Sistemasi: Jurnal Sistem Informasi
Volume 13, Nomor 6, 2024: 2375-2385
ISSN:2302-8149
e-ISSN:2540-9719

Design and Development of Budget Absorption Discipline Notification Application using SDLC Method

[1]Yohana Christela Oktaviani, [2]Yulia Wahyuningsih*
[1,2]Program Studi Ilmu Informatika, Fakultas Teknik, Universitas Katolik Darma Cendika
[1,2]Jl. Dr. Ir. H. Soekarno No.201, Klampis Ngasem, Kec. Sukolilo, Surabaya, Jawa Timur 60117, Indonesia
*e-mail: yulia@ukdc.ac.id

(***received*****:** 24 August 2024, ***revised*****:** 26 October 2024, ***accepted*****:** 5 November 2024)

Abstract

Optimal budget absorption in a region requires streamlined solutions. One such solution is simplifying the budget submission process through technology-based approaches. This study utilizes the SDLC methodology to create a durable application for Public Housing, Settlement Areas, and Human Settlement Offices, meeting their requirement for an effective budget submission tool. The SDLC method allows for continuous evaluation and development according to agency requirements. The outcome is APPA, a Budget Absorption Notification Application designed for the Public Housing, Settlement Areas, and Human Settlements Office in Jember. This application has helped to ensure that the budget approval process is not a sync point in achieving project deadlines. One of the aims of this research was to develop a technology-driven solution that could be implemented to increase optimal regional absorption which is expected can facilitate and accelerate budget execution and public service delivery more prettily than ever.

Keywords: *budget absorption, e-government, good-government, sdlc methods*

1 Introduction

Budget absorption refers to the percentage of an allocated expenditure budget that has been implemented and reported by regional leaders or SKPD to DPRD or regional heads through a financial document known as the Budget Realization Report. Budget absorption describes how capable the government is in achieving policy development targets set in financial figures in financial reports, which are public accountability media. Public finances must be managed based on applicable regulations and for the public interest, including planning the payment schedule for one fiscal year [1].

Regional government expenditure is one strategy the government uses to stimulate economic growth. Generally, planned government spending aims to provide essential goods and services that cannot be provided by the private sector and meet the basic needs of local communities. If the budget allocation is carried out efficiently by the government, then its limited funding revenue sources can be maximized to fund crucial activities. Limited resources necessitate that the government thoughtfully choose initiatives and allocate funding cost-effectively and productively. [2].

Software Development Life Cycle (SDLC) provides a structured approach for creating, updating, and refining systems, models, and methodologies employed in software engineering. The SDLC method assists in developing a product. SDLC is considered a traditional, systematic, and sequential model for software development. It serves to address all user requirements related to the existing system. System development needs may arise from changes or the creation of new applications. Additionally, SDLC helps software developers estimate the lifespan of created or utilized software [3].

Failure in software development is usually termed a Software Crisis, meaning that the software built does not meet intended objectives and fails to function as intended. Software Crises can be avoided through various methods during software construction, among the latter is the SDLC. SDLC is a necessary process when building an information system. It comprises six stages: 1. Analysis: creating a management workflow analysis. 2. Design: collecting data about system development requirements and making plans. 3. Development: designing management workflow and programming needed for the information system. 4. Implementation running the built system according to its

 ISSN:2302-8149
e-ISSN:2540-9719

respective functions. 5. Testing: conducting tests on the system to identify and rectify errors. 6. Maintenance: implementing and maintaining the created system [4].

Previous research has not provided a holistic solution addressing the inhibiting factors of budget absorption. While separate studies on general application usage exist, this research begins by analyzing the specific needs of the Department of Public Housing, Residential Areas, and Works Creation Service Jember regarding budget absorption challenges. It then designs an application tailored to aid the budget absorption process within the relevant SKPD environment.

Many researchers have conducted studies using the SDLC method on various objects. For example, research on implementing a Software Development Life Cycle (SDLC) in Software Application Development. The technique represents the stages in creating software applications from analysis, design, construction, implementation, and testing to system maintenance. The results show that the SDLC method reduces the occurrence of software crises due to its detailed stages from analysis to maintenance [5].

Further research was conducted on the analysis of budget implementation performance achievement. An e-MPA application is required for budget monitoring purposes. The findings indicate differences in budget absorption consistency and agreements after the implementation of the e-MPA application, demonstrating issues with budget consistency. Statistical results on absorption stability and budgeting reveal a misalignment of objectives caused by inappropriate communication patterns, information support, and understanding of e-MPA application guides [6].

Research was conducted using the SDLC method with a waterfall model to create a web-based Business Travel Order System for the Central Bureau of Statistics in Pesisir Selatan Regency, to enhance report precision. This systematic or sequential process facilitates the effectiveness of the SPPD creation process, ensures proper data storage and security, allows access anytime and anywhere, and solves existing problems in data input and timely report generation [7].

