Journal of Information Systems and Informatics
Vol. 6, No. 1, March 2024 e-ISSN: 2656-4882 p-ISSN: 2656-5935
DOI: 10.51519/journalisi.v6i1.695 Published By DRPM-UBD

Digitalization of Archipelago Cultural Insight Education Using Extreme Programming Method

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Abstract

This paper presents the development of the Archipelago Cultural Insight Education Application, an Android-based platform designed to enhance the learning of Nusantara's rich cultural heritage. Utilizing Extreme Programming (XP), an agile software development methodology, the application was developed to accommodate the dynamic requirements of educational content and interface design. The XP approach facilitated rapid iterations and continuous feedback, ensuring the application remained aligned with educational goals and user needs. The application features a user-friendly interface with dedicated sections for Traditional Houses, Local Attractions, Regional Foods, Folk Songs, and other cultural elements. Each section provides comprehensive data and detailed descriptions that aim to educate and engage users. The design prioritizes intuitive navigation and ease of content management, which is critical for the educational effectiveness and sustainability of the app. Moreover, the integration of multisensory learning elements, such as auditory content in the Folk Songs section, enhances the educational experience by providing a more immersive understanding of the cultural context. The application's development process and its features illustrate the benefits of applying agile methodologies in educational technology, highlighting how they can be used to produce a robust, engaging, and informative educational platform. This study contributes to the field by demonstrating the practical application of agile principles in the design and implementation of educational technology that effectively bridges cultural education and digital innovation.

Keywords: extreme programming, cultural education, android application development, multisensory learning

1. INTRODUCTION

In an era where communication technology is evolving at an incredible speed, smartphones have become an integral part of daily life [1]. The evolution of smartphone operating systems, particularly with the emergence of the latest version of Android, has ushered us into a new era of digital interaction, offering more sophisticated features and enriching the user experience. This development not only enhances the capabilities of devices but also fundamentally changes the way we access information, communicate, and especially, the way we learn [2].

The COVID-19 pandemic has accelerated digital transformation, especially in the education sector, forcing educational institutions around the world to adopt web-based E-Learning platforms and mobile apps. This step, although a solution to the global crisis, also marks the transition to a more flexible and inclusive form of education, enabling students from diverse backgrounds to access learning materials without the constraints of time and space [3].

However, this transition has also exposed gaps in access and readiness to use digital technology among student groups, especially among elementary school students who require a more tailored learning approach [4]. To address these gaps, the development of technology solutions that are not only innovative but also intuitive for young users is necessary, ensuring equal learning opportunities for all students.

In efforts to address these challenges, the Android-based Archipelago Cultural Insight Education application has emerged as a promising solution [5]. This application, designed to present interactive learning materials about Indonesian culture, combines the latest educational technology with rich and relevant content. Through the implementation of Extreme Programming methods, this application is designed to adapt to changing curriculum needs and assessment methods, promising an educational platform that can evolve with the dynamics of technology and educational needs.

Therefore, this research aims to apply the principles of Extreme Programming in the development of this educational application, choosing this method for its ability to support rapid software development and responsiveness to changes [6]. This marks an evolution in education where technology, apart from being a substitute for face-to-face teaching, transforms into a vital tool that enhances the quality and accessibility of learning. By encouraging innovation and expanding access to effective educational technology, we unlock the full potential of each student, preparing them not only for academic success but also for life in a continually evolving digital era.

2. METHODS

Extreme Programming (XP) approach is utilized in this study. Extreme Programming is a software engineering development activity aimed at forming small to medium-sized teams. This method is particularly useful for systems with unclear requirements and where requirements frequently change very rapidly [6]. It emphasizes frequent releases in short development cycles, which increases productivity and introduces checkpoints where new customer requirements can be adopted. Furthermore, Extreme Programming, often abbreviated as XP, is one of the Agile-based software development methodologies [7]. This means that

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

Extreme Programming is one of several methodologies that can be used to implement Agile software development principles. Agile itself is a software development principle that prioritizes adapting to changes [9], values the functionality of the application over documentation, and other Agile principles [10]. The iterative approach of XP, with its regular cycles of feedback and adaptation, is particularly suited to environments where the project scope and requirements are expected to evolve over time. This methodology supports a collaborative working environment, ensuring that the development process is aligned with customer needs and end-user requirements. The process of XP as shown in Figure 1.

