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DEVELOPING A MOBILE DONATION APPLICATION TO ENHANCE NGO PROJECT SUCCESS

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Abstract*— In recent decades, more and more natural disasters and wars have been happening around the world, more notably in Middle Eastern countries such as Syria and Yemen. Therefore, multiple Non-Governmental Organizations (NGO) were started to help reduce the aftermaths and causes of these conflicts. Socially, NGOs play a significant role in society, yet, they face many obstacles, including issues related to promoting campaigns on social media and collecting online donations from a single secure source. Therefore, this project proposes a method that helps NGOs by implementing a donation application on mobile phones, which promotes ongoing projects and collects all donations with a secure payment option. Moreover, the project discusses its availability on both IOS and Android systems, the integration of online payments with donation applications like Google Pay, and the enhanced security of online payments compared to traditional methods like cash or cheques.

Keywords*— Non-Governmental Organizations, Donation, Application, Mobile Phones.

I. INTRODUCTION

Non-Governmental Organizations, also known as NGOs, provide a wide range of services worldwide and focus on social and humanitarian levels. NGOs are constantly progressing and researching advanced methods and programs to dedicate constructive change to their moral causes and duties. NGOs include many types of associations, such as organizations that are large, small, local and more, and the educated elite and professional personnel staff them. Some of the most known NGOs in the Islamic nations are Muslim Aid, Islamic Relief Worldwide, CARE International, Mercy Corps, and World Vision; these NGOs play a vital role in advocating for human rights, democracy, social change, and humanitarian relief. The NGOs are non-profit and not controlled by governments, and their scope can be local, national, or transnational. NGOs are flexible, adaptable, innovative, collaborative, knowledgeable, and accountable on many levels, as well as they offer urgent assistance and promote sustainable development.

Mobile applications today have become a vital element in every person's life; therefore, businesses are directing their attention towards mobiles and applications due to their significance. Some of the most important advantages of developing a mobile app include reaching a larger audience, increasing staff efficiency and time management, saving money by offering online services, increasing brand exposure, and adding more revenue. To enhance the chances of a successful project, certain criteria must be met, which include respecting users' feedback and acting upon it, being adaptable and flexible, and suiting the needs and requirements of the different platforms (Android, Apple 'iOS', and Windows phones). Things to consider while selecting a development platform include the target audience, resources available for development, and costs.

To build a mobile application, several steps must take place, firstly, the planning phase (define the objective, target audience, and features and functioning of the application); then after the planning is completed, the mobile application is designed, which includes developing the mockups, wireframes and prototypes of the application; then comes the development stage where the code of the program is written, tested, and troubleshot; the fourth stage is the testing of the application on many devices, in many contexts, and with many users; lastly, the application is deployed, which includes uploading it to the app store and advertising it to consumers. The application must always be maintained, which means any bugs must be constantly fixed and the programs must always be upgraded to suit the needs of all customers.

To develop cross-platform mobile apps, several approaches can be implemented, such as native development, which is writing a code for each platform and is considered the most costly approach but allows the best control over the feel and

appearance of the app, hybrid development, which is writing a code to create programs for different platforms and is considered faster and less expensive than native development but provides less control and performance, and lastly, web development, which is creating a web app to view from a mobile device and is considered the least expensive and quickest method, yet it has its functionality and performance limitations. Deciding which approach to use is determined by the specific demand and objective.

Cross Platform Tools (CPTs) are considered a native development alternative, aiming to decrease mobile application development costs by sharing an application codebase portion between different platform implementations [1]. CPTs save the money and time needed to design individual apps for each platform. The most common CPTs include Xamarin (writes codes to create apps for iOS, Android, and Windows Phone), React Native (builds user interfaces with React, a free and open-source front-end JavaScript library), Ionic (creates apps for iOS, Android, and the web using CSS, JavaScript, and HTML), and Flutter (that utilizes a Google computer language called Dart). Some factors to consider while selecting a CPT are ensuring that the platform would support the system, has strong development tools, and obtains a large and active community.

