Android-Based Digital Library Application Development

https://doi.org/10.3991/ijim.v16i11.32055

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Abstract—Digital technology has enabled the dissemination of all types of information, replacing traditional formats with automated systems. As a result of the development of digital technology, the library has also entered a new era, which is then called the digital library era. Digital library is considered as one form of modern library where the dependence will be on modern technology in the conversion of information and data to digital formats to achieve greater effectiveness and efficiency in storing and processing information and then transmitting it. Therefore, the purpose of this study is to develop an Android-Based Digital Library Application at the Department of Education Management, State University of Surabaya. This study uses the research and development method proposed by Borg and Gall by applying the nine stages. The results of this study indicate that the development of an Android-Based Digital Library Application at the Education Management Department, State University of Surabaya has been successfully implemented with the results of the trial getting an average percentage above 80% which is included in the very feasible category to be implemented. Even so, evaluation and monitoring must continue to be carried out to prevent errors or problems that may occur, as well as material to continue developing this Android-Based Digital Library Application.

Keywords—android, digital library, system information

1 Introduction

The library is one of the facilities that support the learning process in an educational institution. In fact, not only educational institutions, libraries are also used as a source of information that is needed by the general public. Therefore, it is not surprising that a city has a public library which was established to facilitate the public in finding sources of information. The library is a place of preservation of culture and knowledge. It plays an important role in society. Libraries have a function, namely, creating opportunities for literacy, learning and education, forming new ideas for creative and innovative society, ensuring authentic records of knowledge created by past generations [1]. Libraries are a unique place for Education resources. Therefore, the role or function of the library is very important as a means for the community to find sources of information. Traditionally, libraries store printed and handwritten materials [2], however, in recent years,

traditional libraries have been increasingly displaced by libraries that are integrated with technology, because we have now entered the era of digital technology.

The 21st century brings various changes that affect human life, one of which is the rapid development of digital technology. Digital technology itself began to develop a few years ago, where now it has been used in almost every aspect of human life. Digital technology has enabled the dissemination of all kinds of information, replacing traditional formats of information that are usually more carefully curated such as newspapers [3]. Currently the distribution of information has replaced its role with digital technology, including libraries. Dissemination of information through libraries that used to be done manually is now done automatically through the system. As a result of the development of digital technology, the library has also entered a new era, which is then called the digital library era.

Digital library is a library management process that uses digital technology assistance in carrying out the process. It can be said that the process of collecting, recording, disseminating, and storing information that used to be done manually by traditional libraries, is now done automatically with the help of digital technology. The concept of a digital library was first developed by Americans in the early 1990s [4]. After experiencing gradual development over several years, digital libraries have finally become one of the important aspects of modern library development [4]. Libraries adapt technology with the aim of sending information to their users and also to connect with their users more effectively and efficiently [5]. By using technology, digital libraries change library services from traditional ways to become more innovative by offering technological advances to meet user needs for information [6]. Traditional libraries are only able to provide information in printed or written form [7], but with library technology they can provide information in digital form that can be accessed anywhere and anytime.

Digital library is considered as one form of modern library where the dependence will be on modern technology in the conversion of information and data to digital formats to achieve greater effectiveness and efficiency in storing and processing information and then transmitting it [8]. In education, the digital library acts as a learning platform for students, a means for writing (as a writer), and a resource for teaching and learning activities [9]. Although digital libraries can be considered as a source of information, digital libraries can also be considered as powerful resources that can provide new opportunities to involve students in inquiry-based learning. In the partnership guidelines for 21st century skills it has also been stated that "today no organization can achieve results without integrating technology into every aspect of its daily practice. It is time for Educational Institutions to maximize the impact of technology as well" [10]. Therefore, the development of digital libraries in educational institutions is very important to do.

