

Short Paper

e-Kabisig App: Mobile Application Bayanihan Community Donation App with Geo-mapping

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Abstract

Purpose- This study focuses on the development of a mobile application designed to facilitate donations of usable items such as clothes, food, and other goods to assist those in need within the community. The application features various tools, including a donation posting function, location mapping, and donor recognition points.

Method- The study was conducted in small local government unit in Laguna and employed a combination of descriptive and developmental approaches utilizing the SDLC Waterfall Model for system development.

Results- The study's results demonstrate that the mobile donation application is an effective tool to aid the community in donating easily while reducing waste and assisting those in need. The developed system gained highest rating of excellent for software evaluation both from system users/respondent s and IT experts.



Conclusion- Ultimately, this study illustrates that the integration of mobile technology into the donation process can serve as a powerful tool for community support and waste reduction curbing the wastage of valuable resources and providing assistance to those in need.

Recommendations- expanding the mapping coverage to encompass multiple municipalities and also implement the donations to encompass disaster and calamity scenarios, such as typhoons, fires, and earthquakes that can use to utilized as an emergency resource for municipalities.

Research Implications – The developed system has the potential to help the community that effect on technology on giving the local government to reaching those in need. The study also integrate gamification that support user engagement and improve level of participation in the community and use the system as channel of donation and tool when emergency occurs.

Keywords – Donation Drive, Bayanihan, Geo-mapping, Mobile Application, Point Incentives

INTRODUCTION

e-Kabisig App is a great demonstration of the Filipinos' "bayanihan" mentality (Serazon, 2017). Filipinos are known for their generosity and willingness to help during times of disaster, often donating food, clothing, and other items to those in need in their community. It motivates Filipinos to see themselves as one community (Menguin, 2022). Because of bayanihan, every Filipino can be encouraged to help by donating items such as food, old clothes, and books that can still be used (DSWD, 2018). People also like to donate when they are trusted, but other people who give do not want to take credit or they want to donate anonymously. Donating is also a passion of Filipinos, especially if it is for the community (Siruno, 2021). GivingUSA (2018) reports that the total amount donated to charitable organizations in 2017 was \$410.02 billion (2.1% of GDP). In comparison to 2016, this represents a rise of 5.2% in real dollars and 3.0% in inflation-adjusted dollars.

In the Philippines, daily waste production amounts to about 35,580 tons. In the urban and rural regions, respectively, each individual in the nation generates around 0.5 kilograms and 0.3 kilograms of waste each day (Hizon & Zamora, 2019). GivingUSA (2018) reports that the total amount donated to charitable organizations. According to Environment Management Bureau (EMB) CALABARZON (2018), the average volume of wastes generated within the Region 4-A is about five thousand six hundred ninety four tons per day (5,694).¹⁷ was \$410.02 billion (2.1% of GDP). In comparison to 2016, this

represents a rise of 5.2% in real dollars and 3.0% in inflation-adjusted dollars. In the study of Wheaton et al. (2016) presents web and mobile technology to motivate understanding of the link between motivation of users to engage in new environmental behavior and the degrees of technology that influence the sustaining to visit nature tourism. As well as the study of Castell et al. (2015) utilized the technology that enable citizen to participate in monitoring the sustainability of environment through a user-friendly and visually informative layout, using both web services and mobile phone apps.

However, Donations can be made to local organizations, such as churches, community centers, thrift stores, schools, and charitable organizations for items like used books, usable devices, and underused furniture. Commonly donated goods include clothing, hand sanitizer, and canned food to keep people warm, safe, and fed (GivePulse, 2021). During covid-19 pandemic there are donations called community pantry as it is known, bore a sign: one can give what he/she can, and others can take what they need. Due to little government support, individuals are taking matters into their own hands and displaying "bayanihan," or the spirit of solidarity, as seen by the pantries, according to President Rodrigo Duterte (Cabato, 2021). CALABARZON has the sixth-highest yearly per capital poverty threshold among the proposed federated regions. There are also many poor people in Laguna; Laguna has 5.43 percent of poverty incident also there are 396.50 USD poverty threshold in Laguna (Mapa, 2018).

When mobile phones begun, the sole capabilities were to make calls, send texts, and keep contacts. Because technology is also expanding in the country, it can be used to help the poor and reduce global waste. These advancements have inspired researchers and designers to develop mobile interventions that target a variety of environmental sustainability issues (Nkwo et al., 2022). This approach can be applied in the field of solid waste management to improve the way it works nowadays (Debrah et al., 2021). Donors can pick the location of the closest human community that accepts donations in the form of used, usable products by using location-based services to learn the locations of governmental systems nearby (Pribadi et al., 2021). Geocoding is the process of using a street address to assign longitude and latitude coordinates, mapping a donor's address a few blocks away from its actual location is low-risk for an arts organization (Fredricks, 2018).

