An All-Inclusive Digital Framework for Collaborative Community Transformation for Sustainable Development

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Abstract— Technology as a part of world development can be utilized for public welfare and services. In this current era, people's lives and activities depend mostly on technology. Consequently, technology can foster massive contribution to problem-solving in communities and can easily enable several services hitherto considered difficult. One area of interest is the utilization of technology to enable faster solutions to common problems in a community. Monitoring the challenges and developments in a community through a community reporting and collaborative transformation system is still not that popular despite the obvious benefits. The idea of crafting a digital collaborative transformation system becomes crucial to solving the common problems in a community and how to achieve a smooth collaborative relationship between the citizens and their respective political representatives. Consequently, this study aims to offer a comprehensive framework for the development of a digital collaborative community transformation, consisting of community members' responses and communication channels linked with the person-in-charge, budgeting suggestions, volunteering, as well as nomination and voting systems. The approach adopted in this study is to use an exploratory strategy to discuss all the critical processes from the standpoint of the users, as well as the technology for designing, creating, and integrating the system to gather users' inputs.

Keywords— Digital Collaborative System, Community Engagement, Crowd-Transformation, Digital Reporting, Location-Based System, Community Transformation, Sustainable Development.

I. INTRODUCTION

One growing area of research focuses on how individuals and groups can participate in the developmental process to achieve sustainable development. The whole world is facing increasingly challenging situations at the local and global levels. The United Nations (UN) in 2015, sets 17 lofty all-encompassing agendas for sustainable development targeting 2030. These sublime and comprehensive agendas cannot be achieved without deliberate participation, conscientious contribution, true commitment to sustainable living, carefully planned partnerships as well as responsible global citizenship among all citizens at local, regional, and international levels. Unfortunately, at local levels, collaborative engagements between the citizens among themselves as well as with their political representatives are dislocated, unrewarded and hence, ineffective. Consequently, with the current engagement scenario among citizens in a community, achieving the sustainable development goals (SDGs) by 2030 is an uphill task.

The main motivation for this study is the administration of Umar ibn Khattab (r), one of the foremost Muslim Caliphs. During his administration, he used to walk around regularly at the night to keep up with what was going on in the community and make several decisions, policies, and appointments to improve the life of the people based on his findings. Many leaders at this present time, do not have sufficient time to move around the communities, many representatives have been seen in the past few years to be extremely surprised and sad when they visit or got to know the situation of their neglected constituencies for the first time.

In this context, this study aims to propose a comprehensive framework for community engagement and transformation leveraging the power of the crowd and resources of all the citizens to rapidly and sustainably achieve needed development. This proposed framework intends to provide a community platform that encourages the citizens to work together, by exploring available channels for collaboration, thereby collaboratively participating in choices before their government representatives make decisions on their behalf. The

framework equally incorporates components to allow the citizens to volunteer in areas where they are useful and capable, ensure fair reward systems in the forms of ratings, appointments, and nominations for all citizens as well as ways to encourage highly-performing government executives.

A community's development lies not only in the hands of political representatives and bureaucrats but also in its citizens. An active citizen has the power to bring positive change in his/her neighborhood. An ever-increasing number of people are stepping up to initiatives that can make their communities and nearby neighborhoods and even city, more comfortable to live in. More and more people feel a sense of obligation or duty to their neighborhood and city and are effectively involved in activities to make their neighborhood and city even better. This is often referred to as citizen participation [1], defined as a process in which individuals get involved in decision-making that affects them in the programs, environments, and institutions. As citizens turned out to be more associated with public life, the government needs to adjust and take greater initiative and action in the community. It means local authorities support their communities by taking care of their citizens and their surroundings, making sure everything is satisfactory. This should lead to a cordial relationship between the government and society by improving a two-way relationship of relating and working together. Unfortunately, the current arrangement is inefficient, unencouraging, and even deliberately or inadvertently discouraged by the government or public organizations [1]. On the other hand, citizen cooperation with the public management has been pivotal to the success and development of many rural and urban centers [2].

The big picture of this research is a framework that enables citizens in a community to have a better interface with their community leadership and government representatives as well as become active participants in the decision and development of their community.

Many communities are neglected and often their problems may not be known to their representative politicians. Often, politicians have difficulties accessing developmental issues and challenges in remote and rural settings. This is mainly caused by the impossibility of the need to regularly travel around the constituencies to inspect or witness their challenges and developmental needs. Secondly, in most remote areas, there is the problem of accessibility and transportation. Roads are often bad or in some worst-case scenarios, no route can be accessible by car. This cause people in these areas to have difficulties communicating with their local government representatives or responsible authorities. They often have to find their way to solve the problems in their areas and are often incapacitated to do much due to funding and resources.

