Revamping KELUARGAKU 2.0 Information System: A Journey of Innovation

Heni Rachmawati[1], Anggy Trisnadoli[2], Indah Lestari[3], Muhammad Iqbal[4]

{henni@pcr.ac.id[1], anggy@pcr.ac.id[2], indah@pcr.ac.id[3], iqbal19si@mahasiswa.pcr.ac.id[4]}

Information Technology Department, Politeknik Caltex Riau, Pekanbaru, Indonesia[1,2,3,4]

Abstrak. Pusyanra Lancang Kuning, an integrated service model focusing on excellent customer service and meeting the needs of all age groups, introduced its website, "Keluargaku," in 2022 to support their efforts. However, the initial version of Keluargaku faced issues such as bugs, errors, data input problems, and limitations, resulting in ineffective information dissemination and an unattractive static view. To address these problems, reengineering was undertaken for Keluargaku version 2.0. The reengineering process employed the prototyping method in two iterations, leading to 15 significant feature improvements and three additional features. The system was developed using the latest Laravel framework and underwent user acceptance and performance tests. The results showed that Keluargaku 2.0 was well-received and effectively supported the Lancang Kuning Pusyanra team's work. During performance tests, where 100 virtual users generated 2340 requests, there were no failed requests, and the average response time was 30,719 ms, demonstrating the system's good performance.

Keywords: *Reengineering, Prototyping, Performance Test*, *Pusyanra Lancang Kuning*,

1 Introduction

Pusyanra Lancang Kuning (The Center for Family Welfare Services) also known as PPKS, is an integrated service model that prioritizes excellent and professional services, taking into consideration the needs of families across all age groups, from toddlers and teenagers to the elderly. Pusyanra Lancang Kuning operates under the auspices of the Representation of the National Population and Family Planning Agency (BKKBN) in Riau Province, providing information, guidance, consultation, and counseling on the Bangga Kencana program.

Currently, Pusyanra Lancang Kuning has a first version of a web-based information system called "Keluargaku" [1]. This website aims to manage information about activities, articles, and counseling information at Pusyanra Lancang Kuning. Before the implementation of the first version of the Keluargaku information system, Pusyanra Lancang Kuning operated in a random and manually documented manner, leading to several challenges in monitoring activities. To optimize the performance of Pusyanra Lancang Kuning, the Keluargaku web-based information system was developed as an online information medium.

The primary objective of developing the first version of the Keluargaku information system website was to maximize information and education in the implementation of Pusyanra's work

ABEC 2023, September 21, Bengkalis, Indonesia

DOI 10.4108/eai.21-9-2023.2342884

programs. Additionally, it aimed to ease the administrative tasks of conveying information related to activities and counseling, thereby enhancing the effectiveness of meeting these needs. During its implementation, the first version of the Keluargaku information system encountered several issues in information management, such as bugs, program errors, data input mistakes, and limitations in form data, resulting in inadequate and inaccurate information delivery. Moreover, as the database accumulated more data, relevant data search became increasingly difficult. Another drawback was that when visitors filled in the guest book, the data input in the admin panel could not be sorted based on the date of form submission. Furthermore, as the database grew, loading data on the page became cumbersome and consumed substantial browser memory when the admin accessed it.

To address the issues of the first version of the Keluargaku website, a reengineering of the information system was conducted with the latest version, namely, Keluargaku information system version 2.0, utilizing the prototyping methodology approach. Prototyping is a software development approach based on a working model [2]. The approach using the prototyping method is a software development approach that involves creating a physical model of a system, serving as an initial version of the system [3]. The prototyping approach is a technique in system development that uses prototypes to represent a system, enabling users to envision the system's development [4]. It is a part of the product that articulates the logic and interface that will be displayed [2]. A prototype serves as an early demonstration of building a system, explaining the concept and appearance planning of the software. This approach showcases how a software is executed before entering the actual construction phase [5].