The study aims to develop a system that can utilize the GPS to determine the location donated items and the distance of those who receive the item. Also, to notify the community if there is an available donation such as food, clothes and other useful items. To evaluate the system Functionality, Portability and Performance using test-casing and Technology Acceptability Model evaluation tool.

System Framework

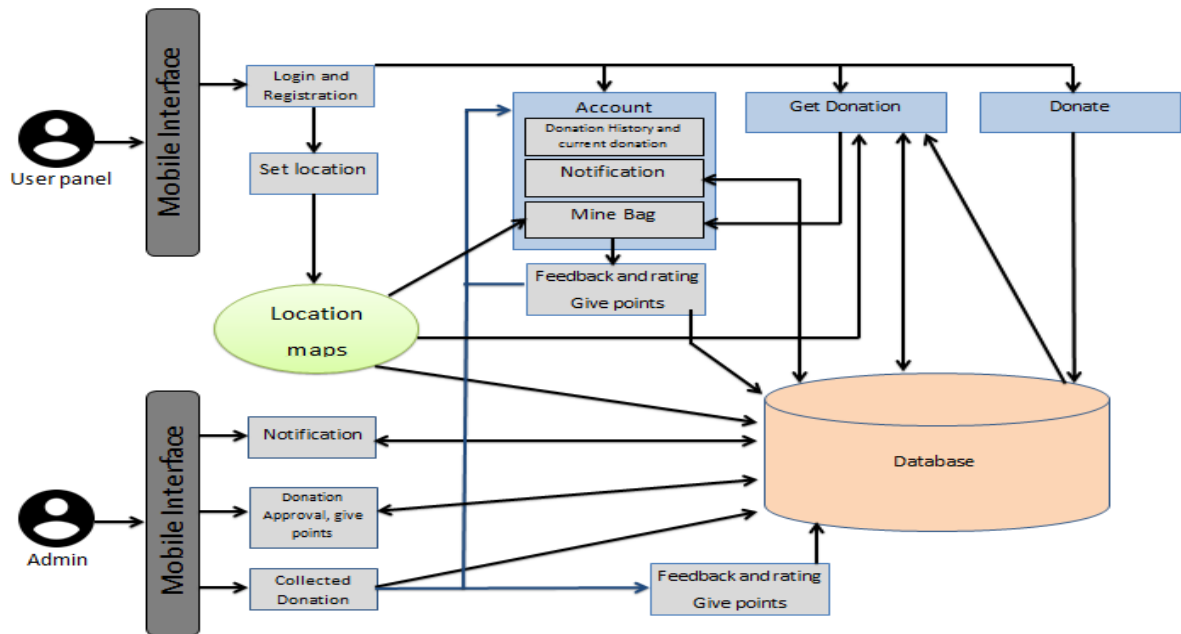


Figure 1. e-Kabisig App conceptual framework.

A better conceptualization will make the system more understandable. The framework shows the key process of “e-Kabisig App: Bayanihan Community Donation Drive Mobile Application for Community using Geo-Mapping”. There are two users of the system the admin and the user. The admin user’s job is to approve the donation if the food is still safe to eat like canned food or items that can still be useful. Furthermore, the administrative user possesses the capability to collect and distribute donations within the community. Upon initiating the application, users encounter a login form. The users undergo a one-time registration process and subsequent phone number verification. The data will be saved into the database, but if the user has an existing account in the app the user can login directly.

The central hub of user interaction is the main menu or account page, which features two buttons: "Get Donation" and "Donate".

Within the account section, users can access their profiles, ascertain their point accumulation from donations, and observe the trust boundary. The trust boundary shifts as the user amasses a predefined quantity of points. Additionally, the account interface facilitates the viewing of current donations and enables the tracking of donated items. Indicators delineate the status of these items—whether they are awaiting approval, approved, or claimed. The user can also reference their donation history, peruse feedback and ratings attached to their contributions, and receive notifications regarding the

reception and arrival of their donations. Alerts are dispatched to users regarding impending item expiration.

The "Get Donation" button serves individuals seeking access to essentials like food, clothing, and other necessary items they might be unable to afford. This interface provides users with an overview of available donations encompassing food, attire, etc. Items near their expiration dates are accorded priority for allocation. Geographic information is provided to guide users to the donation pickup points. Post-receiving donations, users can express gratitude by rating donors, offering feedback, and allotting points.

Conversely, the "Donate" button enables users to contribute food, unused clothing, books, and other useful items for the benefit of others. During the donation process, users are prompted to provide pertinent information such as their name, remarks, expiration dates, and address. Subsequently, the administrative user assesses the safety and suitability of the donation.

Finally, the administrative module assumes a pivotal role in overseeing the donation approval process, with a particular focus on consumable goods to ensure individual safety. Administrative users also possess the authority to collect and distribute donations to recipients in need. Additionally, the administrative user can customize the points associated with donated items to accurately reflect the contributions of donors. This administration extends to local barangays, where donation pick-up points are often established as well as both the main admin and barangay admin notify when there is new donation and close to expire item.