Digital technology itself is divided into several types based on the media, such as websites and electronic using computer media, while applications using mobile media, and so on. Of these types, the one that is currently the most favored by the community is Android or mobile applications. Android is an operating system for mobile phones. In the mobile world like this, android is one of the operating system platforms that makes it easy for manufacturers to design high-end phones. The reasons why android is popular today include android being able to operate multiple apps at the same time,

android has a customizable home screen, android has a better app market, android is hardware independent, android lets you install custom ROMs, android allows you use widgets to manage your app settings right from your home screen, android integrates with Google and Social Media, android gives you more options to fit your budget, innovative products like location aware services, nearby store locations etc, are some of the additional perks in Android.

Based on this background, this research was conducted with the aim of developing an Android-Based Digital Library Application at the Department of Education Management, State University of Surabaya. The achievement target of this research is the Android-Based Digital Library Application software and also the results of testing the effectiveness of the Android-Based Digital Library Application which will be carried out by distributing questionnaires to users first before being implemented.

2 Method

This research uses the Research and Development (R&D) method or research and development. Gall and Borg, in his book "Educational Research", explains that "Research and Development (R&D) in education is an industrial development model that aims to design and develop products where the results will be used to learning" [11]. The results of the design of the learning products are then tested in the field, evaluated, and refined so that they can produce learning products that are in accordance with the standards, and are effective, efficient and of good quality to be used. Among the various "Research and Development (R&D) models that exist, the model proposed by Borg and Gall is a model that specifically directs research and development in the field of education, especially learning. The model proposed by Borg and Gall is more commonly known as the ten-step model. The ten main steps of "Research and Development (R&D) or research and development" proposed by (Gall and Borg 1983) are as follows [12]:

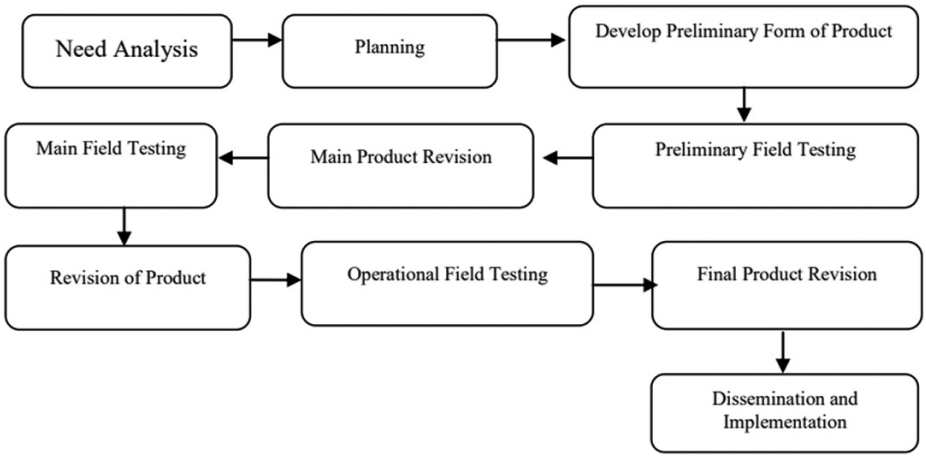

Fig. 1. Borg and Gall research and development stages

This study uses the Research and Development method for developing the android based digital library application at Educational Management State University of Surabaya, this research is limited to the ninth stage which includes the needs analysis stage, planning, model development, limited product trials, initial product refinement, trial wider field, adjustment of product results from field trials, final product trials, and final product revisions.

3 Result

3.1 Need analysis

Need analysis is the first stage of research and development of Android-Based Digital Library Applications. At this stage the researcher analyzed things that may be needed by the Department of Education Management, State University of Surabaya based on the results of routine evaluations. The results of the needs analysis show that due to the Covid-19 Pandemic and also the sudden change in the learning system, many students find it difficult to access learning resources. Although previously the Department of Educational Management, State University of Surabaya already had a digital library, the department felt the need to develop and improve their digital library. Because not only for students but also for educators and education staff, the library is an important thing. Therefore, the Department of Education Management, State University of Surabaya decided to develop an Android-Based Digital Library Application with the aim of making it easier for students and also educators and education staff to access the information needed.

