ISSN 2347 - 3983
Volume 8. No. 4, April 2020
International Journal of Emerging Trends in Engineering Research
Available Online at http://www.warse.org/IJETER/static/pdf/file/ijeter21842020.pdf
https://doi.org/10.30534/ijeter/2020/21842020

Mobile Application Using Location-Based Service for Supporting Tourism Industry

Dita Madonna Simanjuntak[1], Gede Putra Kusuma[2]
[1]Computer Science Department, BINUS Graduate Program - Master of Computer Science, Bina Nusantara University, Jakarta, Indonesia, 11480, dita.simanjuntak@binus.ac.id
[2]Computer Science Department, BINUS Graduate Program - Master of Computer Science, Bina Nusantara University, Jakarta, Indonesia, 11480, inegara@binus.edu

ABSTRACT

As mobile device users increase and the emergence of wireless network technology, the use of applications related to the tourism industry is also increasing. This study aims to create applications that help tourists find information about tourism in North Sumatra, Indonesia easily. This application provides information in two languages: English and Bahasa Indonesia. The information includes recommended tourist destination, photos and descriptions of tourist attractions. This application acts as a tour guide base on service by using mobile devices specifically for Android users. To find out the influence of the use of this tourism application on the user's interest, the application is evaluated by potential users. Evaluation is carried out using the Technology Acceptance Model (TAM). The results of evaluating the use of tourism applications concluded that the behavioral intention for the proposed tourism applications is 63.4%.

Key words: Tourism Application, Location-Based Service, Mobile Application, TAM Model, Statistical Analysis.

1. INTRODUCTION

For decades, traditional cellphones only function to make calls or send messages because of limited technological capabilities. However, after the evolution of technology generation 4.0, there have emerged smartphones or mobile devices that cause users to have a connection to the world wide web through software commonly called a mobile application [1]. The technology most commonly used by the public these days is mobile devices such as smartphones. This technology has many features that are very useful for daily life [2].

Mobile device users actually can access the world wide web through the browser instead mobile applications. But there are several advantages that users get when using a mobile application rather than using browser, such as 1) mobile applications can be specialized to find a need that is not provided by the website, 2) mobile applications provide better services for users to get discounts, compare prices, access and share information about a product, restaurant, transportation [3], it can even monitor blood pressure [4], 3) mobile applications are always active so users will receive notifications or updated information that can help improve the efficiency of their work [5]. As mobile device users increase and the emergence of wireless network technology, the use of applications related to the tourism industry is also increasing [6]. One sector that can develop the economy in an area is the tourism industry that can attract tourists to visit [7]. So far, there are several applications that support travel in booking airplane tickets, train tickets, bus tickets, hotel, restaurant, and hire tour guide services.

In addition, some researchers have developed a mobile version of the tourism application that combines the 3D cellular GIS (Geographic Information System) architecture and hybrid recommendation engine. This application provides features that can help tourists to obtain information about real tourism, one of them is 3D based maps [8]. Other researchers have also developed tourism applications that allow tourists to get information that does not overlap because the application can filter out inadequate content. This application is possible to make decisions with a hybrid-based recommendation approach that consists of collaborative filters, content-based recommendations, and demographic profiles [9]. In this study, we developed a location-based service based mobile application to support the tourism industry in North Sumatra, Indonesia. This application provides information in two languages namely English and Bahasa Indonesia.

The study objectives are:

1. To implement mobile application using location-based service to support the tourism industry in North Sumatra, Indonesia,
2. To evaluate user acceptance of the mobile application using location-based service.

The benefits to be achieved in this study are mobile application using location-based service in North Sumatra, Indonesia can increase tourism visits in the area.

2. RELATED WORKS

There were many researchers who conducted research on mobile tourism applications. In 2009, Yu *et al.* proposed a tourism application that could recommend attractions, hotels, restaurants and travel packages so that tourists can make travel plans [10]. The application is implemented by location and time-based system architecture. After that, researchers test the feasibility and effectiveness of the application. One year later, in 2010, Shi *et al.* presented the architecture and implemented an application on mobile devices with the iOS platform [11]. This application is called the Tour Guide application based on location. With this application, users get various kinds of information related to travel, including Google Maps service so they can reach their destination more easily. Then in 2012, Noguera *et al.* made a recommendation system used on mobile devices [8]. According to them, this application is very useful because it helps tourists to find tourist attractions according to what they want based on information from previous users. However, the application also has several limitations, one of which is that it has not been able to filter information. Therefore, they present applications with innovative features that can implement a recommendation system by combining a hybrid recommendation engine and 3D architecture (Geographic Information System) 3D. Recommended tourism locations and 3D-based interfaces provided through the application's features can help tourists in their travels. The conclusion that can be drawn based on previous researches that have been outlined above is that tourism applications on mobile devices are growing.

