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GOMS-based User Experience for Cultural Tourism Application in Indonesia

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Abstract. Indonesia's diverse cultural heritage presents an opportunity for tourism, yet traditional approaches and insufficient technology utilization hinder its full potential. We propose the development of a Cultural Tourism Application, specifically targeting the rich cultural attractions of Yogyakarta, Indonesia. The research develop the GOMS (Goals, Operators, Methods, and Selection Rules) model to design user-friendly interfaces for discovering cultural attractions, providing detailed information, searching, and exploring historical timelines and helped us understand the steps and knowledge required for users to achieve their goals within the app This model allows for a systematic understanding of user interactions and cognitive processes within the context of the Cultural Tourism Application. A User Acceptance Testing (UAT) survey reveals a high level of acceptance 91.2% for the Cultural Tourism Application, signifying its effectiveness in enhancing learnability, efficiency, memorability, safety, and overall user satisfaction.

Keywords: Cultural Tourism, Tourism Application, User Acceptance Testing, GOMS Model.

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1. Introduction

Indonesia is an a country that is has the potential in tourism [1]. With possession of 17,508 islands, therefore, Indonesia is one of the richest culture country that has its own uniqueness [2]. Indonesia is a country with a multitude of distinct cultures due to its broad cultural background, which makes it imperative to maintain Indonesian culture [3].

This diverse cultural fabric not only shapes Indonesia's character, but also has a major impact on the Indonesia tourism industry. Tourism is a very important sector in both developed and developing countries [4]. Furthermore, traveling is becoming more and more popular in the digital age [5]. The Indonesian government is facing multiple challenges concerning the advancement of tourism areas, encompassing both domestic and international aspects [6]. The issue of Indonesia's tourism development lies in the insufficient utilization of technology to enhance cultural experiences for both tourists and locals, persisting with traditional approaches. There are research by [7] about Application of QR codes as a new communication technology and interactive tourist guide in Jaboi, Sabang, an economical solution from the side of technology. However, it should be noted that this research has not yet

demonstrated a significant improvement in the tourism sector in terms of providing a seamless digital experience.

Despite this, the integration of digital technologies in the tourism industry has the potential to revolutionize how tourists access information about destinations in Indonesia. Tourism businesses are going digital, which will make it easier for travelers to find information about places and improve their overall experience [8]. According to [9] many companies and organizations are leveraging mobile devices as an online platform for promotional purposes, capitalizing on the rapidly increasing number of smartphone users. In the tourism industry, mobile applications are regarded as highly efficient tools for advertising. There is an application by [9] about Development of Interactive Mobile Application with Augmented Reality for Tourism Sites in Batam. But, this research only focused in tourism in general, not cultural tourism. There are research by [10] about Design and Development of Tourism Geographical Information System of Semarang City Based on Android Mobile. But, this research only focused in tourism in Geographical, not based on User Experience cultural tourism.

Our research is the first to develop Cultural Tourism Application. Tourism that provides living culture, cultural heritage, and physical and intangible cultural attractions is known as Cultural Tourism. One of the cultural tourism icon with the largest tourism potential in Indonesia is Yogyakarta. Information about Indonesian cultural tourism applications is still lacking, and Yogyakarta is no exception.. Yogyakarta Special Region has a lot of tourism potential, both natural and cultural. The region's abundance of tourist attractions makes it one of Indonesia's most popular tourist destinations [11]. Moreover, there are many cultural heritage from Hindu, Buddhist, Islamic, and Dutch colonial periods [12].

We aim to develop a cultural tourism application, which is a software program or mobile app designed to enhance the experience of travelers and tourists interested in exploring and learning about the cultural aspects of a particular destination. There are research by [13] about ICONS: a Mobile Application for Introduction Culture of North Sulawesi which is expected to be a medium of information and knowledge for users. However, the current focus of the ICONS on serving as a medium for information and knowledge dissemination may not fully address the broader needs of cultural tourism. To enhance its effectiveness, the application should consider incorporating interactive features, guided tours, and real-time updates on cultural events and experiences, thereby transforming it into a more engaging and comprehensive resource for tourists seeking an immersive cultural experience.