As a community representative one needs to solve many problems. It is sometimes hard to know what current problems are occurring in some particular areas. However, if the public has the power or way to divulge their problems or share them openly with their administrators, then the authority can become aware and provide immediate and adequate responses and actions. Consequently, the services would reach and benefit the wider populace. This benefits and eases the tasks and responsibilities of the community representatives by enabling them to observe most of the challenges and issues early on from the onset, nip them in the bud, and help in proper planning. The authority can easily find out some alternative ways to get rid of or address the problems. Politicians and public administrators are like doctors, if a doctor does not know where the patient's pain is or not even aware of the patient's pains, how then can he administer appropriate treatment. The outcome of the system is to report the problem by notifying the authority in charge and solve each problem based on priority. The main challenges are budgeting funds for solving problems, priority areas, before and after situations, monitoring the community representative's actions, and reaching out to the person in charge.

The remaining part of this paper is organized thus: The immediate section discussed a review of literature as well as past related work on community reporting and transformation systems. It also includes underlying factors for community participation. This was followed by the approach adopted to develop the framework, which was subsequently followed by the usability evaluation of the reporting component of the framework. The final section provides a summary of the outcome of the study, recommendations, and future work for the enhancement of the framework.

II. RELATED WORK

In this section, a review of existing community systems is discussed. Most of the existing community systems are specifically focusing on reporting systems. Past studies related to the proposed framework and the effectiveness of such frameworks for community engagement are equally discussed.

The term community is used in this study to refer to "a group of people with various characteristics who are connected by social ties, share regular points of view, and take part in joint activity geographical locations or settings" [3].

A few studies have been carried out to propose community reporting systems. However, not many were done on civic issues to provide avenues for citizens to complain directly to government representatives. It is even rare to find similar research specifically targeted at communities. As mentioned above, one crucial problem that needed to be solved by this system is the accessibility problem in each community setting. Many communities are neglected and often their problems did not reach their representative politicians. The benefit of dividing the problems into classes is to make it easy to identify and analyze the problem and directly pass it to the respective authority and help prioritize the more serious problem, especially affecting a larger number of people due to several reports on the same issue. The module on reporting includes reviewing the before and after the situation of the reported issues. A form of crowd rating, crowd reviewing approach. In reality, even though there are high chances of getting fake reports. With the help of the community crowd review, the users can easily identify and raise their voices against fake posts. This would equally be used to rate down the person who posted the complaint.

The significance of this research is to provide an efficient framework for members of the society to report any community challenges or needs to the appropriate quarters, participate in promoting good engagements among citizens, volunteer to solve community issues as well as a proper communication interface with public officials and organizations. With this framework, if implemented, the appropriate public quarters can have access to identify happenings in any part of the communities and collectively work together to ensure an improvement of the situation of the communities and the environment. In addition, the public can also rate the complaint or report posted which serves as a support for active participation among citizens. Lastly, the study when implemented would provide insight into the general study of reporting & improvement systems in community service. The main aim of the framework is to enable each member of the community to communicate and collaborate easily among themselves as well as with their leadership and government representatives regarding any community challenges or needs, to let the responsible authorities give responses and take required actions to ensure that an improvement is made.

In addition, the public can also vote up the report posted which supports the active participation of netizens. Lastly, the research will give insight into the general study of reporting & improvement systems in community service. The study focused on developing reporting & improvement digital system for all the communities.

A. Theoretical Background of Citizen Participation & Community Volunteering

This study touches on two critical aspects of community development, namely Citizen Participation & Community Volunteering. These two areas are discussed one after the other respectively in the following subsections.

1. Citizen Participation,

Citizen Participation is generally considered citizen power – citizen control, "self-help" or "citizen involvement" or citizens' "absolute control" which could be misleading due to the limited citizens' involvement in reality. Citizen Participation is the extent to which citizens are given the opportunities, means, and privileges to exercise some influence in the running of the affairs of their community. It is the "maximum feasible involvement of the poor" [4] in a community. The foremost theory on citizen participation is referred to as the "Ladder of Participation" [4], [5] containing eight rungs discussed as follows.

- **Manipulation:**

This is the lowest level in the stages. The public and observers are "manipulated" into believing that public involvement is taking place in "manipulation". This can occur in several ways, such as in Citizen Advisory Committee meetings where the residents are influenced by the officials rather than the other way around. Noble projects are more concerned with commercial interests than they are with assisting groups of less fortunate people.

