapid increase in the number of robots [12], it is crucial to note that internet accessibility has not uniformly improved in all places, including Community

Learning Center (CLC) locations. In fact, some CLCs may entirely lack access to the internet. This limitation can potentially hinder the Monev team in fulfilling their duties. Therefore, to enhance the effectiveness and efficiency of monitoring and evaluation at CLCs, the development of a web-based or mobile application system is necessary. This system should be capable of functioning both online and offline. Consequently, an innovative and reliable approach is required, which involves developing the eMonevCLC application using the RAD method with a low-code platform, AppSheet, which offers a range of features that enable the creation of diverse applications [13].

The development of applications using the RAD method has proven its reliability. As a stated by Hidayat, N., & Hati, K. [14] that the software development process with the RAD method emphasizes a rapid and dependable development cycle, making it a benchmark for creating superior application systems in terms of speed, accuracy, and cost-effectiveness.

The AppSheet platform is distinguished by its low-code characteristics, facilitating rapid development. Furthermore, the application development process with AppSheet ensures minimal maintenance risk and incorporates an offline mode option [15,16], making it particularly well-suited for Community Learning Center (CLC) locations without internet access. However, it is crucial to emphasize the significance of continuously monitoring internet connectivity conditions at CLCs to ensure seamless functionality. This article will comprehensively explore the development of the eMonevCLC application using the AppSheet platform with the Rapid Application Development (RAD) method. Additionally, it will delve into discussions on functionality, effectiveness, and the benefits derived from user feedback.

2. Methodology

Rapid Application Development (RAD) was adopted as the methodology for developing the eMonevCLC application. RAD is an approach to software development that prioritizes speed and adaptability, employing an interactive and evolving method that fosters collaboration between developers and end-users [17]. The selection of RAD for eMonevCLC's development was driven by its ability to swiftly create functional applications and iteratively enhance their quality [18]. Furthermore, RAD emphasizes rapid prototyping and immediate feedback in software development [19], consistently delivering superior and high-quality results compared to alternative approaches like waterfall, agile, scrum, and others [20-22].

AppSheet is the preferred platform for developing the eMonevCLC application. It is a low-code development platform (LCDP) integrated with Google Sheets and Google Drive [23]. AppSheet enables developers to create applications without the need for coding expertise, thereby facilitating a rapid application development process that aligns with the characteristics of RAD [24].

The development process of the eMonevCLC application using RAD encompasses key phases, including requirements planning, user design, construction, and cutover for actual use [25-27], as illustrated in Figure 1.

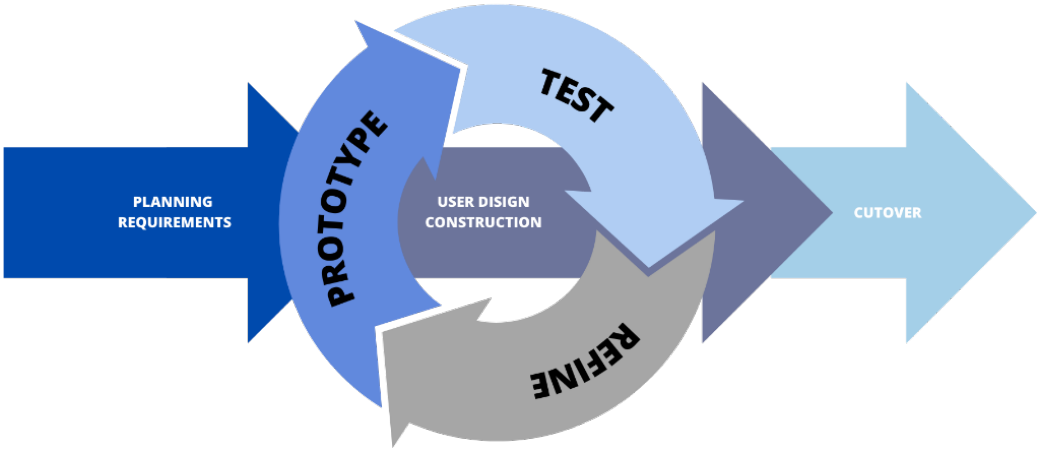

Fig. 1. Rapid Application Development (RAD) Method

3. Results

3.1 Requirements Planning

Requirements Planning involves gathering and defining the requirements to build the application. It typically includes brainstorming sessions between users and developers to identify the project's scope, objectives, and functionalities. The involvement of both parties is crucial, with the goal of creating a clear and comprehensive description of what the application should achieve [28]. During this stage, on-site observations, interviews with CLC teachers, and interviews with users. These interviews are employed to gather the necessary requirements.