Some of the most common mobile applications of NGOs are donation applications (to make one-time or repeated donations to non-profit organizations), volunteer applications (to assist volunteers in offering their help to a non-profit organization), and applications for service delivery (to supply schedules and provide feedback to clients). Yet, there are some disadvantages of mobile applications by non-profits, such as the high cost of maintaining a mobile application, limitations of accessing technology, and fear of data leaks.

In this project, a useful donation application for NGOs is structured to enable the help to be delivered to those in need and those suffering from wars and natural disasters. Flutter cross-platform by Google is to be implemented to develop the app, which creates a native-looking application for both iOS and Android from a single codebase. Some of the most prominent advantages of Flutter include the great performance of Flutter apps, rapid development, and significant developer community. The main objectives of this research are: to collect data about the online tools and mobile application benefits that improve NGO projects, to build a donation application on mobile phones, and to evaluate the donation application.

II. METHOD

2.1. Research Design

The project studies how NGOs can promote and achieve success by integrating a donation mobile application. Surveys and statistical analysis are conducted to collect data on the usage patterns of the mobile application, donation trends, and donor behavior, to conclude information and achieve the research objectives. Firstly, useful data is collected to research the features that would improve NGOs campaigns and initiatives, then examine the functions to aid in donor involvement and money-raising; secondly, a contribution mobile application is created based on the data found, which requires assessing the procedures of developing the app, including design, progressing, and testing; thirdly, the mobile application is assessed and validated for effectiveness, which includes locating areas of satisfaction and ensuring the functionality of the application will meet the needs, therefore, the research would provide practical assistance and significant insights on the steps of establishing a donation application for NGOs with the preferable execution and outcomes.

2.2. Procedure

To construct a successful donation application, certain phases must be involved and met: the first phase is researching and studying the application for NGOs, then the second phase is building the NGO application, and lastly, the third phase is validating and evaluating the NGO application.

The first phase starts with identifying and understanding the types and benefits of a donation mobile application, where donors can use contribution applications to make fast and simple donations and they can share their donated amounts on social media to raise awareness and inspire others to donate to NGOs. Venmo, PayPal, Square, and other well-known mobile payment services can be used to make donations. Geolocation can monitor locations and offer donors the option of finding nearby NGOs to donate to. Multiple technologies can be used to establish a successful donation application, including native development tools, cross-platform development tools, and hybrid development that combines native and cross-platform technologies, which can offer the best features of both technologies but it can be harder to construct. Java, Swift, Kotlin, C++, and C# are popular programming languages for developing mobile applications, as well as Flutter, React Native, Ionic, Xamarin, and Cordova are the most common developing frameworks. Software Development Kits (SDKs) provide the developers with the libraries needed to create applications for platforms, and Application Programming Interfaces (APIs) enable developers to access information from services of third-party settings. Lastly, a payment processor must be implemented to allow customers to complete their transactions, like PayPal and SenangPay.

The second phase of the process is building a successful donation application, which starts with establishing the development setup and includes installing and working on an Integrated Development Environments (IDEs) tool like Android Studio or Xcode and installing Flutter (the development framework that runs on multiple platforms), to

develop the application on more than one platform and run it smoothly according to the requirements of each platform. Then, a new Flutter project is initiated by creating a new project on Flutter through launching Xcode or Android Studio, then selecting “File” and “New”, thereafter choosing “Project” and picking the project template, and lastly, clicking “Next”. Then, the application can be designed and previewed on different screen sizes and devices. Next, the application can be developed using Dart, a programming language used by Flutter and specializes in creating applications with high performance and quality. The application can be tested using personal devices or a testing service like Firebase Test Lab or TestFairy. Once the application is ready to be deployed, it can be released on App Stores by establishing a Google Play Developer account or App Store Connect. Finally, the application must be promoted to attract donors via email marketing, social media exposure, and paid advertisement.

