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E-MUSEUM PROTOTYPE INNOVATION FOR EDU TOURISM DEVELOPMENT BASED ON SMART DIGITAL ANDROID APPLICATION

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Abstrak- Museum merupakan salah satu objek wisata pendidikan (edu-tourism). Museum biasanya digunakan sebagai alat pembelajaran bagi masyarakat. Potensi besar museum sebagai sarana pendidikan dan pariwisata kurang dikenal oleh masyarakat karena tidak adanya sistem informasi terintegrasi yang berkaitan dengan informasi museum. Salah satu inovasi yang dapat menarik perhatian masyarakat adalah pengembangan aplikasi e-museum berbasis Android. Dengan aplikasi e-museum berbasis Android, masyarakat dapat mengetahui spesifikasi masing-masing museum sehingga mereka dapat menerima informasi sesuai dengan kebutuhan mereka. Spesifikasi masing-masing museum sehingga mereka dapat menerima informasi sesuai dengan kebutuhan pengunjung. Penelitian ini bertujuan untuk menginovasi pengembangan museum berdasarkan teknologi informasi dan mengembangkan potensi museum sebagai objek wisata pendidikan. Pengembangan situs web digital menggunakan metode penelitian dan pengembangan (RnD) dengan langkah-langkah pengembangan model ADDIE. Model ADDIE terdiri dari lima langkah, yaitu: (1) analisis, (2) desain, (3) pengembangan, (4) implementasi, dan (5) evaluasi. Hasil penelitian ini adalah penciptaan prototipe E-Museum dengan platform situs web yang memiliki hasil kelayakan ahli (validasi produk) dengan penilaian ahli media sebesar 4,35 (layak) dan penilaian ahli materi sebesar 4,25 (sangat layak). Hasil evaluasi akhir produk secara keseluruhan dengan nilai rata-rata skor total menunjukkan nilai 4,3, sehingga dapat disimpulkan bahwa media yang dikembangkan “sangat layak” dari aspek penilaian pengguna..

Kata kunci: *Aplikasi mobile, museum, android, Inovasi,, Edutourism*

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Abstract-The museum is one of the educational tourism objects (edu-tourism). Museums are usually used as a learning tool for the community. The great potential of museums as a means of education and tourism is less known by the public because there is no integrated information system related to museum information. One of the innovations that can attract the public is the development of Android-based e-museum applications. With the android-based e-museum application, the public can find out the specifications of each museum so that they can receive information according to their needs. Specifications of each museum so they can receive information according to visitor needs. This research aims to Innovate the development of museums based on information technology and develop the museum's potential as an educational tour. Digital website development uses the Research and Development (RnD) research method with the ADDIE model development steps. The ADDIE model consists of five steps, namely: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. The result of this research is the creation of an E-Museum

prototype with a website platform with expert feasibility results (product validation) with the results of the media expert'sexpert's assessment of 4.35 (feasible) and the material expert'sexpert's assessment of 4.25 (very feasible). The results of the final evaluation of the product as a whole with the average value of the total score show a value of 4.3, so it can be concluded that the media developed is "very feasible" from the aspect of user assessment.

Keywords: *Mobile application, museum, Android, Innovation, Edutourism*

INTRODUCTION

The rapid development of information technology and telecommunications infrastructure, particularly database services, has changed the orientation of civilization in various sectors, including the tourism industry. To maximize Indonesia's tourism potential, the advantages of the three main elements—people, nature, and heritage—are insufficient without the support of digitalization. The tourism industry is currently facing digital trends that have transformed how people plan trips, from searching for information (looking), booking tickets or tour packages (booking), to making online payments (pay) (Wahyuni et al., 2023). Therefore, application development continues to be undertaken by tourism industry actors to maintain the existence of specific tourist attractions. One destination that needs to focus on digital development is the museum. As an educational tourism object that exhibits historical objects, art, and science, museums have an important role, although their visitor numbers are often lower than those of nature-based tourism destinations. Juwita et al. (2020) note that the dull image of museums, perceptions of ancient and haunted buildings, and monotonous information delivery are major inhibiting factors. Most museum information is still presented through written texts, information boards, guides, books, or brochures, which directly or indirectly affects the number of visitors. Therefore, the development of e-museum applications has become an urgent need to ensure that museums remain relevant in the eyes of modern society.

One innovation that can be developed is the e-museum application. Previous studies have shown that e-museum development serves various purposes, such as the Android-based Lampung Museum Collection Introduction application, which offers a virtual tour to introduce museum collections to local and international tourists (Azzahra et al., 2019). Other applications have also utilized Augmented Reality (AR) or Virtual Reality (VR) technologies as interactive media that enable visitors to interact with museum collections online (Pramana et al., 2021). In this research, the development of the e-museum application focuses on the Android platform, considering its widespread use in Indonesia, particularly among millennial students. This application is expected to allow users to view images of museum collections accompanied by informative and interactive descriptions that meet user needs.