3.1.1 On-site observation and interviews with CLC teachers

To obtain a comprehensive understanding of the development of eMonevCLC, it was essential to conduct internet connectivity checks at 156 CLCs. The objective was to ensure that the application could be used and accessed in accordance with the internet network conditions at these CLCs in Sabah and Sarawak. The location and the internet connectivity status at CLCs are shown in Figure 2 and 3, respectively. Internet connectivity checks were carried out in two stages: the first stage involved direct on-site observation conducted from October 22nd to November 6th, 2022, and the second stage consisted of interview with teachers instructing at the CLCs, conducted from August 10th to August 23rd, 2023. The purpose of these interview was to validate the findings of the on-site observations.

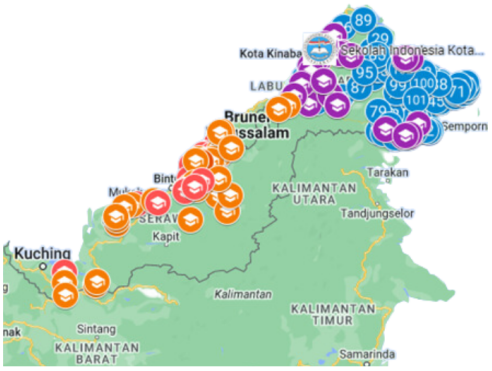

Fig. 2. The locations of CLCs in Sabah and Sarawak

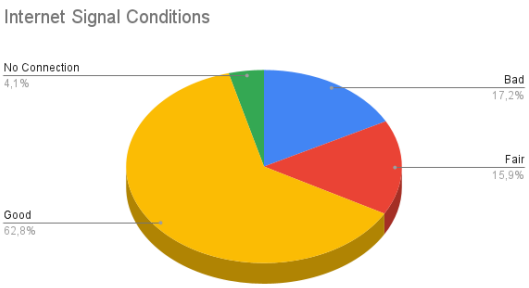

Fig. 3. The internet connectivity status at CLCs

Based on both observations and interviews concluded that the internet connectivity conditions at CLCs were categorized as Good, Fair, Bad, No connection.

i. Good: The internet connection was strong and stable. Users could stream videos, browse websites, and use online applications without any noticeable interruptions.
ii. Fair: The internet connection was acceptable but had occasional slowdowns or interruptions. Users could still perform most online activities, but there might have been some inconvenience.
iii. Bad: The internet connection was weak or unreliable. Users experienced slow speeds, frequent interruptions, and difficulties in accessing online content.
iv. No connection: There was no internet connection available. Users could not access the internet at all.

Based on Figure 2 and 3, the majority of CLCs, approximately 62.8%, had a good internet connection, while 15.9% had an internet connection that was acceptable but had occasional slowdowns or interruptions. 17.2% had a bad internet connection, and 4.1% of CLCs had no internet connection available. In conclusion, most CLCs had a good internet connection. However, the development of the eMonevCLC application should also consider accessibility under less favorable signal conditions, including areas with no internet connection at all.

3.1.2 User interviews

Conducting in-depth interviews with users is crucial for gaining profound insights into the application's development. These users are members of the Monev teams at Sekolah Indonesia Kota Kinabalu, responsible for overseeing Monev activities at CLCs. During these in-depth interviews, various aspects related to application design and construction were discussed.

Based on the in-depth interviews conducted with 30 users during the pre-building phase of the eMonevCLC application have yielded valuable insights that can be categorized into three overarching dimensions: Functionality, Effectiveness, and Benefits. These findings provide essential guidance for the development process, ensuring that the application aligns closely with user needs and expectations.

Functionality emerges as a central pillar in user requirements. Participants emphasized the importance of an intuitive and user-friendly interface, effective main features, stability in internet connection, reliability, efficiency in data management, and ease of form filling. These functional aspects form the foundation of the application, ensuring that users can navigate and utilize its capabilities effortlessly.

The Effectiveness of the eMonevCLC application is another key dimension highlighted in the interviews. Users lauded its ability to enhance CLC evaluation and monitoring processes, making them more manageable and efficient. Furthermore, the application outperforms conventional paper-based approaches, offering rapid and accurate reporting, promoting collaboration, and identifying areas for improvement. These effectiveness features contribute to a more streamlined and efficient workflow.

Beyond functionality and effectiveness, the application's Benefits have a profound impact on users. These benefits encompass enhanced work effectiveness, increased transparency in presenting monitoring results, improved informed decision-making, quicker problem identification, and reduced manual errors and information loss. These advantages collectively enhance the quality and efficiency of the monitoring and evaluation process, ultimately benefiting the entire Monev team.

The findings from the in-depth interviews underscore the critical role that Functionality, Effectiveness, and Benefits play in shaping the eMonevCLC application's development. A user-centric

approach that addresses these dimensions will ensure that the application not only meets but exceeds user expectations, leading to a more effective and efficient CLC monitoring and evaluation process.