This research develop an app on an iOS smartphone for Cultural Tourism in Indonesia using MapKit to find the user point. The main feature is historical information, addresses and navigation, photo galleries, types of cultural tourism, updated information, specific recommended times so user could utilize their time in Yogyakarta effectively. This paper develop a model based on GOMS (Goals, Operators, Methods, and Selection rules) to achieve a deeper understanding of user interaction and cognitive processes within the context of a Cultural Tourism Application. GOMS (Goals, Operators, Methods, and Selection Rules) is a method for analyzing tasks based on user cognition, known for its high reliability and efficiency [14]. Goal signifies the task to be accomplished and the final outcome expected from the user, Operator is a series of actions involving perception, movement, or cognitive processes. Method pertains to the organized structure of goals and actions. Selection rules are employed to decide the most suitable method of operation based on the specific context of use.

Furthermore, this research stems from the notable absence of previous studies utilizing this methodology in the realm of cultural tourism applications. In essence, this research represents a pioneering contribution to the domain of cultural tourism technology and user experience design, as we use the GOMS method to develop a Cultural Tourism Application that redefine the way travelers engage with and appreciate the cultural heritage of Yogyakarta, Indonesia.

2. Methods

In this study, we applied the research methodology with a focus on the Agile development cycle illustrated in Figure 1. The design and development of KulturHub was determined to be best served by

the Agile paradigm. A mobile application that is high-quality, dependable, and long-lasting will be produced if it is developed using the Agile methodology. Agile contributes to the system's enhanced functionality and performance. By means of continuous testing and issue resolution, it also aids in the elimination of system failure [15] .

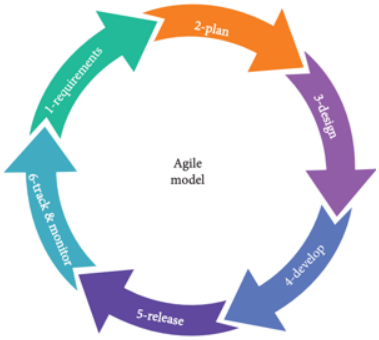


Figure 1. Agile Model

This Agile development cycle, adopted after the implementation of our proposed system, consists of six primary phases, as elucidated by [15] : (1) requirements, (2) planning, (3) design, (4) development, (5) release, and (6) evaluation. Requirements, researcher focuses on develop an app on an iOS smartphone for Cultural Tourism in Indonesia named KulturHub that can seamlessly accommodate evolving user needs on features encompassing historical information, addresses and navigation, photo galleries, various types of cultural tourism, updated content, and specific recommendations. Planning, the planning phase of our app development project strategically decided to harness the power of Swift as Programming Language, SwiftUI as Framework, and MapKit as our core technologies, aiming to create a seamless and engaging user experience. This choice aimed to ensure a seamless and engaging user experience. Design, in the design phase, the application of the GOMS method provided a structured approach to dissecting user tasks into discrete Goals, Operators, Methods, and Selection Rules, enabling us to systematically refine the app's user interface and interaction design. Developmen, the next phase is development, in this phase researcher actively translated design specifications into code, leveraging Swift, SwiftUI, and MapKit as the core technologies. This phase was implemented the planned features and functionalities, adhering to agile methodologies to ensure iterative progress and continuous integration of user feedback. Release, in the release phase, researchers remained vigilant for post-launch issues, swiftly addressing any user-reported bugs or concerns, and planning for subsequent updates and enhancements based on real-world user interactions. Evaluation, the evaluation phase within this Agile framework corresponds to the User Acceptance Testing (UAT). This phase involves the assessment of research outcomes, the drawing of conclusions, and the evaluation of the extent to which research goals were achieved, akin to the UAT evaluation's role in ensuring software meets end-user requirements and expectations.

Figure 2 shows the components of the User Acceptance Test (UAT) approach include learnability, efficiency, memorability, safety to use or low error rates, and a high level of satisfaction [16]. Learnability, the research will assess the learnability of the system by measuring how quickly new users, can grasp its functionalities and navigate through it without encountering significant barriers. Efficiency, this study aims to evaluate the efficiency of the software in terms of task completion time and resource utilization, ensuring that users can achieve their objectives swiftly and with minimal effort. Memorability, the research will investigate the memorability of the user interface, examining how well users can recall and utilize the system's features after a period of non-use, thereby reducing the need for retraining. Safety to Use or Low Error Rates, this research will focus on assessing the safety of the product, aiming for a low error rate during usage to ensure that users can interact with the system confidently without encountering adverse consequences. High Level of Satisfaction, the study will

gauge user satisfaction levels to determine the overall user experience, with the objective of promoting user adoption, positive feedback, and long-term user loyalty to the product.

