

Performance Analysis of Family Welfare Empowerment Application: A Kanban Method Approach

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ABSTRACT

This research examines the application of the Kanban method in testing a family welfare empowerment application. The Kanban method, initially developed by Toyota in manufacturing, has been effectively applied in software development. This study involves a series of tests involving various features within the application, such as user registration, village data collection, processing of the family welfare empowerment data at the Village/District level, and more. The test results show that most tests were successful, highlighting the application's success in executing essential functions such as user registration and event scheduling. However, some tests failed, primarily in inputting village, hamlet, and community unit data. These results indicate that using the Kanban method in testing a family welfare empowerment application can potentially enhance development and testing efficiency. Metrics such as testing time, test success, and time efficiency have provided valuable insights into the application's performance. In conclusion, this testing provides a foundation for further application development, focusing on improving the areas that experienced testing failures. This research also opens up opportunities for further studies on using the Kanban method in software testing in various other application development contexts.



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I. INTRODUCTION

Empowering family welfare has become a crucial topic in the current social and economic context because the family is a fundamental societal unit [1]. Family welfare profoundly impacts individual development, social relationships, and community stability. Economically, prosperous families contribute to economic growth through enhanced productivity of their members. Furthermore, considering shifting social dynamics and contemporary challenges, such as urbanization and technological advancements, empowering families through applications can serve as a vital means to improve access to education, healthcare, and economic opportunities [2]. Hence, exploring the performance analysis of family welfare empowerment applications using the Kanban method becomes relevant in optimizing families' contributions toward social well-being and economic growth [3]. Empowering families can have a far-reaching positive impact on society as

a whole. By providing support, knowledge, and skills to families, individuals within the community can better understand their rights, optimize education and employment opportunities, and enhance their understanding of health and family planning [4]. This fosters personal development and empowerment within the family unit and generates a ripple effect throughout the broader community. Empowered families have the potential to create healthier environments, offer improved education for children, and contribute to economic empowerment and social welfare enhancement [5]. Thus, family empowerment is crucial in building a more inclusive, competitive, and sustainable society in the long term [6]. The role of technological applications in supporting family welfare empowerment is pivotal. These applications facilitate access to crucial information, services, and resources that empower families to make informed decisions about their health, education, and economic prospects [7]. Through user-friendly interfaces, these technologies enable

families to manage their financial matters, access educational resources, and participate in community initiatives, thus fostering active engagement in improving their overall well-being [8]. Furthermore, digital platforms provide a means for families to connect with support networks, share experiences, and learn from each other, enhancing their sense of belonging and social capital [9]. Consequently, technological applications transform family agency and societal well-being by promoting accessibility, education, and connectivity for families across diverse socioeconomic backgrounds. Developing applications to support family empowerment presents challenges from various societal contexts and technological complexities. Ensuring inclusivity and accessibility of the application across varying socioeconomic backgrounds and technical literacy levels is a significant challenge. Maintaining data security and privacy while collecting sensitive personal information to tailor services to individual needs requires robust cybersecurity measures [10]. Technical challenges such as creating intuitive user interfaces and seamless integration of complex functionalities can hinder user adoption [11]. Furthermore, staying abreast of rapidly evolving technological trends and user preferences poses an ongoing challenge [12]. Balancing these multifaceted challenges is crucial to creating practical and sustainable applications that genuinely empower families and contribute positively to their well-being.

The primary objective of this research is to analyse the performance of testing in the context of family welfare empowerment applications. Through a comprehensive examination of testing outcomes and methodologies, the study aims to identify factors influencing the success or failure of testing procedures within the domain of family welfare applications. By evaluating testing methodologies' efficiency, effectiveness, and reliability, the research seeks to extract insights that can guide the enhancement of testing processes, contributing to the overall quality and functionality of family welfare empowerment applications [13]. This study's analysis of testing performance can significantly contribute to advancing family empowerment application development. Valuable insights can be gained by dissecting the testing outcomes, identifying patterns of success and failure, and assessing the efficiency of testing methodologies. These insights, informed by empirical data [14], can guide developers in refining the application's features, enhancing user experience [15], and addressing specific challenges such as data validation and complex functionalities [16]. Additionally, by recognizing the strengths and weaknesses of different testing procedures, the research can inform the allocation of resources, ensure more thorough testing coverage, and ultimately create more robust and user-centred family empowerment applications.

