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Web-Based Virtual Tour for Tourism Promotion and Education at Taman Teknologi Pertanian Garut

Rickard Elsen[1*], Zatnika Insan Kamil[2], Reski Ramdhani[3]
[1,2,3]Institut Teknologi Garut, Indonesia

***email:** rickardelsen@itg.ac.id

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ABSTRACT

The Agricultural Technology Park (TTP) in Garut possesses significant educational tourism potential that requires effective promotion through interactive digital media. This study aims to design and develop a web-based Virtual Tour serving as both a promotional and educational medium for visitors. The development process followed the Multimedia Development Life Cycle (MDLC) method, comprising six stages: concept, design, material collection, assembly, testing, and distribution. The Virtual Tour integrates 360° panoramic views, educational texts, audio-visual materials, location maps, and interactive hotspots. System evaluation was conducted using the Black Box Testing method to verify functionality, followed by usability testing employing a convenience sampling technique with 38 respondents assessed on a 1–5 Likert scale. The results of the Black Box Testing indicated that all features performed as intended, while usability testing produced an average score of 4.52, categorized as "Very Good." These findings confirm that the developed Virtual Tour is feasible and effective as a medium for tourism promotion and education. Future studies are recommended to incorporate Augmented Reality elements and interactive educational quizzes to further enhance user engagement and learning experiences.

1. INTRODUCTION

The rapid advancement of digital technology has profoundly influenced numerous sectors, including the tourism industry. Digital transformation has emerged as a major catalyst for tourism development, as travelers increasingly depend on online platforms to access information, plan itineraries, and make travel-related decisions. One notable innovation that has gained substantial attention in this context is Virtual Tour technology. A Virtual Tour refers to an interactive simulation of a real-world environment that integrates multimedia components—such as panoramic imagery, video, audio, and text—to enable users to remotely explore destinations, effectively mimicking an on-site experience [1]. This technology offers significant potential for destination marketing and tourism promotion, particularly through web-based platforms that allow prospective visitors to experience attractions virtually before undertaking an actual visit.

Garut Regency, located in West Java, Indonesia, possesses diverse tourism potential, one of which is the Garut Agricultural Technology Park (TTP). The park serves both as an agro-tourism destination and an educational site that showcases agricultural innovations, modern farming technologies, and scenic natural landscapes [2]. However, current promotional strategies for TTP Garut remain largely conventional, relying on print media and word-of-mouth communication. These methods limit the reach and effectiveness of information dissemination, while the available digital media still fail to provide a comprehensive overview of the park's attractions and educational content.

Several previous studies have highlighted the potential of Virtual Tours as effective promotional and educational tools. For instance, a study by [3] developed a campus Virtual Tour using the Multimedia Development Life Cycle (MDLC) method to improve prospective students' understanding of campus facilities. Similarly, [4] implemented a 360° Virtual Reality application for destination promotion in Purbalingga, which demonstrated enhanced visitor engagement compared with traditional media. Furthermore, [5] designed a Virtual Tour integrated with a geographic information system (GIS) for public green spaces in Jambi, showing the effectiveness of interactive platforms for tourism promotion. Likewise, [6] created a 360° Virtual Tour for North Toraja that successfully increased destination visibility. In addition, [7] examined usability testing factors in web applications, offering valuable insights for developing user-centered designs in interactive digital media.

Although previous studies have demonstrated the effectiveness of Virtual Tours in enhancing destination appeal, visitor engagement, and information dissemination [8], no prior implementation has been developed specifically for the Garut Agricultural Technology Park (TTP) featuring interactive components such as educational hotspots, scene-to-scene navigation, and audio narration. Given this context, the present study was undertaken to design and develop a web-based Virtual Tour for TTP Garut equipped with these interactive features to enhance users' exploration experience and the quality of information delivery. Accordingly, this research aims to produce a Virtual Tour platform that serves as a more effective digital promotion medium than conventional approaches, while simultaneously strengthening TTP Garut's dual function as both a tourism destination and an agricultural education center.

