

Evaluation Of Navigation Application

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ABSTRACT

With the rapid progress of technology development, we can see, nowadays, users are increasingly interacting with the application on the Internet. As users, grown accustomed with these technologies, it began widespread and thus, become a norm in our daily lives. The navigation industry does not lack behind on this development. Usability of a website or application is a strong predictor of the user satisfaction and intention to use. In recent years, we could see growth of navigation technology in the online world that create competition between these providers. This study undertakes the Google Maps and Waze application as a case study. Many variables affects the number of visitors these application received, with both shine in their respective aspects. Google Maps excels in overall navigation accuracy and ease of use. Meanwhile, Waze shines in real-time traffic updates, crowd-sourced information, and a highly interactive user interface. This aspects is what captivates users to use these navigation applications.

Keywords

- System Usability Scale (SUS) : The scale used to measure the usability of both navigation application
- Navigation Accuracy : The accuracy of the application on directing you through to the destination set
- Real Time Update : The update of any information regarding navigation on the application for both, Google Maps and Waze.
- Traffic Update Accuracy : The accuracy on an update on traffic during the usage of the application while driving to a certain destination. As an example a sudden accident updated on the application.
- Quantitative Usability Score : The score calculated from the SUS questionnaire using the SUS formulas.
- Crowd Sourced Information : The information gathered from the users (crowds) through an application.
- User-Centered Usability Assessment : An usability assessment that are based on the response from the user directly.

1. INTRODUCTION

Navigation applications such as Google Maps and Waze have become an essential tools for commuters, offering real time directions, traffic updates and a range of features to enhance

the travel experience. This case study compares Google Maps and Waze in multiple aspects, in terms of navigation accuracy, user interface and additional features such as traffic update and community-based alerts. This aims to highlight theirs strengths and weaknesses.

As both companies are owned by Google, this motivates this case study to compare two distinct apps while being developed or run by the same company. How can one company can create such a different applications that has its own uniqueness and interactive features. Based on the findings after we finished the study, we can conclude many things from it based on the data receives.

The findings shows that Google Maps and Waze may have similar goals for their apps, both of them are unique. Google Maps excels in navigation accuracy and also offers a clean, user-friendly interface, making it ideal for users that wants reliability and application ease of use. Meanwhile, Waze, provides features such as crowd-sourced traffic updates and interactive features, attracting user who prioritise real time, user-generated tragic reports. This appeals to the user who wants to avoid congestion and want to receive instant updates from other drivers. This comparison, provides many valuable insights for choosing between these two incredible tools depending on the user needs.

2. METHODOLOGY

This part shall describe the methodology of how to achieve the objectives of the case study given. The method used to evaluate the performance of Google Maps and Waze are a user-centered usability assessment which is System Usability Scale (SUS). SUS is a standardised questionnaire whom provides detail information of user satisfaction and helps to point out which platform has the better user experience. The major tests that have been done includes the navigation accuracy, the easiness on using the application, real-time update and traffic updates accuracy. Based on these aspects, participants filled in the SUS questionnaire which have a standardised 10-item question to find the user point of view on the usability of the system. The score for SUS, calculated from the participants responses are based on the quantitative usability score out of 100 for each of the platforms. Its measure the user experience for these aspects, which is ease of use, complexity and learnability.

The SUS questions are as follows :

- 1) I think that I would like to use this system frequently.
- 2) I found the system unnecessarily complex.
- 3) I thought the system was easy to use.

- 4) I think that I would need the support of a technical person to be able to use this system.
- 5) I found the various functions in this system were well integrated.
- 6) I thought there was too much inconsistency in this system.
- 7) I would imagine that most people would learn to use this system very quickly.
- 8) I found the system very cumbersome to use.
- 9) I felt very confident using the system.
- 10) I needed to learn a lot of things before I could get going with this system.

The users will rank each of the 10 templates questions above based on their level of agreement which starts from 1 until 10. A few custom questions are also added which is :

- 1) Navigation Accuracy
- 2) The Application Ease Of Use
- 3) User Interface Satisfaction
- 4) Real-Time Update Performance
- 5) Traffic Update Accuracy

After the data have been collected, the SUS questionnaires will be analysed to collect and measure its scores. The score will be the benchmark for usability measures, meanwhile, the custom questions will provide general information or insights on the specific user experience on both applications.

3. RESULT

3.1 Objective Metric Outcome

After collecting a total of 20 response on the questionnaire, we can make a analysis based on the result obtained. To evaluate the usability of both navigation application, Objective and Subjective data have been collected so that we can analyse the usability of this both app collectively. Below, are the result of recorded key objectives metrices performed by 5 participants. These key objectives consist of app response time, number of navigation errors and the best estimated time for the same route and time.