Location-based service is a service where the location of someone or an object is used to form services [12]. Examples of location-based services are interactive maps, directions to get to destinations, or recommendations for tourism activities [11]. The network is one of the important things to operate a mobile device because it functions to reject or receive messages from other mobile devices. In addition, it also serves to inhibit or activate the location of mobile device information via GPS. [13]. Google maps is an official web mapping service developed by Google, which is similar to other online map services, such as Yahoo! Map and MapQuest [14]. Google maps was launched in 2005. It is an application that has revolutionized online mapping services on a global network. Interactions between clients and servers are allowed on Google Maps so that they can download additional map information directly. Based on Asynchronous JavaScript and XML (AJAX), this interaction aims to maintain a sustainable connection [15].

One model that can be used to predict user acceptance of Information Technology is the Technology Acceptance Model (TAM) [16]. TAM aims to determine the effect of external variables on internal variables, namely beliefs, attitudes, and intentions of users of Information Technology. TAM has two important components in explaining system usage, namely perceived ease of use (PEOU) and perceived usefulness (PU) [17]. However, besides PEOU and PU, there are several other components as shown in Figure 1.

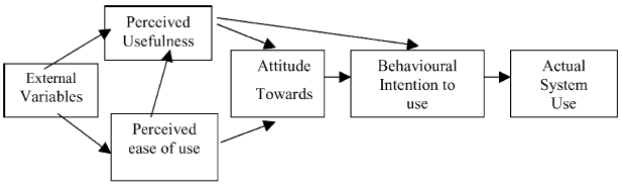

Figure 1: Original technology acceptance model [17]

3. RESEARCH METHODOLOGY

There are alternative ways to develop the tourism industry, for example creating new tourist attractions, reforming and renovating existing tourist attractions, doing promotion through various media, and so forth. However, these ways are considered insufficient to answer the challenges of the tourism industry going forward. It is time for the tourism industry to move more effectively by utilizing technology. In realizing mobile-based tourism applications, in this study the application is implemented by applying the waterfall Software Development Life Cycle (SDLC) model as shown in Figure 2.

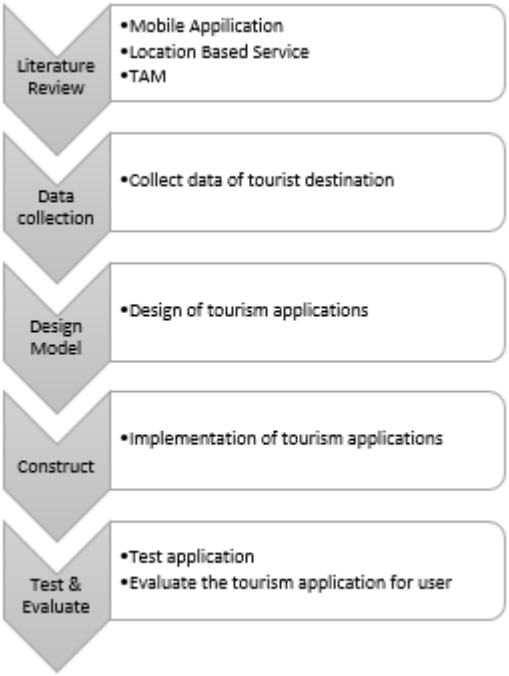

Figure 2: Research framework

Stages undertaken to achieve the objectives of this study, which are: 1) conduct literature review to find theories related to the study, 2) collect tourist destination data where the priority tourist destination is the closest to the 2 airports in North Sumatra, Indonesia, 3) implement the tourism application based on location-based service on mobile using the Android Studio development platform, 4) create design system that is illustrated through use case diagrams, class

diagrams, sequence diagrams, and activity diagrams, and 5) testing the tourism application to ensure all functions are running well and evaluating it to determine the acceptance and use of the application among the people using the technology acceptance model (TAM).

