JOURNAL OF APPLIED INFORMATION SYSTEMS AND INFROMATICS

Implementation of User-Centered Design Method in the Development of Tangkolo Village Website Based on User Experience to Improve Mobile Accessibility

Leli Donaningrum[a]

[a]*Departement of Informatics, Siliwangi University, Tasikmalaya, Indonesia*

Corresponding author: 2370060005@student.unsil.ac.id

Abstract

In the era of digital transformation, village websites have an important role as a medium of information and public services. However, unattractive website design and low accessibility, especially on mobile devices, are obstacles in creating an optimal user experience. This research aims to improve the quality of Tangkolo Village website using User-Centered Design (UCD) approach. By involving users in every stage of design, this research created an intuitive and responsive prototype. Usability measurements using the System Usability Scale (SUS) provided quantitative data to evaluate the quality of the interface. The results showed that implementing UCD significantly improved accessibility, efficiency, and user satisfaction. These findings confirm the importance of a user-centered design approach in creating inclusive digital experiences and supporting transparency of public services in villages.

Keywords: Village website, User-Centered Design (UCD), accessibility, user experience, System Usability Scale (SUS), responsive design, digital transformation.

Manuscript received 27 Nov. 2024; revised 29 Nov. 2024; accepted Nov. 2024. Date of publication Nov. 2024.

I. INTRODUCTION

In the midst of this rapid development, people are increasingly dependent on digital technology to fulfill their daily information and service needs. Information accessibility through websites is one example of significant digital transformation. Websites are not only a means of disseminating information, but also serve as a bridge of interaction between service providers and users. For villages, the existence of an effective website is an opportunity to bring public services closer to the community, while supporting transparency and easy access to information. Tangkolo Village, as one of the villages that seeks to utilize technology to improve public services. However, the unattractive website design is an obstacle in realizing a better experience for all users [1].

In this case, the User-Centered Design (UCD) approach can help overcome these obstacles by focusing on user needs. Previous research shows that applying UCD in website development significantly improves the quality of user experience. For example, Gunawan et al. found that UCD improves ease of use and user satisfaction in mobile-based systems [2]. In addition, the use of UCD on websites can increase accessibility and improve the interface, making it more user-friendly. User-centered design can increase the satisfaction of website visitors, especially in terms of ease of accessing information and visual comfort [3].

In the era of digital transformation, village websites play an important role as a medium for information and community services. However, challenges such as sub-optimal accessibility, especially on mobile devices, become an obstacle in providing a satisfying user experience. Based on data, more than 70% of the population in Indonesia uses mobile devices to access the internet, so improving accessibility is an urgent matter to be considered [4]. For this reason, user-centered design approaches, such as User-Centered Design (UCD), offer a solution by placing user needs and preferences as the main focus in the development process. This method has been proven effective in improving the quality of user experience, efficiency, and satisfaction through more intuitive and responsive interfaces [1], [2].

Several recent studies have revealed the effectiveness of applying UCD methods in various fields. Research by Gunawan et al. (2023) showed that the UCD method successfully improved the quality of mobile-based teaching information systems, especially in terms of ease of use and user satisfaction [2]. In addition, Hariansyah (2024) revealed that the application of UCD is able to create an interface that is responsive and in accordance with user preferences, thus increasing their level of satisfaction [1].

Overall, the implementation of User-Centered Design method in the development of Tangkolo Village website not only aims to meet accessibility standards, but also to create a fair and equal digital experience for all users. Thus, it is

expected that the village website can serve as an effective tool in increasing community participation and strengthening public services in this digital era.

II. Theoretical Foundation

A. *User Centered Design*

User Centered Design (UCD) is a system design approach that places the user as the primary focus in development. In UCD, the design process is divided into four main stages:

1. Usage Context Specification
   This stage aims to identify who the app users are and under what conditions they use it.
2. User and Organization Requirements Specification
   Identifies the specific needs that the application must fulfill to meet user expectations.
3. Design Solution Production
   Design a prototype based on the identified needs, then test it with users to get feedback.
4. Design Evaluation
   Test whether the design that has been created meets the needs of users and whether any improvements need to be made based on the test results [5].

