KaByahe: a mobile application focusing on the historical and cultural places within the city of Manila

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Abstract. With the Philippines’ rich historical and cultural heritage, tourism remains a vital sector and is one of the greatest contributors to its rising economy. Manila, its capital, has a vast list of historical and cultural places that mirrors the country’s rich historical and cultural heritage. The developers were inspired to develop a mobile application called KaByahe with the purpose to determine the different historical and cultural places within Manila and serve as its users’ own guide in exploring more of its historical and cultural roots. The developers strongly believe that this project is important not only for the benefit of the tourists in exploring Manila, but also, for its local people, to aid them in knowing what has transpired beyond these places and promote appreciation and understanding of the city’s origins. The developers used Agile Development Methodology since the strategy is to develop using short development cycles to focus more on addressing potential issues and produce quality output per cycle. With this, the developers were able to work more efficiently and collaboratively. The developers were able to gather substantial information through various testing procedures conducted to address both functional and non-functional requirements. Based on the results of these, KaByahe was deemed to successfully meet the objectives set by the developers.

1. Introduction
Tourism remains one of the greatest contributors to the rising economic status of the Philippines. In 2017, the tourism industry contributed approximately 3.35 trillion to the country’s economy. [1] The country’s capital, Manila, has a tremendous rundown of historical and cultural places reflecting the nation’s past. One of Manila’s oldest and most popular historical and cultural places is Intramuros, which was once the Spaniard’s political and military base in Asia. [2] In 2019, at least 3.7 million tourists visited Intramuros, specifically Fort Santiago, according to an article by Faye Almazan of The Manila Times. Intramuros Administration (IA) head, Guiller Asido, detailed that there was an evident increase from the usual 400 to 500 daily to an average of 1,200 to 1,300 tourists who visited the historical site adding that they were able to generate P100 million in revenue versus the P94 million they made in 2018. Demographics showed that 70% were local tourists and 30% were foreign tourists. [3] Based on the volume of tourists who have been visiting the country, the number of accredited tour-guides available cannot accommodate the rapid growing count. For instance, in an article written by JM Agreda, which was published last 2013 by Sunstar, Baguio City, one of the top tourist destinations in the country, ironically has only three accredited tour guides.

Based on the information gathered and to address the stated problem of lack of tour guides, the developers were able to develop KaByahe which consisted of both web and mobile applications. KaByahe mobile is intended to help its target users to explore more of Manila’s historical and cultural places by functionalities such as generation of list of places either based on user preferences or user’s
current location, the capability to post a comment/review or photo on a thread which will serve as the
user’s moment on a certain place, the capability to show a pop-up message box whenever a user passes
by a historical or cultural place, show weather information, and suggest the shortest possible route from
the user’s current location to the desired destination. KaByahe web, on the other hand, was created for
the administrator’s use in managing and maintaining the contents of KaByahe mobile.

2. Objectives of the Study
The project’s main goal was to develop a mobile application to determine Manila’s rich historical and
cultural places and aid local or foreign tourists in exploring more about these places. One of the main
features of the application is to generate a list of places based on the preference of the users. Another is
to allow them to openly share their experiences by posting a comment/review or uploading photos. It
also provided the shortest possible route from the user’s current location to the desired destination and
while on the road, provided a brief description of each historic or cultural place a user passed by through
a pop-up. The developers also created a web application to manage the contents of the mobile
application.

The project provided a web application for the administrator and a mobile application for its users.
For KaByahe web, the administrator had the capability to view the total number of registered users, the
total count who downloaded the application, the total number of places, and the total number of
preferences. The administrator was also able to modify new and existing historical and cultural places
by adding, editing, and deleting. Hence, new and existing preferences can also be managed. The initial
categories of preferences were churches, monuments, museums, parks, institutions, libraries, and
theatres. These were considered initial because it can be modified through the administrator side.

For KaByahe mobile, the application required the user to create an account if the user wanted to post
a moment (photo, comment/review) on a certain place. It also asked the user regarding preferences upon
initial login. These preferences can be changed by the user later on. It displayed a list of places according
to the user's preferences and a list of nearby places based on the user’s current location. Hence, a map
was also displayed. Lastly, it was also able to provide weather information to the places where historical
or cultural landmarks were present.

KaByahe mobile was limited to run on the Android platform and with the presence of Internet
connection. The user may use the application first-hand. However, the user was not able to share a
moment on a specific place unless he is already logged in and his account is already verified. The
generated list of places was limited only to historical or cultural places within the City of Manila. Photos
to be uploaded on a thread was limited to one photo per upload. Uploading of videos was also out-of-
scope. Lastly, in the generation of the shortest possible route, the default mode of transportation was by
car and traffic was not a factor in determining the route.