Table 1 : Objective Metric Outcome

Participants	Application	App Response Time (seconds)	Number of Navigation Errors	Best Estimated Time for the same route and time (minutes)
1 Android	Google Maps	2	0	35
	Waze	3	1	34
2 IOS	Google Maps	1.5	1	33
	Waze	2	0	31
3 Android	Google Maps	2.5	0	36
	Waze	3	2	35

4 IOS	Google Maps	2	1	34
	Waze	2.5	1	32
5 Android	Google Maps	1.8	0	37
	Waze	2.2	0	35

Based on this results, we can see the distinct difference and the similarities from both applications and operating system. As both application and operating system become factors that effects the key objective metrices.

According to the data obtained, we could see that in IOS, the app response time are better for both applications which is for Google Maps, (1.5s – 2s) and for Waze, (2s – 2.5s) compared to Android which is for Google Maps, (1.8s – 2.5s) and Waze, (2.2s – 3s). For the number of navigation errors, we also could see that Android outperform IOS in this matter. The number of navigation error in Google Maps for android is 0 for 3 devices meanwhile for IOS, it is 2 for 2 devices. For Waze, the Android have 3 error out of 3 devices compared to IOS, which is 1 error out of 2 devices. Lastly, by using the same route and the same time of the day, we compare the best estimated time to reach a certain destination. The IOS outperformed Android which is for Google Maps, it has an estimate (33-34) minutes compared to Android which is (35-37) minutes. Meanwhile, for Waze, the estimated time is (31-32) minutes for IOS and (34-35) minutes for Android.

3.2 System Usability Scale (SUS)

With 20 Participants respond to the questionnaire, the data collected from this scale have been analysed to showcase the usability of both applications. From the data collected, a total of 100 score, maximum and 0 score minimum can be calculated. 100 score represent the application have great usability meanwhile 0 score represent that the application has a very bad usability. Below are the result obtained from the SUS questionnaire for both applications, Google Maps and Waze.

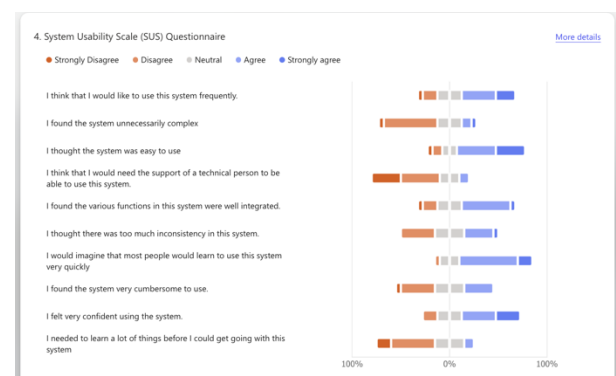


Figure 1 : Google Maps SUS Result

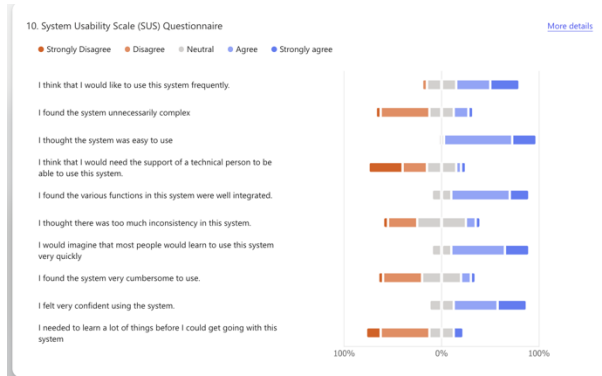


Figure 2 : Waze SUS Result

Based on the result above we have calculated the SUS score based on the formulas below,

For odd numbered question (Question 1, 3, 5, 7, 9) :

[User Rating] – 1 = ____ points

For even numbered question (Question 2, 4, 6, 8, 10) :

5 – [User Rating] = ____ points

The total of points, then being added up from the 10 questions the user answered. The total points, then being multiplied by 2.5 to get the individual user SUS score.

[Question 1: ____ points] + [Question 2: ____ points] + ... [Question 10: ____ points] = ____ total points from user.

[User SUS score] = [Total points from user] X 2.5

This process are repeated 20 times as there are 20 participants in this questionnaire. From the SUS score calculated, an average SUS score have been calculated. It shows that for Google Maps, it has an average SUS score of 63.13 meanwhile, for Waze, it has an average SUS score of 68.25.