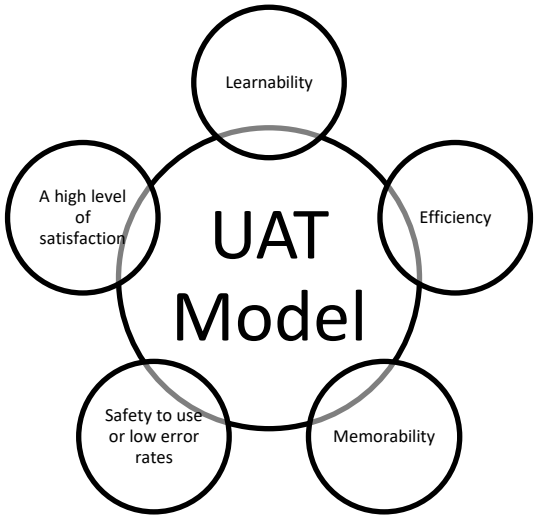


Figure 2. User Acceptance Testing Model

2.1. GOMS Model

In this research, we applied the GOMS Model to design a user-friendly cultural tourism application. The GOMS Model helped us understand the steps and knowledge required for users to achieve their goals within the app. We outlined GOMS Models for key activities: Discover, Detail, Search, and Timeline feature. These models ensure that the application is intuitive and meets user needs, enhancing the cultural exploration experience for users exploring Indonesian attractions.

GOMS is one of the methods used to examine a task [17]. A GOMS model serves as a depiction of the essential user knowledge needed to perform tasks within a device or system. It embodies the instructional information detailing the steps on how to accomplish the desired tasks, which the system relies upon for execution[18]. In this cultural tourism application, users will have several goals.

The rationale behind using GOMS as a framework is to create a valuable model specifically tailored for developing GOMS models solely focused on interface design, without the need for prior prototyping or user testing [18].

2.2. User Acceptance Testing (UAT)

User acceptance testing (UAT) is a test that is intended outside the system, namely the user. Testing is aimed at users related to face-to-face tutorial activities then the purpose of user acceptance testing is to determine the feasibility of the software. In User acceptance testing (UAT), it is carried out using a survey method, namely by distributing questionnaires to users who have previously been given tutorials on using the application.

3. Results and Discussion

3.1. Implementation in the Application

The GOMS Model can be implemented in a user interface such as figure 3(a), figure 3(b), figure 3(c) and figure 3(d).

In figure 3(a), the main menu Discover is shown. The main aim of the Discover feature is to allow users to explore a list of cultural attractions in Indonesia. To achieve this goal, users should click the Discover button on the home screen. Once they do so, the method employed is to display a list of cultural attractions accompanied by thumbnails and titles. Users can easily scroll through this list to discover more options. When a user selects a specific attraction from the list, the system will provide detailed

information about that cultural attraction. In the end, the selection process is straightforward, as users simply choose one from the list of cultural attractions they wish to explore.

In figure 3(b), the primary purpose of the Detail feature is to furnish users with comprehensive information about a selected cultural attraction. To access this wealth of information, users initiate the process by clicking on one of the cultural attractions from the list provided in the Discover screen. Once selected, the Detail feature employs the method of displaying an exhaustive range of details related to the cultural attraction. This information encompasses a descriptive overview, an assortment of photographs, precise location data, and other pertinent particulars. This feature serves to enhance the user's understanding and appreciation of the chosen cultural attraction by offering a deep dive into its characteristics and significance.

In figure 3(c), the principal aim of the Search feature is to grant users the ability to search for cultural attractions based on specific keywords or geographical locations. Users initiate this search process by clicking on the Search button available on the home screen. Subsequently, the feature employs the method of presenting a user-friendly search box. Within this box, users are encouraged to input relevant keywords or specify their desired location for the search. After entering this information, the application retrieves and displays search results that align with the provided keywords or location.

Users are then afforded the opportunity to select one of the results from the displayed list, enabling them to further explore the chosen cultural attraction. Essentially, the Search feature offers users a tailored approach to discovering cultural attractions based on their specific interests and criteria.

Moreover, when users discover cultural attractions through the Search feature and wish to learn more about a particular attraction, they can seamlessly transition to the Detail feature. This allows for a deeper exploration of the selected attraction, providing users with comprehensive information to enhance their understanding and appreciation of the cultural site. In this way, the Search and Detail features work in tandem to offer users a versatile and informative cultural exploration experience.