Previous research has identified the needs and challenges of family empowerment through applications, shedding light on crucial aspects of this domain. Studies have emphasized the importance of tailoring applications to address families' diverse needs and preferences, acknowledging that a one-

size-fits-all approach may not effectively cater to the unique circumstances of each family unit [17]. Additionally, research has highlighted challenges related to data security and privacy in applications aimed at family welfare, underlining the significance of building robust cybersecurity measures to safeguard sensitive information [18]. These findings underscore the necessity of developing technologically driven solutions that align with families' nuanced needs and concerns while maintaining a secure and user-friendly environment. Previous research has employed various methodologies to measure the effectiveness of applications in the context of family welfare empowerment. Studies have utilized user surveys and feedback to assess user satisfaction, perceived utility, and ease of use, providing insights into the overall impact of the application on families [19]. Additionally, researchers have conducted longitudinal studies to analyse changes in family behaviour and well-being following the implementation of the application, providing a comprehensive understanding of its influence [20]. These studies have employed mixed-methods approaches, combining qualitative and quantitative data, to gauge the holistic effectiveness of applications in achieving their intended goals of enhancing family welfare and empowerment. In the context of family welfare empowerment, various testing methods are commonly employed to evaluate the effectiveness and functionality of applications. Usability testing, involving real users navigating the application, offers insights into user interactions, preferences, and areas of improvement [21]. Functional testing is used to verify if individual features and functionalities of the application work as intended, ensuring the application meets its specified requirements [22]. Performance testing evaluates the application's performance under different conditions, such as high user loads, providing insights into its responsiveness and stability [23]. These testing methods collectively contribute to a comprehensive assessment of application quality, ensuring its alignment with the goals of family welfare empowerment. The utilization of the Kanban method in application development and testing has been explored in previous research. Kanban, a visual management tool, has been adopted to enhance workflow management, prioritize tasks, and ensure smooth collaboration among development teams, thus facilitating iterative development and testing processes [24]. Studies have highlighted its effectiveness in improving efficiency, minimizing bottlenecks, and enabling real-time progress monitoring [25]. By visualizing the workflow, Kanban allows teams to allocate resources judiciously, leading to more timely and informed decision-making [26]. This method's integration with Agile principles aligns well with the iterative nature of software development, making it conducive for managing complex projects like family welfare empowerment applications.

A notable research gap can be identified based on the existing literature regarding analysing testing performance in family welfare empowerment applications. While there is

research on testing methodologies, user satisfaction, and the effectiveness of these applications [27], there appears to be a scarcity of in-depth studies specifically addressing the challenges and strategies for improving the testing processes in this domain. Most literature focuses on the user-facing aspects and impacts of such applications, leaving room for more comprehensive investigations into the intricacies of testing methodologies, identifying testing bottlenecks, and optimizing testing procedures for family welfare applications. This research gap suggests a need for more targeted studies that delve deeper into the nuances of testing within the context of family empowerment applications to enhance their overall quality and impact. The limited research on evaluating testing performance in family welfare empowerment applications using the Kanban method can be attributed to several factors. Firstly, adopting the Kanban approach in the context of family welfare applications is a relatively recent development, and research often lags behind emerging practices. Secondly, the domain of family welfare empowerment may not have garnered as much attention in the technology and software testing research community compared to other sectors, resulting in a lack of focus on testing methodologies specific to this domain. Furthermore, the application of Kanban in software development and testing has historically been more closely associated with broader software engineering practices rather than domain-specific applications. Hence, there exists a gap in the literature regarding the tailored implementation of Kanban in the family welfare empowerment context, presenting an opportunity for future research to explore this intersection.