B. *System Usabillity Scale*

The System Usability Scale (SUS) is one of the most popular approaches in usability testing. SUS consists of questionnaires that measure various aspects of a product's usability, which can include how easy an application is to understand, how efficient it is to use, as well as how satisfying it is for the user [6]. SUS itself uses 10 statement items followed by 5 answer options, ranging from “strongly agree” to “strongly disagree”. The resulting score from the SUS questionnaire provides an overview of the usability quality of the system based on user perception, although it does not provide in-depth details on specific issues found on the application interface [7].

C. *Design Iteration and Prototyping*

Design iteration and prototyping are important steps to explore, refine, and communicate design ideas. Iteration in design refers to an iterative improvement process where prototypes are tested, improved, and retested to refine the product. Research shows that prototypes not only serve to test functionality, but also to accelerate the process of learning and exploring design concepts [8], [9].

Prototyping itself can be done with various methods, from physical models to virtual models, depending on the design stage and specific goals. For example, low-fidelity prototypes are often used in the early stages of design to test basic concepts, while high-fidelity prototypes are used in the late stages to get closer to the final product [9].

III. Materials and Methods

A. *Research Approach*

This research uses the User-Centered Design (UCD) method, which focuses on the needs, preferences, and involvement of users in every stage of development. UCD is applied to improve the accessibility of Tangkolo Village website on mobile devices, as it is important to ensure the interface is intuitive and can be accessed easily by the villagers [10], [11]. This method helps produce application designs that meet user expectations through an iterative process based on direct user feedback.

B. *Research Stages*

This research was conducted in the following stages:

1. User Requirement Analysis
   Data collection was carried out through a Google Forms-based questionnaire distributed to selected participants in Tangkolo Village. This questionnaire was designed to determine user needs for the Village website.
2. Prototype Design Drafting
   Website prototype design using design tools such as Figma focuses on simplicity and responsiveness, especially for mobile devices, to ensure optimal user experience.
3. Design Evaluation
   This process focuses on testing and assessing the design that has been created with SUS to ensure that it meets the needs and preferences of users. In a related study, this website prototype testing was conducted to assess the convenience and accessibility of the user interface (UI) through various methods such as observation, questionnaires, and interviews, and using approaches such as Empathy Map to explore user needs. The research also showed the importance of intuitive design elements to increase user satisfaction in interacting with digital platforms [12].

C. *Data Analysis*

Quantitative data was obtained through usability measurement using the System Usability Scale (SUS), which assesses the ease of use of a website based on ten statements related to interface and functionality. The calculated SUS scores were then analyzed to identify aspects that need to be improved in the website design, particularly to improve accessibility on mobile devices. In addition, qualitative data was collected through a user survey focusing on their experience when using the website. The results of this data analysis were used to make improvements to the interface to better suit user needs and be more accessible on mobile devices.

IV. Results and Discussion

A. *User Requirement Analysis*

Data collection was conducted through a questionnaire distributed using Google Forms. This questionnaire was designed to obtain information related to users' experiences in accessing and using the Village website. By understanding their experience, I was able to identify existing problems and design a solution that better suited their needs.

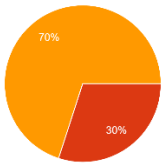
Some of the aspects questioned in the questionnaire included ease of navigation, where users were asked to rate how easy it was for them to find the information they needed on the village website. In addition, users were also asked to provide an assessment of the website's access speed, specifically related to how fast pages or content load.

The questionnaire also evaluates the design and appearance of the website, by asking whether the design is attractive and responsive, especially when accessed via mobile devices. Finally, users were asked to assess the suitability of the content

on the village website, including whether the information presented, such as village programs, news, and announcements, was relevant and complete.