In figure 3(d), the primary purpose of the Timeline Feature is to enable users to explore the history of historical buildings in Indonesia. This is achieved through users clicking the Timeline button on the home screen. The method involves presenting a historical timeline that combines text, and important dates to convey information about these historical buildings. Users can actively engage with the content by scrolling through the historical timeline, allowing them to select and view different historical periods of the buildings.

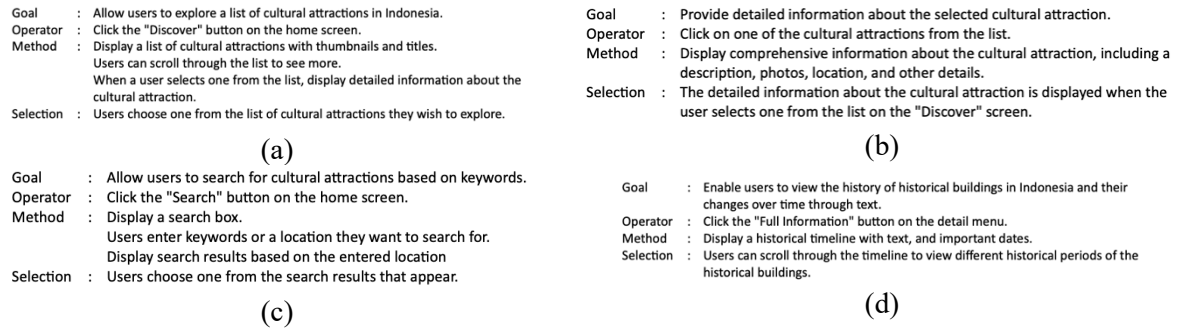
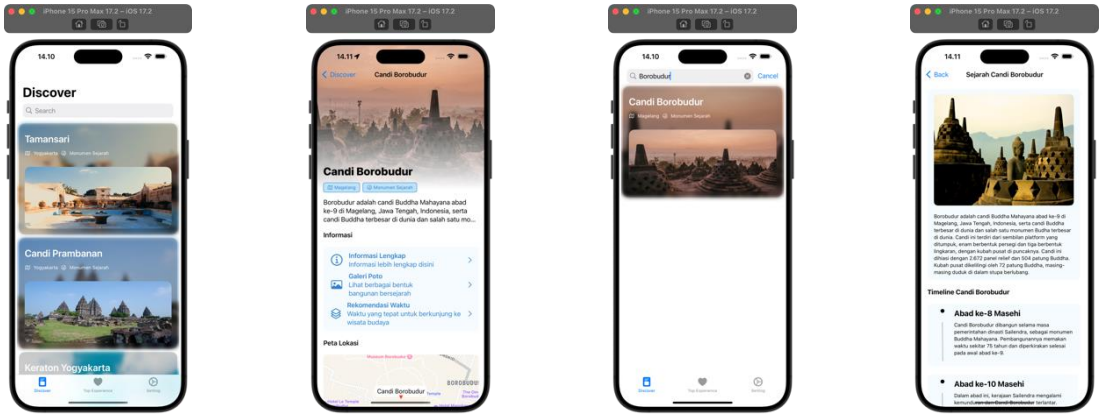


Figure 3. (a) GOMS Model on Discover Activities. (b) GOMS Model on Detail Activities. (c) GOMS on Search Activities. (d) GOMS Model on Timeline Feature

The GOMS Model can be implemented in a user interface such as figure 4(a), figure 4(b), figure 4(c) and figure 4(d). In figure 4(a), the main menu Discover is shown. The main aim of the Discover feature is to allow users to explore a list of cultural attractions in Indonesia. Figure 4(b) is detail menu, the main aim of the Detail Menu feature is to provide detailed information about the selected cultural attraction. Figure 4(c) is search menu, the main aim of the Search Menu feature is to allow users to search for cultural attractions based on keywords. Figure 4(d) is timeline feature, the primary objective behind the

Timeline Feature is to empower users with the ability to explore the historical evolution of buildings in Indonesia along with their transformations over time, all through textual information.