This research is anticipated to contribute to the existing knowledge gap regarding analysing testing performance in family welfare empowerment applications in several ways. Firstly, it provides a dedicated exploration of the application of the Kanban method, a relatively under-researched aspect in the context of family empowerment applications [28]. By systematically examining testing outcomes and methodologies, it seeks to bridge the gap in understanding the effectiveness of testing procedures tailored to this specific domain. Additionally, this research focuses on the nuances and challenges unique to family welfare applications, aiming to unearth insights that can be applied to optimize testing processes, thereby enhancing the quality and impact of these applications in improving family well-being [29]. Doing so lays the foundation for a more informed and efficient approach to testing within this critical area, ultimately benefiting developers and end-users. The potential impact of this performance testing analysis on the future development of family empowerment applications is significant. By identifying areas of testing efficiency and challenges, this research can inform the development process, facilitating the creation of more robust, user-centred applications. The insights gained from this analysis can guide developers in streamlining testing procedures [30] and optimizing the user experience, ultimately enhancing user satisfaction and engagement. Additionally, this research contributes to the

broader understanding of the intersection between technology and family welfare, paving the way for more tailored and effective solutions [31]. It lays the groundwork for a systematic approach to testing that can lead to the creation of applications that better serve the needs of families, potentially improving their overall well-being and quality of life [32]. The findings of this research can offer practical guidance for application developers and practitioners seeking to harness the potential of the Kanban method to enhance testing performance in family empowerment applications. By pinpointing areas of testing efficiency and inefficiency [33], this study equips developers with a roadmap to optimize their testing procedures and streamline workflows, ultimately improving the quality and user experience of these applications. It also underscores the importance of iterative development and real-time monitoring facilitated by Kanban [34], enabling practitioners to adopt a more adaptive and responsive approach to application development. Additionally, the research highlights the significance of aligning Kanban principles with the unique needs of family welfare applications [35], guiding practitioners in tailoring testing methodologies to this specific domain, thus enhancing the overall effectiveness of testing strategies.

II. METHODOLOGY

The tested Family Welfare Empowerment Program (PWEP) application is software designed to support and enhance family well-being through various features and functions. This application encompasses a wide range of parts, such as user registration, village data collection, community data collection, sub-neighbour data collection, sub-district data collection, Community Empowerment data collection, Village/Neighbour-level PWEP (Family Welfare Empowerment Program) data management, sub-neighbour PWEP data management, sub-district Empowerment of Family Welfare data management, Family Card data management, resident data management, Household Land Use data management, Household Industry data management, Cadre data management, resident activity data management, and mother and baby data management. Its purpose is to facilitate families' access to relevant services, provide a platform for efficient data management, and enable ongoing performance evaluation in family empowerment. In the testing context, this application is evaluated for its effectiveness, reliability, and functionality efficiency, focusing on using the Kanban method in development and testing.

The Kanban testing method is an approach in software testing inspired by lean management practices and the Kanban method in development [36]. This method represents testing tasks as Kanban cards on a Kanban board, with each card depicting a testing task or scenario. The Kanban board illustrates the testing workflow, from planning to completion [37].

The Kanban method revolves around visualizing workflow, controlling the flow of work, and reducing waste

in processes. In application development and testing, the Kanban method is applied by organizing tasks on a Kanban board, which consists of columns representing various stages in the development process, such as analysis, design, development, testing, and release. Each task is represented by a card or element that moves through these columns by progress. This method enables teams to visualize the workflow, identify bottlenecks, and prioritize tasks based on need. With better control over the flow of work, application development and testing can be conducted more efficiently, be responsive to changes, and focus on delivering added value to the project.

The fundamental concept of the Kanban method is a visual system used to manage workflow more efficiently. This method originated from management practices in manufacturing industries but was later adapted for software development. In Kanban, work is represented by "cards" (or "items") that are moved through a Kanban board with several columns representing different statuses, such as "To Do," "In Progress," and "Done." The main principle is to limit work in progress to avoid overloading and to focus on completing ongoing tasks before starting new ones.

The Kanban method is applied in software development and testing by structuring workflow and testing more systematically. Work is broken down into smaller tasks and placed in the "To Do" column. The item is moved to the "In Progress" column as a task is being worked on. Once the job is completed, the thing is transferred to the "Done" column.

In the context of application testing, the Kanban method can be applied similarly. A card represents each testing item, and the Kanban board defines the testing workflow. Tasks such as writing test scenarios, executing tests, and reviewing test results are described in the corresponding columns on the Kanban board.

Kanban boards typically consist of a large table with columns representing various workflow stages. Here is a simple illustration of a Kanban board.