3.1. Design of Tourism Application

Tourism application aims to help visitors in deciding which tourist destinations to visit by looking at the distance, length of trip, and overview of the location. The application provides several features illustrated through use case diagrams as shown in Figure 3.

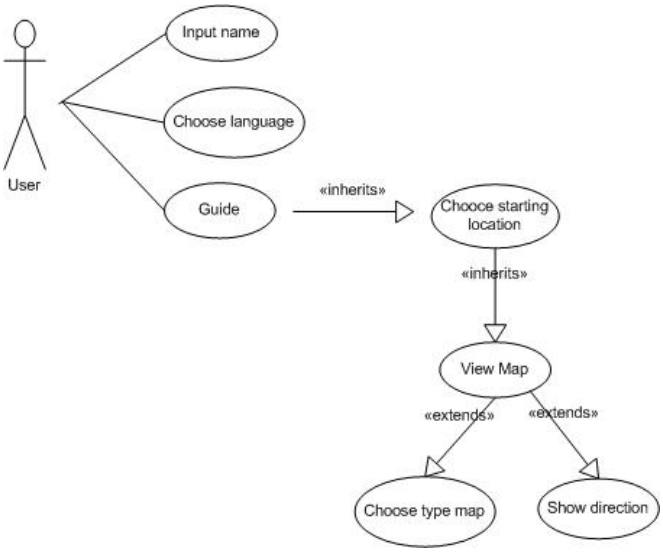

Figure 3: Use case diagram of the tourism applications

Class diagrams of the tourism applications as shown in Figure 4 illustrate each class and each relationship between classes. While, Figure 5 shows the sequence diagram of the use case input name and select the language.

