

Flushify: A Toilet Finder Mobile Application

Winston Rafael N. Carmelo, Mhenard Djoe U. Galapate, Mark Anthony C. Laurente, Patrick John V. Peregrino, Joseph B. Campit

*Pangasinan State University
Bayambang Campus*

Abstract

This study aimed to develop a Toilet Finder Application called Flushify used for finding nearby public toilets. It focuses on solving the problem of tourists and travelers who need to find and use a comfort room. The system automatically locates available toilets near the user's location. The system also provides navigation and route to the selected toilet. Furthermore, it would also allow the user to report changes, suggest a toilet, and provide review to help improve the data accuracy which will contribute to the community and benefit all users. Users can also rate the toilet so that other users can use the rating to decide if they want to use the toilet. Users can also add toilets not included in the map that are not specified in the app. The researchers used the research and development method in this study. The evolutionary prototyping model was used in the development of the project. It is a life cycle model in which the system is developed in increments so that it can readily be modified in response to the end user and customer feedback. The application was subjected to user acceptability evaluation. Based on the results of the test, the project had passed all the criteria of the user acceptability evaluation.

Keywords: *Flushify, android application, toilet finder, mobile application, evolutionary prototyping*

Introduction

Mobile technology has evolved significantly through time and in the last few years, humankind has produced new types of devices in the form of smartphones, camera phones, Android phones, and tablet phones. People are using mobile applications to complete their tasks, hence work becomes easier for them. With the rise of mobile phone applications, people today are looking for information on the go. This is one area of mobile phone technology enhancement that allows developers and programmers to offer users just what they seek under their preferred area of interest.

Google's Android is one of the latest and unique innovations, which has instantly taken over the mobile market. It is an open-source mobile platform which allows developers from around the world to develop applications for Android-supported mobile devices. There are many applications on both Google Play Store and Apple's App Store that everyone can download to provide services they need. Almost all kinds of services can be offered through these apps. One example is the Trivago app which can find the nearest hotels around those who look for some. The app can also sort the price according to the consumers' budget.

In this regard, the proponents decided to develop an android toilet finder mobile application that would help tourists and travellers find nearby public toilets. The application is also capable in locating comfort rooms that have the facilities for Persons with Disabilities (PWDs). The application was developed with intensive research on Location-based services and Map Overlays to provide the user's comfort.

Objectives of the Study

The primary objective of the project was to develop a Toilet Finder Android Mobile Application that would help people find public toilets in case of urgent or normal needs.

Specifically, this study aimed to:

1. identify the functional requirements and the non-functional requirements of the system, and
2. develop the proposed system using Evolutionary Prototyping method.

Materials and Methods

Research Design

This study used the research and development method of research. According to Richey and Klein [1] development research is a systematic study of design, development, and

evaluation processes with the aim of establishing an empirical basis for the creation of instructional and non-instructional products, tools, and new or enhanced models that govern the development process. The Evolutionary Prototyping Model was used in the development of the project.

Results and Discussion

User Requirements of the Project

The user requirements of the android toilet finder mobile application were divided into functional and non-functional requirements. Functional requirements of the system document the operations and activities that a system must be able to perform. Non-functional requirements detail the constraints, targets, or control mechanism of the system.

Functional Requirements

The following are the Functional Requirements of the system. The system must have the following:

1. an admin login module;
2. an admin file management module where administrator can add, update, and delete records of the application;
3. a viewer page for viewing automatically all available public toilets near the location of the user with information details;
4. a route navigation display with a map of the selected public toilets; and
5. a page where user can provide comments and rating to the toilets they have already used.

Non-Functional Requirements

The following are the non-functional requirements of the system:

1. The system offers better system security by providing a login module.
2. The system improves the response time of the system.
3. The system improves data integrity by providing validations and exception handlings.
4. The system improves a way of storing data by using a Relational Database.