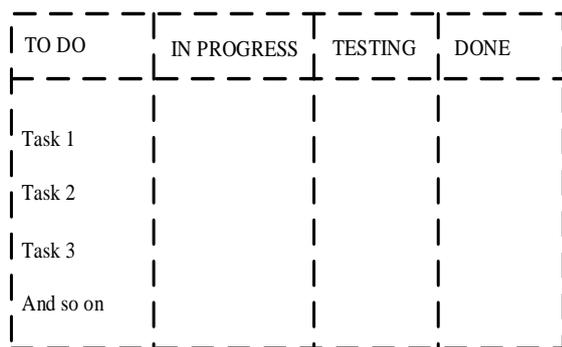


Figure 1 Illustration of a Kanban board

Kanban boards typically consist of several columns, usually including:

- 1) *To Do*: This is a list of tasks or work that has not yet started or been completed.

- 2) *In Progress*: Tasks or team members are working on them.
- 3) *Testing*: The task is completed but needs to be reviewed or confirmed before being considered finished.
- 4) *Done*: The task is completed and ready to be delivered or used.

Team members often use cards or sticky notes to represent each task or item on the list and move these cards from column to column as the work progresses. This allows the team to see the work status and identify tasks requiring attention visually. Kanban boards are flexible tools that can be customized to the needs of a specific group or project. They help manage workflows, enhance collaboration, and track project progress in a clear and easily understandable way.

Mathematical equations related to the Kanban method are uncommon in application development and testing. However, if you want to provide an example relevant to workflow, you can consider metrics such as Lead Time, which calculates the time taken to complete a task from start to finish. The mathematical equation for Lead Time can be expressed in LaTeX format as follows:

$$\text{Lead Time} = \frac{\text{Total Task Completion Time}}{\text{Number of Tasks Completed}}$$

Please note that this mathematical equation is just an example that may be related to the Kanban method in the context of application development and testing. More specific equations can be developed based on the needs and metrics relevant to your project.

Testing in the context of family welfare empowerment application development involves a series of steps, acceptance criteria, testing scenarios, and measured performance metrics:

1) *Testing Steps*:

- **Test Planning**: The initial phase involves test planning, including defining testing goals, scope, and required resources.
- **Test Design**: Creating scenarios, determining test data, and designing test scripts.
- **Test Execution**: Running the testing scenarios using the prepared test scripts.
- **Monitoring and Reporting**: Monitoring test outcomes, recording defects (bugs), and compiling test result reports.
- **Evaluation and Improvement**: Analysing test results to improve the application, retesting, and resolving issues.

2) *Acceptance Criteria*: These criteria determine whether the application has passed testing. They can encompass various aspects, such as functionality, performance, security, and overall application quality.

3) *Testing Scenarios*: Testing scenarios are steps or situations that simulate real-world application usage. This

includes interaction with various application features and various problems that may occur.

4) *Performance Metrics*: These metrics measure application performance during testing. They can include aspects like response time, loading speed, stability, and resource usage like CPU and RAM.

The entire testing process aims to ensure that the application functions correctly, meets user needs, and minimizes the risk of errors when used in a production environment. Test results are the basis for application improvement and preparation for its release to end-users.

III. RESULTS AND DISCUSSION

Testing various features of the family welfare empowerment application is a crucial step in comprehensively evaluating its performance. In detail, this involves examining key functionalities such as user registration, village data collection, processing of family welfare empowerment data at different administrative levels, and the quality of data input, particularly related to village, hamlet, and community unit data. User registration tests assess the efficiency of the registration process, including data validation and compliance with application rules. Village data collection tests focus on the application's ability to accurately gather village-related information, including data input accuracy and retrieval capabilities. Evaluation of data processing at the village level ensures conformity with established guidelines and safeguards against data loss or processing errors. Quality data input tests involve validating data accuracy and detecting errors like invalid, duplicate, or incomplete data. Lastly, tests for village, hamlet, and community unit data collection examine the application's proficiency in retrieving detailed information at these levels and executing specialized functions. Detailed recording of test results, including identified errors, forms the foundation for further application development and improvement efforts. Identifying issues and prioritizing necessary enhancements are critical to enhancing the application's performance and reliability in empowering family welfare.

Time efficiency in the Family Welfare Empowerment application refers to how quickly the application can perform various functions while maintaining data security. It encompasses the speed at which tasks like data collection and processing are executed, ensuring a responsive user experience. Simultaneously, it emphasizes safeguarding sensitive data to prevent unauthorized access or data breaches. Balancing speed and data security is crucial for the application's smooth operation without compromising data integrity.

