Development of Mobile Academic Information System (AIS) UIN Syarif Hidayatullah Jakarta Based on Android with Performance Evaluation Based on ISO/ IEC 25010

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ABSTRACT

Academic information systems are used to present information and organize administration related to academic activities. UIN Jakarta has an academic information system called AIS (Academic Information System) that can be accessed through a website or Android mobile application. 13 of 39 users complained about its performance. The author has interviewed one of PUSTIPANDA's staff and got information that the current version of AIS Mobile was built using hybrid Android. In terms of performance based on ISO/IEC 25010, an Android application built using native Android is better than using hybrid Android. Therefore, the author researched the development of AIS Mobile using native Android because it can create applications with the best performance. The results of the research are in the form of AIS Mobile applications that have better performance than the previous version.

CCS CONCEPTS

• Information systems ~Information systems applications ~Mobile information processing systems

KEYWORDS

Academic Information System, AIS Mobile, Native Android,

ISO/IEC 25010

1 Introduction

Academic information systems are used to present information and organize administration related to academic activities. With this kind of software, it is expected that academic administration activities can be appropriately managed, and the needed information can be obtained easily and quickly [1]. One of the academic information systems is AIS (Academic Information System), owned by Universitas Islam Negeri Syarif Hidayatullah Jakarta.

AIS UIN Jakarta is available in the form of web and Android-based applications. Users can access AIS web ais.uinjkt.ac.id domain[2]. Both students and lecturers can access AIS to carry out academic administration activities. However, the AIS web has some problems if it is accessed using a mobile device; it is caused by the amount of data to be accessed where the specifications of mobile devices are sometimes limited. In Android-based applications, users can download it in Google Playstore and search for AIS Mobile.

Some studies have discussed performance comparisons between native Android and hybrid Android. Research [3] and [4] compares the native Android performance of Android and Hybrid

Android based on ISO 25010; the results of this research are the performance of native Android is better than hybrid Android.

2 Theoretical Basis

2.1 Mobile Application Development

There are three approaches used to develop mobile applications [5], including:

Native application
Native applications are applications intended explicitly for specific mobile platforms and use programming languages and develop software according to the platform. For example, native Android applications are written using Java programming language and Eclipse tools, while iOS / iPhone is made using Objective-C languages and Xcode tools.

Web application
The web application is a website application that is specifically optimized for use in smartphone environments. This application is built using web technology standards, such as HTML5, CSS3, and JavaScript. The write-once-run-anywhere approach to web applications produces cross-platform mobile applications capable of working on different mobile platforms.

Hybrid application
The intuition of a hybrid application is to embed HTML5 mobile applications into a native container. This application seeks to combine the advantages of the HTML5 mobile web application approach and native applications. Simply put, this approach will convert HTML5 mobile web applications to the target smartphone's native application. Specific software support is needed for implementing this application, namely the mobile application development framework

2.2 ISO/IEC 25010

One of the software quality benchmarks uses ISO 25010, created by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). ISO 25010 replaces the ISO / IEC 9126 standard [6]. The ISO 25010 product quality model categorizes product quality properties into eight characteristics: functional suitability, reliability, performance efficiency, usability, security, compatibility, maintainability, and portability.

Based on the author's research, that refers to performance and additions to the application features. The author uses two sub-characteristics at ISO 25010, namely functional suitability and performance efficiency.

2.3 Related Works

Some similar studies have discussed comparisons between native Android and hybrid Android. Assessment [3] and [4] compare native Android and hybrid Android in terms of memory usage, CPU time, launching applications, and application performance.

The results of this research native Android are faster than hybrid Android. But the research aspect does not use an internet connection.

Research [7] compared the speed of UI processing and network operations on social media applications. This research states that native Android is faster in processing UI components and network operations than hybrid Android on social media applications.

Research [8] produced an Android application, namely AIS Mobile, for students and lecturers. However, the application has several features, such as KRS Validation, Assessment, View Lecture Schedule, and View Assessment. There are still many features that are not yet available in the results of this research.

3 Methodology

In developing this system, a system development methodology was used with the RAD method. There are 3 phases used in the RAD method [9] as depicted in Figure 1, namely:
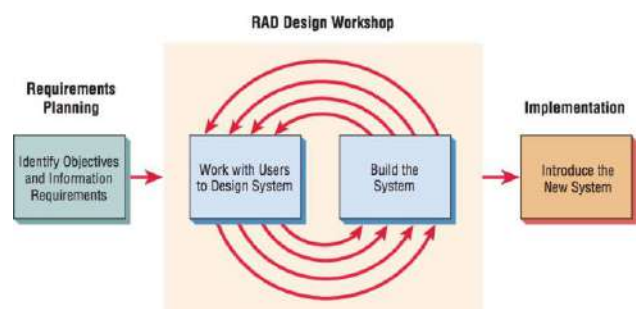1) Requirements Planning.
2) RAD Design Workshop.
3) Implementation.

Figure 1: Rapid Application Development

3.1 Requirements Planning

In this phase, users and meeting analysts identify the objectives of the application or system and identify the information requirements generated from these objectives. Orientation in this phase is solving company problems. Although information technology and systems can direct a portion of the proposed system, the focus will always be on achieving company goals.