METHODOLOGY

Research Design

The study employed a combination of descriptive and developmental research methodologies. The use of a descriptive research design allowed the researchers to provide comprehensive answers to the research questions. Descriptive research was well-suited to gathering substantial data that contributed to valuable recommendations (McCombes, 2019). Meanwhile, the developmental research approach involved a systematic examination of the creation, implementation, and evaluation of instructional programs, procedures, and products. These had to adhere to criteria of internal consistency and effectiveness, distinguishing it from fundamental instructional development (Richey, 2005).

Population and Sample Size Determination

The study covered individuals who possessed Android smartphones and resided in Barangay Bagumbayan, Paete, Laguna. Additionally, the barangay officials, who served as system administrators, were included. Furthermore, IT experts were engaged to evaluate the functionality and performance of the developed system.

Data from 196 respondents who own Android smartphones in Barangay Bagumbayan, Paete, Laguna was collected through random sampling. The sample size was calculated using Slovin's formula: $n = \frac{N}{1 + Ne^2}$, where N represents the general population of Barangay Bagumbayan. This approach was chosen to ensure a robust representation and a sufficiently large feedback from potential users. The population of Barangay Bagumbayan is 5503.

Data Collection Procedures

The researchers utilized various techniques to gather important data for the study. Here are the lists of the data collection methods applied in the study:

Interview

The researchers conducted interviews with LGU of Paete to obtain information about how many barangays in Paete had high poverty cases. The research also sought the assistance of the Municipal Social Welfare and Development Office representative in Paete for additional information about Waste management and Donation system related to the development of the mobile application. The researcher interviewed the barangay captain and the secretary of barangay Bagumbayan, Paete, Laguna. During the interview, the barangay captain had said that it was good to have a donation system application to become more organized and systematic in the donation process in the community and easily monitor the donation when it came to food because the system could notify if the food was close to expiration.

Questionnaires

Following the development of the mobile application, questionnaires were distributed and collected via surveys or Google Forms. The proposed system was evaluated for its effectiveness using adapted questionnaires. The researchers adopted the Technology Acceptance Model's (TAM) questionnaire from Saltzmann & Boenigk's study "Blood donors' usage intentions of donation appointment-scheduling systems during the COVID-19 pandemic and beyond." This questionnaire assessed the Usefulness, Ease of Use, User Satisfaction, and Attribute Usability of the system.

Statistical Treatment

Data analysis and statistical tools were employed to address the study's specific objectives and were discussed. The Likert Scale, ranging from 1 to 5 (with 1 as the lowest and 5 as the highest), was used to interpret evaluation results.

Table 1. The analysis and statistical tools that the proponents used.

VARIABLES	STATISTICAL TOOL
Respondents' evaluation in terms of Usefulness, Ease of Use, User satisfaction, and Usability	Weighted Mean Rank
IT Experts software evaluation using Functionality, Usability, Reliability, and Performance Efficiency	Weighted Mean Rank

The statistical tool used for analysis is the weighted mean, in combination with ranking, to derive the average score for each question. The weighted mean involves assigning a weight to each number in the set before calculating the average. This method was employed to assess Usefulness, Ease of Use, User Satisfaction, and Attribute Usability. Ranking of the averages was also conducted to identify the highest average in the evaluation, assigning greater weight or significance to certain scores within the set as shown in Table 1.

Project Design

The Software Development Life Cycle (SDLC) was the process of discovering software in phases. According to several experts, the Waterfall model was never intended to be used as a process model for actual projects. Regardless, the Waterfall model was usually regarded as the first structured SDLC methodology. It was also a simple strategy: completing one step before moving on to the next.

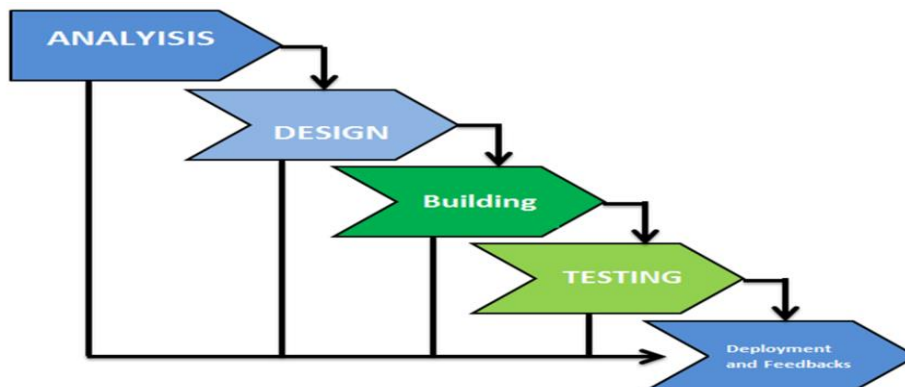


Figure 2. software development cycle waterfall model

Planning and Requirement Analysis

Initial data collection was undertaken by interfacing with local government units (LGUs) and various barangays in Paete, Laguna, through interview sessions. The amassed data was synthesized, analyzed, and subsequently incorporated into the system. Interviews were conducted with LGU and barangay officials to discern the details of donation processes and allocation responsibilities.