The performance of the Kanban method in testing the Family Welfare Empowerment application demonstrates advantages in managing testing workflow, fostering closer team collaboration, swift adaptation to changing

requirements, and flexible control over testing timelines. Kanban's success relies on the team's understanding of this method and their ability to communicate effectively. In the context of this application, Kanban has facilitated the identification of both successes and failures in testing, enabling necessary improvements and maintaining efficiency in application development.

A. Results

The results and discussion of this research are presented as follows.

TABLE 1.
FAMILY WELFARE EMPOWERMENT APPLICATION TESTING RESULTS

| No | Feature | Test Name | Test Time (hours) | Test Success |
|----|---|---|-------------------|--------------|
| 1 | User Registration | User Registration | 2.5 | Successful |
| 2 | User Registration | Event Scheduling | 3.0 | Successful |
| 3 | Village Registration | Village Data Input | 4.2 | Failed |
| 4 | Village Registration | Village Data Search | 5.5 | Successful |
| 5 | Hamlet Registration | Hamlet Data Input | 3.8 | Failed |
| 6 | Hamlet Registration | Hamlet Data Search | 4.9 | Successful |
| 7 | Neighbour Association Registration | Neighbour Association Data Input | 3.5 | Successful |
| 8 | Neighbour Association Registration | Neighbour Association Data Search | 4.0 | Failed |
| 9 | Neighbour Unit Registration | Neighbour Unit Data Input | 2.8 | Successful |
| 10 | Neighbour Unit Registration | Neighbour Unit Data Search | 3.2 | Successful |
| 11 | Community Group Registration | Community Group Data Input | 4.5 | Failed |
| 12 | Community Group Registration | Community Group Data Search | 5.0 | Successful |
| 13 | Processing of Village/Neighbour-level Family Welfare Empowerment Data | Village-level Family Welfare Empowerment Data Input | 3.7 | Failed |
| 14 | Processing of Village/Neighbour-level Family Welfare Empowerment Data | Village-level Family Welfare Empowerment Data Search | 4.1 | Successful |
| 15 | Processing of Neighbour Association-level Family Welfare Empowerment Data | Neighbour Association-level Family Welfare Empowerment Data Input | 2.9 | Successful |

| | | | | |
|----|---|--|-----|------------|
| 16 | Processing of Neighbour Association-level Family Welfare Empowerment Data | Neighbour Association-level Family Welfare Empowerment Data Search | 3.3 | Failed |
| 17 | Processing of Neighbour Unit-level Family Welfare Empowerment Data | Neighbour Unit-level Family Welfare Empowerment Data Input | 2.6 | Successful |
| 18 | Processing of Neighbour Unit-level Family Welfare Empowerment Data | Neighbour Unit-level Family Welfare Empowerment Data Search | 3.0 | Failed |

The table above includes the test results for several family welfare empowerment application features. Each test has a column that lists the test number, the part being tested, the test name, the test time in hours, and the test success status. This data can be used to evaluate the application's performance and identify areas that require improvement.

1) *Testing Success:* Most application tests were successful, with 11 out of 18 tests yielding positive results. This reflects the application's ability to perform essential functions such as user registration, event scheduling, and Neighbour Association and Neighbour Unit data input.

2) *Testing Failures:* Although most of the tests were successful, some failed, particularly those related to village and neighbour data input, Community Group, and the processing of PKK data at the village and neighbour levels, as well as at the Neighbour Association and Neighbour Unit levels. This indicates the presence of issues or bugs that need to be addressed in the application.

3) *Testing Duration:* The time required for testing varies but generally falls within a reasonable range, typically around 2.5 to 5.5 hours. However, it's important to note that longer testing times can disrupt application development efficiency.

4) *Needs Improvement:* These results indicate that there are some aspects of the application that require improvement, particularly in the input of data for neighbours, villages, and community units and the processing of Family Welfare Empowerment data at the village/community level, as well as at the neighbour unit level. The development team should prioritize improvements in these areas to enhance the performance and reliability of the application.

Overall, these testing results provide an initial insight into the performance of the family welfare empowerment application and will serve as a foundation for further development and enhancement of this application.