3.2 RAD Design Workshop

This phase is the phase for designing and repairing, which can be described as a workshop. Analysts and programming can work to build and show visual representations of designs and work patterns to users. This design workshop can be carried out for several days, depending on the application's size to be developed. During the RAD design workshop, users respond to existing prototypes, and analysts improve modules designed based on user response.

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3.3 Implementation

In this implementation phase, analysts work intensely with users during workshops and design business aspects and non-technical companies. When these aspects are approved, and systems are built and screened, new parts of the system are tested and then introduced to the organization.

4 Results and Discussion

Use Case Diagram describes the interaction between users or users and applications as shown in the Figure 2.
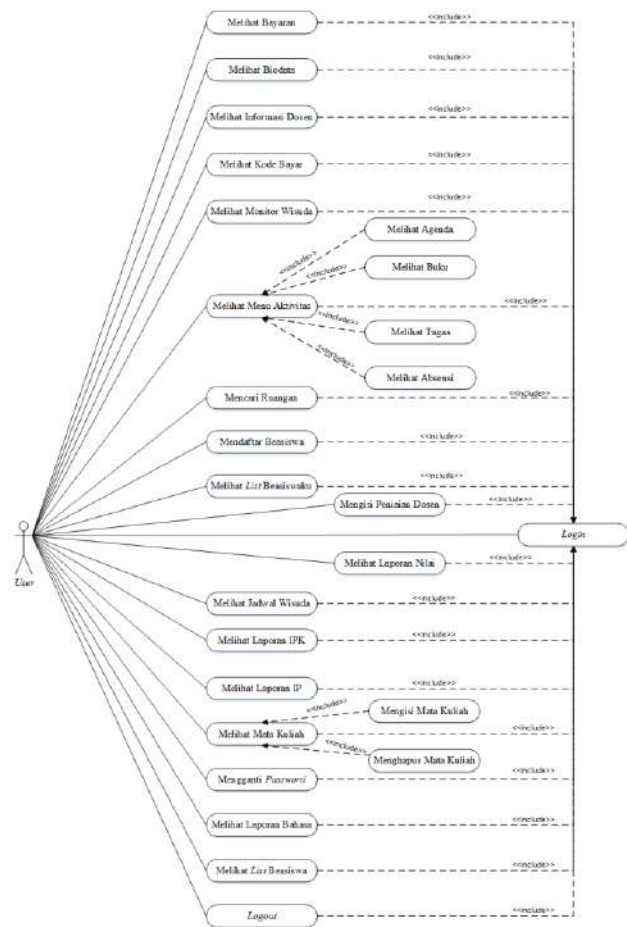

Figure 2: Use Case Diagram

On the recapitulation page, the assessment uses the scoring method. Here are the calculations:

Table 1 AIS Mobile Native Performance efficiency test result

Device	CPU	Memory	Time Behavior (s)
Mate 9	3,95%	13,12	0,33
Pixel	6,63%	12,12	0,41
Pixel 2	4,05%	14,37	0,27
LG G6	8,24%	17,12	0,58
Galaxy S9	3,18%	17,12	0,29
Average	5,21%	14,77	0,37

Based on the testing results as shown in Table 1 that the average CPU usage on the native version was 5.21%, memory usage was 14.77 MB, and time behavior was 0.47 seconds.

Table 2 AIS Mobile Hybrid Performance efficiency test result

Device	CPU	Memory	Time Behavior (s)
Mate 9	9,02%	15,75	0,39
Pixel	11,16%	15,12	0,52
Pixel 2	6,98%	16,12	0,34
LG G6	15,01%	19,25	0,77
Galaxy S9	8,51%	14	0,37
Average	10,14%	16,05	0,48

On the other hand, the average CPU usage on the hybrid version was 10.14%, memory usage was 16.05 MB, and time behavior was 0.48 seconds as shown in the Table 2.

Table 3 Performance efficiency test result

Aspek	Native	Hybrid
CPU	5,21 %	10,14%
Memory (MB)	14,77	16,05
Time Behavior (s)	0,37	0,48

Based on all the performance efficiency tests aas shown in Table 3, it can be concluded that the native version of AIS Mobile is better than the hybrid version even in the CPU utilization aspect, the native version is almost doubled efficient as the hybrid version. This result is almost the same as the previous research [4], where native Android has better performance than hybrid Android.

5 Conclusion and Suggestion

5.1 Conclusion

Based on the results of this research that have been explained above, it can be concluded that:
1. AIS was developed using native Android and integrated with the AIS web.
2. AIS Mobile native has more complete features than the hybrid version. There are some additional features, namely lecturer information, monitoring for graduation, graduation

payment code, and graduation schedule. Besides, there are some improvements to find rooms and fill in KRS features.

3. The performance of the AIS Mobile native version is better than the hybrid version. The performance efficiency test was proven using ISO/IEC 25010, which on CPU utilization aspects, the CPU usage of the native version (5.21%) is almost doubled efficient than the hybrid version (10.14%). In other aspects, time behavior and memory utilization, the native version is superior to the hybrid version.

5.2 Suggestion

This research is still not perfect, so it needs some further development. These are some suggestions from this study, namely:

1. Develop the system in other mobile platforms, such as iOS, Windows Phone, and so on.
2. Add some features that same as on the web version.
3. Create an application with a good UI/UX design.

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