The third phase of the process is validating and evaluating the application, which can be achieved through a series of steps. The first step is unit testing, which is testing individual code units like classes or functions, and it is an essential step to check the code functionality according to the requirements with no present errors. The second step is integration testing, which is testing the communication of different code units with one another, this step is crucial to guarantee that all components are integrated adequately. The user interface of the app is tested in a process called UI testing, to ensure that all the features are functioning properly and the application is user-friendly. The application is then tested to check its performance when run under a heavy load of users without crashing or slowing down, in a process called performance testing. Then comes the security testing to ensure the app is not easily attacked by hackers or exposed to security vulnerabilities. Multiple testing instruments can be utilized such as Flutter Test, Flutter Performance, and Flutter Driver. The testing should be conducted on different devices with various screen resolutions and sizes to guarantee the smooth running of the application on all devices. Clients’ feedback is essential to accomplish application success and highlight areas to enhance, which is achievable through user interviews, usability testing, and surveys. Lastly, the application must be constantly enhanced to ensure continuous client satisfaction, through resolving bugs, integrating new features, and modifying items according to the feedback of users.

III. RESULTS

3.1. Data

The donation mobile application is designed using the UI toolkit of Flutter, and it should run on both iOS and Android systems. The user should be able to sign up and then sign-in, or continue in the guest mode, then navigate through the app between the different campaigns listed under NGOs. Using enangPay (iOS and Android) and Google Pay (Android), donors can make any desired amount of donation, and both of these options take payments securely and safely. SenangPay is a popular payment gateway in Malaysia that protects the data of its clients using standard security methods, a user-friendly gateway with a range of payment options, and the payments are conducted swiftly and easily, which leaves the clients satisfied and content.

Firebase is an easy-to-use feature with a simple Application Programming Interface (API) that integrates easily into Flutter, and it is used to authenticate data in the app, therefore, it is secured and prevents unwanted access, then, a Firebase Software Development Kit (SDK) is added in “pubspec.yaml” file to the codebase. Synchronization of real-time data is supported by Firebase for all clients, to ensure that all information is always up-to-date.

The main page of the donation application (Home Page) contains all projects and campaigns of different NGOs listed together with the middle part containing the three categories of “Feeding, Clothes and Water” associated with the countries that will receive the respective donation, as well as, Home, Categories Details, and Profile are displayed with icons to facilitate navigation.

SenangPay and Google Pay can both be used to finalize the donation, where SenangPay can be utilized on iOS and Android systems through WebView, which will allow the application to navigate using WebView to SenangPay of the URL (https://app.senangpay.my/payment), while Google Pay only takes payments using a device with an Android operating system that Google supports.

3.2. Descriptive Analysis

The first step is accessing the login page, where users can sign-up/login, as shown in Figure 1: Signup/Login Page Form. Several features can be used for safeguarding data, like two-factor authentication, email verification, and password selection options. An option of changing the language between Arabic and English is also offered.

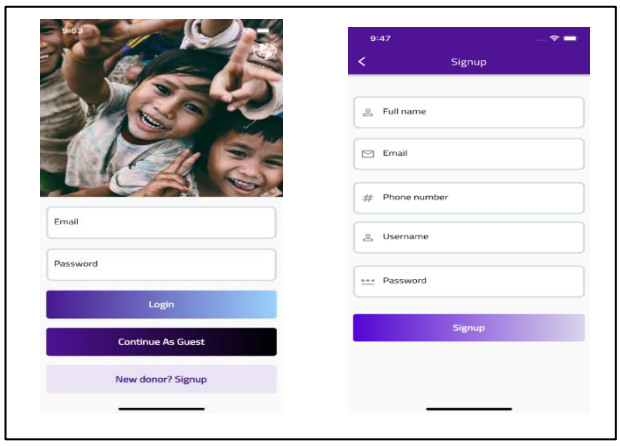


Figure 1 Signup/Login Page Form

The second step is the Firebase console, where the plugins in the Flutter code are shown in Figure 2: Firebase Plugins. After configuring Firebase SDK, create a new application with a special package name for iOS and Android, then generate two "google-services.json" files, where the first one is added to the Android folder and the other to the iOS folder, thus, the SDK is now configured and synced with the application, as shown in Figure 3: Firebase SDK Configuration.