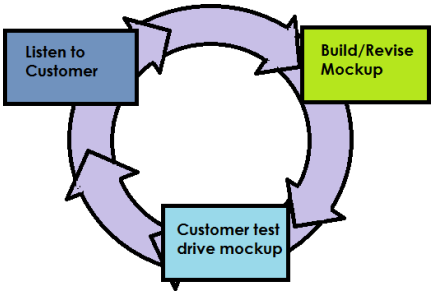

Fig 1. Prototyping Method Illustration

Figure 1 illustrates the stages of the prototyping cycle, which include listening to the customer, building a prototype, and having the customer test-drive the prototype. The prototyping cycle continues iteratively until the system is deemed complete and approved, meeting the customer's requirements, and ready for deployment. Following system implementation, the testing phase included User Acceptance Testing (UAT) and performance testing using web application tools such as K6 and Grafana.

The development of the Keluargaku information system version 2.0 with a prototyping approach yielded positive results, making it a suitable initial step for the development of the system. Pusyanra Lancang Kuning can leverage these findings to enhance the implementation of its work programs for better performance.

2 Research Methodology

During the development of the Keluargaku 2.0 information system software, utilizing the prototyping method, two iterations were prepared, each following the cycle as described below:

- Listen To Customer: In this stage, listening to the customer was carried out to identify user requirements, actors, and use case diagrams. L1 represents Listen To Customer for the first iteration, and L2 represents Listen To Customer for the second iteration.
  - L1: Conducted interviews with the Pusyanra Lancang Kuning team to gather user needs.
  - L2: Engaged in discussions with the Pusyanra Lancang Kuning team to reevaluate the requirements for adding new features and improving the system.
- Build Prototype: Next, the prototype for the admin panel and visitor pages was developed. B1 represents Build Prototype for the first iteration, and B2 represents Build Prototype for the second iteration.
  - B1: Constructed the prototype based on user requirements gathered from the interviews with the Pusyanra Lancang Kuning team.
  - B2: Developed the prototype for unidentified requirements or additional features and system improvements.
- Customer Test-Drive Prototype: After building the prototype, the customer tested the system, including its functional and non-functional requirements. C1 represents Customer Test-Drive Prototype for the first iteration, and C2 represents Customer Test-Drive Prototype for the second iteration.
  - C1: Conducted testing of the functional aspects of the system built in the first phase.
  - C2: Conducted testing of the functional aspects of the system built in the second phase.

Based on each cycle conducted, the iterations were continued until the system was deemed successful and aligned with user requirements. The development process of the Keluargaku 2.0 information system involved two iterations. The details of each iteration are summarized in Table 1.

Table 1. Iteration details

Iteration	Activity
First Iteration	• Conducted interviews with Pusyanra Lancang Kuning, KS-PK, and ADPIN to identify the requirements for the system to be developed. • Built a prototype of the Keluargaku version 2.0 website system. • Identified additional feature requests and system revisions.
Second Iteration	• Added interfaces for managing UPPKA stores and UPPKA product data. • Incorporated a feature for managing Standard Operating Procedure (SOP) data. • Revised several elements on the homepage of Keluargaku version 2.0.

Iteration	Activity
	• Integrated audio elements into the homepage interface of Keluargaku version 2.0.

During the development process of the Keluargaku 2.0 information system, utilizing the prototyping method, two iterations were carried out. These iterations were aimed at implementing the system in code form before its public release.

In the first iteration of prototyping, the initial stage involved "Listen to Customer I." In this phase, the developers conducted interviews and discussions with representatives from Pusyanra Lancang Kuning, as well as the KS-PK and ADPIN departments at the Riau Province representation of BKKBN. The discussions and interviews took place on September 16, 2022, with the purpose of gathering and mapping user requirements. Several requirements were identified from each department for the planning of the Keluargaku 2.0 information system development. The mapping of user requirements can be observed in Table 2.