3.2 Planning

After defining what you want to develop, the next step is to plan what is needed in the development process. At this stage the researcher determines what, when, who, and how aspects. What is needed for development, such as tools and materials, budget, and so on. Then when the development will be carried out, the deadline for each step must be planned so that it does not require a lot of budget expenditure. Next is to determine who will be involved in the development, because the development of the Android-Based Digital Library Application is related to technology, it requires experts from outside the Education management department who understand well how to develop Android-based applications. The last is how this development will be carried out, meaning what methods will be used to develop the research. In this study the method used is the research and development method proposed by Borg and Gall.

3.3 Development

Development is the most important stage in this development process, because it is at this stage that researchers begin to develop products that will be developed as planned. If an error occurs, it must be started from the previous stage again, therefore accuracy is needed at this stage, especially in this research related to very complicated technology. The results of developing Android-Based Digital Library Applications at the Department of Education Management, State University of Surabaya are as follows:

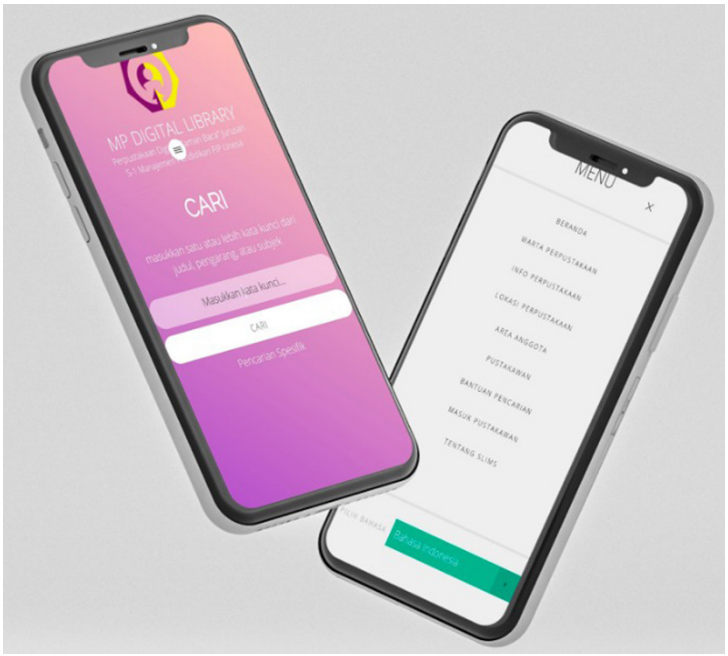

Fig. 2. Main view of Android based digital library application

Fig. 3. Login menu of Android based digital library application

Fig. 4. Android based digital library application menu display

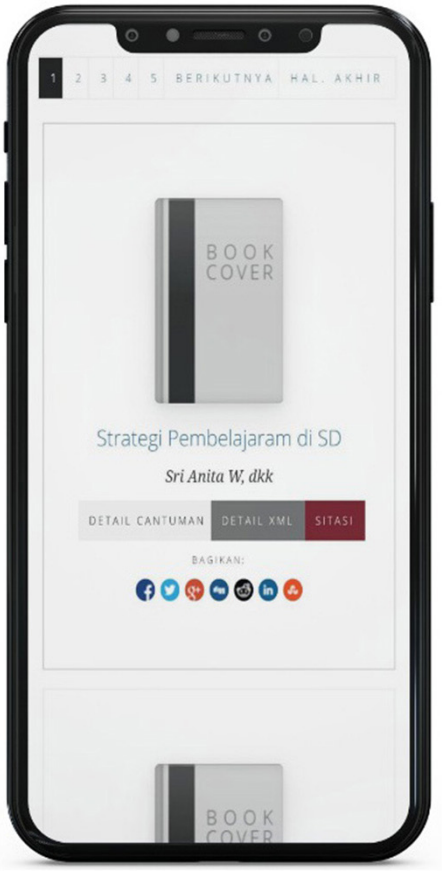

Fig. 5. Example of displayed book on Android-based digital library application

3.4 Limited product trials