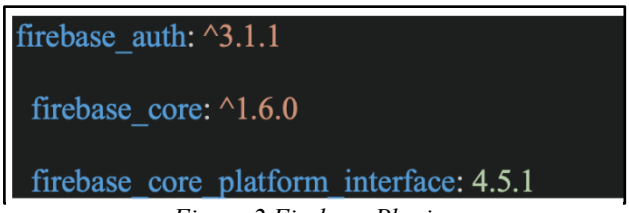


Figure 2 Firebase Plugins

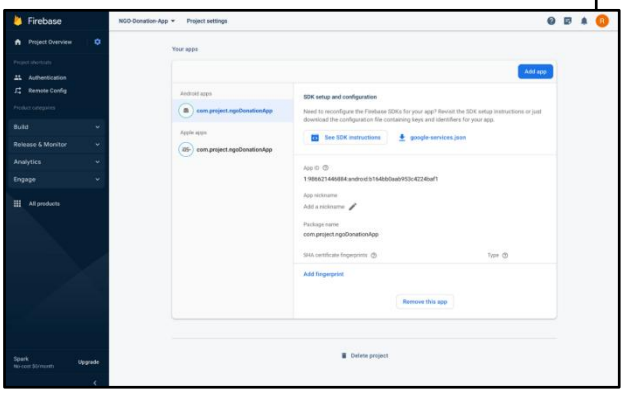
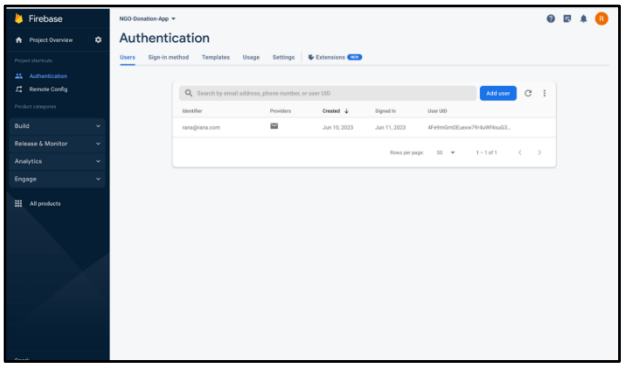


Figure 3 Firebase SDK Configuration



When users start a new account, the API "CreateUserWithEmailAndPassword" will be called, and the identifier and data will be synced on the database with the administrator having the option of managing all these users, as shown in Figure 4: Authentication Tab. Then the following step is the users' ability to log in using their email and password, as the "OnClick" action will activate an API called "SignInWithEmailAndPassword", and will navigate into the Home Page once it returns as a success order. The Home Page is shown in Figure 5: Home Page.

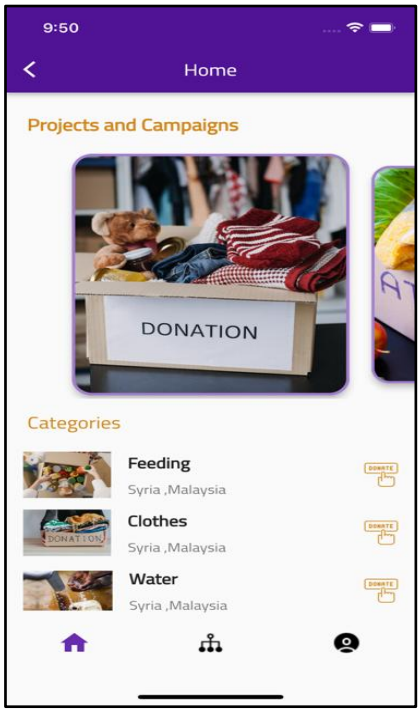


Figure 5 Home Page

The Home Page can navigate the user to the "Project Details" by clicking on one of the project cards, which will show the title, description, photos, statistic progress, and updated donations amount of the project, as shown in Figure 6: Project Details Page. Then, donors can click on "Donate Now" to open the payment options for the user to choose from. A similar process is conducted to choose one of the categories, and the selected category will be highlighted in light purple, as shown in Figure 7: Categories Details Page, and the donation option for this section is the same with the option "Donate Now".