The objectives of this research include: (1) producing an e-museum application product to encourage increased tourism potential in the field of education; (2) determining the feasibility of the developed e-museum application; and (3) identifying the effect of e-museum application usage on increasing visits by the younger generation to museums in Yogyakarta and strengthening the potential of museums as smart edutourism destinations. The development of e-museum applications provides several benefits. For universities, it contributes to academic research and serves as a foundation for further innovation. For the public, the application facilitates access to educational information about museums and increases interest in learning through museum-based media. For museum managers, the application has the potential to attract both domestic and international visitors, thereby increasing management productivity. In addition, this innovation benefits partner institutions by contributing to national educational development and enhancing public trust in partner products.

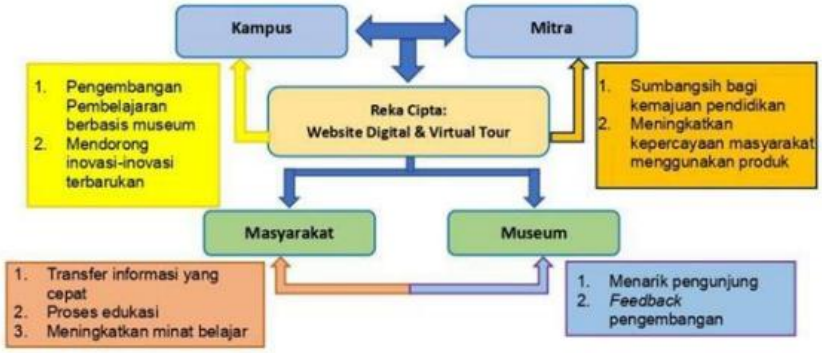

Fig. 1. Development Benefits Chart

LITERATURE REVIEW

Innovation

According to Hamijoyo (as cited in Kusnandi, 2019), innovation comes from the Latin word innovation, which means renewal and change. Nafi'ah and Sutimin (2020) explain that innovation is closely related to technology, which opens opportunities for organizations to introduce new products or improve the design and production processes of existing products or services. Wulandari et al. (2021) add that innovation is a new idea that emerges within a specific social context and is used to solve existing problems. From these various definitions, innovation can be understood as a new idea developed to improve a product or service, making it more attractive and better than before. Innovation also has several characteristics related to how quickly it is accepted by society. According to Rogers (as discussed in Rahouti et al., 2021), these characteristics include (1) compatibility, (2) complexity, (3) relative advantage, (4) observability, and (5) trialability.

Prototype

A prototype is an early model or trial version of a product used to test a design concept or functionality before further development. In software or information system development, prototypes are often used to illustrate how a system will operate, allowing developers and stakeholders to provide immediate feedback. Prototyping is a process that enables developers to create an initial version of an application or system to identify user needs more effectively and refine the design based on user evaluations (Rahouti et al., 2021). Prototypes may be simple or complex, depending on the development stage and trial objectives. In software development methodologies, prototyping can accelerate development cycles, improve communication between developers and users, and reduce the risk of errors in the final product (Dix et al., 2004). In addition, prototyping is known to increase user satisfaction because users can be directly involved in testing and improving the design (Schwaber, 2002). Thus, prototyping is an invaluable tool in product and system development, enabling early identification and resolution of potential problems.

Museum

Museums are one of the objects that can be utilized as smart edutourism, functioning as learning resources for the community (Kiswantoro & Damiasih, 2018). Although museum functions continue to evolve over time, their essential purpose remains unchanged, with scientific and artistic foundations at the core of the museum concept (Půček et al., 2021). According to Sinurat et al. (2020), a museum is a repository for historical collections with cultural value that serves to preserve the heritage of past civilizations. In Law No. 11 of 2010 on Cultural Heritage, museums are mandated to protect, develop, and utilize collections of objects, buildings, or structures designated as cultural heritage and to communicate them to the public. Consequently,

museums function as repositories of historical objects and are responsible for transmitting the values contained within their collections. Government Regulation (PP) No. 19 of 1995 further states that museums function as institutions that store, care for, secure, and utilize cultural, natural, and environmental objects to protect and preserve national cultural wealth. This broad function is also emphasized by Iskandar and Suryo (2021), who describe museums as places for storing, preserving, and communicating material evidence of human culture, nature, and the environment.