Designing the Software

The proposed system's design was visually shown by creating the mobile app's layout using Adobe XD. This provided a comprehensive guide for mobile application development. The design approach adopted for the user interface featured minimalist aesthetics. The application's logo was crafted using Adobe Illustrator, alongside selected images for the profile menu.

Building Software

Android Studio was harnessed as the primary development platform to actualize the mobile application, constituting the principal channel for propagating the donation system's services.

Location Mapping Flowchart

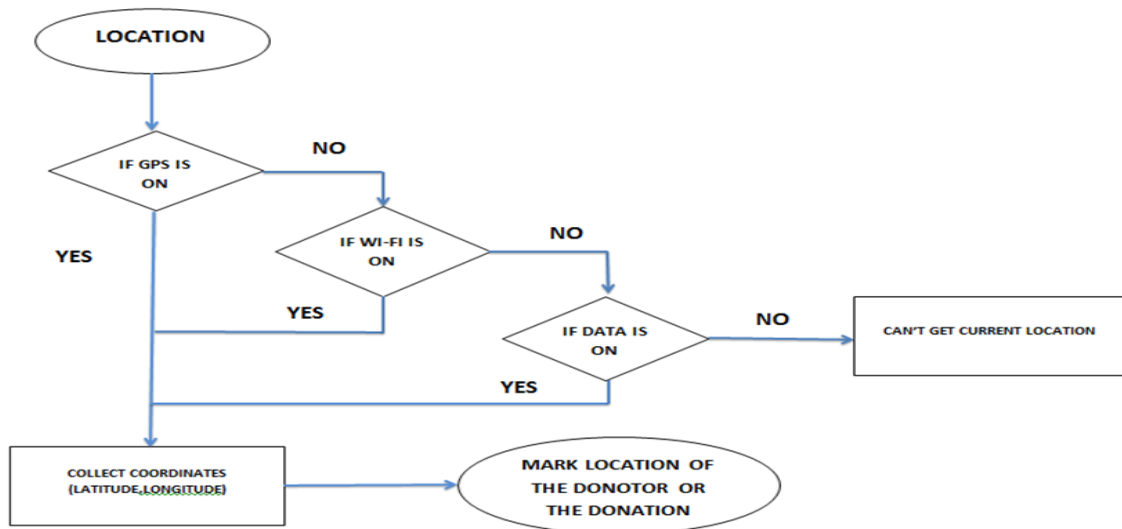


Figure 3. Location Mapping Flowchart

The location mapping flowchart process was utilized. The researchers used Here Maps SDK to show the map and display the location where the donation was picked up. For the application to get the location of the donator, the location and GPS of the donor's

mobile phone had to be turned on, and then the location information was collected, such as the current coordinates of longitude and latitude; the current location automatically showed in Google maps.

Testing

Testing encompassed the engagement of Barangay Officials and residents of Barangay Bagumbayan, Paete, Laguna, who possessed Android smartphones. The evaluation included usefulness, ease of use, user-satisfaction, and usability evaluations by both barangay officials and residents. IT Experts appraised the system's Functionality, Usability, Reliability, and Performance Efficiency aspects.

Deployment and Feedback

Following verification and validation of the system's efficacy in waste reduction and community support, implementation commenced in Barangay Bagumbayan, Paete, Laguna. After user interaction, an online survey was conducted utilizing a questionnaire to gauge user experiences and collect feedback for future enhancements.

For the Likert scale utilized, the researchers determined its minimum and maximum values. They derived a range of 4 by subtracting the lowest value (1) from the highest value (5). Calculating the step size as 0.80, derived from dividing this range by the number of scale points (5), the researchers adjusted this computed step size by 1 to define the highest value within the scale presented in Table 2.

Table 2. Likert Scale for System Evaluation

Numerical Rating	Equivalent
4.21-5.00	Excellent
3.41-4.20	Very Good
2.61-3.40	Good
1.81-2.60	Fair
1.00-1.80	Poor

RESULTS

The e-Kabisig App: Bayanihan Community Donation Drive using Geo-mapping” was developed to create a mobile application that will help the needy people in the community by donation. The result of this study can provide insights and help the Barangay and Community.