3.2 User Design and Construction

Based on the requirements discovery, the eMonevCLC application was developed using AppSheet, a low-code development platform (LCDP) (as shown in Figure 4). This choice was made because AppSheet empowers individuals to create mobile and web applications without requiring coding skills and utilizes Google Sheets as the database and Google Drive for file storage. Additionally, AppSheet offers seamless multiplatform support, enhancing its value for digital innovation [29,30]. Moreover, it provides an intuitive graphical interface for application design and construction [31] and includes an offline mode for use in areas with no internet access.

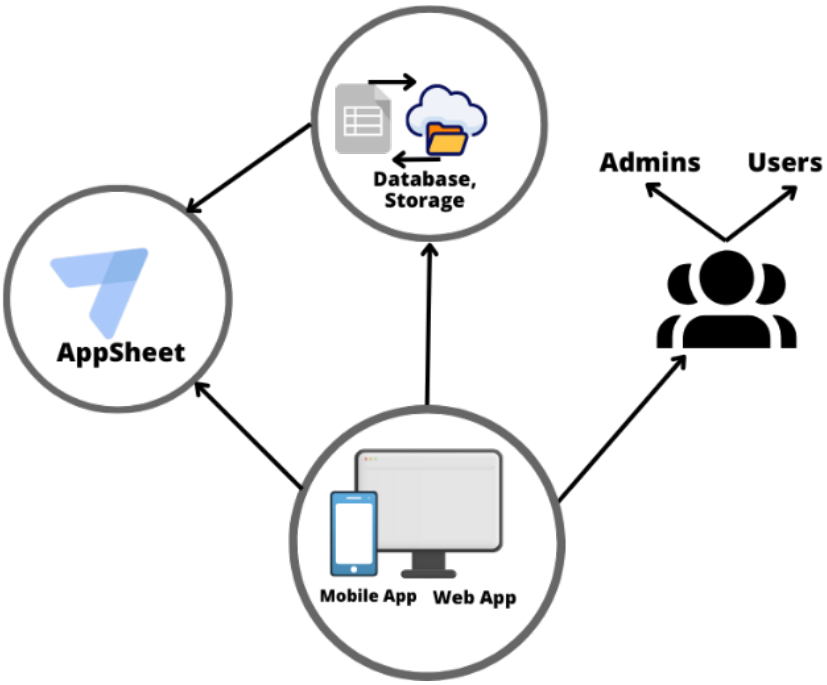

Fig. 4. eMonevCLC Construction

AppSheet is an excellent fit for the Rapid Application Development (RAD) approach for several reasons. First, it facilitates rapid prototyping, enabling swift creation of functional application prototypes, aligning perfectly with RAD's focus on quick prototyping. Second, AppSheet minimizes the requirement for coding [32], making it accessible to individuals with varying coding skills, thus enhancing collaboration within RAD teams. Furthermore, it allows flexible data integration, enabling seamless connection to diverse data sources, a crucial feature for RAD projects with changing requirements. Its visual interface simplifies iterative development based on user feedback, empowering developers to create user-friendly interfaces tailored to end-users' needs. Additionally, AppSheet supports cross-platform development, ensuring applications work well on various devices. Lastly, it promotes collaborative development, enabling multiple team members to work simultaneously on the same project, a vital aspect of RAD projects [33].

3.2.1 The flow of using the eMonevCLC application

As shown in Figure 5, the eMonevCLC is designed to streamline the monitoring and evaluation process for both administrators and users in accordance with RAD characteristics. Administrators are responsible for assigning users to teams based on their Monev placement tasks and adding new teams when necessary. Additionally, administrators hold the authority to perform application maintenance in case of errors and are tasked with generating comprehensive team reports in PDF format.