3. Review of related literature, systems, and technologies
Most people, either at a young or old age, have smartphones today and it became an integral part of
every individual’s life due to useful mobile applications which were relatively easy to access and simply
make one’s life better as a result. [4]. The developers decided to come up with a mobile application
because smartphones are more ubiquitous than laptops or personal computers. [5] Today, travel
applications are the 7th most downloaded in the application categories and as technology continues to
bloom even more, new trends are continuously rising.

Among the vast list of tourist destinations throughout the world is the Philippines, which was
considered as one of the top tourist destinations by people all over the world. Not only does this country
have beautiful beaches and scenic spots for people to enjoy, but also a rich historical and cultural
background that tourists find interesting. The Philippines became a melting pot of various cultures like
Spanish, Chinese, Japanese, and American which had greatly affected the Filipino customs, traditions,
and norms. With these influences, its historic landmarks have played a major part in its tourism industry.
[6] Among the destinations that tourists can explore in the Philippines is Manila, its capital. The complex
past of Manila still stands through due to its historical and cultural landmarks evident until now. In fact,
according to an article written by Stephanie Mayo, Intramuros, the oldest administrative district in Manila, and the ever-famous Rizal Park were just one of the top ten historical landmarks to be seen and visited in Manila. [7] These landmarks speak beyond what is seen by the naked eye, Manila’s historical and cultural roots.

Within the sixteen administrative districts of Manila namely Binondo, Ermita, Intramuros, Malate, Paco, Pandacan, Port Area, Quiapo, Sampaloc, San Andres, San Miguel, San Nicolas, Santa Ana, Santa Cruz, Santa Mesa, and Tondo lies different historical and cultural structures, even places, which serves as an instrument to look back on the story of the past. Adhering to KaByahe’s vision, to determine these places and aid local or foreign tourists know how rich the history of Manila is, below are some features of KaByahe along with its references to other existing applications in the market:

**Table 1. Some of KaByahe features and comparison to other existing mobile applications.**

| KaByahe features                                                                 | Comparison to other applications                                                                 |
|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1. To provide a list of places based on gathered user preferences where distance and preferences were the basis of generating a list of places for the user. Based on the user’s preference selection and distance approximation, the application generated a list of places for the user. | Comparable to Sygic, a travel application, which generates itineraries for the user, except that it does not include user preferences. [8] |
| 2. To automatically pin and display the user’s current location, given that permission was enabled, using the coordinates returned by the API. | This is similar to the study titled “PWDirectory - Mobile Application”, [9] which also utilized the Google Maps API. |
| 3. To see nearby historical and cultural places based on the user's current location and share moments by uploading a photo or a review which will be included in a place’s thread upon successful upload. | Comparable to the “Near Me Now” and “Travel Advice” features of the application TripAdvisor. [10]. |
| 4. To provide accurate weather information for a certain historical or cultural place which is vital most especially in planning activities for a certain day. | Similar to Packpoint’s functionality to produce weather information to help aid the user in creating his pack list. [11]. |
| 5. To generate the shortest possible route from the user’s current location to the destination, assuming that the default mode of transportation was car. | Similar to Waze, instead, the route was automatically set to shortest, not an optional fastest or shortest route. [12]. |

4. **Methodology**

The totality of the Agile Development Methodology comprised of five phases:

a) Brainstorming, wherein the project was envisioned and prioritized. In the Philippines, educational tours were one of the most unforgettable moments of a student’s academic journey. It happens every year and itineraries are mostly focused on the historic and cultural places around the reach of the academic institution a student is enrolled in. The developers actually incorporated their own experiences that led to the creation of KaByahe specifically the integration of the pop-up feature where a pop-up containing a brief description, fun fact, or a trivia appears whenever a user passes by a historical or cultural place. This resembled the developers’ experience of their own tourist guides giving trivia whenever their bus passed by a historic or cultural place back then. Apart from these experiences, the developers also considered the rapid growth of technology and its impact to educational tours. Now, more than
ever, educational tours started to utilize the use of travel applications to further amplify the purpose of the trip. The developers thought that it would be a great opportunity not just for the students, but also for the local and foreign tourists to have a deeper understanding of the different historic and cultural places within Manila.

b) Designing, wherein the developers decided on how the application would look like to its target users keeping in mind to make it easy to use, easy to understand, and easy to learn. The developers designed the application to overall make it simple and provide the user ease in usage and seamless user experience.

c) Development wherein the actual implementation and coding took place. The developers used short development cycles when developing each functionality identified. At the end of each cycle, a test was conducted to perform changes whenever there were issues to further build a quality application.

d) Quality Assurance to test whether the functionalities developed are working as expected. Apart from the tests conducted per cycle, the developers conducted a test not just for a specific functionality but for the entirety of the application itself to make sure that the integration of functionalities were all working as expected. The developers were able to conduct unit, integration, and system integration testing to test whether both major and minor functional requirements were aligned to both KaByahe web and mobile applications.

e) Deployment wherein the application is subject for release. Below are some screenshots of KaByahe Web and Mobile application:

![Figure 1. KaByahe Web Application](image1)

![Figure 2. KaByahe Mobile Application - Selecting Preferences and Nearby Places](image2)
The developers decided to utilize the Agile Development Methodology instead of the traditional Waterfall model, which is sequential, for the strategy is to develop the application through the use of incremental and iterative work [13] to focus on the improvements in the development phase. Hence, this methodology was able to help the team work more efficiently and collaboratively.