Research was conducted to evaluate the implementation of the Village Financial System Application (Siskeudes ver.2.0.3) in improving the performance of village officials, utilizing Task Technology Fit. Various issues were found in financial reporting and recording errors, including delayed reporting, partly due to task incompatibility in operating applications. The Financial and Development Supervisory Agency (BPKP) developed SISKEUDES (Village Financial System Application) using Partial Least Square (PLS) to enhance village financial management. The finance department, with its financial expertise, showed superior performance [8].

Subsequent research was focused on planning and implementing a system for providing funds to regional financial and asset management bodies. Currently, the financial management process, including fund provision, is done manually using Microsoft Excel, which has disadvantages, including requiring considerable time. To address these issues, an automated, centralized application that can be accessed online is being developed to facilitate the operational activities of the Funds provision unit. This study employs the waterfall model for software development, with Black Box testing for system verification [9].

A study was conducted on the development of a web-based corporate cost budget information system for PT Bumitangerang Machinedotama, aimed at streamlining company cost planning through an automated system that generates organized final report summaries. The implementation of a budget plan system using the SDLC method is expected to solve ssexisting problems, eliminating the need for manual methods in budget planning [10].

Another study focused on a Village Fund Management Information System at the Dangga Mangu Village Office, East Wewewa District, Southwest Sumba Regency. Currently, the process of managing incoming and outgoing funds at the office involves manual recording in two books: receipt and expenditure. Based on this, an information system was designed using the SDLC method. The resulting system successfully accelerates the process of searching for incoming funds based on donor name, month, or amount, and outgoing funds based on payment type. It also facilitates inputting transaction data and preparing reports [11]. The research aims to support the development of an application for the Public Works Creation Service Jember agency that requires tools for the budget submission process using the Systems Development Life Cycle (SDLC) method.

 ISSN:2302-8149
e-ISSN:2540-9719

2 Literature Review

Jember, a district in East Java, Indonesia, has its capital in Jember City, situated in the middle of East Java's Horseshoe area. The district comprises 31 sub-districts, including 28 with 226 villages, three with 22 urban villages, and three sub-districts with 22 urban villages. In a large number of sub-districts and regencies, in several ways, the interests of the government are still lacking in their implementation; in particular, one of the government agencies in Jember Regency, namely the Public Housing, Settlement Area and Human Settlements Service, has complained about the absorption of the regional budget. This issue requires specific attention to ensure proper absorption of all regional budgets, particularly in Jember district offices where budget absorption could be improved, including the Public Housing, Settlement Areas, and Works Creation Services [12].

Regional Government Financial Assessment: The aggregate Regional Government Expenditure Budget in East Java in 2022 reached IDR 134.26 trillion, with realization up to the first quarter of 2022 only 9.28% of the budget ceiling. The Deputy Governor of East Java instructed all regional apparatus organizations (OPD) within the scope of the East Java Provincial Government to accelerate the realization of the 2022 APBD. The target for absorption of the Regional Expenditure Budget in Q I is 23.58%, Q2 II is 57.34%, and Q3 III is 84.12%, so in Q IV, it should reach 100% [1]. In addition, in one of the districts in East Java, especially in Jember district, according to the Chairperson of Commission A DPRD Jember, Tabroni, after a meeting with the Population and Civil Registry Service in the Jember DPRD, East Java, almost all OPD partners of Commission A have budget absorptions that are still below 50 percent. The low absorption of the APBD in several OPDs was also acknowledged by the Chairperson of Commission B DPRD Jember, Siswono, who said that OPD partners in their commissions were also still stagnant. Employees who are transferred must adjust again. Based on this, he hopes each OPD will work to absorb the budget, especially for activities directly related to the community. Meanwhile, confirmed separately, Jember Regent Hendy Siswanto is optimistic that APBD absorption can reach 90 percent by the end of 2021 so that all OPD programs will work. "All OPDs have made a statement of ability to immediately carry out activities and realize the budget above 90 percent" [13].

Factors Influencing the Effectiveness of Education Expenditure Budget Absorption Planning, Regulation, and Coordination. Budget planning and coordination influence budget absorption effectiveness. Further research is needed to identify additional factors affecting budget absorption across various organizations [14]. In cases of suboptimal budget absorption, several factors need to be addressed to ensure smooth budget absorption, such as the factor of policy changes, both national spending policies and the commitment factor of leaders and implementers of activities to carry out activities according to the plan must be clear, the two factors of problems in budget execution must be precise and clear, in other words, higher budget implementation issues correlate with lower work unit budget absorption [15].