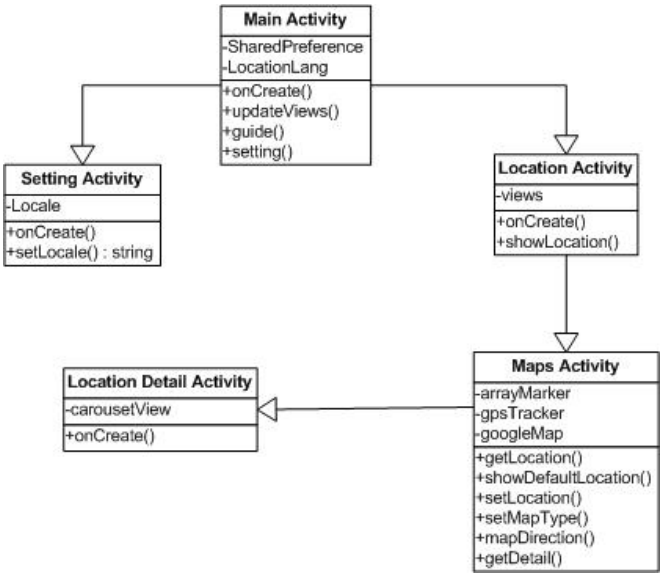

Figure 4: Class diagrams of the tourism applications

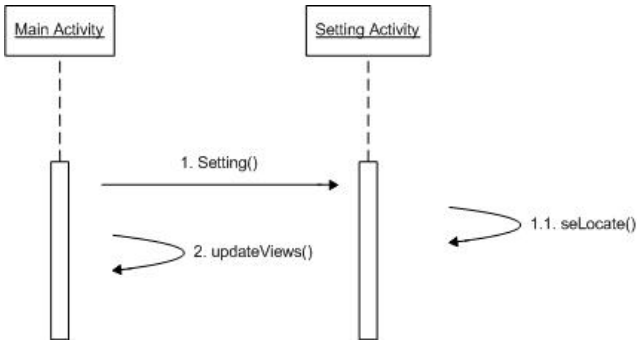

Figure 5: Sequence diagram of the use case input name and select the language

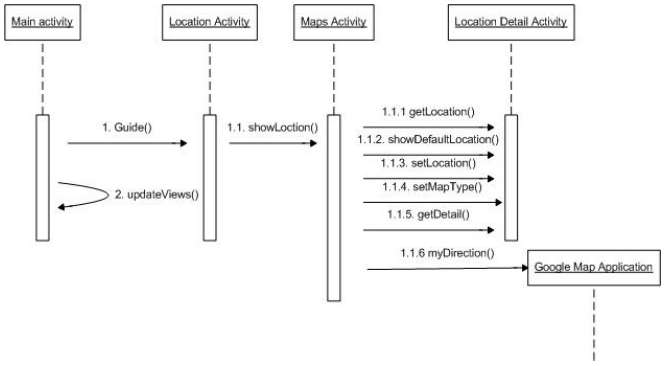

Figure 6: Sequence diagram of the use case guide

Figure 6 shows the sequence diagram of the use case guide. User can choose the guide menu and settings as a start point in the tourism application. If the user selects the settings menu as a start point, then the user can directly fill in the name data. If the user selects the guide menu as a start point, the user will be asked to choose the airport location as the default location. After that the application will display a map that shows the current location and attractions closest to the current location. When the user selects one of the attractions, the application will display details about the location of the tour. In addition, the user can choose show direction so that the application displays the trip route from the current location to the tourist location you want to go through the application map. These features illustrated through activity diagrams as shown in Figure 7.

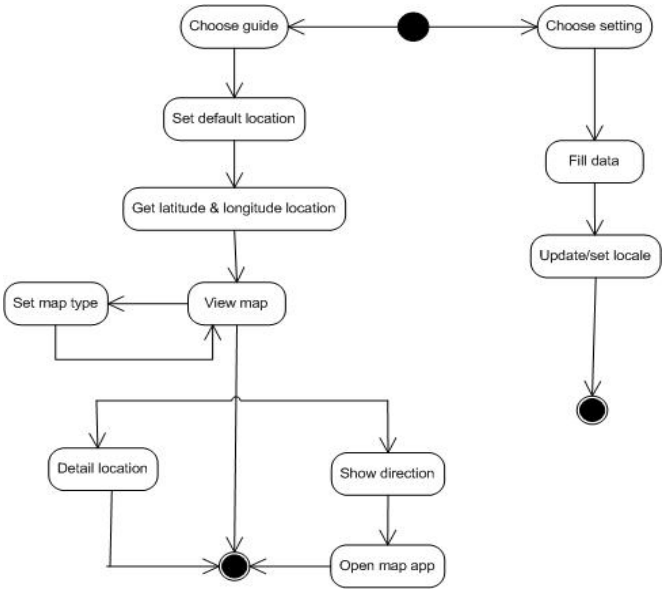

Figure 7: Activity diagrams of the tourism applications

3.2. Implementation of Tourism Application

The tourism application is built using the Android platform using the Java Mobile programming language. Android specifications that are used are Operating System Android version 5.1 Lollipop, Octa Core (Processor), 3 GB RAM memory, 32 GB External Memory. The specifications of the software used are Java Development Kit (JDK) 8u171-windows-x64, Android Software Development Kits (SDK), and Android Studio 1.0.

These are steps of creating the tourist prototype that will be seen in the application's user interface: 1) collecting tourist destination in North Sumatra, Indonesia, 2) create a database of images and decryption of tourist destinations, 3) get the latitude and longitude coordinates of a tourist destination, 4) make the googlemapsfloatingmarkertitles plugin: title and bounds. On the main page, the application has 2 menus namely guide setting and menu. On the setting page, user can fill in a username, while on the menu page, user can choose start location. When the user chooses one of start location, the application displays several tourist destinations closest to selected location as shown in Figure 8.

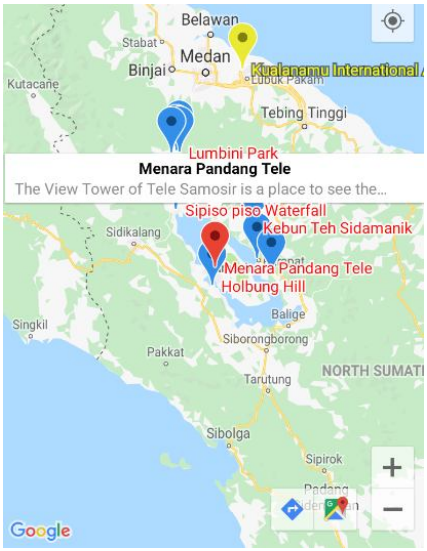

Figure 8: The closest tourist destination to the start location

When user selects one of the tourist locations, the application provides some images and information about the tourist location as shown in Figure 9 and 10.