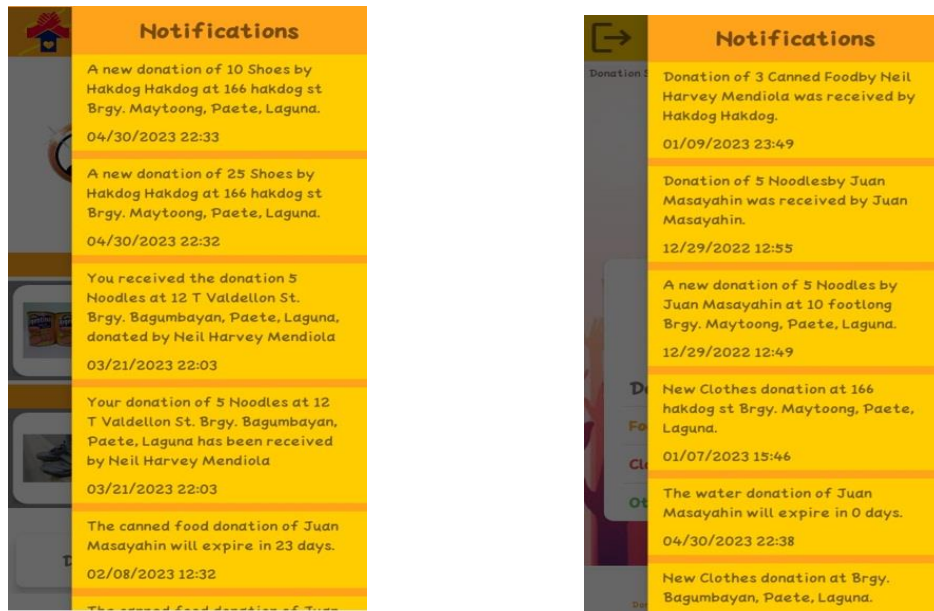


Figure 4. Notification of user and admin of e-Kabisig App

The system has a notification feature that alerts both the user and the admin about new donations, the donor's details, and whether the miner has received the donations, also the date and time of the activity are displayed in the notification panel of admin and users.

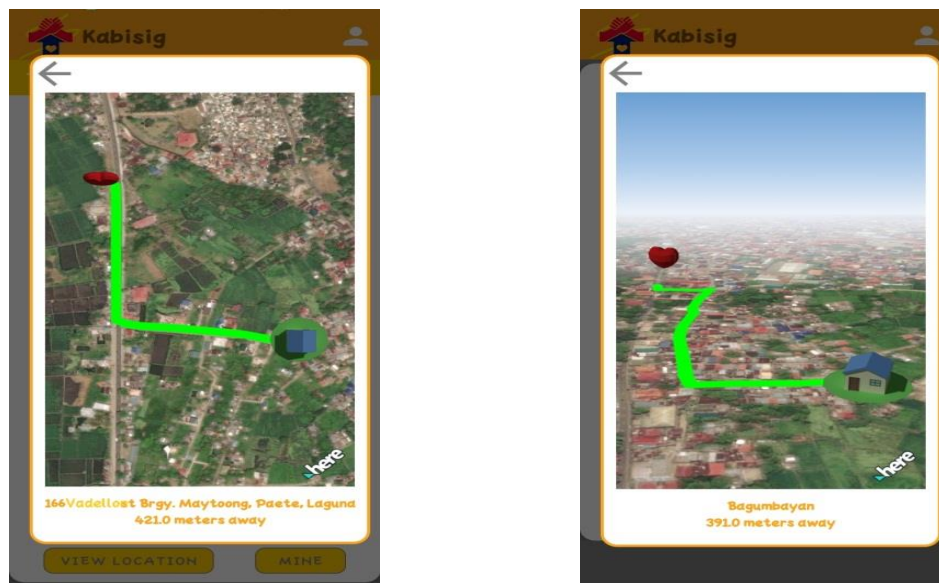


Figure 5. Mapping and location of e-Kabisig App

The donor's location and mapping are displayed through the system's map feature, indicating the distance and route from the donor to the miner. The map displays the donor's street number and barangay to provide the exact address to the users. The

donor's location is represented by a heart icon, while the miner's location is marked by a house icon, and a green line depicts the road or route.