Table 2. The first cycle of mapping user requirements

No	Problem	Implemented Features/Functions
1.	Pusyanra Lancang Kuning : We want to update the Keluargaku website to make it more dynamic. This includes fixing several bugs and errors in the program	• Reimplementing features from the first version of the Keluargaku website is a primary aspect of this website's development, ensuring that the features present in the first version are also available in the Keluargaku version 2.0 website. • The article search feature allows Keluargaku visitors to search for specific article data. • The institution collaboration data feature enables visitors to learn about the institutions that collaborate with Pusyanra Lancang Kuning. • The "about" data feature is intended to facilitate editing of information related to Pusyanra Lancang Kuning.
2.	KS-PK : We want to update the Keluargaku website to make it more dynamic	• The hyperlink feature is aimed at adding links to access Data and Information from BKKBN Riau Province. • The additional hyperlink feature menu aims to provide links to access data and information from BKKBN, BKKBN Central, and BKKBN Riau Province.
3.	ADPIN : We want to make the Keluargaku website more dynamic through updates	• The pop-up guest book form feature is designed to automatically display a modal pop-up guest book form when visiting the Keluargaku website. • Displaying the total number of guest book entries allows visitors to view the total guest book data on the homepage.

After conducting first cycle of user requirements mapping in Table 2, the next step is to identify the actors. The table for actor identification I can be seen in Table 3.

Table 3. First cycle of user identification

Users	Actor	Description
Pusyanra Lancang Kuning	Super Admin	The role of the super admin login encompasses accessing and managing various features in the Keluargaku Dashboard. The

Users	Actor	Description
		super admin has privileges to oversee and manage the following aspects: • Keluargaku Dashboard • User data • Counseling types and counseling data • Article categories and article data • Service types and counselor data • Playlists and video material data • E-books data • Guest book data • Administrator data • "About" data, including vision, mission, and objectives • Institution collaboration • Organizational structure • Contact information • Schedule data • Information and slide images. The super admin role is granted the authority to access all these features and perform necessary management tasks.
Other services under Pusyanra Lancang Kuningg	Admin	The role of the admin login is limited to accessing and managing article categories and article data.
Website Visitor	Visitor	Visitors have restricted rights on the Keluargaku website, allowing them to view the homepage, fill out the guest book, participate in counseling sessions with counselors, and visit links on the website (Data and Information from BKKBN, BKKBN Central, and BKKBN Riau Province).

Based on the actor identification in Table 3, the next step involves designing a use case diagram, which aims to describe the system's utility from the actor's perspective in achieving specific goals and depicting the functional requirements of the information system [6].
After completing the listen to customer I phase, the next stage is the build prototype I phase, which aims to construct a system prototype as a representation before proceeding with the coding of the Keluargaku 2.0 information system.

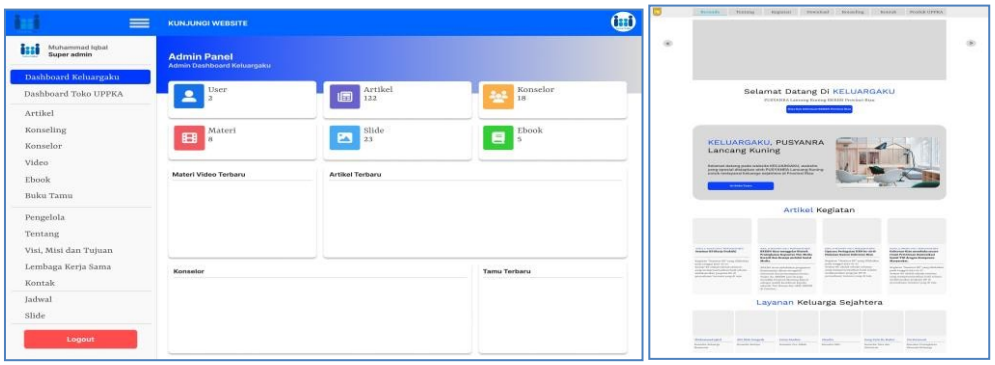

Fig 2. *Dashboard* Page of Keluargaku 2.0 for Admin & Visitor

After completing the listen to customer I and build prototype I stages, the next phase involves customer test-drive prototype to conduct testing on the prototype. During the prototype testing, customers requested several revisions and additional features on the admin panel, including adding a dashboard menu for UPPKA Store with CRUD functionality for products and incorporating CRUD for SOP of Pusyanra Lancang Kuning. Additionally, a menu interface was added to display UPPKA products on the visitor's homepage. Further revisions included changes in the color scheme, menu positions, and font on the visitor's homepage. As the system kept track of revisions and feature additions, the prototyping cycle continued and proceeded to the second iteration.