Analysis of the situation at the Housing, Settlement, and Human Habitat Services was conducted at Jember Regency, and the following general problems have been identified: (1) Budget absorption is not optimal due to the absence of task reminder notifications from several divisions that causes the schedule that has been determined to be delayed and inappropriate so that budget absorption is not adequately absorbed; (2) There is a lack of effectiveness in correspondence management. All incoming letters must be manually checked by leadership, who are not always present in the office. This leads to the accumulation of incoming letters and sometimes results in double assignment letters from leaders to members, as they still have to check manually. To achieve optimal regional budget absorption, a solution is needed to ensure budget absorption, considering the large budgets in each area. The proposed solution involves developing a technology-based process to facilitate budget submissions, thus addressing some of the existing constraints. This research formulates a solution to overcome the above problems by developing an easy-to-use, "APPA" (Budget Absorption Notification Application) is a technology-based budget submission process. This tech solution is specifically created to tackle partner-related issues and optimize human resources. It will be implemented through UI/UX design, prototypes, and a website-based application.

Many researchers have applied the SDLC method to various projects, including the development of a web blog information system enabling students to create articles on diverse topics such as knowledge, personal experiences, tutorials, problem-solving, and news. The SDLC Waterfall method

 ISSN:2302-8149
e-ISSN:2540-9719

used in this application has been shown to provide maximum output [16]. The SDLC Waterfall method has also been applied in developing a student final project guidance information system. This research utilized Black Box testing and the PIECES method for evaluation. The test results showed that this system is valid and proven to help students carry out final assignment guidance through the system [17]. In addressing the problem of suboptimal gutter purchasing processes, which were previously done manually, An Android gutter ordering application was developed using the SDLC method to assist sales personnel in handling orders more quickly [18]. Law Number 20 of 2003 concerning the national education system mandates the development of numeracy skills for all citizens, a Game-Based Learning Application for Multi-Language-Based Mathematics Learning was developed using the SDLC method. This game allows students to engage in independent study at their convenience, potentially leading to cognitive improvements [19]. Additionally, a case study regarding nurses spending increasing amounts of time on computers, which led to inefficiencies in care, prompted the development of a customized tool. This tool, designed to access clinical information and perform bedside documentation, aims to help increase efficiency. The SDLC model was employed in designing and developing applications for hospital environments [20]. One effective method to assist in the development of medical record applications is the Extreme Programming SDLC, which has been shown to produce high-quality software that meets user needs. The success of this software development with XP can avoid patchwork in application development[21]. Mobile app usage and development are rapidly growing, with powerful devices offering tools for daily life management. One example is a notification-based application developed using the Extreme Programming SDLC methodology [22]. Improving distribution quality in building communication networks for startups can be enhanced by using a push notification application designed with the SDLC method. Firebase Cloud Messaging provides a push notification feature for sending notification messages to Android devices [23]. Creating a real-time visitor tracking application that is useful for security without constantly checking CCTV, using SDLC and Arduino methods, a system was designed to help users monitor visitors through real-time notifications, potentially enhancing location security [24]. An inventory system was created for PT. Palugada Indonesia replaced their traditional recording methods for transactions and stock, which were prone to errors primarily due to human involvement. The study resulted in a Web-Based Inventory Application for PT. Palugada Indonesia [25]. Knowing school academic information is essential for parents to monitor their child's attendance during school hours, providing peace of mind when their children are at school. Many schools have yet to implement a computerized student attendance system, limiting monitoring capabilities to school staff only. Effective monitoring should extend beyond schools to include parents and guardians, fostering increased student discipline. The application of an Android-based system utilizing push notification technology can be a solution for notifying parents about student attendance information [26].

3 Research Method

This study employs the SDLC method. In this study, the stages are (1) Requirement Analysis, (2) Design, (3) Development, (4) Testing, and (5) Maintenance [27].

3.1 Requirement Analysis

This stage is when collecting information that aims to solve a problem. Any information obtained will be studied and extracted to conclude. The requirement analysis stage is illustrated in Figure 1 below.

 ISSN:2302-8149
e-ISSN:2540-9719

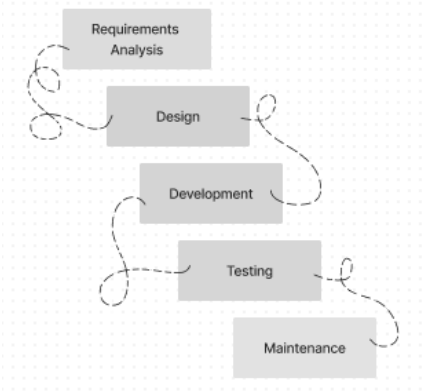

Figure 1. Stages of the process SDLC method

3.2 Design

The application design phase follows the analysis stage, providing detailed design patterns based on previous findings.

3.3 Development

This stage is a lengthy phase in the SDLC method, as it involves implementing the High-Fidelity design into actual code. The development process for this application utilizes GitHub tools for the application repository and employs the Laravel framework as the coding implementation language. Specifically, this stage focuses on creating an application that matches the design established in the previous phase.

3.4 Testing

This stage is dedicated to testing whether the developed application is suitable for use by the Public Housing, Residential Areas, and the Urban Development Department of Jember. While testing the application, staff at the Housing, Settlement, and Human Habitat Services will undergo training. This approach aims to assess the application's viability and educate employees on its proper use.