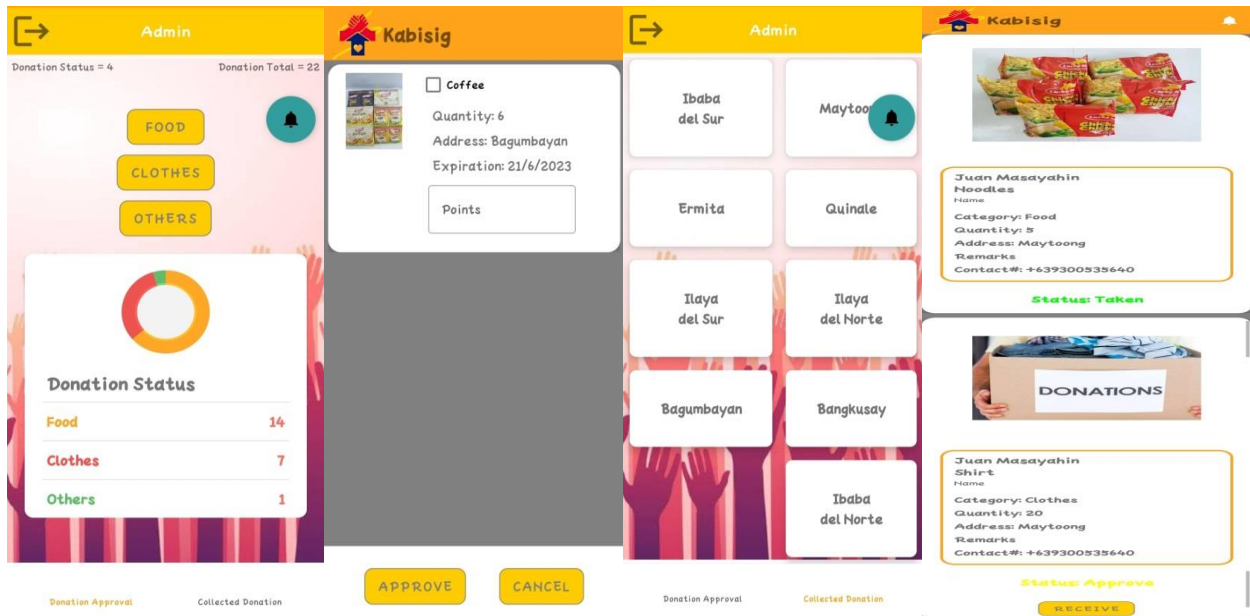


Figure 6. Admin monitoring and approval

The administrative user oversees the safety of donations intended for community distribution. This involves a meticulous examination of provided details, including the actual image, labeling, expiration date, and accompanying remarks. To enhance the verification process during donation approval, a distinct pin code is allocated to each barangay. This pin code, which boasts both hide and unhide features, serves to fortify the privacy and security of this verification mechanism.

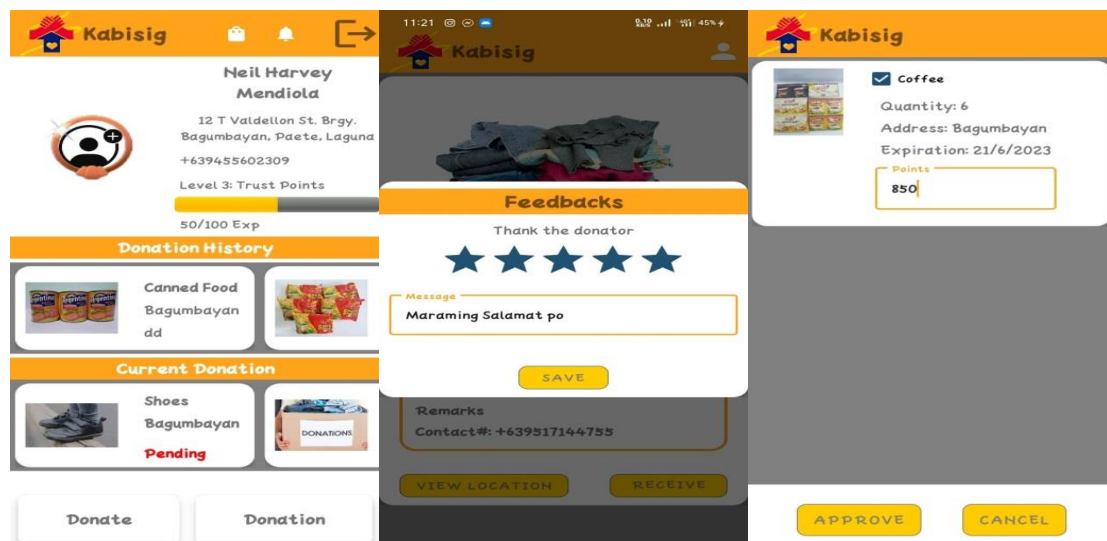


Figure 7. Pointing system of the e-Kabisig App

A point-based system is implemented, wherein the allocation of points is contingent upon the nature of the donated items. The administrative entity possesses the authority to attribute points to various items, encompassing clothing and other reusable articles. This point accumulation system contributes to augmenting users' trust levels. Users have the prerogative to advance through distinct avatar borders, progressing from bronze to silver, gold, platinum, and ultimately diamond, upon achieving all five (5) levels.

Table 3. Shows the result of software evaluation by the respondents

TAM Criteria	Mean	Descriptive Rating
Usefulness	4.33878	Excellent
Ease of Use	4.33878	Excellent
User Satisfaction	4.40408	Excellent
Attribute Usability	4.41224	Excellent
Grand Mean	4.373	Excellent

The system achieved a remarkable overall grand mean of 4.373, signifying excellence based on the established criteria. Specifically, the extents of Usefulness, Ease of Use, and User Satisfaction attained respective scores of 4.338, highlighting their high performance. Particularly noteworthy is the Attribute Usability, which garnered the highest score of 4.412 in mean, strongly suggesting users' affinity for utilizing the system. Evidently, the application's substantial utility, user-friendliness, and significant potential to aid disadvantaged individuals within the community are apparent.