2. RESEARCH METHODOLOGY

This study uses the Multimedia Development Life Cycle (MDLC) method because it is considered suitable for developing interactive multimedia applications that combine text, images, audio, video, animation, and interactive elements in a structured manner [1]. MDLC has six main stages as follows:

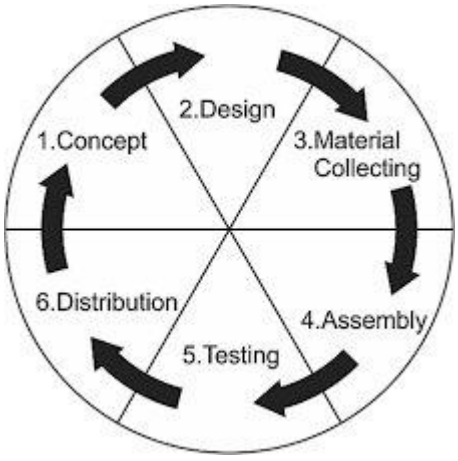

Figure 1. Multimedia Development Life Cycle [1]

1. Concept: Determining the objectives of developing a web-based Virtual Tour application, target users, and the platform to be used.
2. Design: Designing application specifications including structure, interface, storyboard, and navigation flowchart.
3. Material Collecting: Collecting materials such as 360° panoramic photos, images, audio narration, and other supporting materials according to the design.
4. Assembly: Assembling all multimedia elements into an application according to the design, including the integration of 360° panoramas, interactive hotspots, audio narration, and inter-scene navigation.
5. Testing, Testing the application through;
    a. Alpha Testing uses Black Box Testing to evaluate application functions according to specifications.

b. Beta Testing involves users directly to assess satisfaction levels, ease of use, and exploration experience. Questionnaire data is processed using a Likert scale.

6. Distribution: Store and submit the final application to the Garut Agricultural Technology Park management via cloud storage (Google Drive) along with technical documentation on its use. This stage also serves as a final evaluation for future improvements.

In addition, usability testing was conducted to assess the effectiveness, efficiency, and user satisfaction with the application [9]. This testing identified interface issues and measured ease of use based on user feedback. The sampling technique used non-probability sampling with a convenience sampling approach. Respondents were specifically selected, namely tourists or members of the public who were interested in agricultural education tourism destinations, so that they could provide relevant assessments of the Virtual Tour media that had been developed [10].

3. RESULT AND DISCUSSION

3.1. Application Development Results

A web-based virtual tour application has been successfully developed using 360° panoramic photos, interactive hotspots, audio narration, and educational information about the Garut Agricultural Technology Park. Users can explore the area interactively via desktop or mobile devices without the need for additional installation. The navigation structure allows for smooth movement between panoramic points. Each hotspot provides specific information, such as plant descriptions, facilities, and the technologies used. The integration of audio narration enhances the immersive experience and supports educational objectives.

3.2. Functionality Testing Results (Alpha Testing)

Alpha testing was conducted to evaluate the functionality of the system and to ensure that each feature performed according to the design specifications. This stage focused on internal testing of the developed application before it was evaluated by end users and is commonly used to identify potential functional issues at an early stage [11] [12]. Black Box testing showed that all key features, including navigation, panoramic view, audio playback, and information access, performed according to specifications without any functional errors. The following are some of the alpha test results in Table 1.

Table 1. Alpha Testing Results

Test Data	Test Item	Expected Result	Conclusion
Home Button	Displaying the Home Page	Display Page	Successful
Galery Button	Displaying the Gallery Page	Display Page	Successful
Information Button	Displaying the Information Page	Display Page	Successful
More Button	Display More Information Pages	Display Page	Successful
Virtual Tour Content (Information Logo)	Displaying Images Related to Plantation Information	Display Image	Successful
Virtual Tour Content (Voice Button)	Playing audio information about Plantations	Voice Performance	Successful
Virtual Tour Content (Video Logo)	Showing Educational Destination Documentation Videos	Show Video	Successful

Based on the test results in Table 4, all test items, including page navigation, content display, audio playback, and video playback, ran as expected. No functional errors or significant technical issues were identified during this alpha testing phase. This indicates that the application meets the functional specifications as designed and is ready to proceed to the beta testing phase to directly measure user satisfaction and experience.