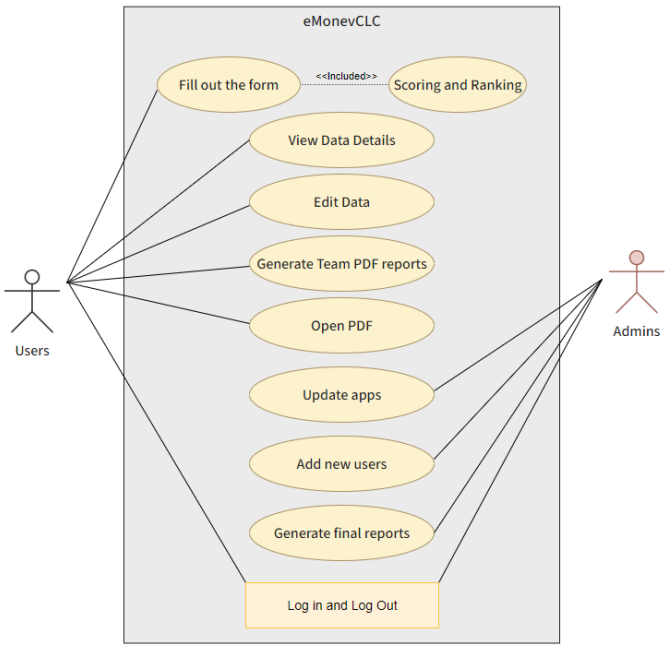

Fig. 5. The Use Case Diagram for using the eMonevCLC application

Users, on the other hand, are categorized into several teams corresponding to the Monev task allocation at CLCs. The primary responsibility of Monev teams is to complete the provided Monev data entry forms within the application and provide assessments based on predefined indicators. Each team has the capability to generate reports in PDF format.

To access the application, users can log in using the user email addresses registered by the administrator in the database. This eliminates the need for users to undergo a registration process within the application, with the aim of expediting the login procedure.

3.2.2 Database preparation and customization

The first stage of creating eMonevCLC using AppSheet begins with the preparation of a new database through Google Sheets. The prepared database includes information such as the names of monitoring and evaluation teams, the list of CLCs for Monev, and the Monev assessment instruments and indicators. Subsequently, the data from Google Sheets is imported into tables in the AppSheet settings for display (as shown in Figure 6).

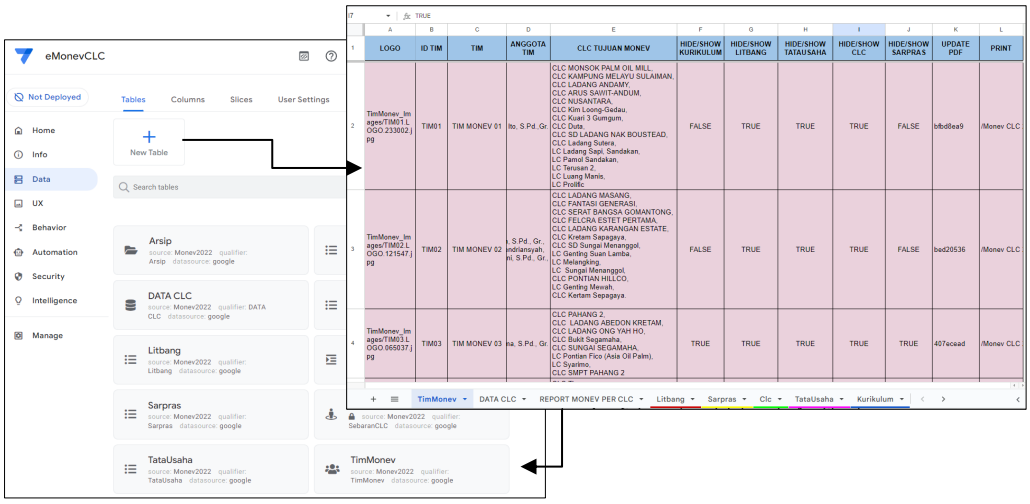

Fig. 6. Importing database to AppSheet

The second stage encompasses UX customization, which, as emphasized by Díaz-Oreiro, *et al*., [34], is a crucial aspect for assessing the quality of a product. The primary objective of UX is to refine the design of eMonevCLC, ensuring a favorable user experience. Figure 7 shows that the process involves the configuration of various View Types, such as list view, table view, card view, image view, calendar view, and others. Additionally, it involves setting up the display for layout, navigation, and menus. The coloring text function serves to highlight important information or differentiate specific elements by applying text color. Color choices in text can also aid in data readability and comprehension. The Branding step allows the addition of the app logo, theme, and background image. The third stage, known as Behavior and Actions settings, involves the use of actions to automate various data-related tasks such as making report in CSV format, adding, editing, deleting, or saving data. In the fourth stage, Automation involves the use of bots to generate reports in PDF format.

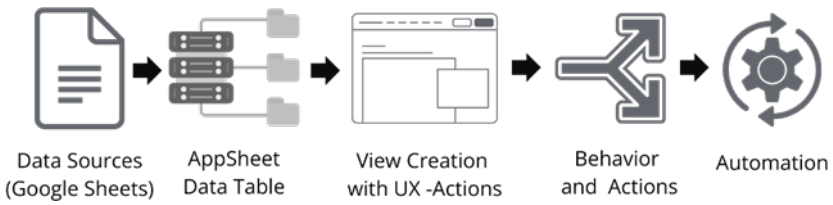

Fig. 7. The stages of database preparation and customization

Before proceeding with deployment, the application undergoes a small-scale test using a prototype version, which is an initial iteration of a product or application created to assess and validate design principles, functionality, and user interactions [35]. A small-scale prototype test, spanning two days, was conducted to obtain feedback from users. This test involved 30 users and revealed that data input and uploads within the application could not be saved to the database without an internet connection. Therefore, improvements were necessary for the application prototype. However, after undergoing inspection and adjustments, this issue was successfully resolved by enabling the Offline/Sync function in the system settings (as shown in Figure 8) [36].