Moving on to the second iteration of prototyping, the development process of the Keluargaku 2.0 information system continued until it met the requirements of Pusyanra Lancang Kuning. In the subsequent prototyping iteration, specifically the second iteration, the process returned to the listen to customer stage. In the listen to customer II phase, the developers held discussions with Pusyanra Lancang Kuning and the KS-PK department at the Riau Province representation of BKKBN. The discussions and interviews aimed to gather and map user requirements for the planning of the Keluargaku 2.0 information system in the second iteration. The mapping of user requirements can be seen in Table 4 below.

Table 4. Mapping of the second prototype cycle

No	Revision/Addition	Implemented Features/Functions
1.	Addition of UPPKA Store Dashboard	• UPPKA Data Management Interface: This feature displays the interface for UPPKA product data.
2.	Addition CRUD of UPPKA Product	• UPPKA Store Product Data Management: This feature is accessible only to the super admin role login and is used to manage UPPKA product data
3.	Addition CRUD of SOP Services	• SOP Data Management: This feature is accessible only to the super admin role login and is used to manage SOP data through an input link form
4.	Addition of welcome sound	• "Welcome" Audio Feature: This feature is automatically activated when visitors access the Keluargaku website and displays audio data
5.	Updating the Homepage Interface of Keluargaku	• Color Scheme and Font Modification • Addition of BKKBN Video Link • Displaying only 3 latest articles, previously 4 articles were shown • Relocation of the Counselor menu under the "About" submenu • Placing Vision, Mission, and Objective data under the "About" menu

After completing the user requirements mapping for the second iteration in Table 4, the next step involves identifying the actors for this second iteration. The identification of actors can be seen in Table 5 below.

Table 5. Second cycle of user identification

Users	Actor	Description
Pusyanra Lancang Kuning	Super Admin	Roles of the super admin login encompass accessing all features and managing the Keluargaku Dashboard, user data, counseling

Users	Actor	Description
		types, and counseling data, article categories, and article data, service types, and counselor data, playlists, and video material data, E-book data, guest book data, administrator data, "about" data (including vision, mission, and objectives), institution collaborations, organizational structure, contact information, schedule data, information, and slide images.
Web Visitor	Visitor	Visitors have restricted rights on the Keluargaku website, allowing them to view the homepage, fill out the guest book, participate in counseling sessions with counselors, and visit links on the website (Data and Information from BKKBN, BKKBN Central, and BKKBN Riau Province)

Based on the actor identification in Table 5, the next step is to design a use case diagram, aiming to describe the system's utility from the actor's perspective based on listen to customer II to achieve specific goals and depict the functional requirements of the Keluargaku 2.0 information system. After completing the listen to customer II phase, the subsequent step is the build prototype II phase, which aims to construct a system prototype based on the results of customer test-drive prototype I. This is done to provide a representation of the Keluargaku 2.0 information system before implementation in the form of program code.

After completing the listen to customer II and build prototype II stages, the next phase involves customer test-drive prototype II, which aims to conduct testing on the prototype. The results obtained from customer test-drive prototype II are deemed complete, and the designed features align with the requirements of Pusyanra Lancang Kuning, KS-PK department, and ADPIN department at the Riau Province representation of BKKBN. Consequently, the testing results can be implemented into the system and undergo performance testing on the system.

The development of the Keluargaku 2.0 information system utilizes the prototyping method, enabling users to visualize and describe the system before the coding process. This accelerates the development process, facilitating early and constructive feedback from users, and allowing for flexibility in accommodating user needs throughout the development cycle. The development process using this method focuses on the design aspect to provide an initial overview of how the system will function. If the development were to employ the waterfall method, changes during the development process would become less flexible. Consequently, handling large and complex projects would take longer compared to the prototyping method. Initially, this development employed the Extreme Programming (XP) approach. However, considering the extended duration of the system's development and the limited involvement restricted to programmers only, this method proved to be less suitable for this system's development.