Limited product trials are limited trials that are carried out after the product has been developed. In this study, trials were conducted using the same standard category at each stage of the trial, but the number of samples used was different. In this limited trial, the number of samples used was 5 people from the Department of Education Management, State University of Surabaya. The instruments used in the trials in this study are as describe in the Table 1:

Table 1. Test questionnaire instrument

No.	Category	Total Question
1.	Functional	5 items
2.	Design	5 items
3.	Ease to access	5 items
4.	Suitability of needs	5 items
Total		**20 items**

The results of the limited trial on this Android-Based Digital Library Application are shown in the Figure 6:

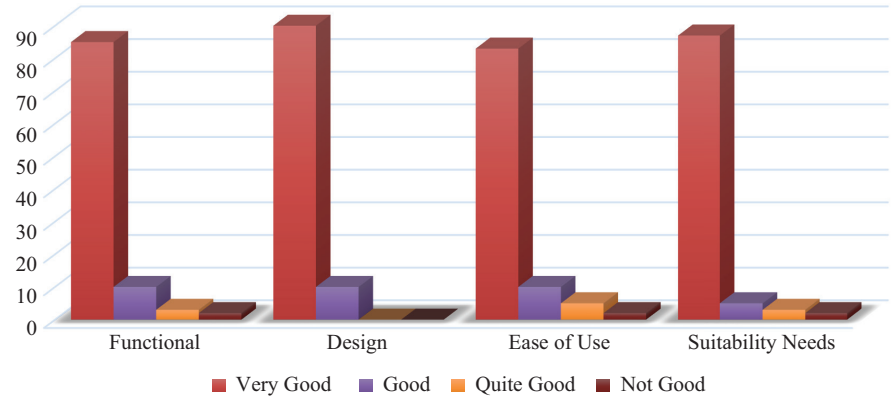

Fig. 6. Limited product trial result

3.5 Initial product refinement

Initial Product Refinement is the stage where researchers make initial improvements after the results of the trial come out. In the limited trial conducted in this research, there are several things that need to be improved, for example, the results from the ease-of-use category show the least of the other categories. This means that there are still many users who feel that this Android-based Digital Library Application is not easy enough to access its use. In addition, considering the suggestions given by the user, at this stage of improvement the researcher focuses on improving the ease of access of the Android-Based Digital Library Application.

3.6 Trial wider field

The Wider Field Trial is the second stage of testing in the research and development of this Android-Based Digital Library Application, with a larger number of samples and involving experts in the testing. In this trial, the number of samples used was 15 people,

which were taken randomly from students and employees of the Department of Education Management, State University of Surabaya. The test results of the Android-Based Digital Library Application in this second stage are shown in the Figure 7:

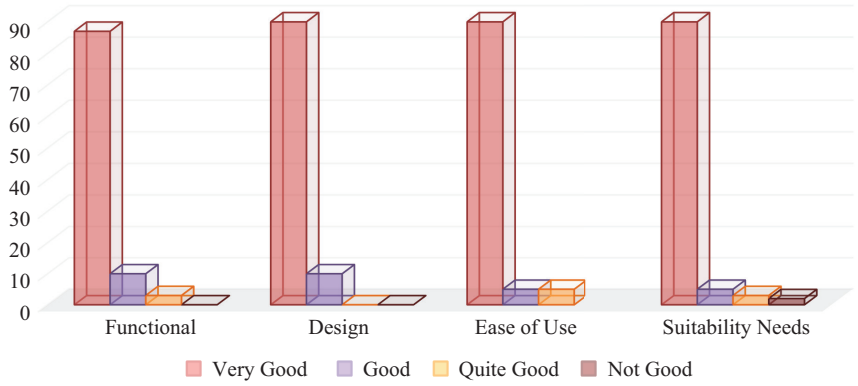

Fig. 7. Trial wider field result

3.7 Adjustment of product results from field trials

The results of the second trial with a larger number of samples showed that the improvements made had a positive impact, as evidenced by the increasing percentage of the ease-of-use category, even the functional category also experienced an increase. However, based on trials conducted by experts, the Android-Based Digital Library Application still faces obstacles, namely the display is still too small which results in the lack of clarity of the menus in the application. Display is the most important thing in application development, because it is through the appearance that the user will first be interested in the application, therefore in this second improvement stage the researcher focuses on beautifying the appearance of the Android-Based Digital Library Application.

3.8 Final product trials

Final product trials are the last trial phase. After repairing the application, it will be tested for the last time before it will be implemented in the Department of Education Management, State University of Surabaya. The results of the last trial of the Android-Based Digital Library Application at the Department of Education Management, State University of Surabaya with a sample of 35 people are shown in the Figure 8:

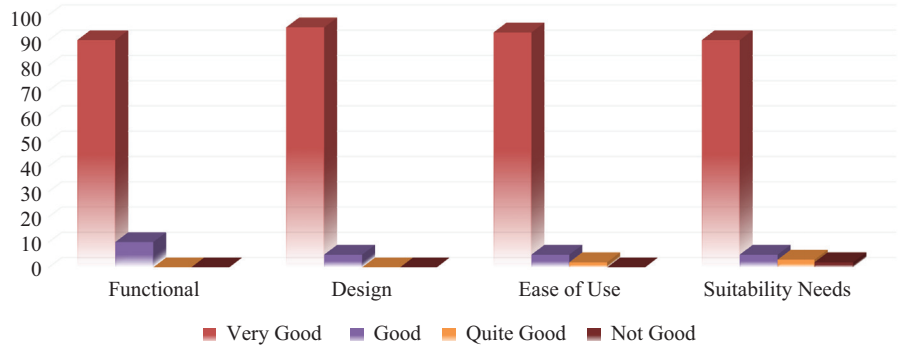

Fig. 8. Final product trial result

3.9 Final product revisions

After the last trial was carried out, the next stage was the refinement of the application before it was implemented. This last refinement stage is considered indispensable in order to measure the accuracy of the developed product. If there are still obstacles in the results of the last trial, at this stage the researcher must be able to fix it before the application is distributed and implemented. However, the results of the last trial in this study were no longer found obstacles, even some categories experienced an increase in percentage, this means that the previous improvements have been successfully carried out and at this stage the researchers only need to make improvements to the Android-Based Digital Library Application so that when the application is implemented there are no things that are not desirable.

4 Discussion

The development of digital libraries has been widely carried out by educational institutions to answer the challenges of the development of the digital technology era or digital transformation. Digital transformation is implemented by integrating technology in various fields of human life, such as operating models, collaboration models with external and internal environments, services provided, technology used, and information management [13]. This digital transformation has resulted in changes in almost all aspects of life, including academics, for example libraries that initially used conventional methods to become digital-based or often known as digital libraries [14]. A digital library is defined as a representation of the complex and sudden appearance of the collection, organization, design, storage, retrieval, and dissemination of digital information at various stages of development [15]. Digital libraries that are currently being developed are digital libraries based on mobile apps. Because in today's digital era, more people use smartphones to access information for easier and more convenient reasons. Therefore, this mobile app-based digital library was developed to meet the needs of the community [16]. Many libraries have followed the trend of increasing

smartphone use by developing and improving technology to make library services widely accessible to users [17]. Increased development of online content by libraries allows users to access content remotely without the need to visit a physical library [18]. Realizing the change in the concept of an increasingly advanced library, the Department of Education Management, State University of Surabaya decided to develop an Android-Based Digital Library Application to make it easier for students as well as educators and education staff to get library services that are easier and more comfortable. By implementing an Android-based mobile library application into library services, it can enable closer interaction between users and the library system, especially access to personal library accounts, so that users can monitor the status of borrowing books they have anytime and anywhere without the need to come and ask the librarian directly [19].