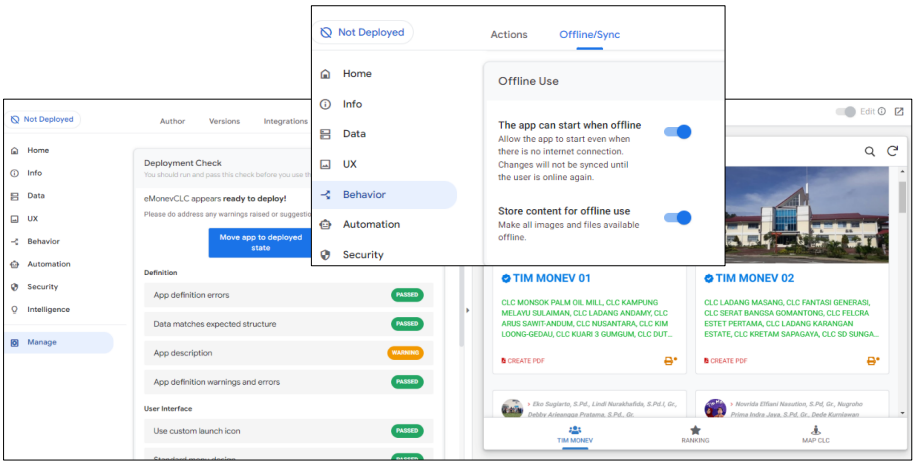

Fig. 8. Configuring the Offline/Sync function

In Figure 9, the application construction process represents the refinement of the prototype results that have been tested. To log into the eMonevCLC application, users need to utilize the "Browser link" for the web version and the "Install link" for the mobile version. Subsequently, users can log in to the application using their respective registered user emails.

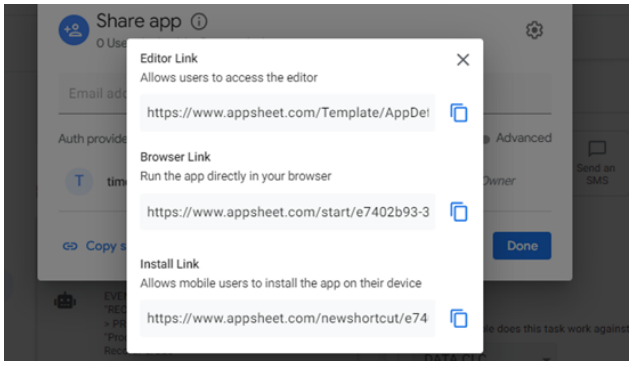

Fig. 9. Configuring the sharing of Browser and Install Links

As shown in Figure 10, when users log into the application, they can select the "Monev Team" menu and choose the team's name designated by the administrators to fill out the eMonevCLC form. Users can also view the populated CLC data and download it in CSV format.

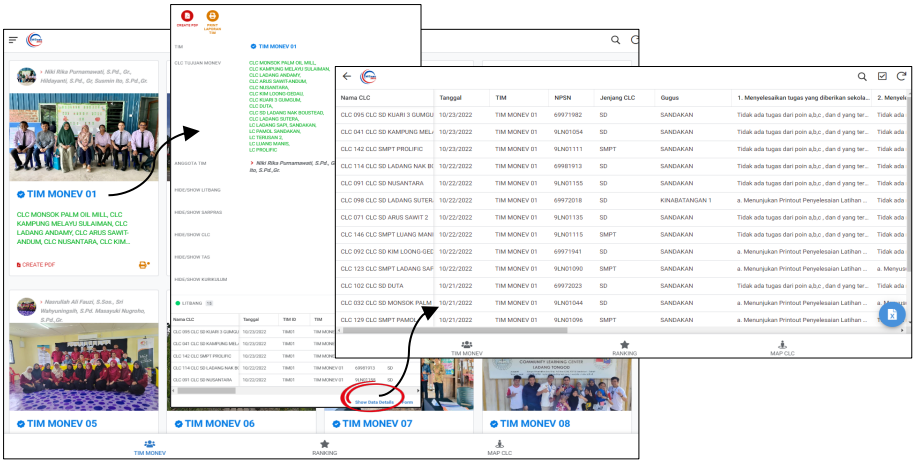

Fig. 10. User Menu and CLC data access

As depicted in Figure 11, users can generate team reports in PDF format by clicking the "Create PDF" button and open the PDF file by pressing the "Open PDF" button.