Figure 9: Information page about tourist sites

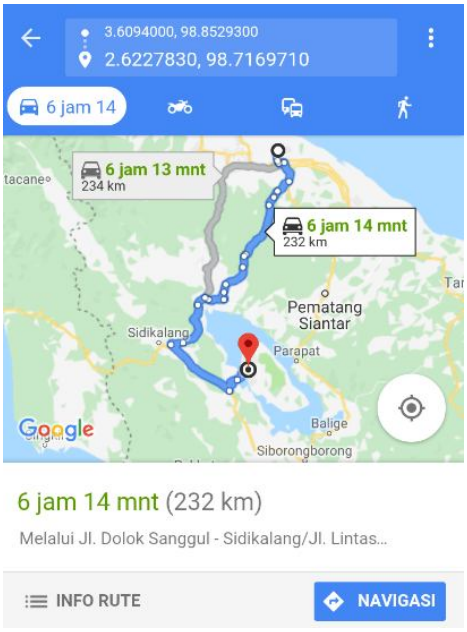

Figure 10: Information page about trip length

3.3. Testing and Evaluation

The tourist application is tested using the black box method to find out the functions that are running well. Then the tourist application will be evaluated. The purpose of this study is evaluating perceived usefulness of tourism applications (PU), perceived ease of use of tourism applications (PEOU), and behavioral intentions of users to use tourism application (BI). The evaluation method used is quantitative approach based on the results of respondents filling in the questionnaires. The instrument that will be used to evaluate the results is a questionnaire with a likert scale (1 up to 5). The responses from respondents will be statistically tested using the method of multiple linear correlation to test the validity and reliability. Validity test is performed with Corrected Item-Total correlation technique and the reliability test is performed with Cronbach Alpa technique. The sampling technique in this study is Purposive Sampling. The sample in this study is Android smartphone users.

The research evaluation model carried out in testing refers to the Technology Acceptance Model (TAM) specifically on the variable perceived usefulness and perceived ease of use. Research evaluation model of this study is shown in Figure 11.

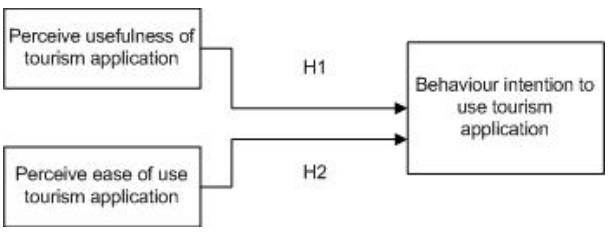

Figure 11: Research evaluation model

Based on research evaluation model above, there are two hypotheses of this study as shown in Table 1.

Table 1: Research hypotheses

No	Hypotheses
H1	Perceived usefulness of tourism application has a significant influence on behavioral intentions of users to use tourism application
H2	Perceived ease of use of tourism applications has a significant influence on behavioral intentions of users to use tourism application

Variable questions are arranged according to the TAM model where each variable has three questions as shown in Table 2.

Table 2: Questionnaire of User Behavior To Use The Tourism Application

No	Variable		Indicator
1	Perceived usefulness of tourism applications (PU)	PU1	Tourism applications of North Sumatra improve the quality of my travel
		PU2	Tourism applications of North Sumatra enable me to complete my tour faster
		PU3	Tourism application of North Sumatra allows me to complete more tourist visits than I should have done
2	Perceived ease of use of tourism applications (PEOU)	PEOU1	Learn to operate tourism application of North Sumatra is easy for me
		PEOU2	I can get tourism application of North Sumatra easily
		PEOU3	My interaction to tourism application of North Sumatra is obvious
3	Behavioural intentions of users to use tourism application (BI)	BI1	I intend to increase the use of mobile-based tourism applications of North Sumatra in the future
		BI2	As far as possible, I will use a tourism application of North Sumatra to travel in North Sumatra
		BI3	I like to use tourism applications in North Sumatra.

4. EVALUATION RESULTS

In this section, the evaluation results are explained and given comprehensive discussions at the same time. Results are presented in tables that help the readers to understand easily.

4.1. Validity and Reliability Testing

Test the validity and reliability of the variable BU, PEOU, and BI carried out using IBM SPP 21.0 software as shown in Table 3.

Table 3: Test the validity of variables

Construct	Items	Alpha
Perceived usefulness of tourism applications (PU)	3	0,871
Perceived ease of use of tourism applications (PEOU)	3	0,850
Behavioral intentions of users to use tourism application (BI)	3	0,921

The results of the validity test of the benefits of using the tourism application in the Table 3 shows the value of corrected item-total correlation obtained from questions PU, PEOU, and BI is greater than 0.3 so that those questions have good validity.