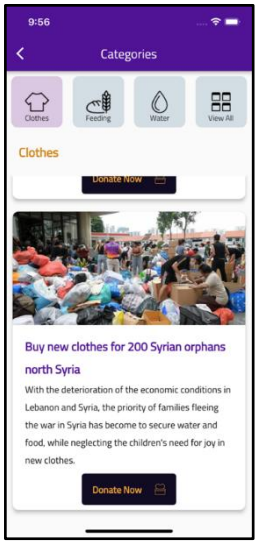
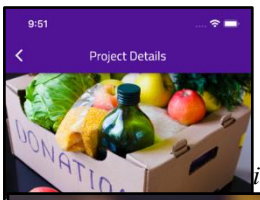


Figure 6 Project Details Page

Figure 7 Categories Details Page



As shown in Figure 8: Profile Page, the profile page displays the total donations sent since creating the user account, the amount donated in the ongoing month, the "Donate Now" button, and the "Logout" option, which would enable the Firebase API call "SignOut".

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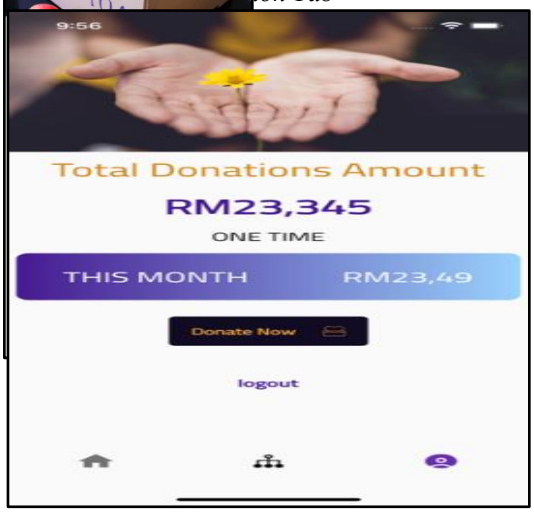
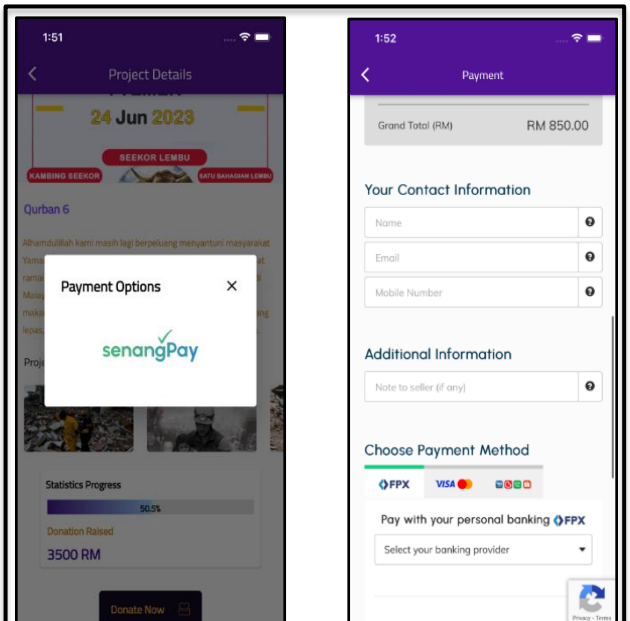


Figure 8 Profile Page

To use SenangPay on iOS and Android devices, the user must enter the project name and donation amount once the payment page is displayed, then all the user contact information must be completed before making the payment, as shown in Figure 9: Donate with SenangPay WebView, and after all the fields have been filled, users can click on "PAY" to finalize the payment successfully. Suppose the user wishes to directly donate to a project displayed on the Home Page or in the Categories. In that case, they can do so by clicking "Donate Now" under the specified project, which will navigate them to the payment page with the initial donation amount displayed on the screen, and they can complete their payment successfully. On the other hand, users can click on the "Donate with Google Pay" option to open Google Pay, then add their personal information and debit or credit card details and save the card, as shown in Figure 10: Donate with Google Pay; thus, users can enter the donation amount and proceed with the payment successfully.