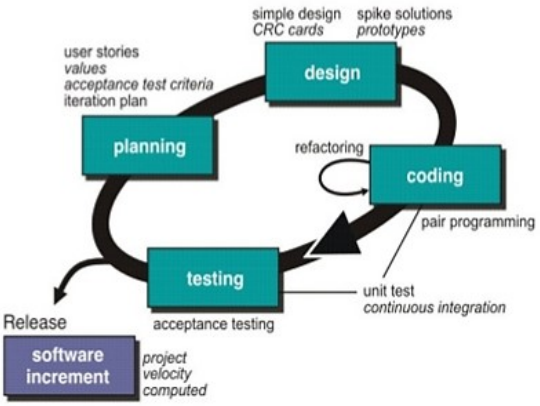

Figure 1. Extreme Programming

This method was conceived by Kent Beck, a software engineering expert [11]. Extreme Programming is a software development model that simplifies the various stages of system development, making them more efficient, adaptive, and flexible [12]. Extreme Programming (XP) employs an object-oriented approach and includes a set of rules that occur within four activity frameworks: Planning, Design, Coding, and Testing [13]. Based on Figure 1 the details process are as follows.

2.1. Planning

During this phase, an analysis is conducted on the scope of issues present in the software development of Archipelago Cultural Insight Education. The goal is to develop a solution that enhances the foundational knowledge of elementary school students, addressing specific educational needs and objectives.

2.2. Design

At this stage, the requirements of the users are transformed into a system model. The design process utilizes UML (Unified Modeling Language) modeling tools to

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create activity diagrams for the Archipelago Cultural Insight Education Application. This includes detailed planning of the system's outputs, inputs, and interfaces to ensure a user-friendly and effective educational tool. Figure 2 is an illustration of the application requirement.

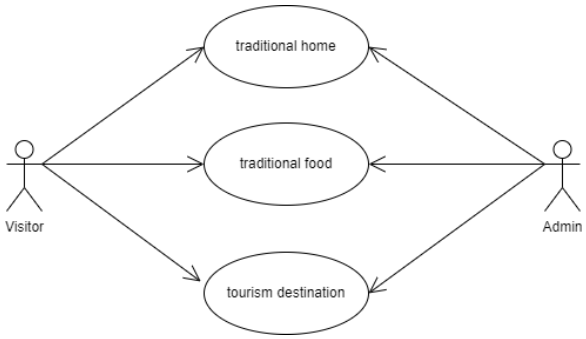

Figure 2. Use Case Diagram

Referencing Figure 2, the Use Case Diagram illustrates that the admin role encompasses various responsibilities, such as managing data related to Traditional Houses, Regional Foods, and Tourist Attractions. Conversely, the Users or visitors engage with the system through distinct processes, including accessing detailed information about Traditional Houses, exploring data on Regional Foods, and discovering insights into Tourist Attractions. This setup ensures a comprehensive interaction both for managing and retrieving cultural and touristic data.

2.3. Coding

This stage involves the actual development of the Archipelago Cultural Insight Education. The coding process integrates the previously designed system components into functional software. The application is built using Android-based coding and incorporates a MySQL database, which is highly capable of handling the extensive data required for the application. This phase is crucial as it translates design elements into a working model, ensuring that the application's architecture supports efficient data processing and user interaction.