4.2. Partial Hypothesis Testing (t-Test)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	,573	2,052		,279	,783
Perceived_Usefulness	,573	,170	,575	3,370	,004
Perceived_Easy_of_Use	,371	,186	,340	1,993	,063

a. Dependent Variable: Behavioural_Intention

Partial hypothesis test (t-test) shows how much influence each independent variable has on the dependent variable. The hypotesis test result is shown in Table 4.

Table 4: Hypothesis test results with t-test

confidence level= 95%, α= 5%

t tabel = t (α/2 ; n-k-1)

t tabel = t (0,05/2 ; 20-2-1) = t (0,025 ; 17) = 2,109

Test criteria:

a. If α < 0,05 or t value > t tabel, then hypotesis is accepted

b. If α > 0,05 or t value < t tabel, then hypotesis is denied

Hypothesis 1 (H1): There is an effect of the perceived usefulness of using a tourism application on behavioral intentions to use a tourism application. The partial hypothesis test results for the calculated t value for the variable perceived usefulness of using tourism applications (PU) with the variable behavioral intention to use tourism applications (BI) is 3.370. T value > t table is 3,370> 2,109 and significance probability is 0,04 <0,05 so H1 is accepted. Thus, it can be concluded that there is an effect of the perceived usefulness of using a tourism application on behavioral intentions to use a tourism application.

Hypothesis 2 (H2): There is an effect of perceived easy to use tourism applications to behavioral intentions to use tourism applications. The results of the partial hypothesis test of the calculated t value for the variable ease of use of tourism applications (PEOU) against the variable behavioral intention to use tourism applications (BI) are 1,993. T value> t table is 1.993> 2.109 and a significance probability of 0.063 <0.05 so that H2 is not accepted. Thus, it can be concluded that there is no influence of the ease of use of tourism applications on behavioral intentions to use tourism applications.

4.3. Simultaneous Hypothesis Testing (F-Test)

Simultaneous hypothesis testing (F-test) shows how much influence the independent variable together on the dependent variable. The hypotesis test result is shown in Table 5.

Table 5: Hypothesis test results with F-test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30,231	2	15,115	17,458	,000 [b]
	Residual	14,719	17	,866		
	Total	44,950	19			

a. Dependent Variable: Behavioural_Intention

b. Predictors: (Constant), Perceived_Easy_of_Use, Perceived_Usefulness

confidence level= 95%, α= 5%

F tabel = F (k ; n-k)

F tabel = F (2 ; 20-2) = F (2 ; 18) = 3,55

Test criteria:

a. If α < 0,05 or F value > F table, then hypotesis is accepted

b. If α > 0,05 or F value < F table, then hypotesis is denied

Additional hypothesis (H3): There is an effect of the perceived usefulness of using a tourism application and the ease of using a tourism application simultaneously on behavioral intentions to use a tourism application. Based on the test results in the table above, it is known that the significance value for the effect of the independent variables simultaneously on the dependent variable is 0,000 <0.00 and the calculated F value is 17.458> F table 3.55, so it can be concluded that H3 can be accepted which means that there is an influence of the use benefits tourism applications and ease of use of tourism applications simultaneously for behavioral intentions to use tourism applications.

4.4. Coeficient of Determination Analysis

The coefficient of determination (R2) serves to find out what percentage of influence is given by the independent variable on the dependent variable. The coefficient of determination result is shown in Table 6.

Table 6: Test results of the coefficient of determination (R2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,820[a]	,673	,634	,930

a. Predictors: (Constant), Perceived_Easy_of_Use, Perceived_Usefulness

Based on the test results of the coefficient of determination in the table above, it is known the value of R Square is 0.634 (63.4%). Thus, the magnitude of the contribution of the benefits of using tourism applications and the ease of using tourism applications for behavioral intentions to use tourism applications is 63.4%, while the remaining 36.6% is influenced by other factors not examined in this study.

5. CONCLUSION

The tourism application implemented in this study is based on location-based service on mobile, especially on the Android platform. The results of testing tourism applications indicate that the function is going well. While the results of evaluating the use of tourism applications concluded that the behavioral intention for tourism applications is 63.4%, while the remaining 36.6% was influenced by other factors not examined in this study.