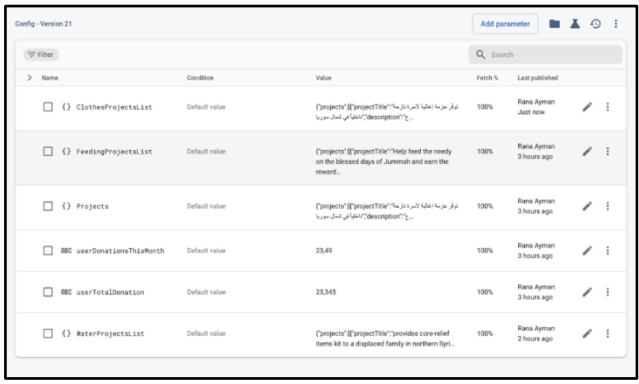


Figure 10: Donate with Google Pay

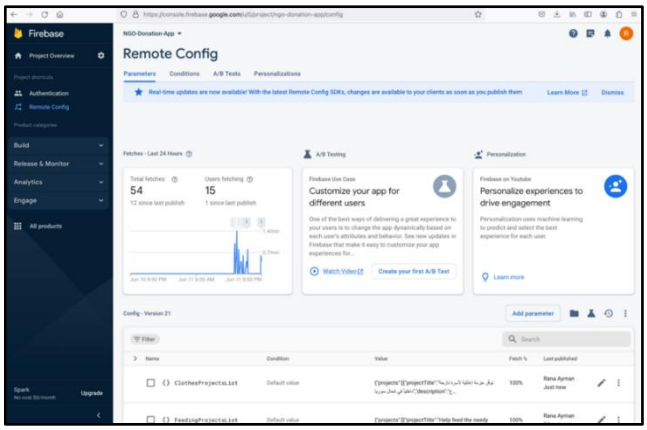
Figure 9 Donate with SenangPay WebView

Figure 12 Remote Config Values

Firebase Remote Config is a feature that can manipulate the behavior and design of the application without having to update the app by consumers and to utilize this feature, certain steps must be followed. The first step is adding the plugin of Remote Config in a "pubspec.yaml" file in the Flutter code, as shown in Figure 10: Firebase Remote Config Plugin. Then parameters of Remote Config are created for each setting to allow the alteration from the Firebase Console.

Figure 11 Remote Config on Firebase Interface

Once Remote Config is enabled in the donation application, the parameters' values can be updated using the Firebase interface, which automatically updates the values in the application once it is woken up or run by consumers. Figure 11: Remote Config on Firebase Interface shows the interface of Firebase Remote Config.



Six remote values are configured in the donation application, i.e., Projects, FeedingProjectsList, ClothesProjectsList, WaterProjectsList, userDonationsThisMonth, and userTotalDonation. The values listed in the projects list are configured in JSON format, while the amounts are configured in string format. The values are shown in Figure 12: Remote Config Values. The values can be easily modified by the developer when any change in the project's information is needed.

Once all the desired changes are conducted to the values, the "Save" button is pressed and the "Publish" button after it in the Remote Config interface, as shown in Figure 13: Remote Config Publishing Action. The changes will then be synced in the application as the API "fetchAndActivate" will retrieve the updated information from the application.