- **Therapy**

Public servants and administrators who design pseudo-participatory initiatives designed to persuade individuals that they are the issue are engaging in participation as therapy. Instead of allowing citizens to have a say in how things are done, this type of engagement, known as therapy, puts them to work changing themselves.

- **Informing**

This level suggests that true public participation is impossible without informing the public. The public must also be informed early on about activities and plans because delayed information makes it harder for the public to participate fully and exercise influence. If a citizen is not well-informed, they cannot engage in society fully.

- **Consultation**

In this stage, neighborhood gatherings, and open forums are the most often utilized techniques for obtaining public input. Participation remains merely a ceremonial act when those in positions of authority limit citizen involvement to this level, treating people as statistical abstractions. The focus in this rung is on how many people attend meetings, take brochures home, or respond to a survey that is used to measure participation. Through all this work, citizens only

gain the satisfaction of having "participated in participation."

- Placation

At this level, citizens start to have some influence, albeit frequently under less than ideal circumstances. Participation in advisory and planning committees are examples to demonstrate placement. It is the person in power who ultimately decides whether to even consider the advice and even planning provided by the population in this situation, where conventional agencies are thought of as carrying out projects, and few methods have been created to promote organisational reform. Major planning choices are typically made by government personnel and formalistically endorsed by policy boards. People are once more, for the most part, being prepared for.

- Partnership

Public institutions, officials, or administrators engage in participation as a partnership when they permit citizens to bargain for better terms, use their veto power to overturn decisions, split financing, or submit requests that are at least partially granted. For instance, "Negotiation between citizens and stakeholders" is how power is divided in a partnership[6].

- Delegated power

Delegated power involves a few really committed citizens and does not happen very frequently. Negotiations between citizens and government representatives may result in citizens gaining a disproportionate amount of decision-making power. These agreements often include programme specifications as well as a predetermined line-by-line budget.

- Citizen control

First of all, it must be understood that no one has complete control, and neither do the people. This is the highest level of authority that a person can attain, and it indicates that they have complete control over a programme or plan and the ability to "negotiate the circumstances under which 'outsiders' may change them." A neighbourhood corporation with its funding source and no middlemen is a relatively popular example. In terms of coastal management, there are no recorded instances of citizen control.

2. Community Volunteering

An individual or organization who willingly donates their time and labour to community service is called volunteering. Volunteering is important in a community to engage the community people in contributing to community development[7]. Volunteering can be motivated by a variety of factors, including values, understanding, social, career, protection, and enhancement[8], [9]. Interest in an activity may result in volunteering. There are some examples of why people should practice volunteering. For instance, desiring to learn and experience something new, or having free time, maybe a catalyst or motivation for volunteering [7]. The key to keeping volunteers happy is to treat them with respect. The impact of praise and acknowledgment is crucial in maintaining volunteer motivation[10]. Even if it is scaled back from what workers receive, investing in personal development and training helps volunteers understand their roles better and inspires them to become better people. Putting people in small groups and working with them to build a sense of community may make them more likely to want to do good things for others.

The general consensus is that volunteering has many positive effects on communities as well as the volunteers themselves. The authors in [7] examine a variety of informal and official initiatives aimed at young people as well as broader motivational elements that encourage adults to get engaged as they explore characteristics that increase the likelihood, satisfaction, or sustainability of volunteering throughout the special issue. Furthermore, by being nurturing to their children, parents can promote prosocial attitudes and behavior [11]. As a result of their relationships with their parents, children who develop secure attachment types are also more inclined to volunteer in the future [12]. Children can transition from typical care with the aid of socialization.

To help young people, feel a sense of belonging to established communities, socialization may also involve introducing them to those communities. Religious institutions are illustrative, and involvement in religion has historically been linked to volunteering [13]. Working together on projects can even improve the attitude toward helping the community. Volunteering encourages social integration, equality, and self-sufficiency, highly valued in a community. The educational sector is where community service requirements are most frequently used. Because volunteer programmes can be promoted as having advantages for both knowledge and communities [14]. One reason why volunteering is required is that it has been associated with freedom and self-determination. As volunteers may be engaged in particular topics and specific populations in need of assistance, community involvement is required to sustain community service. Promoting the practice of volunteerism and involvement in the community as a means of achieving this shared future of better trust and collaboration. Being a volunteer may be rewarding if it allows one to put essential ideals and principles into action or if it allows one to contribute to the future of communities. Because there may be additional extrinsic rewards available and driving such preferences, volunteers find these activities motivating [15]. Other-

focused volunteerism may be increased through specific socialisation experiences and encouragement to form and associate with groups that share similar prosocial attitudes and values.