Based on the analyzed questionnaire results, the following are the main findings related to the user experience when using the Village website:

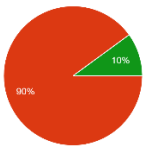
1. Ease of Navigation



Picture 1 Ease of Navigation Questionnaire Results

Based on the results, 70% of respondents found it very easy to find the information they needed on the Village website. However, 30% of respondents felt that it was quite difficult for them to find the information. This shows that most users feel that the website navigation is good enough, but there are some areas that need to be improved to make it more accessible to all users.

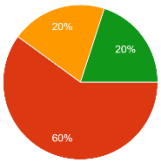
2. Access Speed



Picture 2 Access Speed Questionnaire Results

90% of respondents felt that the website loads pages or content quickly, which indicates that the website is quite efficient in terms of access speed. However, 10% of respondents felt that the speed was quite slow. This indicates that while most users do not experience speed issues, there are some improvements that need to be made to ensure better accessibility for all users.

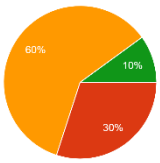
3. Website Design and Display



Picture 3 Website Design and Display Questionnaire Results

60% of respondents rated the website design as attractive, but not responsive on mobile devices, while 20% of respondents felt the design was less attractive and not responsive on mobile devices. A total of 20% of respondents rated the design as very attractive and responsive. These results show that there is a need to improve the design to be more responsive on mobile devices, as well as improve the appearance to be more attractive and easy to use by all users.

4. Content Appropriateness



Picture 4 Content Suitability Questionnaire Results

60% of respondents rated the relevance and completeness as lacking, while 30% of respondents felt that it was quite relevant, but incomplete. A total of 10% of respondents rated it as irrelevant and incomplete. These results indicate that most users feel that the content on the Village website is not fully relevant and complete.

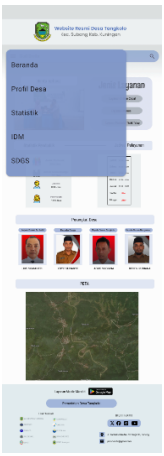
These results provide a clear picture of areas for improvement on the Village website, particularly in terms of ease of navigation, speed of access, and responsiveness of design on mobile devices.

B. *Design of Prototype Design*

A prototype is an initial design or model of a user interface (UI) developed to test concepts and functionality. In this context, a prototype is used to design a mobile web-based interface for a cosmetics store, with the aim of providing a visual and interactive overview of how the application or website will function after full development [13].

As the next step in the design process, the following prototype interface design is shown, which illustrates the arrangement of visual and interactive elements on the village website to enhance the user experience.

Picture 5 Home



Picture 6 Menu

The “Fast Online Service” menu on the Tangkolo Village website is designed as a tool that provides easy and efficient access for residents to take care of various administrative documents online. With the main purpose of simplifying and accelerating the public service process, this menu is equipped with a number of elements that support this function. The title “Fast Online Service” directly describes the essence of this menu, while the available service buttons, such as Permit, Certificate, Power of Attorney, and other options, are designed to provide clear and intuitive navigation.

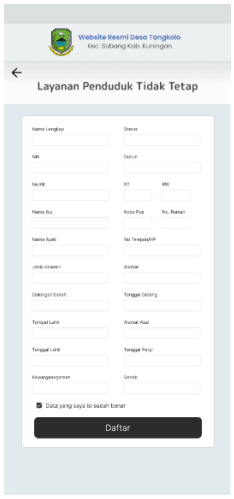
In addition, a contact phone number is provided to ensure users can get additional help or information if needed. In the

footer, there is supporting information in the form of related links, official contacts, and social media links that increase user accessibility and convenience. This design not only focuses on function, but also on clarity and completeness of information, thus becoming an effective and modern public service solution.

The menu design on the Tangkolo Village website has a simple structure with a horizontal arrangement and clear and easy-to-read text. The menu is divided into several main categories, such as Home, Village Profile, Statistics, IDM, SDGs, Services, Village Devices, Maps, and Mobile Services, to make it easier for users to find information. The menu display is designed to be consistent with the use of uniform fonts, colors, and spacing between items, giving a neat and professional impression. This design focuses on delivering effective information without excessive visual elements.