System Development

In the system development, the developer used a Rapid Application Development (RAD) model specifically the evolutionary prototyping model. Evolutionary prototyping is a lifecycle model in which the system is developed in increments so that it can readily be modified in response to end-user and customer feedback [2]. It is a development method in which a prototype is built, tested, and then reworked as necessary until an acceptable prototype is finally achieved from which the complete system or product can now be developed. The main goal of the model is to build a very robust prototype in a structured manner and constantly refine it. It emphasizes a continuous gathering of requirements to build a product or system through an initial prototype and a succession of refinements [3].

The Evolutionary Prototyping process begins with requirements data gathering in the data gathering activity in the communication phase followed by a quick planning, designing and building the prototype. After building the prototype, further refinements to the requirements were generated and the process begins again.

The researcher used Evolutionary Prototyping because it allows the developer to create portion of the solution and demonstrate functionality and future improvements of the system. This approach is best suited to the development of the project because of its iterative process that takes place between the development and users and not all requirements of the system can be detailed ahead of time.

The Evolutionary Prototyping Model in Figure 1 shows the iterative process in the development of the system.

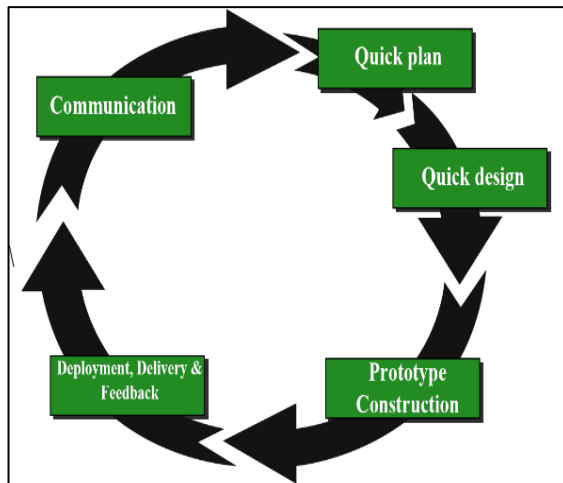


Figure 1: Evolutional Prototyping Model

System Models

User functional requirements was determined before the development of the project to create system models which are vital in process of system development. The developers analysed and designed the system through the use of Unified Modeling Language (UML) diagrams.

UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. UML includes a set of graphic notation techniques to create visual models of object-oriented software systems. UML combines techniques from data modeling, business modeling, object modeling, and component modeling and can be used throughout the software development life-cycle and across different implementation technologies.

The figure below shows the Unified Modeling Language (UML) Use Case Diagram that depicts the interactions between users and the system.

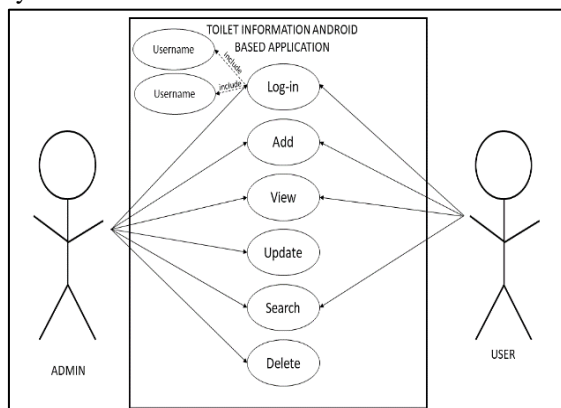


Figure 2: Use Case Diagram of the System

System Architecture

Figure 3 depicts the Web-based System Architecture Diagram of the project.

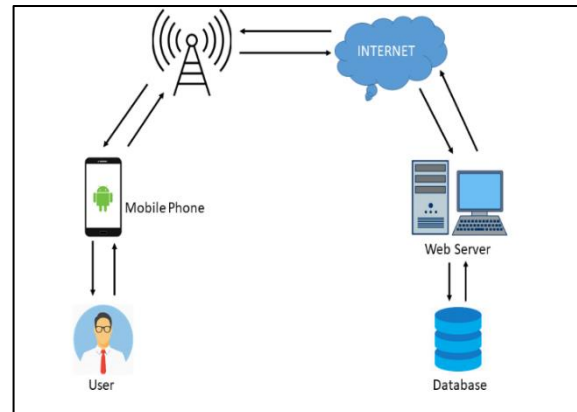


Figure 3: Web-based System Architecture of the System

Figure 3 above shows the process of web-based architecture where the users are connected to the web server that manages all the resources through the internet.