3.5 Maintenance

This final stage, the maintenance phase, involves correcting any errors identified during the testing conducted in the previous stage.

4 Results and Analysis

The process for developing a website-based Budget Absorption Notification Application based on the SDLC design method Figure 1 is as follows:

4.1 Requirements Analysis

At this stage, the researcher found that the problem experienced by the Public Housing, Settlement Areas, and Human Settlement Services was a delay in the process of disbursing budget absorption for each existing activity package due to delays in the management of the required data. The researcher concludes that the Housing, Settlement, and Human Habitat Offices require a notification system (reminder) that serves as a reminder for any matters or tasks that must be completed to achieve budget absorption for the activity packages they want to carry out.

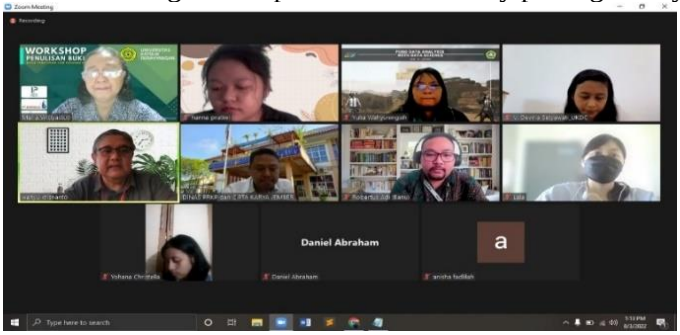

Figure 2. Collection of requirements with the department of housing, residential areas, and urban development jember online

 ISSN:2302-8149
e-ISSN:2540-9719

Based on the online meeting for collecting requirements shown in Figure 2, the following results were obtained from the relevant office as follows: (1) Budget absorption is not optimal because there are no task reminder notifications from several divisions, which causes the predetermined schedule to be delayed and not appropriate, resulting in suboptimal budget absorption. (2) There is a lack of effectiveness in correspondence management, where all incoming letters must be manually checked by the leader, who is not always present in the office. This leads to the accumulation of incoming letters and sometimes results in double assignment letters from leaders to members, as they still have to check manually. The use of the SDLC method has yielded good results for this study, and it will produce an application called APPA (Budget Absorption Notification Application), which functions as a reminder of the tasks that must be completed in a project so that each task can be finished according to the specified schedule.

4.2 Design

We are creating application designs using the Figma application, which are divided into two forms, Low and High-fidelity designs. Low-fidelity design is a software form with minimal user-prototype interaction, where the prototype is usually made in a black-and-white interface [28]. These prototypes help speed up designers' presentation of conceived concepts and solutions to users. The outcome of the Low-fidelity design is shown in Figure 3 below.

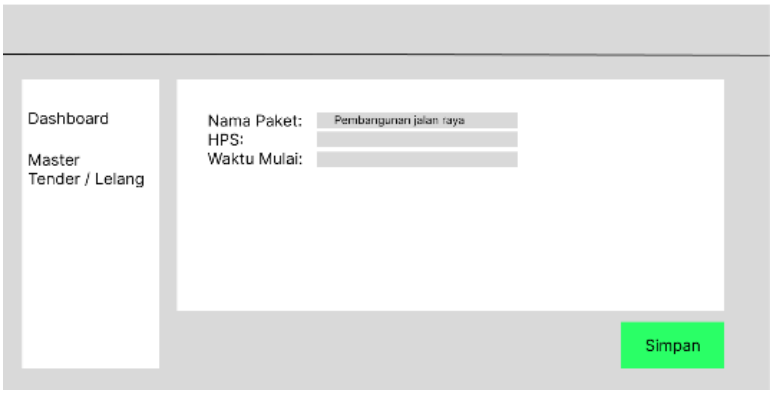

Figure 3. Low-fidelity design

Figure 4 shows the result of the High-fidelity design of APPA (Budget Absorption Notification Application).

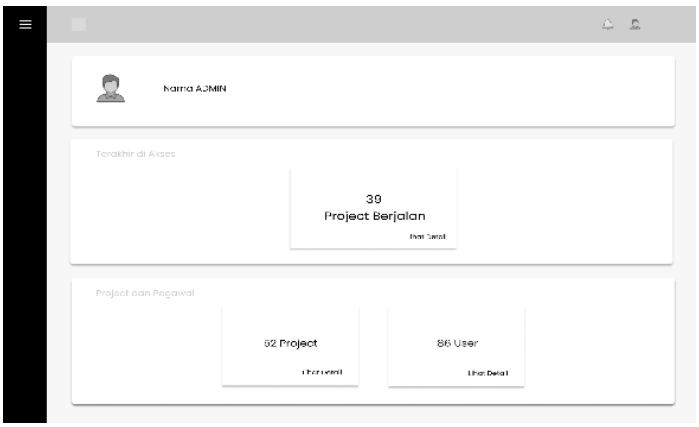

Figure 4. High-fidelity design

4.3 Development

Based on the implementation method that has been designed, the development of this application prototype is carried out according to the planned goals. Derived from the needs analysis and observations, the application prototype was successfully built and is still being developed. The development process for this application uses GitHub tools for the application creation repository and the Laravel framework that is shown in Figure 5.