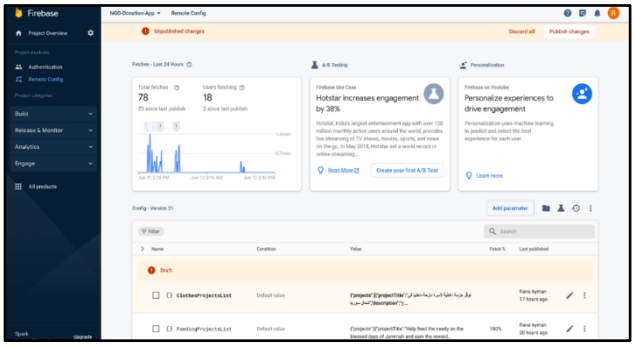


Figure 13 Remote Config Publishing Action

IV. RESULTS AND DISCUSSION

The donation application is designed to allow instant donations to be transferred to the NOGs without hassle and with speed using modern technology and techniques. The app is designed using the UI toolkit of Flutter, and it runs on both iOS and Android systems. The user can navigate through the app between the different campaigns listed under NGOs and donate using SenangPay (iOS and Android) and Google Pay (Android). Firebase is integrated into Flutter and used to authenticate data in the application, which keeps the application secure and up-to-date.

The following steps are followed to start up the donation application: create the sign-up page to log in or allow a guest login access, design the Firebase Console, authenticate the Firebase Console dashboard, design the home page, assign the project details and create the project details page, create the categories details page, generate the profile page, understand and differentiate the payment process (general donation or direct donation to a certain project) and methods (SenangPay and Google Pay), and utilize the Firebase Remote Config. Remote Config improves the user experience because it is easy to use and convenient to integrate into the application design, therefore, donors will not have to download updates to check new functions or app designs. The home page contains NGOs' campaigns under three categories (Feeding, Clothes and Water), and the application displays the Home, Categories Details, and Profile icons for easy access.

V. IMPLICATIONS

When the application is associated with the NGOs and ready to be released, donors can download it and donate an amount of their choosing to any available project registered under the Firebase Console; thereafter, the donation will change lives by ensuring that deprived people will have access to food, housing, water, medical necessities, and others basic needs. The donations conducted anytime and anywhere using the application will give hope and enhance the life quality of the ones who need it the most.

VI. LIMITATIONS AND FUTURE RESEARCH

Some limitations met during the building of the donation application are: including all the operating systems in the scope of the project, such as Linux, Windows, and macOS, and expanding the options for payment to the international level, like Apple Pay and PayPal, for people living overseas and are not able to use the common Malaysian payment methods. For future research, it is recommended to expand the features and include new services, like setting up recurring donations, collaborate with well-known organizations to spread awareness and collect larger donations, allow the selection of multiple projects to donate to simultaneously, allow other types of payment methods, like Apple Pay, and integrate techniques to keep the donors satisfied by maintaining the functionality and security of the application.

VII. CONCLUSION

This project examined the procedure of setting up a donation mobile application that is associated with non-governmental organizations (NGOs), which act as private initiatives that help people in need and bring constructive change to today's society. Lately, new mobile donation applications have emerged due to the wide popularity of smartphones, which facilitate the lives of consumers and provide safe and detailed payments. Using the Flutter framework, the project built the donation cross-platform application to be accessible on both Google Play and the App Store. The application has a user-friendly interface, protects private data, and is available on Android and iOS systems, allowing consumers to pay using the SenangPay payment gateway (on Android and iOS devices) or Google Pay (on Android devices). Donors can sign up, sign in, or continue as guest users; additionally, Firebase Authentication is utilized to ensure secure transactions by utilizing email verification, two-factor authentication, and password strength requirements. The donors are now able to donate with an amount of their choosing to any project under the Firebase Console, in order to assist those in need and to create the change that our world needs at the moment. Any amount donated can improve other people's way of life and may provide them with the water, food, medical care, and shelter that they lack. The donation application project achieves its objective by giving people in need hope for the near future and giving the donors the feeling of satisfaction that comes from helping others after successfully donating anytime and anywhere.

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