3.3. User Satisfaction Test Results (Beta Testing)

The beta testing phase was conducted by involving respondents selected using convenience sampling techniques, which is sampling based on ease of access and availability of respondents. Respondents consisted of tourists and the general public who had accessed or tried the Garut Agricultural Technology Park Virtual Tour application. The purpose of this testing was to evaluate the usability of the web-based application that had been developed [13].

The testing referred to the five main aspects of usability testing according to [14], namely Learnability, Efficiency, Memorability, Errors, and Satisfaction. The assessment was conducted using a Likert scale with a range of 1–5, where 1 means "Strongly Disagree" and 5 means "Strongly Agree" [15]. The details of the testing results are shown in Table 5. The average score for the five aspects was calculated using the following formula:

$$f = (R1 \text{ X } S1) + (R2 \text{ X } S2) + (Rn \text{ X } Sn) \quad (1)$$

Description :
F = Total Score
R = Number of respondents' choices
S1 = Category Score 1
Sn = Category Score To n

$$P = \frac{f}{N} \quad (2)$$

Description :
P = Average Score
F = Total Score
N = Total Respondents

Table 2. Likert Scale

Satisfaction Level	Scale
Strongly Agree	5
Agree	4
Hesitant	3
Disagree	2
Strongly Disagree	1

Below is a table detailing the average scores for the five aspects assessed in the usability testing.

Table 3. Usability Testing Results

Usability Aspect	Score
Learnability	4.45
Efficiency	4.48
Memorability	4.55
Errors	4.61
Satisfacation	4.52
Average	4.52

Based on the test results in Table 3, the Learnability aspect scored 4.45, Efficiency 4.48, Memorability 4.55, Errors 4.61, and Satisfaction 4.52. The overall average was 4.52, which falls into the "Very Good" or "Strongly Agree" category. These results indicate that the Virtual Tour of the Garut Agricultural Technology Park application has met usability criteria optimally, in terms of ease of learning, efficiency of use, ease of recall, minimal errors, and user satisfaction levels.

3.4. Discussion

This study successfully designed and developed a web-based Virtual Tour for the Garut Agricultural Technology Park as a medium for tourism promotion and agricultural education. The application integrates 360° panoramas, audio narration, videos, and interactive hotspots, enabling users to explore the site virtually while also accessing educational content. Usability testing with 38 respondents resulted in an average score of 4.52 on a five-point scale, which indicates that the application is functional, easy to use, and provides a highly satisfying user experience. These findings demonstrate its feasibility as both a promotional and educational tool, offering broader reach and a more engaging way to introduce the destination compared with conventional methods. However, the research is limited by the relatively small number of respondents and the absence of more advanced features. For future development, it is recommended to integrate technologies such as Augmented Reality and interactive quizzes to create a more immersive and educational experience, thereby further enhancing tourism promotion and user learning outcomes.

4. CONCLUSION

This study successfully designed and developed a web-based Virtual Tour as a promotional and educational medium to interactively introduce the potential of the Garut Agricultural Technology Park. The developed application includes 360° panoramas, educational explanatory texts, multimedia features (audio and video), location maps, and interactive hotspots to facilitate virtual navigation.

Black box testing (alpha testing) results showed that all features functioned properly without system errors. Meanwhile, usability testing (beta testing) involving 38 respondents yielded an average score of 4.52 on a 1–5 Likert scale, falling into the "Very Good" category. These findings indicate that the application meets usability criteria and is suitable for use as a promotional and educational tool for tourism.

For further development, this study suggests adding Augmented Reality (AR) features to provide a more immersive exploration experience, as well as integrating interactive educational quizzes to enhance user engagement. This development is expected to provide opportunities for other researchers to expand the functions and enrich the content of Virtual Tours as a tool for tourism promotion and education.

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