Development Tools

The following are the tools that were used in the development of the project. Android SDK as the application platform, Java, JavaScript and PHP for the programming languages and Adobe Photoshop CS6 was used for creating design and editing images.

User Interface of the Android Toilet Finder Mobile Application

The following plates display the sample user interfaces of the system.

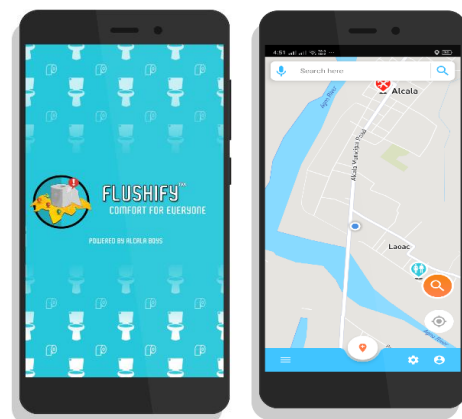


Plate 1:
Splash Screen

Plate 2:
Main Process

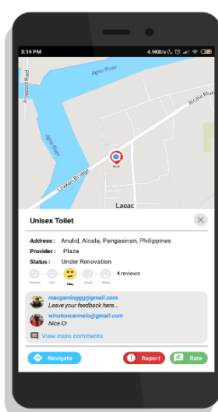


Plate 3: Details of Selected Toilets

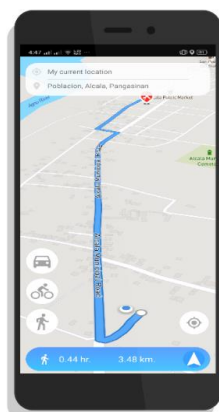


Plate 4: Navigation View

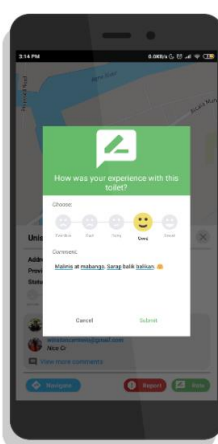


Plate 5: Rate Toilet

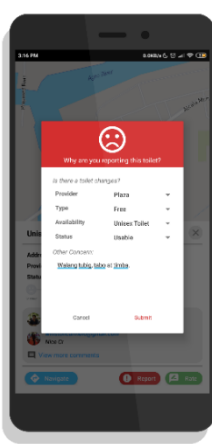


Plate 6: Report Toilet

Evaluation of the System

Table 1 presents the summary evaluation of the system.

Table1
Summary Evaluation of the System

Category	Passed (%)	Failed (%)
Web Admin Login	100%	0%
Admin File Maintenance	100%	0%
Application Running	100%	0%
Navigation	100%	0%
Reviews	100%	0%
Toilet Suggestion	100%	0%

Based on the evaluation results, the system had passed all the criteria of the acceptability test. This means that the system has met all the functional and non-functional properties of the system.

Conclusion and Recommendation

Upon completion of this research, the following conclusions were drawn:

1. The integration of *functional requirements* such that display of route and navigation of selected and *non-functional* requirements such as response time of the system makes the system more efficient, responsive, and helps provide better security.
2. Evolutionary Prototyping model enables the developers manage the project efficiently and provides a better way of developing the system.

Based on the conclusions, the researchers hereby recommend the following:

1. The functional and non-functional requirements should be carefully integrated to provide more efficient, responsive, and secured mobile applications.
2. The Evolutionary Prototyping methodology could be used to develop related projects as its best fits in the development of the project.

References

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| [1] | Richey, R., & Klein, J. D. (2007). Design and Development Research. | Changing World 7th Edition. Cengage Learning; 7th edition |
| [2] | John W. Satzinger JW, Jackson RB, Burd SD (2015). Systems Analysis and Design in a | [3] Sommerville, Ian 2015. Softwsre Engineering 10 th Edition. Pearson |