 ISSN:2302-8149
e-ISSN:2540-9719

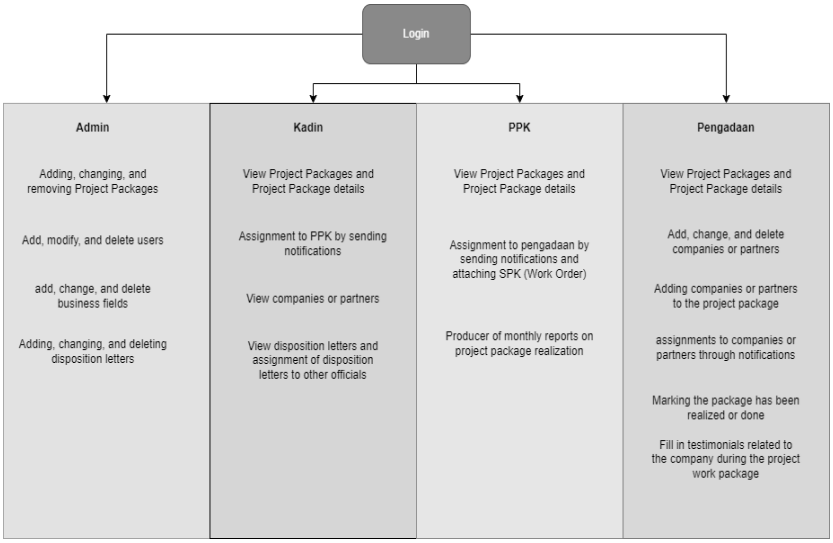

Figure 5. APPA application system overview

The application looks:

1. Role Administrator

   On the admin role's package master page, as shown in Figure 6, the admin can take crucial actions. They can add project packages that can be imported from Excel format documents according to the available templates. Additionally, packages that are not suitable can be deleted or changed using the action buttons available in each package.

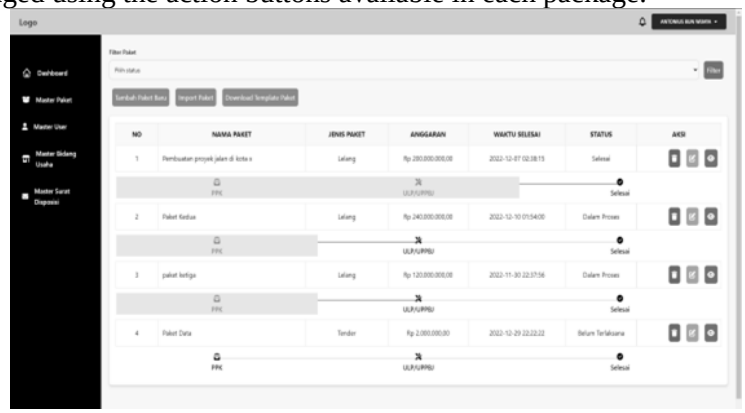

Figure 6. Admin role package master

On the master user page, as shown in Figure 7, the admin can add users to log in to the APPA application. Furthermore, the admin can change, delete, and deactivate user accounts that are no longer in use.

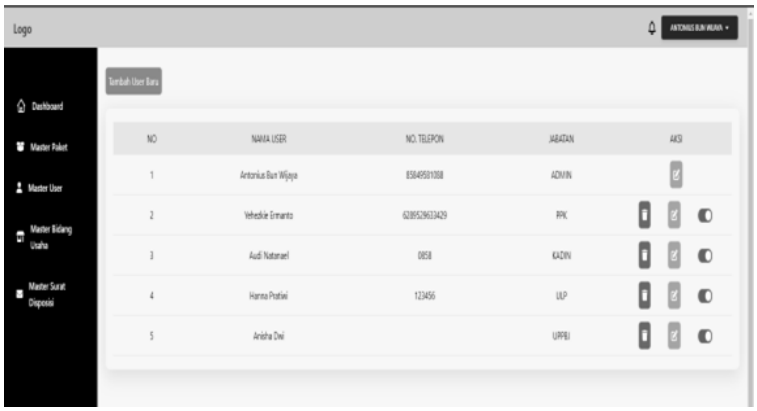

Figure 7. Administrator master user role

2. Department Head Role (Kadin)

 ISSN:2302-8149
e-ISSN:2540-9719

On the Department Head Role page, as shown in Figure 8, each package that the admin has entered can be automatically assigned to the PPK by pressing the blue action button. Additionally, Kadin can view the package details.