In today's digital era, digital media serve as strategic tools because they can reach broad audiences quickly. Information technology enables people to access information anytime and anywhere with ease (Danuri, 2019). Digital media—such as Android- and web-based applications integrated with QR codes or information portals—act as information gateways that facilitate access to various digital features. Based on this perspective, museums are institutions that store and preserve historical objects with cultural value to safeguard national heritage, while e-museum applications represent the application of technology to present museum-related information that can be accessed quickly and easily by the public.

Android Mobile Application

According to Buyens (2001), the term application refers to a ready-made program designed to perform specific functions for users or other applications, while mobile refers to the ability to move from one place to another. Based on this definition, a mobile application can be understood as a program that can operate while users change locations and typically has a relatively small size. Mobile applications are generally accessible through wireless devices such as smartphones and other portable devices. Although mobile applications are often associated with entertainment features—such as games, music players, and videos—these devices allow users to access content anytime and anywhere. Mobile devices vary in size, design, and layout, as well as in memory capacity, connectivity, battery life, power consumption, durability, and processing capabilities.

According to Safaat (2018), Android is a collection of software that includes an operating system, middleware, and core applications for mobile devices. Android has several key characteristics, including its open nature that allows developers to adopt new technologies, its general-purpose functionality, its ability to break application barriers by integrating web data with device information (such as contacts, calendars, or geographic location), and its support for fast and efficient application development through extensive libraries that facilitate the creation of high-quality applications.

Edu-Tourism

Educational tourism is a combination of tourism activities and learning processes (Karyono, 2010). Franco et al. (2022) define educational tourism as travel undertaken by groups to gain direct learning experiences related to the destinations visited. In line with this view, Ankomah and Larson (2000) explain that educational tourism aims to provide comparative insights or knowledge related to the visited field and is often referred to as a study tour or educational trip. Furthermore, Smith and Jenner (as cited in Ritchie et al., 2003) describe educational tourism as a tourism trend that integrates recreation and education by creating tourism products containing learning elements. Educational tourism encompasses various aspects and addresses diverse tourist interests, including culture, language, art, music, architecture, folklore, environmental awareness, flora and fauna, and deeper understanding of cultural heritage and historical sites. Based on these perspectives, educational tourism can be understood as a tourism concept that integrates recreational and learning activities to provide meaningful learning experiences for visitors.

Fig. 2. Edutourism Concept

METHODOLOGY

The development roadmap of the Android-based Prototype E-Museum for Edu Tourism is designed to be accessible via laptops and smartphones. The parties involved in this project include Universitas Negeri Yogyakarta (UNY), industry partners (DUDI), and schools, with PT Technova Solusi Informatika acting as the main technology partner. The museum selected as the content object is the Museum Pendidikan Indonesia, which emphasizes educational themes. The primary outputs of this project include a collection exhibition and virtual tour videos, which are expected to serve as a new platform for improving historical literacy and encouraging public interest in museum visits. The program is targeted for completion within a period of six to seven months. Based on the development roadmap (Fig. 3), the implementation process is divided into three main stages: planning, processing, and program creation.

Fig. 3. Roadmap

In the planning stage, the activities carried out include determining museum objects, creating storyboards for websites and virtual tour videos, designing application displays, and dividing tasks according to team competencies. Activities that have been carried out include determining the museum that will be the object, making the application flow, division of tasks, and scheduling work. In addition, the creation of a temporary application design is currently underway. In the processing stage, activities that include taking videos and photos, collecting data on museum collections (including collection descriptions), and editing and storyboarding virtual videos for the three museums, are underway. Activities to be carried out at this stage include taking videos and photos, collecting data, and editing videos. In the website development stage, activities include refining the collection design and creating a program, including domain creation and coding. Activities to be carried out include program creation and collection design improvement.

Overall, this research uses the ADDIE method (Analyze, Design, Development, Implementation, Evaluation) which is explained through the flowchart in Fig. 4. Data collection was

conducted using observation, interview, and documentation techniques. For data analysis, the technique proposed by Miles and Huberman was used, which includes data collection, data reduction, data presentation, verification, and conclusion.