Various commonly used metrics come into play to assess the application's performance effectively. Firstly, response time evaluates the application's swiftness in reacting to user inputs or requests, ensuring minimal delays in user

interactions. Secondly, throughput gauges the application's capability to handle numerous transactions or requests within a specified timeframe, assessing its ability to concurrently manage high user interaction volumes. Thirdly, the error rate signifies the frequency of encountered errors or bugs during testing, aiming for a low error rate to establish the application's dependability. Fourthly, monitoring resource utilization, including CPU, memory, and network bandwidth, safeguards against server overload and excessive resource consumption. Fifthly, scalability examines the application's adaptability to increased workloads, scrutinizing its performance under typical and peak usage conditions. Sixthly, load testing assesses performance under heavy user loads, pinpointing potential bottlenecks or performance issues. Seventhly, stress testing pushes the application beyond its limits, unveiling vulnerabilities and responses under extreme conditions. Eighthly, availability measures the application's accessibility and operational uptime, which is vital for critical applications. Ninthly, latency quantifies the delay between user actions and application responses, favouring lower latency in real-time or interactive apps. Lastly, scalability under load examines how well the application sustains performance with rising user counts, guaranteeing continued responsiveness during peak usage. These collective metrics offer a comprehensive appraisal of the application's performance, aiding developers in pinpointing improvement areas and ensuring alignment with user expectations.

Testing time metrics, testing success rate, and time efficiency are key indicators that will be used to measure and evaluate the performance of the application and assess whether it aligns with the established targets. Testing time provides an overview of how long the testing process takes, allowing for an examination of whether testing is on track with the planned schedule. The testing success rate measures how many tests were successful, providing insight into how well the application meets requirements and functions effectively. Meanwhile, time efficiency offers an understanding of how efficiently the testing process operates, whether there are avoidable time wastages, and whether the application is tested quickly and efficiently. By utilizing these indicators, we can assess the application's performance in the context of both time and testing quality, ensuring that the application achieves its established development goals.

Metrics for testing an application with the Kanban method can be visualized as follows.

1) *Testing Time:* This metric tracks the time taken to complete various testing tasks. It can be displayed as a timeline or a bar chart, showing the duration of each testing phase. Ideally, the chart should indicate steady progress and minimal delays.

2) *Testing Success Rate:* A pie chart or donut chart can represent this metric. It illustrates the percentage of successful tests versus failed tests. Green for successful tests and red for failures can be used for clarity.

3) *Time Efficiency*: A line graph can be used to depict the efficiency of testing over time. It should ideally show a steady or improving trend, indicating that testing is becoming more efficient as the project progresses.

4) *Task Distribution*: A stacked bar chart can visualize the distribution of testing tasks among team members. It can show who is working on what and how tasks are distributed over time.

5) *Bug Tracking*: A scatter plot or a heatmap can be used to display the number and severity of bugs found during testing. The x-axis can represent time, and the y-axis can represent bug severity, while the size or colour of each point represents the number of bugs.

These visualizations help teams monitor progress, identify bottlenecks, and make data-driven decisions to improve testing efficiency and application quality.

B. Discussions

The testing results have significantly contributed to attaining the research objectives in developing the family welfare empowerment application. Evaluating the extent to which these results align with the research goals involves several key considerations. Firstly, in terms of application effectiveness, most of the testing outcomes were successful, with 11 out of 18 tests demonstrating the application's competence in executing critical functions such as user registration, event scheduling, and efficient data input for Neighbour Association and Neighbour Unit. Hence, the research objectives for gauging the application's efficacy in fulfilling its functionalities have been met. Secondly, the research aimed to identify issues or bugs within the application, and this objective has been accomplished. Notably, several tests, especially those about data input for villages, hamlets, Community Empowerment, and the processing of PWEF data at the village/community and neighbour levels, encountered failures, revealing areas necessitating immediate attention and improvement. Therefore, the testing results effectively pinpoint areas for application enhancement. Thirdly, considering testing duration, the time expended remained reasonably within the expected range, typically 2.5 to 5.5 hours. This suggests efficient testing execution without disrupting the overall efficiency of application development, aligning to evaluate the application's performance within acceptable time constraints. In summary, the testing outcomes have accomplished mainly the research objectives by assessing application effectiveness, uncovering areas for enhancement, and ensuring efficient testing processes. These findings will serve as a robust basis for advancing and refining the application, ensuring it upholds high standards in supporting family welfare. Nevertheless, it is vital to acknowledge that some tests still encountered failures, mandating prompt corrective measures to enhance the application's overall performance.