Based on the results of the last trial as shown above, it can be seen that this Android-Based Digital Library Application reaches an average percentage of above 80% in each category, which is 90% for the functional category, this means that judging from the function of the Digital Application This Android Based Library is already feasible to use; 95% for the design category, this means that the Android Based Digital Library Application has a good design and can attract the attention of users; 93% for the ease of use category, this also means that the Android-Based Digital Library Application is easy to access and use by users; 90% for the suitability of needs category, this means that the development of an Android-based Digital Library Application is very much in accordance with the needs of the Department of Education Management, State University of Surabaya. The results of these trials can also be interpreted that the Android-Based Digital Library Application, Department of Education Management, State University of Surabaya has been maximally developed in each category and is ready to be implemented.

The development of android-based applications does have many benefits for humans in carrying out their activities, including library service activities. Many studies have been conducted regarding the effectiveness of digital technology, digital readiness, digital comics, mobile learning, and the usability of mobile learning applications [20]. Several research results also show relevant results, such as the research conducted by Mukhtar and Putri entitled "Technology Integrated on Media Literacy in Economic Studies on Higher Education", showing the results that the development of Android Economic Development Application (EDA), can improve understanding of media literacy student. The EDA application is feasible to use with a percentage of 79.96% and is easy to use. The level of media literacy competence of students also increased from 28% to 69% at the moderate level. The EDA application makes it easy for students to get information about the meaning, characteristics, competencies, and levels of media literacy [21]. In addition, the results of research conducted by Sadiq also show relevant results related to the development of android-based applications, namely that the mobile application achieves its goal of teaching English as a foreign language with CCI (Child-Computer Interaction) standards and that the application is suitable as an educational tool. Applications developed by researchers will be useful for those who want to develop Android-based educational applications for children based on CCI standards [22]. Research conducted by Pahuriray with the title "School Android-Based E-Service" shows the results that the Android-Based E-Service Application seems very

useful for managing many transactions in the office, which makes communication more effective, and students know more events and activities school [23]. In addition to learning, the development of android-based applications also provides benefits in other fields, such as the results of research conducted by Stephens, which shows that the results from the dataset analysis support the conclusion that the application has succeeded in taking smartphone sensor samples, which can be used to detect defects in the current pavement. mounted to a vehicle windshield, and has the ability to provide relatively accurate and precise location data, given the commercial limitations of smartphone GPS accuracy [24]. Research conducted by Rifki also shows the results that the Arduino-based Sit Up test measuring instrument and Ultrasonic sensor with Android application are deemed suitable for use for Sit Up tests in producing more accurate calculations [25]. Lastly, the research conducted by Sujarwo with the title "Android-Based Interactive Media to Improve Student Learning Outcomes in Social Sciences" also strengthens that android-based application development is effective in various fields, namely Android-based interactive media has a positive effect on student achievement [26]. The results of some of these studies further strengthen that the development of Android-based applications is indeed important to be developed and provides many benefits for its users.

5 Conclusion and recommendation

Based on the explanation and also some relevant previous research results as described above, it can be concluded that the development of an Android-Based Digital Library Application at the Department of Education Management, State University of Surabaya has been successfully implemented with the results of the trial getting an average percentage of above 80% already included in the category of very feasible to be implemented. Even so, evaluation and monitoring must continue to be carried out to prevent errors or problems that may occur, as well as material to continue developing this Android-Based Digital Library Application.

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Article submitted 2022-04-28. Resubmitted 2022-05-20. Final acceptance 2022-05-20. Final version published as submitted by the authors.