3 Result and Evaluation

After all iterations have been deemed successful, the depicted prototype can be implemented into program code. This implementation result utilizes the Laravel framework. A framework is a collection of functions, procedures, classes, and instructions combined in a specialized container to facilitate developers or programmers in writing program code [7]. Generally, frameworks assist developers in programming effectively and efficiently. Laravel is one of the

PHP-based application frameworks under the MIT (Massachusetts Institute of Technology) license, utilizing the Model-View-Controller (MVC) concept and being open source [8].
In the planning phase of developing the Keluargaku 2.0 information system based on a website, the gathering of user requirements is essential. The initial step required for this system development is gathering requirements through direct interviews with Pusyanra Lancang Kuning. After going through two iterations during the planning phase, the system will be implemented in the form of program code.
Once the system has been implemented, the developers proceed with testing, including User Acceptance Testing (UAT) and performance testing using K6 and Grafana. The UAT analysis is conducted by the customer responsible for the development of the Keluargaku 2.0 system. The UAT is performed over two sessions, with the first session taking place on Monday, May 8, 2023, and the second on Wednesday, May 24, 2023. Out of a total of 129 test items, positive results were obtained from the client. Based on the UAT results, all built features align with user requirements. The calculation of UAT can be determined using the following formula.

$$UAT = \frac{'yes'answered}{Number\ of\ Question\ Items} \times 100\% \quad (1)$$

Based on the formula above, the UAT calculation can be performed:

$$UAT = \frac{129}{129} \times 100\%$$
$$UAT = 1 \times 100\%$$
$$UAT = 100\% \quad (2)$$

Next, the performance test summarizes the results of the website's performance tested with successfuly. The testing was configured to run with up to 100 virtual users (VU) for 12 minutes and 20 seconds. Performance testing was conducted using the web application Grafana, which provides visual representation of the system's performance data in the form of graphs, diagrams, and metrics.

Fig 3. Performance Overview

The performance overview results in Figure 3 can be elaborated in the following Table 6.

Table 6. Performance Overview Summary

Overview	Summary
Request Made	: Total requests received: 2,340 requests
HTTP Failure	: Number of failed requests: 0 requests

Overview	Summary
Peak RPS (req/sec)	: 3,83 *request/sec*
P95 Response Time	: 30.719 ms
Analysist	• It is stated that 95% of all responses received from the system during the testing had a response time of 30.719 milliseconds (ms). At the 95.5th percentile, responses had a longer response time than 30.719 ms. The 95th percentile is a commonly used metric in performance testing to provide insights into higher-level response rates of the system. • A total of 2,340 requests were executed on the tested system. The average rate of these requests was 3.1 requests per second (req/sec). This indicates both the quantity of requests made and how quickly these requests were sent within one second..

The following table displays information about the performance of the Keluargaku website based on the metrics measured using Grafana. This can aid in evaluating the website's performance and ensuring that the response time meets the expected standards.

Table 7. The Keluargaku Website Performance

	HTTP Req Check	**Result**
URL	https:// keluargaku.or.id	The URL or website address that was tested.
Scenario	*Default*	It represents the testing scenario used, referring to the standard settings in the testing process.
Method	*Get*	The request method used in the testing, which is used to fetch web pages from the given URL.
Status	200	The response status received from the server, indicating the success of the request and the server providing a valid response.
Count	2.340	The total number of requests sent during the testing to the server.
Min	892 ms	The fastest response time observed during the testing.
Avg	19.218 ms	The average response time sent during the testing
Stddev	9.258 ms	Shows the standard deviation of the response time, indicating the variation or deviation from the measured response times during the testing.
P95	30.719 ms	The 95th percentile value of the response time. It indicates the response time at which 95% of the requests received a response time equal to or better than that value.
P99	31.359 ms	The 99th percentile value of the response time. It indicates the response time at which 99% of the requests received a response time equal to or better than that value.
Max	32.404 ms	The longest response time observed during the testing. At some instances, the server may take longer to handle a certain number of requests.

4 Concussion

In the process of reengineering the Keluargaku 2.0 information system at Pusyanra Lancang Kuning, the applied steps have shown promising outcomes with a positive impact on various stakeholders, including Pusyanra Lancang Kuning itself, counselors, developers, and users. The

development of the Keluargaku 2.0 website has notably enhanced the accessibility of information pertaining to activities and counseling services offered by Pusyanra Lancang Kuning, thus facilitating better communication and engagement with its target audience. This improvement signifies a significant stride towards achieving more effective and efficient service delivery through the revamped information system.