Table 4. Shows the result of software evaluation by the IT Expert

TAM Criteria	Mean	Descriptive Rating	Rank
Functionality	4.9	Excellent	1st
Usability	4.7	Excellent	4th
Reliability	4.85	Excellent	2nd
Performance Efficiency	4.8	Excellent	3rd
Grand Mean	4.8125	Excellent	

The system achieved an impressive overall grand mean of 4.8125, signifying excellence based on the established criteria. Notably, the dimensions of Usability, Performance Efficiency, and Reliability obtained respective scores of 4.7, 4.8, and 4.85, further showcasing their robust performance. Of particular significance is the Functionality aspect, which garnered the highest score of 4.9 in weighted mean. This outcome underscores the system's capability to effectively operate, providing users with accurate information and a satisfying experience, as detailed in Table 4.

Table 5. Result of Software Evaluation by the respondents.

	Weighted mean	Descriptive Rating
Usefulness		
1. It is useful.	4.311	Excellent
2. It helps me be more effective.	4.388	Excellent
3. It helps me be more productive.	4.276	Excellent
4. It meets my needs.	4.347	Excellent
5. It does everything I would expect it to do.	4.372	Excellent
Average Weighted Mean	4.339	Excellent
Ease of Use		
1. Learning to operate e-Kabisig App would be easy for me	4.332	Excellent
2. I would find it easy to get e-Kabisig App to donate what I want it to donate	4.270	Excellent
3. My interaction with e-Kabisig App was be clear and understandable.	4.296	Excellent
4. I would find e-Kabisig App was clear and understandable.	4.372	Excellent
5. It would be easy for me to become skillful at using e-Kabisig App	4.423	Excellent
Average Weighted Mean	4.339	Excellent
User Satisfaction		
1. I'm completely satisfied in using e-Kabisig App.	4.454	Excellent
2. I feel very confident in using the e-Kabisig App.	4.378	Excellent
3. I found it easy to donate using the e-Kabisig App.	4.352	Excellent
4. I can donate more quickly using e- e-Kabisig App.	4.357	Excellent
5. I believe that using e-Kabisig App will increase the needy people to give help.	4.480	Excellent
Average Weighted Mean	4.404	Excellent
Attribute Usability		
1. It was easy to interact with the e-Kabisig App.	4.388	Excellent
2. The capabilities through the e-Kabisig App are clear.	4.352	Excellent
3. I easily found useful things that I need and donate the useful items that I don't use.	4.403	Excellent
4. I found the various functionality in this application was well implement.	4.398	Excellent
5. I think that I would like to use this application always	4.520	Excellent
Average Weighted Mean	4.412	Excellent
Grand Mean	4.373	Excellent

Table 5 as per result of the software evaluation conducted to the users of e-Kabisig App. The highest rating on the usefulness is “it helped me be more effective” with a mean of 4.388 which is means the user system can help the user to be more effective, in terms of Usefulness. it may be more effective to maintain donations by

appreciating and improving their liberty to donate again (Williams, Sun, Masser, 2019). A weighted average of 4.399 has been accumulated on the Ease-of-Use aspect of the survey, interpreting excellent for itself the highest rating in ease of use is to become skillful by using the developed system with a weighted mean of 4.423.

Donating to a mobile application will also support the extension of a community of people by integrating multiple LGUs and barangays into one platform (Fathima, Kavatekar, Ganesh, 2022). By having a descriptive rating of excellent with a weighted mean of 4.404 the system has been proved that the users are satisfied. Finally, the Usability aspect, the last factor appraised in the survey, achieved an average weighted mean of 4.412, concomitant with an excellent rating. Remarkably, donation procedures, given their simplified and cost-effective nature akin to e-commerce processes, are known to exhibit high usability (Nielsen, 2009).

DISCUSSIONS

The system has a notification feature that alerts both the user and the admin about new donations, the donor's details, and whether the miner has received the donations, also the date and time of the activity are displayed in the notification panel of admin and users. In order to notify the users, the donation will approve first by the admin. Additionally, the system notifies the users and admin when donations are close to expiration, especially food items. Receiving a notification, compared with not receiving a notification, increased the probability of opening the app as well as when users received notifications it shows significant and real components of behavior change apps (Bell et al., 2023).

The developed system has the feature where the recipient can view the location of the donor even if it is in the donation wall, also the miners can view the location of the donors in the mine bag. The donor's location and mapping are displayed through the system's map feature, indicating the distance and route from the donor to the miner. The map displays the donor's street number and barangay to provide the exact address to the users. The donor's location is represented by a heart icon, while the miner's location is marked by a house icon, and a green line depicts the road or route. To contact the donor/s of the item the information of the contact number is in the mine bag. The use of GIS/Geo-mapping technology can enhance the donation process by increasing its efficiency and saving time it also helps the recipient of the donation to find the home or where to pick up the donation. This technology can also aid in clarifying an organization's goals and impact by using available maps and data or collecting new data through simple steps (Reeser, 2014).