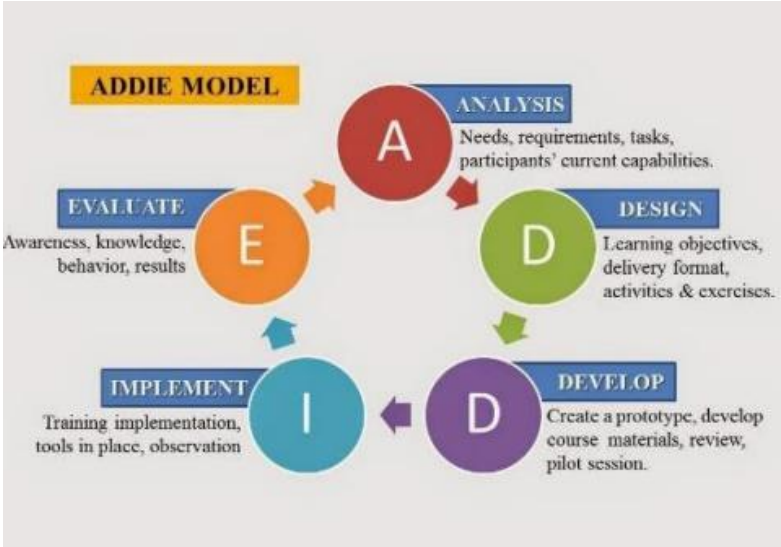

Fig. 4. ADDIE Development Models

RESULT AND DISCUSSION

The stages of developing the Historical Interactive Virtual Reality industrial prototype product are carried out in accordance with the development research method. Development research is carried out with several stages described in the following description.

a. Stage I Analyze (Analysis)

At the analysis stage in the ADDIE method, the main focus is to understand the needs and set clear objectives for the development of an Android application-based E-Museum prototype that will support the development of Edu Tourism. In this research, the analysis stage involves identifying museum objects that will be used as content, mapping the audience who will use the application, and determining the features that need to be in the application to achieve the goals that have been set. The following are details of the analysis stage in this research:

1) Identification of Museum Objects

The first step in the analysis stage is to determine the museum object that will be used as the main content in the e-museum application. Based on this research, Museum Pendidikan Indonesia was chosen as the object because of its relevance to the theme of education which is the main focus in the development of Edu Tourism. The museum also has a collection that is rich in history and knowledge that is in line with the aim of providing educational experiences to users.

2) Audience and User Needs Analysis

In this analysis stage, the target audience that will use the e-museum application is identified. The audience identified includes the general public with a wide age range, especially students and millennials who tend to be more familiar with the use of digital technology. To meet user needs, the app is designed to provide easy access to museum collections, historical information, as well as an interactive experience through a video virtual tour feature. Thus, users not only obtain information but can also experience an interesting educational experience virtually.

3) Determination of Application Features and Functions

This analysis stage also includes determining the main features that will be included in the application, namely collection exhibitions and virtual tour videos. These features are expected to increase visitors' interest in the museum, by providing a more interesting and interactive experience compared to conventional visits. In addition, a technical needs analysis was conducted which included the selection of the development platform (Android) and the utilization of digital technologies such as QR codes and hyperlinks to facilitate navigation and access to further information for users.

4) Technology Needs Analysis
The analysis stage also includes identifying the technology required to support the application development, such as software for application design and virtual tour video creation, as well as the Android platform as the most widely used operating system in Indonesia. The use of this technology aims to ensure that the application can be easily accessed by users through commonly used mobile devices, such as smartphones and tablets.

5) Time Analysis and Division of Tasks
In the analysis stage, the time allocation for each stage of the project and the division of tasks among the team involved are discussed. This plan includes developing a realistic schedule for storyboarding, taking videos and photos, collecting data, and developing and refining application and program designs. With a clear division of tasks, it is expected that the project can be completed within a predetermined time, which is around 6-7 months.

b. Phase II Design

1) The prototype product design was carried out with the following steps:
   a) Developing the Blueprint Design of the E-Museum: An Innovation Prototype for Developing Tourism Potential in Education (Edutourism) Based on Smart Digital Android Application.
   b) Wireframes First, we'll go through a quick iteration, defining interactions and general layout. The interaction design is auto-reflective with a gyroscope sensor. This type of sensor will detect how the movement reaches and reflexes.
   c) Visual Design At this stage, the features and interactions have been approved. Brand guidelines are now applied to the wireframes, and a beautiful interface is created.
   d) Blueprint Here, we will organize the screens into a flow, draw links between screens and describe the interactions for each screen. We call this the blueprint of the app, and it will be used as the main reference for developers working on the project.
   e) Set Canvas Size The process of setting the canvas will be adjusted to the width of the dimension and faced with a 360-degree canvas size. To apply this mobile app workflow to the VR UI, you must first find a reasonable canvas size. The process of arranging content and templates on a 360-degree canvas is done by uploading a board in the 3D Vista application. The full width of the projection represents 360 degrees horizontally and 180 degrees vertically. We can use this to determine the pixel size of the canvas: 3600 × 1800. Here is the uploaded content from the 3D vista software.