3.3 Custom Questions

Custom questions are also included in this questionnaire. The sole reason behind this action are to gather further insights and understanding of the user experience on both applications. 5 custom questions are inserted for both Google Maps and Waze. Below are the question asked,

Google Maps

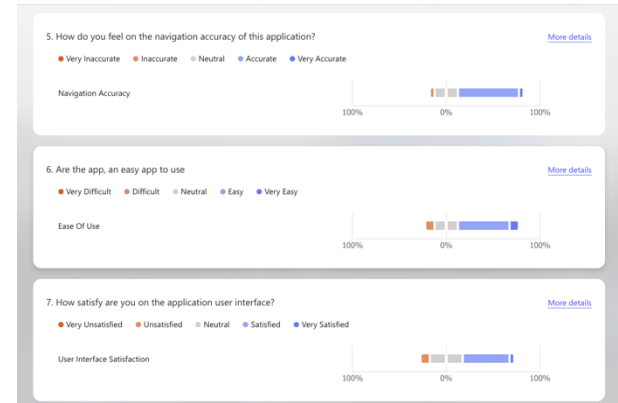


Figure 3 : 3 Custom Questions for Google Maps

From the 3 questions above, it shown that most user agrees that the navigation accuracy of Google Maps are accurate, that Google Maps are easy to use and the user interface satisfies the respondent.

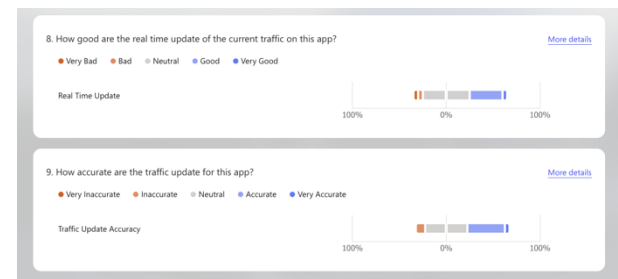


Figure 4 : 2 Custom Questions for Google Maps

Based on the image above, it is shown that most user agrees that Google Maps has very good real time update and has an accurate traffic update.

Waze

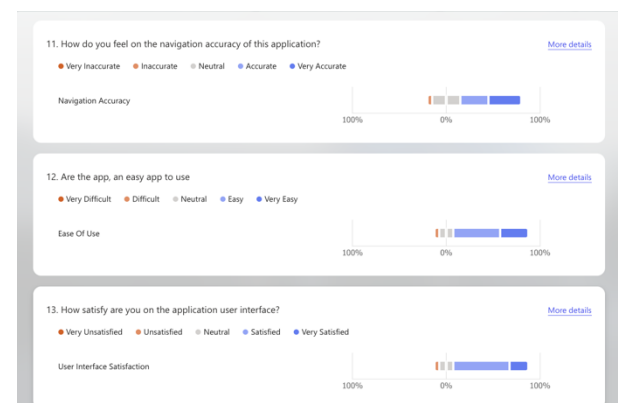


Figure 5 : 3 Custom Question for Waze

Based on the measurement above, it is shown that most user agrees that the navigation accuracy for Waze are accurate, Waze are easy to use and it satisfies the user for its user interface.

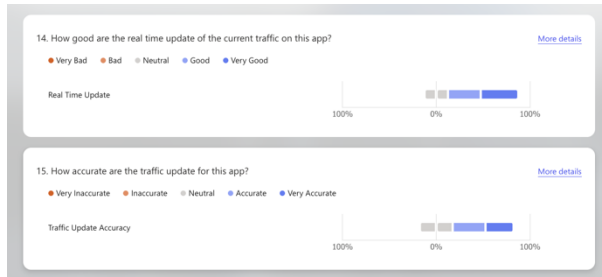


Figure 6 : 2 Custom Question for Waze

From Figure 6, it is shown that all user either neutral on the subject or agree that Waze has a very good real time update and an accurate traffic update.

4. DISCUSSIONS

Based on the research, the usability tests reveal no significant different of user experience on Google Maps and Waze. According to the System Usability Scale (SUS) questionnaire that have been done, it shows that on average, Google Maps achieve an average score of 63.13% meanwhile, Waze on the other hand achieve an average score of 68.25%. Even though, there is no significant difference between these two applications, the usability tests shows that users still prefer Waze compared to Google Maps. This indicates that user

5. SUMMARY

As summary, this research has a provide us a new view on the usability of these two navigation application of Google Maps and Waze. Based on the objective and subjective result and feedback given by the respondents, we can conclude that Waze, in general, is a slightly easier application to use, has a better user interface for the user, a much more better real time and traffic update. While Google Maps excels in navigation accuracy, Waze does not lack far behind on this matter too, thus making Waze a much more superior option.

In the end, Waze are the navigation application that are chosen by its users where the developers have targeted a much more easier applications for users to use. As driving is a very general routine that have are done every day, a much more easier and interactive application are much more preferred. Even though, Waze are the user choice in this research, Google Maps are not a bad option either for users to use. Google Maps provide a much more better navigation accuracy than Waze, so if the user prefer a much better direction for their driving, they may choose Google Maps. If the user prefer a much better update on the traffic and a much easier application to use, then, Waze are the answer.