Picture 7 Fast Online Service

Picture 8 Manual Service



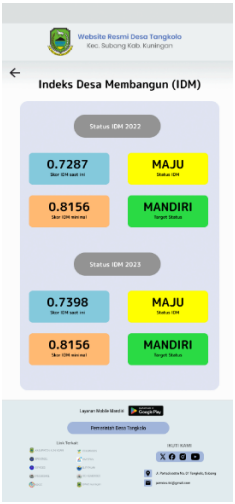
Picture 9 Non-permanent Resident Services

The "Fast Online Service" menu is designed to make it easier for Tangkolo Village residents to quickly process documents online. This menu includes a clear title, service buttons such as Permit and Certificate, phone numbers for assistance, as well as footers containing related links, contacts, and social media.

The "Tangkolo Village Service Manual" design features a list of civil registration services with a vertical layout and a gray background for clarity. The title "Manual Services" is made prominent, supported by the village government logo and official contacts. This design is designed to provide service information easily, facilitate community access, and increase transparency. Its main strengths are simplicity, clarity, and focus on available service information.

The design of the Tangkolo Village non-permanent resident registration form is designed to record personal data and important information completely and accurately. The title "Non-permanent Resident Service" indicates the purpose of the form, while input fields make it easy for users to fill in data. Confirmation checkboxes help ensure data accuracy, and a register button is used to submit data to the system. This design aims to simplify registration, maintain data accuracy, and support village administration through good data management.

Picture 10 Village SDGs Score



Picture 11 Village Development Index

The "Tangkolo Village SDGs Score" design displays key information about the village's achievements in achieving sustainable development goals. The main design elements include the title "Village SDGs Score" displayed in clear and large font as the main focus, the score for each SDGs goal in percentage form, icons representing each SDGs goal and sorted by goal number, and the village's total SDGs score displayed at the top. The village government logo and contact information complete the look to emphasize the official feel.

This design is designed to provide concise information on the achievements of Tangkolo Village in achieving the Sustainable Development Goals, which are a series of global goals set by the United Nations to address various world challenges. This display aims to convey information to the community and related parties about the village's contribution to the SDGs, enable comparison of achievements between goals, demonstrate the transparency of the village government, and encourage community participation in sustainable development efforts.

The advantages of this design include the presentation of information that is simple and easy to understand, even by ordinary people, comprehensive coverage by displaying all 18 SDGs goals, and providing an overview of the strengths and weaknesses of the village in achieving the SDGs.

The design of "Tangkolo Village's Village Development Index (IDM)" displays key information about the progress of village development through IDM score and status in 2022 and 2023. The main design elements include a clear title, a subtitle to indicate the time period, the main metric of IDM score and status, and the target to be achieved, which is "Mandiri". The design also includes the village government logo and contact information to emphasize an official feel.

This display is designed to convey concise information to the community, government, and related parties about village development achievements, compare performance between years, show development targets, and build transparency. The advantages of this design lie in its simplicity, focus on key information, and ability to convey information clearly.

C. Design Evaluation

Design prototype testing is very important as it serves as a key step to ensure that the design meets user needs and performs as expected before full implementation. The importance of prototype testing is to ensure the design meets user needs and provides a comfortable experience before final implementation. This process also helps identify issues in the initial design so that they can be fixed early, reducing the risk of failure once the application is launched [14]. Prototype testing helps ensure that the developed product can meet the needs and expectations of users, and provide an optimal experience [15].

In this study, testing was carried out using the SUS (System Usability Scale) questionnaire to measure aspects of usability. There are 10 questions that are the total measurements in this test, here are 2 tables of evaluation results scores with the SUS method:

TABLE 1 SUS QUESTIONNAIRE RESULTS

Tester	Question									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
T1	5	2	3	1	5	1	5	1	5	1
T2	5	2	5	1	5	1	5	2	5	1
T3	5	2	5	1	5	2	4	2	4	2
T4	4	3	5	2	5	1	5	3	5	2
T5	5	2	4	1	5	1	4	3	5	3
T6	5	2	4	3	5	3	4	2	4	2
T7	5	1	5	1	4	1	4	1	5	2
T8	5	2	5	1	5	2	4	2	5	2
T9	4	3	5	1	4	2	5	1	4	1
T10	5	1	5	1	5	2	5	1	5	1