Administrator's role involves reviewing the donated items to ensure their safety before distribution. They check the provided information, such as the actual picture, label, expiration date, and remarks. Additionally, there is a pin code for each barangay, which

the admin enters to provide another level of verification when approving donations, the pin code has a hide and unhide features in order to protect the pin code for privacy. After the admin approve the donation, the donation will post in the donation wall of the application. The World Health Organization (WHO) in 2010 emphasized the importance of having a simple and effective system for managing, organizing, and distributing donations to quickly identify and ensure the safety of items.

The developed application has a point system that offers a certain number of points depending on the type of donated items, and the administrator can assign points to items such as clothes and other usable items. These points can be utilized to enhance the users' level of trust. The user can change their avatar border to bronze, silver, gold, platinum, or diamond after reaching all five (5) levels. Furthermore, the developers established parameters for selected items that the donors contribute, such as rice, noodles, and canned food. A point-based system is effective for online charity events and fundraising campaigns conducted through apps or platforms. Badges are granted as a form of encouragement and recognition of accomplishments (Give Signup, 2021). Also, the recipient of the certain donation can send a feedback or message in able to thanks the donor of the donation.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings and discussions presented, it is evident that a significant portion of valuable items is discarded as waste, despite their potential usefulness to others. The integration of a mobile donation drive emerges as a potent solution, aiding the community in curbing the wastage of valuable resources and providing assistance to those in need. The system aims to notify the community when there are available donations. Also, to utilize GPS and maps to locate the donations and donors address to pick up the donations. Furthermore, the inclusion of a point-based system within the application serves to incentivize and acknowledge the generosity of donors.

As the result of the study donation in mobile application is effective to prevent the community to throw the useful items that become waste. By developing donation drive in mobile can also help the neediest people in the community that cannot afford to buy some items.

As a direction for future endeavors, the developers recommend expanding the mapping coverage to encompass multiple municipalities. Additionally, incorporating finer details, such as street names and landmarks, could significantly enhance the ease of locating donors through the map feature. Moreover, extending the application's implementation to encompass disaster and calamity scenarios, such as typhoons, fires, and earthquakes, would elevate its utility as an emergency resource, disaster management and relief efforts.

IMPLICATIONS

The study highlights the potential of mobile donation drives in minimizing community waste by redirecting useful items to those in need. This underscores the positive impact of technology on sustainability efforts, presenting opportunities for local governments and organizations to adopt similar initiatives. Moreover, point-based system introduced in the application incorporating gamification elements in social initiatives can enhance user engagement and stimulate higher levels of participation, thereby fostering a culture of social responsibility. Lastly, municipalities and disaster response agencies can explore the integration of similar systems to efficiently channel donations and aid to affected communities during emergencies.

DECLARATIONS

Conflict of Interest

All authors declared that there is no conflict of interest.

Inform Consent

It may not be applicable because the respondents were asked to participate in answering the questionnaire before questionnaire distribution.

Ethics Approval

It may not be applicable because the respondents were asked to participate in answering the questionnaire before questionnaire distribution. Moreover, no human or animal subjects were involved in this study.

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Kian M. Del Prado, currently working as a freelance graphic artist, hails originally from Mabitac, Laguna. He earned his degree in Bachelor of Science in Information Technology majoring in Animation, Motion, and Graphics from Laguna State Polytechnic University-Siniloan campus. Mr. Del Prado found inspiration to pursue graphic art through his exposure to animated and CGI movies. Throughout his on-the-job training and freelance endeavors, he has refined his skills using Adobe Creative Cloud and various graphic design tools. Notably, he has contributed as a graphic artist in the Marilag Festival. In addition to his professional pursuits, Kian is passionate about gaming and digital drawing.

Neil Harvey D. Mendiola, a graduate of Bachelor of Science in Information Technology Major in Animation and Motion Graphics from Laguna State Polytechnic

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Francis F. Balahadia is currently an Associate Professor V and Associate Dean of the College of Computer Studies at Laguna State Polytechnic University-Siniloan Campus. He holds a Master of Science in Information Technology from the Polytechnic University of the Philippines and a Doctor of Information Technology from the University of the East-Manila. With a strong research background, Dr. Balahadia has contributed significantly to the field, serving as a reviewer for research papers in national and international conferences and journals. He has authored and co-authored over 50 published research papers, including 27 Scopus Indexed and one ISI Index paper, which have received recognition and citations from various authors. In recognition of his research excellence, Dr. Balahadia was awarded the Distinguished Faculty Researcher-Junior Category at his university in 2022.