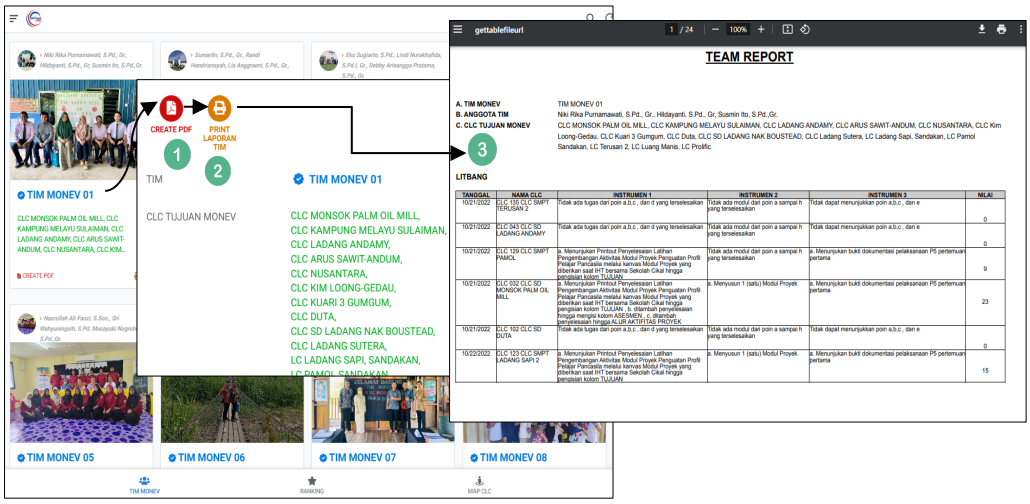

Fig. 11. Creating Monev team reports in PDF format

To view the CLC score results and rankings, users can select the "Ranking" menu along with its description, as shown in Figure 12.

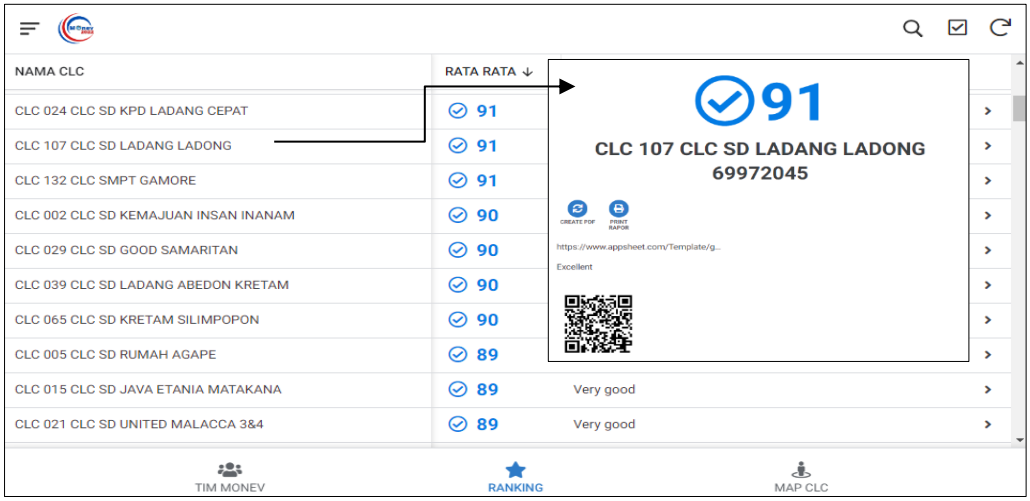

Fig. 12. Displaying the score and ranking from evaluations for each CLC

As depicted in Figure 13, both administrators and users can create CLC reports in PDF format by clicking the "Create PDF" button and then open the PDF file by pressing the "Open PDF" button. The data and scores presented in the PDF are the outcomes of the Monev team's form submissions. And to log out, users can simply click the "Log Out" button available within the application. Figure 14 shows the eMonevCLC application interface on smartphone version.