In Table 1, there is data collected from 10 respondents who answered 10 questions related to the use of the application, as measured using the System Usability Scale (SUS). Each question was scored on a Likert scale of 1-5, with higher scores indicating more positive feelings towards the app features being assessed. After each respondent provided their answers, calculations were made for each question, which consisted of two types:

1. Odd Questions (1, 3, 5, 7, 9)
   The score is calculated by the formula (Score - 1) to indicate a lower negative perception on the scale.
2. Even Questions (2, 4, 6, 8, 10)
   Scores are calculated using the formula (5 - Score) to reflect a positive view of the app's usability.

The raw scores calculated from each respondent are then summed. The total score of all respondents for each question is multiplied by 2.5 to produce the final SUS score. This final score provides an overall picture of how well the application can meet user expectations and needs in terms of usability. The following table shows the final SUS score:

TABLE 2 FINAL RESULTS OF SUS QUESTIONNAIRE

Question										Amt	Score
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
4	3	2	4	4	4	4	4	4	4	37	93
4	3	4	4	4	4	4	3	4	4	38	95
4	3	4	4	4	3	3	3	3	3	34	85
3	2	4	3	4	4	4	2	4	3	33	83
4	3	3	4	4	4	3	2	4	2	33	83
4	3	3	2	4	2	3	3	3	3	30	75
4	4	4	4	3	4	3	4	4	3	37	93
4	3	4	4	4	3	3	3	4	3	35	88
3	2	4	4	3	3	4	4	3	4	34	85
4	4	4	4	4	3	4	4	4	4	39	98
Sum of Final Scores										350	875
Average Final Score										35	88

V. CONCLUSION

This research highlights the importance of the User-Centered Design (UCD) approach in the development of village websites, particularly to improve accessibility on mobile devices. By involving users in an iterative design process, the result is a prototype that is intuitive, responsive, and suited to user needs. The use of System Usability Scale (SUS) helped to identify design weaknesses and provide guidance for improvement. Overall, the implementation of UCD method on Tangkolo Village website is able to create an inclusive digital experience and increase community participation. This supports the goal of digital transformation to provide more transparent, efficient, and accessible public services.

REFERENCES

[1] H. Hariansyah and H. Hariansyah, "Implementasi Metode User Centered Design Dalam Perancangan Ui/Ux Purwarupa Aplikasi Lacakin," *J. Inform. dan Tek. Elektro Terap.*, vol. 12, no. 3, pp. 2029–2042, 2024, doi: 10.23960/jitet.v12i3.4602.

[2] R. Gunawan, A. M. Joharudin, Y. Yudiana, and D. Awalludin, "Analisis Dan Implementasi Metode User Centered Design (UCD) Pada Pembuatan Sistem Informasi Perangkat Mengajar Guru Berbasis Mobile," *Pros. Semin. Nas. Inov. dan Adopsi Teknol.*, vol. 3, no. 1, pp. 12–25, 2023, doi: 10.35969/inotek.v3i1.296.

[3] D. S. Dewi, A. H. Brata, and L. Fanani, "Penerapan User Centered Design dalam Pembangunan Aplikasi Informasi Hostel berbasis Android," *J. Pengemb. Teknol. Inf. dan Ilmu Komput. e-ISSN*, vol. 2548, no. 12, p. 964X, 2018, [Online]. Available: http://j-ptiik.ub.ac.id

[4] F. Adnan, M. H. Muttaqin, and T. Dharmawan, "Penerapan Metode User Centered Design Untuk Mengembangkan E-Learning Universitas Jember Berbasis Mobile," *INFORMAL Informatics J.*, vol. 3, no. 3, p. 85, 2018, doi: 10.19184/isj.v3i3.10072.