Analysing the implications of these findings for applying the Kanban method in testing the Family Welfare Empowerment application reveals several significant insights. Firstly, the high success rate in most tests underscores the Kanban method's efficacy in orchestrating this application's testing workflow, allowing for vigilant progress monitoring and timely issue resolution. This exemplifies the method's positive influence on application testing management. Secondly, the swift identification of testing failures, particularly in areas like data input at various community levels and PKK data processing, highlights the Kanban method's capacity to expedite issue recognition, averting potential adverse repercussions on end-users. This demonstrates its value in pre-emptive troubleshooting. Thirdly, the test results provide a well-defined roadmap for prioritizing enhancements, focusing on rectifying the failed features. The Kanban method's role in facilitating the delineation of priorities on the Kanban board streamlines systematic and tailored improvements in line with the application needs. Fourthly, the testing timeframes remain within acceptable limits, indicating that the Kanban method has adeptly enabled efficient testing without compromising development efficiency. The fundamental principle of efficient workflow management has notably curtailed time wastage. Lastly, these results reflect an unwavering commitment to continual enhancement, empowered by the Kanban method's capacity for perpetual performance monitoring, assessment, and refinement. Each testing setback serves as a learning opportunity, fostering a cycle of improvement. Consequently, these findings underscore the Kanban method's effectiveness in overseeing the testing workflow, expeditiously diagnosing issues, prioritizing ameliorations, and fostering the development of a superior application that bestows more excellent benefits upon its user base.

The assessment of factors influencing test outcomes encompasses several critical elements. Firstly, the complexity level of the family welfare empowerment application yields substantial influence; applications marked by multifaceted features, integrations with external systems, or intricate user interfaces may be more susceptible to testing complications. This complexity often entails diverse data inputs, complex calculations, and nuanced interactions demanding meticulous examination. Secondly, the effectiveness of the Kanban method's implementation in both the development and testing phases holds sway over results. An ill-defined Kanban workflow or suboptimal utilization of the Kanban board can lead to inefficient control over workflow and testing processes. Thirdly, the competence and experience of the development and testing team are pivotal; a proficient team well-versed in the Kanban method and software testing procedures is poised for more favourable outcomes. Additionally, internal corporate policies and constraints, such as stringent time constraints or the imperative for product release, can dictate the permissible margin of error in testing. Furthermore, alterations in project requirements or

specifications during development may disrupt testing processes if not promptly integrated into the Kanban workflow. Moreover, the team's adeptness in issue identification during testing is pivotal, with the Kanban method streamlining the tracking of stalled cards or items encountering testing impediments. Lastly, test data quality forms the bedrock; the faithful representation of real-world scenarios and the inclusion of substantial variations are critical determinants of the precision of test outcomes. Thus, a comprehensive consideration of these factors is indispensable for a deeper comprehension of test results, facilitating the identification of root causes, implementing relevant improvements, and enhancing application performance.

V. CONCLUSION

This research highlights critical test results essential for evaluating the Family Welfare Empowerment application's performance using the Kanban method. Significantly, most tests, including user registration, event scheduling, and data input at various community levels, yielded successful outcomes, showcasing the application's proficiency in executing vital functions. However, specific tests related to data input at diverse community levels and the processing of Family Welfare Empowerment data exhibited failures, indicating areas necessitating attention and enhancement for improved data management and community empowerment. The reasonable testing timeframes suggest that the Kanban method effectively upholds testing efficiency. These findings offer valuable insights into the application's performance and areas demanding refinement, laying the groundwork for further development. Future research directions encompass delving into the reasons behind test failures, comparing Kanban's efficiency with traditional testing methods, assessing the influence of team size on testing outcomes, and developing concrete solutions. Furthermore, conducting larger-scale testing, engaging in end-user evaluations, and exploring Kanban's applicability across diverse fields are suggested. Additionally, performing a more comprehensive literature review and including additional case studies can augment comprehension and steer future research concerning Kanban's implementation in software testing and project management for family welfare empowerment applications.

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