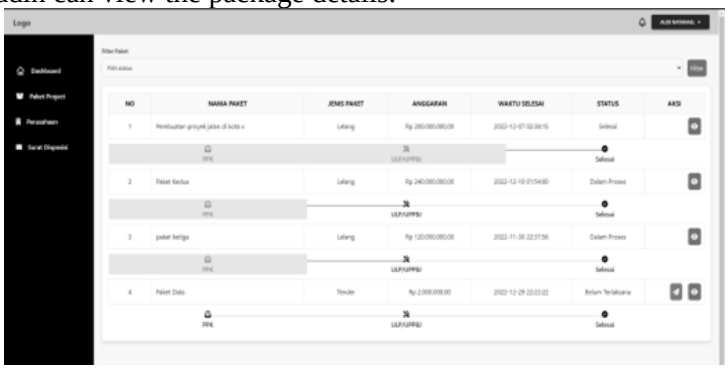

Figure 8. Assignment of packages to department head PPK role

3. Commitment-Making Official Role (PPK)
   On the notification page, as shown in Figure 9, the PPK can see packages assigned from Kadin to be worked on. Then, the PPK will send the package assignment to the procurement officials to realize the project package, where the PPK will send an SPK (Work Order) to the procurement officials.

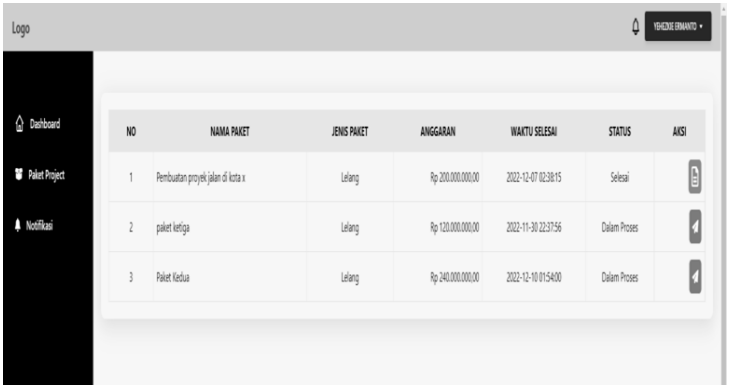

Figure 9. PPK role notification

4. Procurement Role (Pengadaan)
   On the company master page, as shown in Figure 10 for the Procurement role, the procurement official can add a new company or partner who can join and work with the agency.

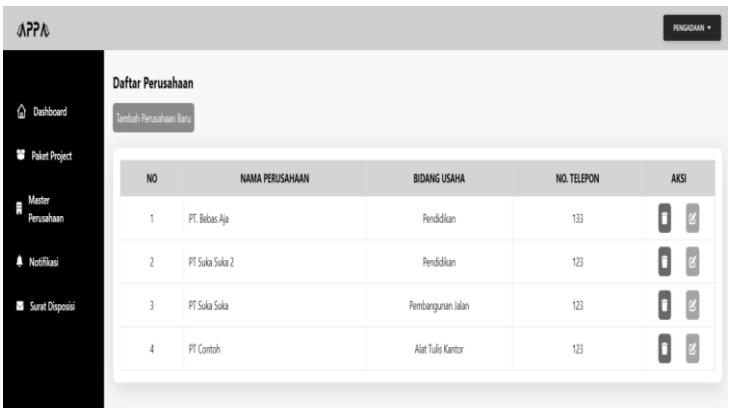

Figure 10. Master company role procurement

On the Procurement role notification page, as shown in Figure 10, the procurement official can enter companies that will realize the package, as shown in Figure 9, and send notifications to companies or partners related to the assignment of the package.

 ISSN:2302-8149
e-ISSN:2540-9719

4.4 Testing

In the testing process using end-to-end testing, this testing is carried out when the application is running, to verify whether the implemented features are working as intended and following the business flow. The testing is performed through manual testing, where the software testing process is done manually to assess if the app's features are functioning correctly. This usually includes verifying all the features listed in the requirements document. Application testing results are presented in Table 1.

Table 1. Black box method application testing

Interface	Questions Testing	Test Results
LOGIN	Can you enter a username and password?	Success
DEPARTMENT HEAD ROLE	Can you view projects and send assignments?	Success
ADMIN	Can we add project packages and input data?	Success
COMMITMENT-MAKING OFFICIAL ROLE	Can you send a project package to work on?	Success
PROCUREMENT	Can add new companies or new partners.	Success

4.5 Maintenance

In the maintenance process, as shown in Figure 11, any reports of errors or bugs related to the application will be communicated from the PRKP Works Creation Service Jember to the maintainer. The maintainer will then make improvements to address the reported errors or bugs. Once the repairs have been made, the maintainer will remotely update the application on the server and confirm with the PRKP Works Creation Service Jember Office that the update has been carried out to fix the issues. The time required for the maintainer to address application errors or bugs depends on the severity of the issues encountered when accessing the application.