6. REFERENCES

- [1] K. Betteridge, "What Every UXC Client Should Know About SUS Scores," [Online]. Available: <https://www.bentley.edu/centers/user-experience-center/what-every-client-should-know-about-sus-scores>. [Accessed 6 November 2024].
- [2] J. Brooke, SUS: A quick and dirty usability scale, Reading: Redhatch Consulting Ltd, 1995.

prefer a more easy user interface application that are easier navigate and used. These are also corresponds with the customised question that Waze has a slightly better user satisfaction.

While both provide an accurate navigation accuracy, it is stated that Waze has a slightly better navigation accuracy than Google Maps. Waze also has a better ease of use for its application and the user satisfaction for the application are better than Google Maps. For real time update and traffic update, it shows quite a contrast between these two applications, where there is a collective agreement that Waze has a better real time update and traffic update. Google Maps on the other hand, has some users that disagree that Google Maps has a good real time update and traffic update.

As we have measured both SUS data and the custom questions data, it hints that the user-friendly approach taken by Waze are more appealing for users who enjoy a much more easier application for them to use. This can be supported by the Objective Metric Outcome where, when the two applications are compared, the numbers of navigation error and the best estimated time to reach the same destination by using the same route and during the same time of the day are that Waze has a low navigation error recorded, and a much better time estimated. While both applications has an almost same aspects that satisfies user, it still shows that user still prefer Waze for its user friendliness and easiness of use.

- [3] A. H. O. H. F. W. A. M. I. S. Azizah Ahmad, "Utilizing WAMMI Components to Evaluate the Usability of E-commerce Website," School Of Computing, Universiti Utara Malaysia, [Online]. Available: <https://jtec.utem.edu.my/jtec/article/view/2752/1810>. [Accessed 5 November 2024].
- [4] E. M. Azham Hussain, "UUM Mobile for Students: A Usability Evaluation on Two Mobile OS Platforms," School Of Computing, Universiti Utara Malaysia, August 2018. [Online]. Available: https://www.researchgate.net/publication/327424446_UUM_Mobile_for_Students_A_Usability_Evaluation_on_Two_Mobile_OS_Platforms. [Accessed 5 November 2024].
- [5] T. W. Fitri Trapsilawati, "Human-computer trust in navigation systems: google maps vs waze," Faculty of Engineering, Universitas Gadjah Mada, Yogyakarta, 3 June 2019. [Online]. Available: https://www.researchgate.net/publication/334461804_Human-computer_trust_in_navigation_systems_google_maps_vs_waze. [Accessed 6 November 2024].
- [6] T. Pritchard, "Google Maps vs. Waze: Which navigation app is better?," 2 November 2024. [Online]. Available: <https://www.tomsguide.com/face-off/google-maps-vs-waze>. [Accessed 6 November 2024].

2024].

- [7] Y. G. Tal Laor, "In WAZE we trust? GPS-based navigation application users' behavior and patterns of dependency," National Library Of Medicine, 10 November 2022. [Online]. Available: <https://pmc.ncbi.nlm.nih.gov/articles/PMC9648768/>. [Accessed 6 November 2024].
- [8] B. Popa, "Here's Why More People Choose Google Maps Over Waze and the Difference Nobody Talks About," autoevolution, 24 August 2024. [Online]. Available: <https://www.autoevolution.com/news/here-s-why-more-people-choose-google-maps-over-waze-and-the-difference-nobody-talks-about-238492.html>. [Accessed 7 November 2024].
- [9] S. V, "Is Waze better than Google Maps? What is the best online map for directions? What are the key differences between Waze and Google Maps?," 24 March 2024. [Online]. Available: [https://www.youngwonks.com/blog/waze-vs-google-maps#:~:text=Regarding%20navigation%20accuracy%](https://www.youngwonks.com/blog/waze-vs-google-maps#:~:text=Regarding%20navigation%20accuracy%20both%20Waze,is%20the%20quickest%20possible%20way..)

[2C%20both%20Waze,is%20the%20quickest%20possible%20way..](https://www.youngwonks.com/blog/waze-vs-google-maps#:~:text=Regarding%20navigation%20accuracy%20both%20Waze,is%20the%20quickest%20possible%20way..) [Accessed 7 November 2024].

- [10] J. F. Cameron Summerson, "Waze vs Google Maps: Which One Is Really Better?," How-To-Geek, 13 April 2024. [Online]. Available: <https://www.howtogeek.com/waze-vs-google-maps-which-one-is-better/>. [Accessed 7 November 2024].