REFERENCES

1. Hoehle, H., & Venkatesh, V. **Mobile Application Usability: Conceptualization and Instrument Development**, MIS Quarterly, *39*(2), 435–472, 2015. https://doi.org/10.25300/MISQ/2015/39.2.08
2. Masood, S. H., & Riza, S. **Global Positioning System Using Mobile Phones: Three-Dimensional Positioning**, International Journal of Emerging Trends in Engineering Research, 8(1), (2020). https://doi.org/10.30534/ijeter/2020/09822020
3. Wang, H.Y. and Wang, S.H. **Predicting mobile hotel reservation adoption: insight from a perceived value standpoint**, International Journal of Hospitality Management, Vol. 29 No. 4, pp. 598-608, 2010 https://doi.org/10.1016/j.ijhm.2009.11.001
4. Panganiban, E. B. **Microcontroller-based wearable blood pressure monitoring device with GPS and SMS feature through mobile app**, International Journal of Emerging Trends in Engineering Research *7*(6), 32–35, 2019. https://doi.org/10.30534/ijeter/2019/02762019
5. Kim, E., Lin, J.S. and Sung, Y. **To app or not to app: engaging consumers via branded mobile apps**, Journal of Interactive Advertising, Vol. 13 No. 1, pp. 53-65, 2013 https://doi.org/10.1080/15252019.2013.782780
6. Lu, J., Mao, Z., Wang, M., & Hu, L. **Current Issues in Tourism Goodbye maps, hello apps? Exploring the influential determinants of travel app adoption**, Current Issues in Tourism, 18(11), 1059–1079, July 2015 https://doi.org/10.1080/13683500.2015.1043248
7. Yuliani, Y., Azhar, M., Hakim, I., Rifai, A., & Retrival, I. **Research Searching Information Mountain on the Java Island to help improve Tourism with the Vector Space Model**, International Journal of Emerging Trends in Engineering Research *8*(2), 317–322, 2020. https://doi.org/10.30534/ijeter/2020/13822020
8. Noguera, J. M., Barranco, M. J., Segura, R. J., & Martínez, L. **A mobile 3D-GIS hybrid recommender system for tourism**, Elsevier Information Sciences, volume 215, 37-52, 15 December 2012.
9. Meehan, K., Lunney, T., Curran, K., & Mccaughey, A. **Context-Aware Intelligent Recommendation System for Tourism**, IEEE International Conference on Pervasive Computing and Communications Workshops (PERCOM Workshops), 328-331, March 2013
10. Yu, C., & Chang, H. **Personalized Location-Based Recommendation Services for Tour Planning in Mobile Tourism Applications**, E-Commerce and Web Technologies, volume 5692, 38–39, 2009
11. Shi, X., Sun, T., Shen, Y., Li, K., & Qu, W. **Tour-Guide: Providing Location-Based Tourist Information on Mobile Phones**, 2010 10th IEEE International Conference on Computer and Information Technology, 2397-2401, 2010 https://doi.org/10.1109/CIT.2010.412
12. Duri, S., Cole, A., Munson, J., & Christensen, J. **An Approach to Providing a Seamless End-User Experience for Location-Aware Applications**, Proceedings of the 1st international workshop on Mobile commerce, 20–25, 2001 https://doi.org/10.1145/381461.381465
13. Attahiru, G. M., & Khoo-Lattimore, C. **Location-based Services: Tool for Tourism Service Promotion**. Journal of Business and Economics, 6(12), 2089–2096, 2015
14. Miller, C. C. **A Beast in the Field: The Google Maps Mashup as GIS / 2**, Cartographica: The International Journal for Geographic Information and Geovisualization, , *41*(3), 187–200, 2006 ttps://doi.org/10.3138/J0L0-5301-2262-N779
15. Hu, S., & Dai, T. **Online Map Application Development Using Google Maps API, SQL Database, and ASP . NET**, Computer Science, *3*(3), 102–110, 2013
16. Moon, J., & Kim, Y. **Extending the TAM for a World-Wide-Web context**, Elsevier Information & Management , 38(4), 217-230, February 2001 https://doi.org/10.1016/S0378-7206(00)00061-6
17. Legris, P., Ingham, J., & Collerette, P. **Why do people use information technology? A critical review of the technology acceptance model**, Elsevier Information & Management, 40(3), 191–204, 2003 https://doi.org/10.1016/S0378-7206(01)00143-4