Acknowledgements

We would like to express our gratitude to all team of PUSYANRA Lancang Kuning and the BKKBN Representative Office of Riau Province for their support and trust in entrusting us to develop and optimize the KELUARGAKU Information System up to this stage. Additionally, we extend our thanks to Politeknik Caltex Riau for support and funding this research.

References

[1] Trisnadoli, A. (2021). Implementasi Extreme Programming (XP) Agile Software Development pada Pengembangan Sistem Informasi KELUARGAKU. Vol, 6, 305–311.
[2] M. I. Saputra, "Metode Prototyping Untuk Mengembangkan Sistem Informasi Registrasi Barang Bukti Kriminal (Studi Kasus Polsek Depok Timur)," 2018.
[3] Mulyanto, "Metode Prototyping Dalam Pengembangan Sistem Informasi," 2009.
[4] A. P. Putri, "Aplikasi Pengendali Penyiaran Informasi pada Wall Display dan Peralihan Jam Kuliah melalui IP Paging di Politeknik Negeri Sriwijaya." POLITEKNIK NEGERI SRIWIJAYA, 2018.
[5] Howard, "Model Prototype," 1997.
[6] Y. Anggraini, D. Pasha, and A. Damayanti Setiawan, "Sistem Informasi Penjualan Sepeda Berbasis Web Menggunakan Framework Codeigniter (Studi Kasus : Orbit Station)," *J. Teknol. dan Sist. Inf.*, vol. 1, no. 2, pp. 64–70, 2020.
[7] Y. Cahyati and H. Murti, "Sistem E-Surat Pada Government Resource Management System Provinsi Jawa Tengah Berbasis Framework Codeigniter," *Univ. Stikubank*, pp. 978–979, 2018.
[8] Y. Mulyana, N. Ramsari, A. D. Rachmanto, and H. Puspita, "Sistem informasi penerimaan peserta didik baru (ppdb) menggunakan framework laravel 8 (studi kasus: smk widya dirgantara)," in *Proceeding Seminar Nasional Ilmu Komputer*, 2022, vol. 2, no. 1, pp. 114–122.
[9] Dhiman, S., & Sharma, P. (2016). Performance testing: a comparative study and analysis of web service testing tools. International Journal of Computer Science and Mobile Computing, 5(6), 507–512.
[10] Firma Sahrul, B., Safi'ie, M. A., & WA, O. D. (2016). Implementasi Sistem Informasi Akademik Berbasis Web Menggunakan Framework Laravel. TRANSFORMASI, 12(1).
[11] Haviluddin, H. (2016). Aplikasi Program PHP dan MySQL.
[12] Ipnuwati, S. (2014). Perancangan Sistem Informasi Penjualan Pada Toko Minak Singa. Explore: Jurnal Sistem Informasi Dan Telematika, 4(2), 12–20. https://doi.org/10.36448/jsit.v4i2.536
[13] Seifermann, V. (2017). Application performance monitoring in microservice-based systems.
[14] Sianipar, R. H. (2015). Pemrograman Javascript: Teori Dan Implementasi (Vol. 1). Penerbit Informatika.
[15] Solichin, A. (2016). Pemrograman web dengan PHP dan MySQL. Penerbit Budi Luhur.
[16] Sovia, R., & Febio, J. (2017). Membangun Aplikasi E-Library Menggunakan Html, Php Script, Dan Mysql Database. Jurnal Processor, 6(2).
[17] Sukamto, R. A., & Shalahuddin, M. (2015). Kolaborasi Rekayasa Perangkat Lunak Terstruktur dan Berorientasi Objek.
[18] Yuliano, T. (2017). Pengenalan PHP. Ilmiu Komputer, 1–9
[19] Zailani, A. U., Perdananto, A., & Ardhiansyah, M. (2020). Penggunaan Model Prototype dalam Membuat Library System di SMPIT AL Mustopa. SMARTICS Journal, 6(2), 89–96.
[20] Zamzami, E. M., & Budiardjo, E. K. (2011). Ontologi Pada Metode Requirements Recovery Dalam Proses Reverse Engineering. Semantik, 1(1)