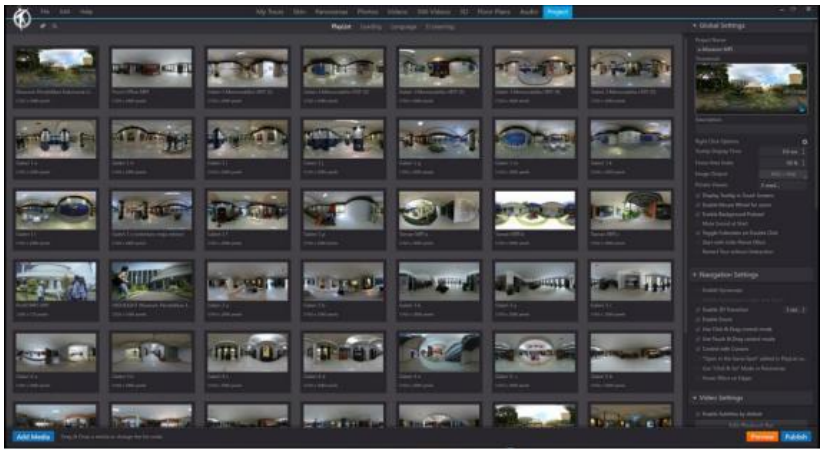

Fig. 5. Content prepared in 3D Vista.

2) Virtual Reality Media Design Process The design process was carried out with four main stages. These stages will be explained in the following sections.
   a) Importing Materials, Images, and Videos
      (1) This process begins with preparing an adequate wifi network so that uploading content runs smoothly.
      (2) After that, the next process is to retrieve the content that has been stored in the cloud (drive).

(3) Thus the material upload process will run effectively and efficiently. The following are adjustments from importing materials in the board so as to optimize the realistic impression on VR media.

b) Determining the View (Main View)

(4) This process is done by first determining the view of the template in the 3D vista platform by measuring the default canvas size.
(5) Placing hotspots or points of view that can be interacted with.
(6) Pairing action buttons, namely directions, menus, and explanations based on the product blueprint design.
(7) Continue the process that has been done in each room or board. The following figure shows the selection of the main view in the 3D vista platform.

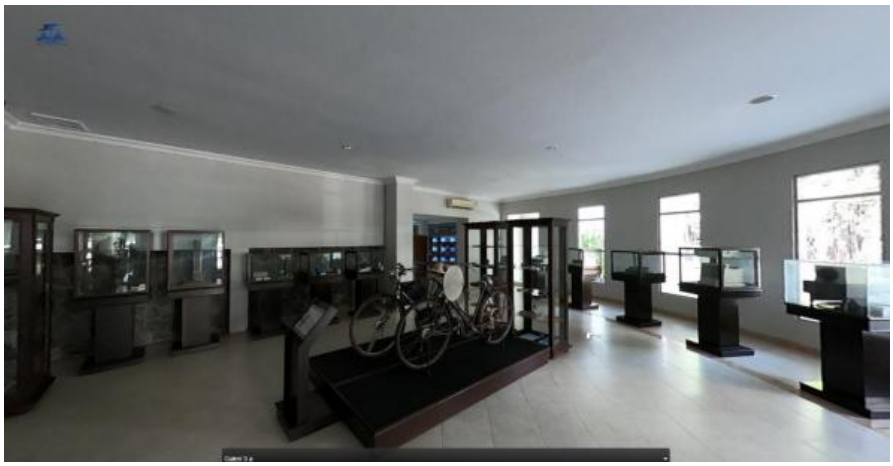

Fig. 6. View Selection in E-Museum

c) Final Review and Adjustment

(8) Rechecking the suitability of the fun fact with the description that has been uploaded to the board.
(9) Checking the recording, resolution, and specifications in the quiz. Both from the positioning of fun facts, from the details of questions, answer options, and timers.

d) Product Finalization

(10) Build the android application by retrieving assets from web hosting.
(11) Finalize and test the finalized APK product by running the program. The following is the process of finalizing and adjusting the layout of the fun facts and materials that have been uploaded on the 3D vista platform.