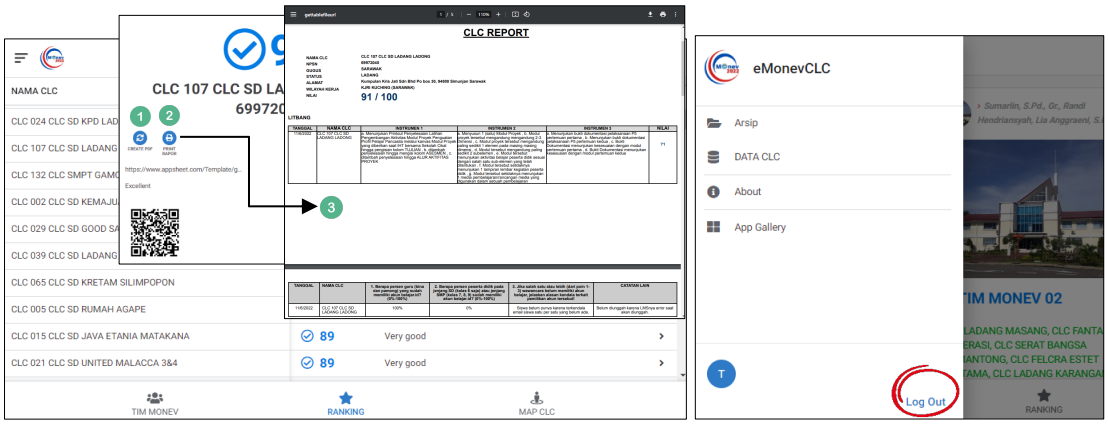

Fig. 13. Generating the Monev reports for each CLC in PDF format and Logout interface

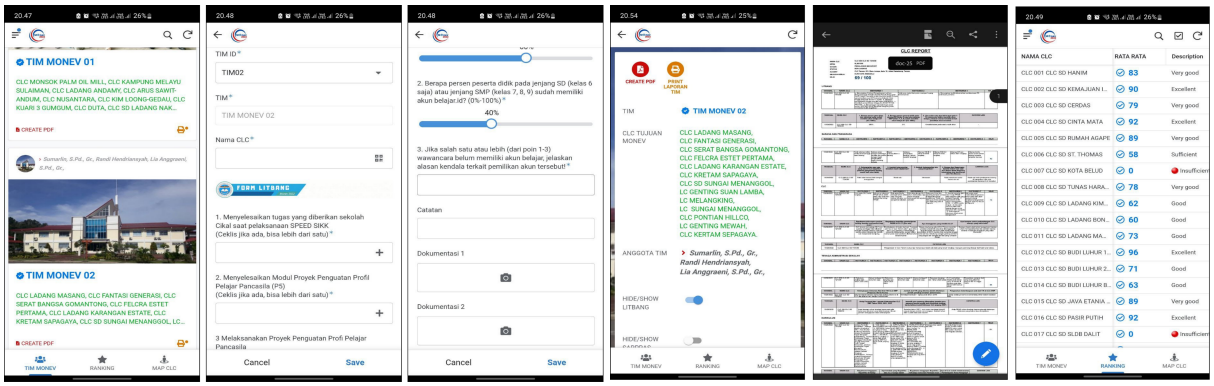

Fig. 14. eMonevCLC application interface on smartphone version

3.3 User Feedback

To evaluate user opinions and satisfaction regarding the functionality, effectiveness, and benefits of the eMonevCLC application, a survey using a Likert scale was conducted. This psychometric tool, as described by Improta *et al.,* [37], is employed to gauge user satisfaction levels and opinions. The survey involved 30 members of the Monev team at Sekolah Indonesia Kota Kinabalu, comprising 21 male and 9 female respondents. It utilized a 5-point Likert scale, spanning from "Strongly Disagree" to "Strongly Agree," and encompassed 15 questions related to the application's functionality (Navigation Interface, Main Features, Stability, Data Management, Form Filling), effectiveness (Evaluation and Monitoring, Comparison with Conventional Approach, Reporting, Collaboration, Problem Identification), and benefits (Job Effectiveness, Transparency, Informed Decision-Making, Problem Identification Speed, Error Reduction).

The results are overwhelmingly positive, with every respondent strongly agreeing (100%) that the application has a user-friendly interface (average score: 4.7) and is effective in various aspects, including CLC evaluation and reporting (average scores: 4.53 to 4.77). Collaboration and transparency are also highly rated (average scores: 4.63 to 4.67). While some areas scored slightly lower (76.67% to 80%), the overall consensus is positive. For detailed survey results, refer to the Table 1 below:

Table 1
The results of responses from 30 participants

No	Question	Average Score	Percentage (%)
1.	The eMonevCLC application features a user-friendly interface for easy navigation.	4.7	100
2.	The main features of the eMonevCLC application function effectively.	4.3	96.67
3.	The eMonevCLC application experiences no disruptions or errors when the internet connection is not stable	3.8	76.67
4.	Managing data and importing PDF files within the eMonevCLC application is easily accomplished	4.3	96.67
5.	Filling out forms in the eMonevCLC application is straightforward.	4.53	100
6.	With the eMonevCLC application, the process of CLC evaluation and monitoring becomes more manageable and efficient.	4.67	100
7.	The use of the eMonev CLC application is more effective than conventional paper-based approaches.	4.7	100
8.	The eMonev CLC application facilitates rapid and accurate reporting of monitoring results	4.77	100
9.	The eMonev CLC application supports collaboration and information sharing among users/teams.	4.63	96.67
10.	The eMonev CLC application helps identify areas that require improvement in CLC management.	4.47	93.33
11.	The use of the eMonev CLC application enhances the effectiveness of my work.	4.57	96.67
12.	The utilization of the Monev CLC application increases transparency in presenting monitoring result information.	4.67	96.67
13.	The use of the eMonev CLC application contributes to more informed decision-making.	4.53	93.33
14.	The use of the eMonev CLC application expedites the problem identification process in CLC	4.2	80
15.	The use of the Monev CLC application helps minimize manual errors and reduces the risk of losing critical information.	4.47	93.33