B. Analysis of Existing Web-Based Reporting System

A few available information systems that allow users to communicate with the authorities and government representatives exist. Many of them are built especially by the state officials for the communities in their city. The appearance of new paradigms for interaction between people and systems, including interaction with mobile systems and sensor-based/context-aware programs, aroused the awareness of organizations for developing applications with civic shed and sensitized them to provide services especially targeted to citizens [16]. The common characteristics of these systems are the use of feedback numbers to check the complaint status and the way the report can be submitted are also in similar approach such that an online form is filled and submitted, and lastly will be forwarded to the responsible government authorities or service provider section to handle the reports. But of course, each system has its unique component. Notable among these community reporting systems include TaliKhidmat [17], Mississauga online service [18], FixMyStreet [19], CitySourced [20], SeeClickFix [21], and IChangeMyCity [22]. The ones discussed below symbolize the civic reporting systems that offer an extensive variety of services and features to local citizens. These systems are evaluated and compared as shown in Table 1 in order to clarify divergent and similar features as well as identify the gaps and inadequacies of all these existing systems.

TABLE 1
COMPARISON OF EXISTING WEB-BASED REPORTING SYSTEM

System Name	Has a cross platform mobile application?	Free to use by public?	Authentication required.	Media attachment to reports.	Locates problem in a map.	Discovers problem in the city.	Enables tracking the problem.	Generates performance report.
FixMyStreet	Yes	Yes	No	Yes	Yes/No	No	Yes	No
Mississauga.ca	No	Yes	No	No	No	No	No	No
CitySourced	Yes	Yes	Yes	Yes, multimedia	Yes/No	No	No	No
SeeClickFix	Yes	Yes	Yes	Yes, Multimedia	Yes	Yes	No	No
TaliKhidmat	Yes	Yes	No, can submit as a guest	Yes	Yes/No	No	No	No
IChangeMyCity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

C. TaliKhidmat

TaliKhidmat was initiated by the Chief Minister's Department of Sarawak. Before being expanded with the addition of the TaliKhidmat Web Portal and online submission in 2005, it is first introduced in 1996, as a public hotline that can be used to ask any questions, submit complaints and give feedback. The hotline was intended as a 24/7 service line using a single contact number 555999 countrywide [17]. By 2010, TaliKhidmat started to support complaint submission and status checking via short messaging service (SMS) application as well as mobile web. The latest enhancement is the eKiosks which is built in 2017 and has expanded until now. Currently, there are three eKiosks in various locations in Kuching such as shopping centres and the Urban Transformation Centre (UTC).

The objective of this system is to help the public to solve any inquiries or problems. This system acts as a communication channel through which users are connected with an accurate service provider section in government agencies or non-government organisations in Sarawak. Complaints can be made by completing the user's information and feedback details on the form provided. After the complaint is submitted, the user can get the feedback number from their email to make a follow-up regarding the complaint submitted.

Besides, problems can also be reported, and the status can be checked through SMS. Although it is a good platform to communicate effectively with appropriate authorities and community leaders as it is initiated by the Chief Minister's Department, the veracity of every complaint reported cannot be affirmed. On the feedback

form provided, there are only division and district choices of reported matters where people can state the location of the problem. But stating only division and district would not be enough to locate the concerned site. Even though people can also state the exact address on the message box provided together with the detail of the problem, it can become laggy for certain people with poor devices and network connections and cause confusion. The use of a map to locate the problem is an option. Besides that, people can choose whether to attach proof such as pictures and files or to just submit a written report.

D. Mississauga.ca

Mississauga.ca is the official online customer service for people in Mississauga city in Canada [18]. This system allows people in Mississauga to not only report or request a service but also pay tickets or penalties, book facilities available in the city, and look for career opportunities. It is indeed an all-round online customer service provided by the city council to improve its people's welfare and livelihood. In the request or report section, people can either choose to request civic services or report issues that happen in the city. Services offered include tree pruning, birthday or anniversary certificate from the Mayor and Members of the Council, repair of burnt-out lights, and taxes and property services. Before submitting a report, people will have to check on several conditions of the issues they want to complain about such that there are certain conditions where people have to deal directly with the contact centre to ensure actions are taken immediately. Incidents that create a hazard or threaten public safety risk are reported directly to the exact authorities or service provider.

After checking through all the conditions, the user will have to provide a valid Mississauga street address, contact information, and email to avoid fake reports and fraud. This email address will then be used to give confirmation of any request or report submitted. A unique service request number will also be given to help people check on the status updates on their requests or report. Request or report information comes after filling in all the personal details where people can select the type of service they want, or the report issued and describe them as detail as possible in the box provided.