Fig. 7. Content upload and finalization process

c. Phase III Development

1) Android-based E-Museum Application Development

One of the main results of this development stage is the development of an Android-based e-museum application. This application is designed with an easy-to-use user interface, in accordance with the target audience, which mostly consists of students and millennials. The use of the Android platform as the main operating system was chosen due to the very high penetration rate of Android devices in Indonesia, so that this application can be accessed by most users. In the development of the app, various key features have been incorporated, including:

a) Collections Exhibition

This feature allows users to view the museum's various collections, accompanied by an informative description of the history, meaning, and context of each collection on display.

b) Video Virtual Tour

This feature allows users to explore the museum virtually. With the help of video and animation technology, visitors can experience an interesting and interactive museum tour without having to be in the physical location of the museum. To ensure the application can run well, the development also involves the process of coding, domain creation, and integration of various elements such as QR Code hyperlinks to facilitate navigation between features.

c) Multimedia Content Development

Multimedia content is one of the key elements in this e-museum application. Content development involves collecting material in the form of images, photos, and videos from the existing museum collection. The process of taking pictures and videos was carried out with the aim of providing an accurate and attractive visual image for users. Collecting data from museum collections is also very important to ensure that the information displayed in the application is educational and informative. After collecting visual materials, the development team conducted video editing and storyboarding for the virtual tour videos that would be displayed in the application. In this process, the team ensured that each video contained relevant information and could provide a fun and interactive learning experience for users.

d) Application Testing and Refinement

After the e-museum application has been developed, initial testing is carried out to ensure that the application can run properly on different Android devices. This test includes aspects of application functionality, such as the ability to access and display museum collections, play virtual tour videos, and application stability when used in various network conditions.

Based on the test results, several improvements and enhancements were made, especially to the application design and the functionality of the existing features. For example, the user interface was refined to make it more responsive and easy to navigate, as well as fixing some technical bugs found during testing. In addition, the development team also optimized the app so that it can be accessed smoothly even when using devices with lower capacity or limited internet network.

e) Feedback Integration and Collaboration with Partners

At the development stage, collaboration with relevant parties such as PT Technova Solusi Informatika, DUDI, and the School is very important to provide feedback and ensure that the developed application can meet user expectations and Edu Tourism development goals. Through this collaboration, the development team obtained input on application design, materials provided, and features that need to be improved, so that the application is increasingly tailored to the needs of the target audience.

d. Phase IV Implementation

Product validation is carried out with the main objective of obtaining data on the feasibility of the product developed. With an assessment method that is divided into two aspects, namely the assessment of media experts and the assessment of historical material experts. The criteria for media experts are:

1) Experts in the field of museums from the Indonesian Museum of Education UNY.
2) Experts in the field of media from the Micro Teaching Laboratory, FISHIPOL, UNY.

Media feasibility validation is based on an assessment in the form of a Likert scale which contains three main indicators, namely:

1) Audio
2) Visual
3) Technical

Validation analysis in the form of a questionnaire on the E-Museum: Prototype of Innovation in Developing Tourism Potential in the Education Sector (Edutourism) Based on Smart Digital Android Applications that have been filled in by material experts, and media experts, are analyzed by researchers using a percentage calculation that uses Likert scale assessment criteria in the form of a checklist. The Likert scale in question is as follows.

Table 1. Likert Scale

Kriteria	Skor
Sangat Baik	5
Baik	4
Cukup	3
Kurang Baik	2
Tidak Baik	1

(Sumber: Sugiyono, 2019: 166)

The average assessment obtained is then converted into a classification of product feasibility so as to obtain a conclusion about the quality of the E-Museum: An Innovation Prototype for Developing Tourism Potential in the Education Sector (Edutourism) Based on Smart Digital Android Application. Widoyoko [22] outlines that the preparation of the classification table is based on the calculation of the highest score, lowest score, number of classes, giving rise to the interval distance. The following is the calculation of the average score range. Based on the above calculations, a classification table with an interval of 0.8 is compiled in the table below.

Table 2. Criteria for Questionnaire Percentage

Rentang Skor Rerata	Kriteria
>4,20 s/d 5,00	Sangat Layak
>3,40 s/d 4,20	Layak
>2,60 s/d 3,40	Cukup Layak
>1,80 s/d 2,60	Kurang Layak
1,00 s/d 1,80	Tidak Layak

e. Phase 5 IV Evaluation

Product evaluation is carried out to get an overview to see several indicators, among others:

Table 3. Product Validation

No	Indicator	Score	Criteria
	Audio		
1	The selection of background sound or background music is in accordance with the atmosphere of the museum.	3,75	Feasible
2	Background sound or background music can be set as needed	4,5	Very Good
3	Background sound or background music does not disturb the user's focus while browsing the E-Museum	4,3	Very Good