[5] D. S. Mubiarto, R. R. Isnanto, and I. P. Windasari, "Perancangan User Interface dan User Experience (UI/UX) pada Aplikasi 'BCA Mobile' Menggunakan Metode User Centered Design (UCD)," *J. Tek. Komput.*, vol. 1, no. 4, pp. 209–216, 2023, doi: 10.14710/jtk.v1i4.37686.

[6] D. P. Kesuma, "Penggunaan Metode System Usability Scale Untuk Mengukur Aspek Usability Pada Media Pembelajaran Daring di Universitas XYZ," *JATISI (Jurnal Tek. Inform. dan Sist. Informasi)*, vol. 8, no. 3, pp. 1615–1626, 2021, doi: 10.35957/jatisi.v8i3.1356.

[7] M. Surahman, N. Widiyasono, and R. Gunawan, "Analisis Usability dan User Experience Aplikasi Konsultasi Kesehatan Online Menggunakan System Usability Scale dan User Experience Questionnaire," *J. Siliwangi*, vol. 7, no. 1, pp. 1–8, 2021, [Online]. Available: https://jurnal.unsil.ac.id/index.php/jssainstek/article/view/3180

[8] B. Camburn *et al.*, "Design prototyping methods: State of the art in strategies, techniques, and guidelines," *Des. Sci.*, vol. 3, no. Schrage 1993, pp. 1–33, 2017, doi: 10.1017/dsj.2017.10.

[9] A. R. Murphy, E. A. Floresca, K. K. Fu, and J. S. Linsey, "Comparing parallel and iterative prototyping strategies during engineering design," *Res. Eng. Des.*, vol. 33, no. 2, pp. 173–190, 2022, doi: 10.1007/s00163-021-00376-7.

[10] R. Hartono and T. I. Ramadhan, "Implementasi Metode User Centered Design (UCD) dengan Framework Kanban dalam Membangun Desain Interaksi," *J. Algoritm.*, vol. 19, no. 2, pp. 823–831, 2022, doi: 10.33364/algoritma/v.19-2.1203.

[11] D. Kurniawan, R. Passarella, S. Fardinelly, F. H. Anggraini, H. A. Mattjik, and S. Rahmayuni, "Implementasi User Centered Design dan Software Requirements Specification pada Perancangan Website," *J. Algoritm.*, vol. 21, no. 1, pp. 343–354, 2024, doi: 10.33364/algoritma/v.21-1.1608.

[12] M. Okty Dea Pratama and S. Suwarni, "Pengembangan Prototipe Desain User Interface & User Experience (UI/UX) Pada Aplikasi OSS URINDO Menggunakan FIGMA," *J. Teknol. Inf.*, vol. 8, no. 2, pp. 155–166, 2022, doi: 10.52643/jti.v8i2.2772.

[13] D. D. Aulia, S. Aminah, and D. Sundari, "Perancangan Prototype Tampilan Antarmuka Berbasis Web Mobile Pada Toko Amira Kosmetik," *J. Ilm. Ilk. - Ilmu Komput. Inform.*, vol. 5, no. 1, pp. 29–40, 2022, doi: 10.47324/ilkominfo.v5i1.134.

[14] M. E. Purbaya, O. W. Syahputra, and H. I. Sianturi, "Perancangan dan Analisis Desain Antarmuka dan Pengalaman Pengguna pada Bengkel Online 'Oto Repair' Menggunakan Pendekatan Design Thinking," *Proc. Natl. Conf. Electr. Eng. Informatics, Ind. Technol. Creat. Media*, vol. 3, no. 1, pp. 180–188, 2023, [Online]. Available: https://centive.ittelkom-pwt.ac.id/index.php/centive/article/view/193/137

[15] O. A. Pradipta, I. M. Sukarsa, and I. P. A. Dharmaadi, "Pengembangan UI Aplikasi Mobile Konsultasi Karir Menggunakan Metode Lean UX," *JITTER- J. Ilm. Teknol. dan Komput.*, vol. 3, no. 1, pp. 1–11, 2022, [Online]. Available: https://ojs.unud.ac.id/index.php/jitter/article/download/84782/43682