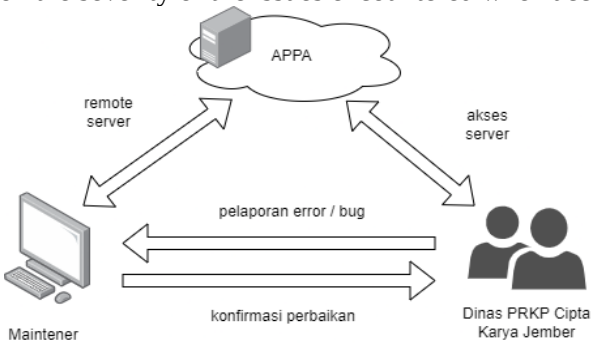

Figure 11. APPA application maintenance

5 Conclusion

The research findings lead to the conclusion that the SDLC method has proven to be beneficial in this research by producing the APPA (Budget Absorption Notification Application) for the Housing, Settlement, and Urban Development Jember Office. APPA can act as a springboard for enhancing and expanding the application of information technology in budget utilization processes. This can positively influence SKPD performance and better address local community needs. As a notification application, APPA can help the Housing, Settlement, and Human Habitat Office enable the timely completion of projects. While this APPA application has been developed, there is still room for further research and improvement, as the current version lacks automated decision-making capabilities, which could allow the application to operate more efficiently and effectively. Future research efforts can focus on incorporating automated decision-making functionalities to enhance the application's performance.

References

[1] Dinas Kominfo, “Wagub Emil Instruksikan TW II 2022 APBD Jatim Terserap 50%,” *Jatim Newsroom*. 2022.

[2] S. Abdullah, M. Muhtar, M. Marwan, and A. Aliamin, “Serapan Anggaran Pada Organisasi Perangkat Daerah : Bukti Empiris dari Kota Banda Aceh,” *J. Akunt. Publik*, vol. 2, no. 1, pp.

66–83, 2019, doi: 10.32554/jap.v2.i1.p66-83.

[3] P. Kusuma Negara, L. Handajani, and L. Effendy, "Studi Kasus Fenomena Tingkat Serapan Anggaran pada Satuan Kerja Perangkat Daerah," *J. Akunt. dan Investasi*, vol. 19, no. 1, pp. 76–91, 2018, doi: 10.18196/jai.190193.

[4] I. R. Gumilang, U. Muhammadiyah, and K. Sukabumi, "Penerapan Metode SDLC (System Development Life Cycle) Pada Website Penjualan Produk Vapor," vol. Vol 1, pp. 47–56, 2022, doi: https://doi.org/10.55606/jurritek.v1i1.144.

[5] M. M. Lucini, P. J. Van Leeuwen, and M. Pulido, "Model error estimation using the expectation-maximization algorithm and a particle flow filter," *SIAM-ASA J. Uncertain. Quantif.*, vol. 9, no. 2, pp. 681–707, 2021, doi: 10.1137/19M1297300.

[6] B. Soediono, "Analisis Capaian Kinerja Pelaksanaan Anggaran Penerapan Aplikasi Electronic Monitoring Pelaksanaan Anggaran (e- MPA)," *J. Chem. Inf. Model.*, vol. 53, p. 160, 1989, doi: https://doi.org/10.23960/jak.v23i1.91.

[7] D. Mallisza, H. S. Hadi, and A. T. Aulia, "Implementasi Model Waterfall Dalam Perancangan Sistem Surat Perintah Perjalanan Dinas Berbasis Website Dengan Metode SDLC," *J. Tek. Komputer, Agroteknologi Dan Sains*, vol. 1, no. 1, pp. 24–35, 2022, doi: 10.56248/marostek.v1i1.9.

[8] W. L. Y. Saptomo, I. Prasetyo, B. S. Nugroho, and E. Rimawati, "Evaluasi Penerapan Aplikasi Sistem Keuangan Desa (Siskeudes ver. 2.0.3) dalam Peningkatan Kinerja Aparat Desa menggunakan Task Technology Fit," *J. Ilm. SINUS*, vol. 20, no. 1, p. 47, 2022, doi: 10.30646/sinus.v20i1.580.

[9] Fabiana Meijon Fadul, "Perancangan dan Implementasi Sistem Penyediaan Dana pada Badan Pengelola Keuangan dan Aset Daerah di Kabupaten Karimun," vol. 3, no. 2, 2019, doi: https://doi.org/10.51742/teknik_informatika.v3i2.705.

[10] A. B. Wandanaya and A. Wicaksono, "Rancang Bangun Sistem Informasi Rencana Anggaran Biaya (Rab) Perusahaan Berbasis Web Pada Pt. Bumitangerang Mesindotama," *J. CERITA*, vol. 4, no. 2, pp. 110–129, 2018, doi: 10.33050/cerita.v4i2.632.

[11] E. Gala and F. Hariadi, "Sistem Informasi Pengelolaan Dana Desa di Kantor Desa Dangga Mangu Kecamatan Wewewa Timur Kabupaten Sumba Barat Daya," vol. 01, no. 01, pp. 11–20, 2022, doi: https://doi.org/10.58300/inovatif-wira-wacana.v1i1.251.