5. Results and discussion

The developers were able to develop the defined major and minor functional requirements and non-functional requirements accompanied with corresponding test cases for each requirement. For the functional requirements and reliability, the developers conducted unit, integration, and system integration testing to test whether both major and minor functional requirements align to both KaByahe web and mobile applications.

For the unit testing, in KaByahe web, the developers conducted two versions of unit testing. Errors encountered were minor in nature such as highlighting of fields in red to denote error and presence of validation messages. Failure marks were immediately resolved after debugging. On the other hand, for KaByahe mobile, there were three versions of unit testing conducted. Again, errors were minor in nature and were immediately resolved after debugging.
For integration testing, one version was conducted for KaByahe web since when tested, all test cases planned obtained pass marks when executed. For KaByahe mobile, there were two versions of integration testing. In the first version, 8 out of 10 test cases obtained pass marks. Again, errors were minor in nature and were resolved after debugging leading to a 10 out of 10 pass marks in the second version.

Lastly, for system integration, both KaByahe web and mobile were enclosed in one version of system integration testing since there were no failures documented when the testing was done.

For the non-functional requirements, the developers conducted SQL injection testing, XSS testing, scalability, and portability testing. Pass marks were obtained after every test case for every requirement was done. For usability, the developers conducted User Acceptance Testing (UAT) at its target sites Intramuros and Rizal Park. They were able to get 20 respondents. In evaluating the responses, the System Usability Scale (SUS) metric was used. The developers computed the average of answers per question by getting the total sum of each question and divided it into the number of respondents. [14] Table 2 below shows how the usability score was computed:

### Table 2. Calculating the usability score.

| Questions | Avg. score of 20 respondents | Odd numbers | Even numbers |
|-----------|------------------------------|-------------|--------------|
| 1. I think that I would like to use this system frequently. | 4.85 | 3.85 |
| 2. I found the system unnecessarily complex. | 1.5 | 3.5 |
| 3. I thought the system was easy to use. | 4.8 | 3.8 |
| 4. I think that I would need the support of a technical person to be able to use this system. | 1.25 | 3.75 |
| 5. I found the various functions in this system were well integrated. | 4.85 | 3.85 |
| 6. I thought that there was too much inconsistency in this system. | 1.2 | 3.8 |
| 7. I would imagine that most people would learn to use this system very quickly. | 4.85 | 3.85 |
| 8. I found the system very cumbersome to use. | 2.5 | 2.5 |
| 9. I felt very confident using the system. | 4.6 | 3.6 |
| 10. I needed to learn a lot of things before I could get going with this system. | 1.25 | 3.75 |
| Total | 18.95 | 17.3 |
| Final Score | \([(18.95 + 17.3) \times 2.5] = 90.625\) |

Table 2 shows that the total final score of the system was 90.625 out of 100. This means that in accordance with the scoring scale shown in Figure 5, the mobile application gained an excellent in adjective ratings and B+ to A in grade scale. Therefore, the results of the testing show that the KaByahe mobile application satisfies the needs of its target users.

### 6. Conclusion and recommendations

#### 6.1. Conclusion
The developers were able to gather substantial information through various testing procedures they have conducted to address the functionality and reliability requirements on both web and mobile applications. For usability, the end users were also given the chance to provide the strong points of the mobile application and point out possible areas for improvement and their suggestions to further improve the application.

![SUS Scoring Scale](image)

**Figure 5. SUS Scoring Scale [15]**

The development of this project provided the developers new knowledge and skills that may aid them in the future. Based on the gathered results, the developers therefore came up with the conclusion that the KaByahe web and mobile application have successfully met the defined objectives, generally, to determine historical and cultural places within the City of Manila and specifically, provide a web application for content management; generate list of places either based on user preferences or user’s current location; provide a thread of comments/reviews or photos to serve as moments and lastly, generation of shortest possible route. All these were met not exceeding the scope and limitations of the project itself.

### 6.2. Recommendations

Based on the gathered subjective feedbacks and suggestions from the users, the following are the recommendations for KaByahe mobile: improve user experience when uploading photos in the moments tab of a specific place by letting the user upload multiple photos and customize these photos through adding stickers, texts, and effects, integrate modification, deletion, and filtering of bad words placed by a certain user, provide text-to-speech functionality similar to Google Maps for enhanced accessibility and lastly, develop KaByahe to run in the iOS platform.

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