Visual			
4	Visual focus balance	4,25	Very Decent
5	Visual brightness level	4,5	Very Feasible
6	Visual color composition (saturation)	4,3	Very Decent
7	Appropriateness of using animation on transitions, illustrations, and texts	3,25	Very Good
8	The accuracy of taking the visual point of view to the distance of the object	4,5	Very Feasible
Technical			
9	Duration of browsing MPI UNY e-Museum ranges from 5-15 minutes	4,25	Very Good
10	MPI UNY e-Museum media can be easily accessed	4,5	Very Good
11	MPI UNY e-Museum media has good resolution quality	4,3	Very Good
12	MPI UNY e-Museum media can simulate objects clearly so that they feel real.	4,25	Very Good
13	MPI UNY e-Museum media can show interesting spots	4,5	Very Good
14	MPI UNY e-Museum media can be operated such as rotating the desired viewing angle	4,3	Very Good
15	MPI UNY e-Museum media presents important points, concise, and systematic.	4,25	Very Good

Based on the table, it is known that the Audio aspect is the first aspect which has three items. The first item is the selection of background music in accordance with the atmosphere of the museum, which obtained a score of 3.75 which is included in the feasible assessment criteria. It is necessary to consider the factor of space conditions in the museum so that the background music chosen can increase the enthusiasm for exploring the museum. Item number two is Background music can be set as needed. Based on the score of 4.5, it can be concluded based on the assessment criteria that it is very feasible. This means that users can easily change the background music usage settings according to their needs. If users need conditions without music, then users can turn off the background music. This condition is in line with item number three, namely Background music does not interfere with user focus while browsing the e-Museum with a score of 4.3 (very feasible).

The Visual aspect has five assessment indicator items, the first item is the balance of visual focus with a score of 4.25. This score when converted based on the assessment criteria has very feasible criteria. This means that the information that appears in the museum media is in accordance with a balanced focus. Then item number two, namely the level of visual brightness Visual color composition (saturation) has a score of 4.5 with very decent criteria. The acquisition of very feasible criteria is inseparable from the post editing of 360-degree panoramic capture results. The difference in light conditions in each room needs to be adjusted so that there is no significant contrast between rooms. Indicator item The accuracy of the use of animation in transitions, illustrations, and text has a score of 4.25 with very feasible criteria. This means that the use of animation between emuseum rooms is appropriate and able to provide a pleasant experience when exploring. Moreover, the indicator item for the accuracy of taking visual viewpoints to the distance of the object obtained a score of 4.5 with very feasible criteria. This condition can occur because the placement of the 360 camera position is done carefully by considering the degree of the lens and the distance to the object. This needs to be done so that users when exploring the museum are not too close which triggers dizziness, nor too far away which can result in location disorientation.

Technically, the use of learning media also obtained very feasible criteria. When detailed further, it can be seen that there are 7 indicator items with the following scores, the duration of browsing the MPI UNY e-Museum ranges from 5-15 minutes (4.25), MPI UNY e-Museum Media can be easily accessed (4.5), MPI UNY e-Museum Media has good resolution quality (4.3), MPI UNY e-Museum Media can simulate objects clearly so that it feels real (4.25), MPI UNY e-Museum Media can show interesting spots (4.5), MPI UNY e-Museum Media can be operated such as turning the desired viewing angle (4.3), MPI UNY e-Museum Media

presents important points, concise, and systematic (4.25). Based on the collective score, it can be concluded that, based on the assessment of the expert, the E-Museum: An Innovation Prototype for the Development of Tourism Potential in the Education Sector (Edutourism) Based on Smart Digital Android Application obtained very feasible criteria with an average score of 4.3.

Table 4. Material Expert Validation

No	Indicator	Score	Criteria
Feasibility of Material Content			
1	Material presented in the E-Museum: Prototype Innovation of Tourism Potential Development in Education (Edutourism) Based on Smart Digital Android Application in accordance with UNY Museum of Education	4,2	Very Feasible
2	The material presented in the E-Museum: MPI can be used for potential development Education Tourism (Edutourism)	4,42	Very Feasible
3	The material presented by the E-Museum: Prototype Innovation of Tourism Potential Development in the Field of Education (Edutourism) Based on Smart Digital Android Application in accordance with the information needs of visitors and potential museum visitors	4,25	Very Decent
4	The material presented in the E-Museum: Prototype of Innovation in Developing Tourism Potential in the Education Sector (Edutourism) Based on Smart Digital Android applications can attract users to export museum collections	4,25	Very Good
Language			
6	Use of clear language	4,21	Very Decent
7	Use of communicative language	4,31	Very Good
8	Use of language that is easy to understand	4,31	Very Good
9	Use of distinctive and persuasive greeting sentences	3,79	Feasible
10	Use of language that is appropriate for the target user	4,21	Very feasible