The survey results reveal a highly positive reception of the eMonevCLC application among its users. Most respondents expressed satisfaction with its user-friendly interface, effective features, and its ability to enhance CLC evaluation and monitoring. Additionally, the application was perceived as more effective than traditional paper-based methods and was commended for facilitating rapid and accurate reporting, supporting collaboration, and increasing transparency. However, some respondents noted room for improvement in terms of stability, problem identification speed, and the identification of areas requiring improvement. Overall, the eMonevCLC application appears to have a significant positive impact on users, enhancing their work effectiveness and contributing to informed decision-making. Figure 15 shows the chart of the survey results from 30 respondents.

As depicted in Figure 15, The overwhelmingly positive feedback on the eMonevCLC application is a testament to its effectiveness in improving CLC management processes. The high average scores and percentage agreement in various aspects, such as user-friendliness and enhanced effectiveness, suggest that the application meets the needs and expectations of the users.

However, the areas identified for improvement, such as performance in unstable connectivity (Q3) and problem identification speed (Q14), should not be overlooked. Addressing these issues could lead to even higher user satisfaction and a more seamless CLC management experience. Continuous feedback and iterative development will be essential to refine the application further and ensure it continues to meet user expectations.

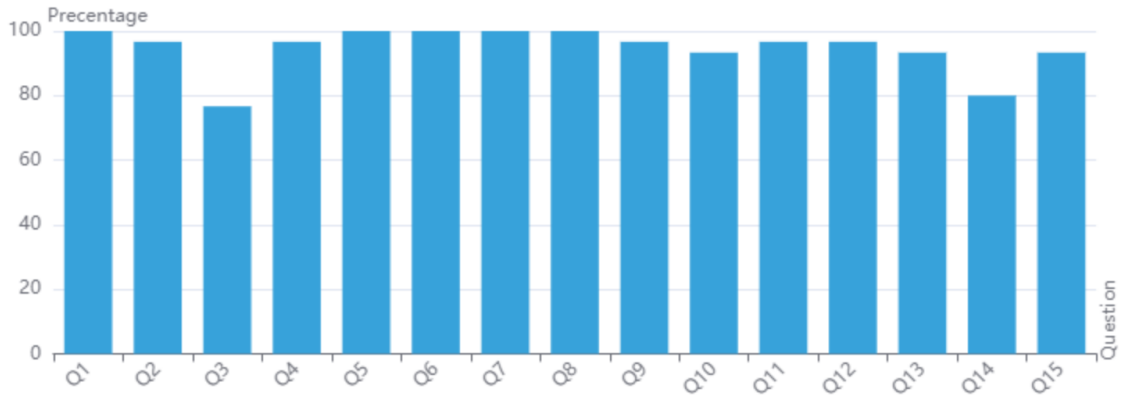

Fig. 15. Chart of the survey results from 30 respondents

4. Conclusions

The development of the eMonevCLC using AppSheet with RAD methodology has revealed vital insights. Feedback has underscored the need for improvements, particularly in addressing stability concerns, notably internet connectivity. Neglecting these issues may lead to user frustration, data management delays, and decreased efficiency.

Moving forward, we plan to adopt a continuous and iterative development approach, guided by user feedback to enhance stability and performance within the AppSheet platform. Prospective enhancements, such as real-time data synchronization and expanded reporting, align with RAD principles. It's worth noting that these findings pertain to a specific user group and context, and variations in connectivity and preferences may exist elsewhere. Our unwavering commitment lies in delivering a robust and user-friendly eMonevCLC application, empowering Monev teams and advancing educational standards for Indonesian Migrant Workers' (PMI) children.

To proceed, the development team will prioritize stability enhancements, with a specific focus on offline functionality in the AppSheet. Regular user testing and feedback collection will be integrated into the development process to ensure ongoing refinements. Additionally, we recognize the importance of continuously monitoring internet connectivity conditions at CLCs. As the project unfolds, our vision of a future where technology bridges educational gaps, ensuring equitable access and quality learning for all, remains steadfast. This work underscores the adaptability and responsiveness of modern software development practices, driven by user-centered design and iterative development facilitated by platforms like AppSheet.

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