[12] "Parasetamol - Wikipedia bahasa Indonesia, ensiklopedia bebas."

[13] "Serapan APBD Jember tahun anggaran 2021 masih rendah - ANTARA News Jawa Timur."

[14] C. Kuntadi and D. Rosdiana, "Faktor-faktor yang Memengaruhi Efektivitas Penyerapan Anggaran Belanja Pendidikan : Perencanaan Anggaran , Peraturan , Koordinasi (Literature Review)," vol. 4, no. 2, pp. 142–152, 2022, doi: https://doi.org/10.31933/jemsi.v4i2.1201.

[15] R. Nugroho, "Faktor-Faktor yang Mempengaruhi Penyerapan Anggaran (Studi Persepsi pada Badan Pendidikan dan Pelatihan Keuangan)," *J. BPPK Badan Pendidik. dan Pelatih. Keuang.*, vol. 10, no. 1, pp. 22–37, 2017, doi: 10.48108/jurnalbppk.v10i1.23.

[16] E. Bayu Kristanto, S. Andrayana, U. Nasional, J. Sawo Manila, K. Jakarta Selatan, and D. Khusus, "Application of Waterfall SDLC Method in Designing Student's Web Blog Information System at the National University," *J. Mantik*, vol. 4, no. 1, pp. 472–482, 2020.

 ISSN:2302-8149
e-ISSN:2540-9719

[17] D. Saputra, H. Haryani, A. Surniadari, M. Martias, and F. Akbar, "Sistem Informasi Bimbingan Tugas Akhir Mahasiswa Berbasis Website Menggunakan Metode Waterfall," *MATRIK J. Manajemen, Tek. Inform. dan Rekayasa Komput.*, vol. 21, no. 2, pp. 403–416, 2022, doi: 10.30812/matrik.v21i2.1591.

[18] R. Amalia, S. M. Sagita, and A. Faisal, "Gutter Ordering Application Design Using the SDLC Method on CV Android," vol. 6, no. 1, pp. 222–234, 2022, doi: 10.52362/jisicom.v6i1.813.

[19] M. S. Qolbi, Z. Z. At Thaariq, S. F. Az-Zahroh, M. M. Anwar, and N. Faiza, "Design and Development of Game-Based Learning Applications for Mathematics Learning Based on Multiple Language to Develop Verbal Capabilities," *JPP (Jurnal Pendidik. dan Pembelajaran)*, vol. 26, no. 2, pp. 51–56, 2019, doi:10.17977/um047v26i22019p051.

[20] F. Ehrler, C. Lovis, and K. Blondon, "A mobile phone app for bedside nursing care: Design and development using an adapted software development life cycle model," *JMIR mHealth uHealth*, vol. 7, no. 4, pp. 1–16, 2019, doi: 10.2196/12551.

[21] I. G. N. Suryantara and J. F. Andry, "Development of Medical Record With Extreme Programming SDLC," *Int. J. New Media Technol.*, vol. 5, no. 1, pp. 47–53, 2018, doi: 10.31937/ijnmt.v5i1.706.

[22] H. Almajed and A. Khamis, "Development of a Location-Based Approaching Notification System," pp. 107–119, 2017.

[23] D. Firdaus, B. Priambodo, and Y. Jumaryadi, "Implementation of push notification for a business incubator," *Int. J. online Biomed. Eng.*, vol. 15, no. 14, pp. 42–53, 2019, doi: 10.3991/ijoe.v15i14.11357.

[24] R. F. Rahman and I. D. Sumitra, "Realtime Notifications on Visitor Tracking Systems Using Android and Arduino," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 879, no. 1, 2020, doi: 10.1088/1757-899X/879/1/012062.

[25] J. A. Haratua, A. E. Widjaja, K. Prasetya, and H. Hery, "Web-Based Inventory Application Development for PT. Palugada Indonesia," *IJNMT (International J. New Media Technol.*, vol. 8, no. 1, pp. 70–78, 2021, doi: 10.31937/ijnmt.v8i1.2063.

[26] U. Hasanah and C. Latiffani, "International Conference on Social, Sciences and Information Technology," *Eur. J. Sci. Technol.*, vol. 4509, no. 1, pp. 1–7, 2020.

[27] A. A. Wahid, "Analisis Metode Waterfall Untuk Pengembangan Sistem Informasi," *J. Ilmu-ilmu Inform. dan Manaj. STMIK*, no. November, pp. 1–5, 2020.

[28] H. Sastypratiwi, Y. Yulianti, H. Muhardi, and D. I. Ulumi, "Incorporating User Experience Evaluation into Application Design for Optimal Usability," *MATRIK J. Manajemen, Tek. Inform. dan Rekayasa Komput.*, vol. 22, no. 3, pp. 529–538, 2023, doi: 10.30812/matrik.v22i3.2793.