(a) (b) (c) (d)

Figure 4. (a) User Interface on Discover. (b) User Interface on Detail. (c) User Interface on Seacrh. (d) User Interface on Timeline

3.2. Result of Analysis User Acceptance Testing (UAT)

The purpose of the outcome is to ascertain the degree of support and acceptance that the system may receive from prospective users. A Likert scale was used to measure the usefulness of the system being constructed in terms of accessibility, navigation, and content for 20 potential system users. [19]. Table 1 shows the questionnaire used in measuring user acceptance of the developed cultural tourism application.

Table 1. Quistionnaire Using A Likert Scale

No	Question	SD	D	N	A	SA
1	I can easily understand how to use this cultural tourism application.					
2	I can easily understand how to use this cultural tourism application.					
3	The interface of this culturalctourism application is easy to remember.					
4	I feel safe and helped when using this cultural tourism application.					
5	Overall, to what extent are you satisfied with this cultural tourism application?					

The test results demonstrate that the developed application satisfies the functional specifications. Nonetheless, errors are still possible in the process. What has been built is a system that can produce the necessary outcomes. It is possible to determine the percentage of each response using the information from the questionnaire results. The following formulas are utilized in the computation of the assessment results.

1. Maximum score: 20 x 5 = 100 (number of respondents x highest Likert score)
2. Minimum score: 20 x 1 = 20 (number of respondents x lowest Likert score)
3. Index (%): (Total Score / Maximum Score) x 100

Provide interval value on index (%)

1. Index 0% - 20% : Strongly Disagree
2. Index 20% - 40% : Disagree
3. Index 40% - 60% : Neutral
4. Index 60% - 80% : Agree
5. Index 80% - 100% : Strongly Agree

Based on the formulas, the calculated results are presented in a table. Table 2 shows the results of the computations based on the formulas.

Table 2. Questionnaire Result

Responden	Question				
	Question 1	**Question 2**	**Question 3**	**Question 4**	**Question 5**
Responden 1	5	4	4	4	5
Responden 2	5	5	5	5	5
Responden 3	5	4	4	5	5
Responden 4	5	4	5	4	5
Responden 5	5	5	5	5	5
Responden 6	5	5	5	5	5
Responden 7	4	4	4	4	4
Responden 8	5	5	4	5	5
Responden 9	4	4	4	5	4
Responden 10	4	4	4	4	4
Responden 11	5	4	4	4	5
Responden 12	4	5	4	4	5
Responden 13	4	5	4	5	5
Responden 14	5	5	5	5	5
Responden 15	5	4	5	4	5
Responden 16	4	5	4	5	4
Responden 17	5	5	5	5	5
Responden 18	5	5	5	5	5
Responden 19	4	3	3	2	4
Responden 20	5	5	5	5	5
Total Score	**93**	**90**	**88**	**90**	**95**
Index %	**93**	**90**	**88**	**90**	**95**

Meanwhile, the following calculation formulas are used to determine the level of user approval of the system:

1. Mean score user acceptance:
   = (Total Score1 + Total Score2 + ... + Total Score 5) / 5
2. User acceptance index (%):
   = (Average Score / Maximum Value) X 100%

The user acceptability interval of the system is calculated as follows:

1. Index 0% - 20% : Very Unacceptable
2. Index 20% - 40% : Not Accepted
3. Index 40% - 60% : Neutral
4. Index 60% - 80% : Accepted
5. Index 80% - 100% : Very Accepted

Calculation of the mean score user acceptance:
= (93 + 90 + 88 + 90 + 95) / 5 = 91,2
The formula for calculating the Acceptance Index is:
= (91,2 / 100) x 100%= 91,2 %

The acceptance test findings show that the level of acceptance of the respondents to the application system that was built was 91,2%, indicating that the respondents rated the application as extremely accepting.

4. Conclusion

Based on the findings of User Acceptance Testing (UAT), it is clear that the Cultural Tourism Application we developed has garnered significant acceptance and favorable feedback from users, achieving an impressive 91.2% on the acceptance index. This outcome underscores the application's

effectiveness in delivering an intuitive and enjoyable cultural exploration experience, improving aspects such as learnability, efficiency, memorability, safety, and overall user satisfaction. In essence, this research represents a pioneering contribution to the domain of cultural tourism technology and user experience design, as we use the GOMS method to develop a Cultural Tourism Application that redefine the way travelers engage with and appreciate the cultural heritage of Yogyakarta, Indonesia. In the context of future prospects, the application holds the potential to transform into an essential tool for both domestic and international tourists intrigued by Indonesia's diverse cultural heritage.

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