Based on the material expert validation table, it can be seen that the material feasibility aspect has 5 indicator items. The first indicator item is the material presented in the E-Museum: Prototype of Tourism Potential Development Innovation in Education (Edutourism) Based on Smart Digital Android Application in accordance with UNY Education Museum obtained a score of 4.25 with very feasible criteria. Moreover, indicator item number two, namely, the material presented in the E-Museum: MPI can be used for the development of Tourism potential in the field of Education (Edutourism) obtained a score of 4.31 with very feasible criteria. Very feasible criteria are also obtained on the instrument items presented by the E-Museum: Prototype of Innovation in Developing Tourism Potential in the Education Sector (Edutourism) Based on Smart Digital Android Applications in accordance with the information needs of visitors and prospective museum visitors with a score of 4.25 and the material presented by E-Museum: Prototype of Innovation in Developing Tourism Potential in the Field of Education (Edutourism) Based on Smart Digital Android Applications can attract users to export museum collections with a score of 4.25 (very feasible). Aspects of language use with indicators of clear language use (4.21), communicative (4.31), easy to understand (4.31), and in accordance with the target user (4.21) as a whole obtained very feasible criteria except for indicators The use of typical

and persuasive greeting sentences with a score of 3.79. Based on this score against the assessment criteria, it is feasible. The overall average score is 4.2 with the media expert validation criteria being very feasible, the results of the final evaluation of the product as a whole with an average value of 4.3 media and 4.2 material so that the total average score shows a value of 4.3, meaning that it can be concluded that the media developed is "very feasible" from the aspect of user assessment (user).

Discussion and Contributions

The development of the Android-based e-museum application presented in this study responds to the growing urgency of digital transformation in the tourism sector, particularly in museum-based educational tourism (edutourism). Digital trends have significantly altered how people plan and experience tourism, ranging from searching for destinations to making online payments (Wahyuni et al., 2023). As a result, museums—often perceived as static and outdated—must innovate to remain relevant, especially to younger and technology-oriented audiences.

The decision to develop an Android-based platform is contextually appropriate, considering the high penetration of Android users in Indonesia, particularly among millennials and students (Safaat, 2012). This demographic is highly familiar with digital devices and responsive to interactive media, making mobile applications a strategic tool for promoting educational tourism. By integrating collection exhibitions and virtual tour videos, the application bridges the gap between conventional museum experiences and contemporary expectations for interactivity and convenience.

While previous studies have explored the use of augmented reality (AR) and virtual reality (VR) technologies in museums (Pramana et al., 2021), this research offers a distinctive contribution by integrating these features into an Android ecosystem designed for broader accessibility. Furthermore, it directly addresses common challenges such as outdated presentation formats and limited access to museum content (Juwita et al., 2020). These improvements align with the broader objective of enhancing historical literacy and fostering interest in cultural heritage among younger generations.

Methodologically, this study employs the ADDIE development model, which provides a structured and replicable framework for educational application development (Widoyoko, 2009). The process—ranging from needs analysis and design to validation and evaluation—ensures that the application addresses user needs in terms of both content relevance and technical functionality. Validation results from media and material experts further confirm the feasibility of the application across audio-visual, technical, and pedagogical dimensions.

However, although the prototype demonstrates strong feasibility, its empirical impact on visitor behavior and educational outcomes has not yet been examined. Future studies should adopt quantitative or mixed-method approaches to investigate whether the application influences actual museum visitation or enhances users' understanding of historical content (Karyono, 2010). Such evidence would strengthen the application's position as a transformative tool in digital heritage and smart tourism development.

In conclusion, this study contributes to the ongoing discourse on digital heritage, smart edutourism, and mobile learning innovation by offering a practical model for museums and educational institutions seeking to leverage mobile technology to revitalize public engagement and enrich learning experiences

Simpulan

This study concludes that the development of an Android-based e-museum application represents a relevant and feasible innovation to support museum-based educational tourism (edutourism) in the context of digital transformation. By integrating collection exhibitions and virtual tour videos, the e-museum prototype is able to respond to contemporary challenges faced by museums, particularly limited access, monotonous information delivery, and low engagement among younger generations.

The application development process, which followed the ADDIE model, ensured that the product was systematically designed, developed, and evaluated according to user needs and educational objectives. Validation results from media and material experts indicate that the e-museum application is highly feasible from audio-visual, technical, and pedagogical perspectives. These findings demonstrate that mobile-based digital media can function not only as an information platform but also as an effective learning resource that enhances historical literacy and supports smart edutourism initiatives.

Furthermore, this study contributes to the field of history education and museum studies by providing a practical model for leveraging mobile technology to revitalize museum engagement and learning experiences. Although the prototype has shown strong feasibility, further research is recommended to empirically examine its impact on visitor behavior, learning outcomes, and long-term museum visitation patterns. Such studies would strengthen the role of e-museum applications as strategic tools in digital heritage preservation and educational tourism development.

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