2.4. Testing

In the final phase, the Archipelago Cultural Insight Education Application undergoes rigorous testing through the Black Box Testing method. This testing focuses on evaluating the application's functional components without knowing their internal workings, aiming to detect any inconsistencies or bugs in the software. The purpose is to ensure that all features of the application perform as intended in real-world scenarios, providing a seamless and robust user experience.

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This comprehensive testing helps in refining the software, ensuring reliability and effectiveness upon deployment.

3. RESULTS AND DISCUSSION

The development of the Archipelago Cultural Insight Education Application, utilizing the Extreme Programming methodology, has culminated in a robust Android-based platform. This application is designed to enhance the learning processes for students and is envisioned to eventually evolve into a startup within the educational sector. For instance, the admin login page displayed in Figure 3 provides administrative access for data management within the application, crucial for updating and maintaining the accuracy of displayed content.

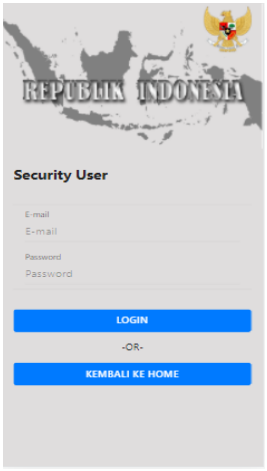

Figure 3. Login Page

Figure 4. Admin Menu

Figure 5. Home Page

Figure 6. About Page

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

Figure 4 displays the Admin Menu page, a critical interface used for inputting diverse educational data into the application. This page is essential for enriching the app's content, ensuring a comprehensive array of cultural knowledge is available to users. The design focuses on user-friendly navigation and efficient data management, enabling administrators to easily update and enrich the application's educational offerings. The home page, shown in Figure 5, acts as the primary portal for users, providing navigation links to various data categories such as Traditional Houses, Local Attractions, Regional Foods, and Folk Songs. This layout is strategically designed to facilitate easy access to a treasure trove of cultural information, thereby boosting user engagement and enhancing the educational impact of the app. Figures 5 and 6 detail the home and about pages, respectively. The about page offers a clear summary of the application's objectives and the extensive range of information it covers, helping users understand the educational ambitions and comprehensive scope of the platform. This page is intended to inform and assure users of the reliable and valuable content the application provides.

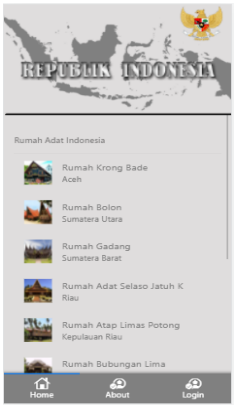

Figure 7. Traditional House

Figure 8. Detail of Traditional House

Figure 9. Local Food

Figure 10. Detail of Local Food

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

Dedicated to preserving cultural heritage, the section for Traditional Houses, illustrated in Figure 7, provides extensive information on various dwellings across Nusantara. The Detail Info page, shown in Figure 8, delves deeper with rich descriptions, aimed at enhancing the user's appreciation of the cultural significance behind each traditional house. The Regional Foods menu, depicted in Figure 9, compiles a variety of local cuisine data, further detailed on the Regional Foods Detail Info page in Figure 10. This segment is designed to educate users about the rich culinary traditions of the region, promoting both cultural appreciation and culinary tourism.

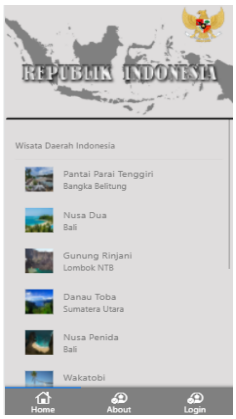

Figure 11. Tourism Information

Figure 12. Detail Tourism Information

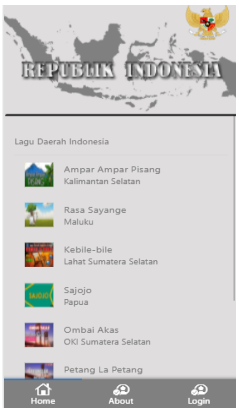

Figure 13. Local Song

Figure 14. Playing Music

Tourist Attractions, highlighted in the menu shown in Figure 11, lead users to a comprehensive Detail Info page, depicted in Figure 12. This part of the application offers detailed insights into various tourist spots throughout Nusantara, enhancing cultural tourism and raising awareness of the region's diverse attractions. The Folk

p-ISSN: **2656-5935** http://journal-isi.org/index.php/isi e-ISSN: **2656-4882**

Songs section, shown in Figure 13, introduces users to the region's traditional music. The Play Folk Song page, illustrated in Figure 14, provides detailed descriptions and playable content, enriching the cultural learning experience by integrating essential auditory elements that capture the essence of Nusantara's musical heritage. Overall, each component of the application is meticulously crafted to provide a thorough and engaging educational experience, emphasizing the rich cultural mosaic of Nusantara. This thoughtful design ensures that users not only access information but also gain a deep understanding and appreciation of the region's culture and traditions.

The Archipelago Cultural Insight Education Application, developed using the Extreme Programming methodology, serves as a prime example of how agile frameworks can be effectively implemented in educational technology projects. The application's development focused on continuous feedback and iterative testing, crucial for addressing the dynamic needs of educational content delivery. By leveraging the flexibility of Extreme Programming, the project team was able to rapidly adapt to changing requirements, such as updates in educational content and user interface enhancements. This approach not only improved the developmental agility but also ensured that the application remained relevant and up to date with educational standards and user expectations.

The Admin Menu and user interface designs are particularly notable for their emphasis on ease of use and functional simplicity. These aspects are critical in educational applications, where a wide range of users, including educators and students, require quick access to information. The administrative functions allow for seamless updates and management of educational content, reflecting an understanding of the need for robust backend support in educational apps. This is essential for maintaining the reliability and relevance of the content provided to users, ensuring that the application continues to be a valuable educational resource.

User engagement is significantly enhanced by the thoughtful layout of the home page and the strategic placement of links to various cultural categories. By providing direct access to information on Traditional Houses, Local Attractions, Regional Foods, and Folk Songs, the application effectively serves as a digital encyclopedia of Nusantara culture. This not only aids in educational pursuits but also fosters a deeper connection between users and the rich cultural heritage of the region. The user-centric design of the application highlights the importance of intuitive navigation in educational technology, which can significantly increase the time spent by users in learning activities.

The detailed informational pages for Traditional Houses, Regional Foods, and Tourist Attractions within the app play a crucial role in promoting cultural education and awareness. These pages provide users with comprehensive data and

in-depth descriptions, which are instrumental in educating users about the cultural significance of each element. Such detailed content enriches the user experience by providing a contextual backdrop for the data presented, which in turn facilitates a more profound understanding and appreciation of Nusantara's cultural diversity.

Finally, the integration of auditory elements through the Folk Songs section represents an innovative approach to cultural education, recognizing the importance of multisensory learning experiences. This feature not only enhances the educational value of the application but also engages users in a more immersive learning environment. The ability to listen to traditional music while exploring related cultural narratives allows users to experience the cultural context in a more holistic manner. This approach underscores the potential of educational applications to go beyond traditional learning methods and offer users an engaging, interactive educational experience.

4. CONCLUSION

The Archipelago Cultural Insight Education Application exemplifies the effective application of Extreme Programming in developing an educational tool that is both adaptive and user-friendly. Through its well-structured administrative and user interfaces, the application facilitates easy access and management of rich cultural content, enhancing both educational outcomes and user engagement. The comprehensive content design and the integration of multisensory elements further enrich the learning experience, promoting a deeper appreciation and understanding of Nusantara's cultural heritage. This project not only highlights the potential of agile methodologies in educational technology development but also sets a benchmark for future applications aimed at cultural education.

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