E. FixMyStreet

Another online reporting system is FixMyStreet. This system allows UK citizens to not only view the situation in other cities but also report and discuss whatever problems they experience in their area. FixMyStreet is a compatible resolution that includes several elements: a web-based system, mobile applications in prime system operations for reporting cases among citizens, and a platform for back-office for governments to monitor events. Launched in 2007, it is a citizens' reporting platform, that specializes in the field of existing road problems and supports a number of problems that can be reported for instance junkies, vandalism, damaged lampposts, or traffic lights and potholes [19]. Now, FixMyStreet has developed to other countries as well as inspired similar projects to be developed such as the Korean version, Canadian version, and German version of FixMyStreet.

This system provides features like searching issues by specific city, problem statistics on each city, reporting problems by attaching pictures, subscription to alerts of problems that happen in the adjacent area, and discussion on problems reported. The reported occurrences that are available to the public prevent duplicate reporting of problems while encouraging online discussion of local problems by citizens. These discussions signify a civic sense from the public and frequently, solutions suggested by the citizens are used.

F. CitySourced

CitySourced is a platform that encourages citizens of the United States to participate and get involved in managing real-time non-urgent issues. It allows residents to report problems occurring in their neighbourhood to the government organizations for further resolution. Users can choose whether to indicate their locations on the map or just manually choose from the list of the areas given. The problems that can be reported are the ones that threaten public safety and well-being, also environmental issues. Through this system also, local government organizations can get feedback and listen to stories from residents, fostering a two-way collaborative interaction enabling them to save money and time in detecting urban problems of this kind [20].

CitySourced promotes a unique way of reporting a problem in which people can submit various media like pictures, audio, or videos to reinforce their report. All submitted reports are constitutionally linked with GPS coordinates and details about the location of each report. Other features of this system include close-fitting unification with other similar applications in the municipal organization. The flaw of this system is that users cannot track the problem they have reported and can only know once the problem has been solved through their email.

G. SeeClickFix

This solution allows citizens of the United States of America to report civic problems that occur in their neighbourhood. It follows a modular design and is not only available in the form of a web-based platform, but also in API and mobile applications which enables all information to be accessed. SeeClickFix approaches the community

with local organizations. This system supports citizens' involvement and proactivity as a pillar of their city. Citizens are given the opportunity to voice out problematic issues in their cities, and also to communicate with responsible government organizations for further resolution [21].

Several enhanced features are available on this system, for example, occurrences of problems can be shared by the public on social networks platform. This encourages the public to discuss the occurrence. It also uses a prioritization system which means the more the problems are shared, the more important. Possibility to set questions by a municipality for different types of problems to report (all types of problems can be configured, as well as questions relating to these topics, all of which are also established in the municipality. Besides that, citizens can receive an alert of every problem reported in their neighborhood.

H. IChangeMyCity

IChangeMyCity is a community reporting and improvement system for residents in cities in India such as Mumbai, Bangalore, Varanasi, and Raipur. It is not only available on web-based platforms but also in the mobile application. This system allows citizens to post complaints about civic problems around their neighbourhood such as bad roads, potholes, damaged roads, lamps, and unremoved waste [22]. They can also include media attachments like photos or videos in the post. It has a voting function to prioritize the complaint posted. The more people vote, the higher the priority. IChangeMyCity gives citizens the opportunity to interact with their local civil authorities and elected representatives to ensure the complaint is resolved. Users can view other issues posted that happen in their area as well as other areas, but the function is only for signed-up members.

From the foregoing sections on Theoretical Background of Citizen Participation & Community Volunteering as well as Analysis on Existing Web-Based Reporting System, this study proposes a comprehensive framework to ensure meaningful participation by the citizens which enables them to exercise citizen meaningful control. Secondly, the study reviewed the existing reporting systems as a guide to incorporate the components necessary for citizen engagement. Other components that serve the purpose of rewards and motivation are equally considered to bring about passionate involvement.

III. FRAMEWORK AND MODULES

The proposed framework in this study offers a local community collaboration[23] and crowd-transformation to ensure that an effective engagement among citizens themselves as well as with their public representatives can be achieved. The framework consists of several modules.

The first module and perhaps the most important, namely; the reporting & collaborative improvement module, is proposed with the aim to help each member of society to communicate effectively with their representative authorities on city or community problems that may be causing hardship, impede progress, and a source of discomfort to a community such as bad roads, unattended waste, and damaged properties. The need for proper engagement with their administrators is especially crucial in remote areas which are more difficult for public officials to access and thereby often neglected.

The second module in the framework is crowd voting for budget prioritization. This is considered crucial to prioritise budget implementation based on the most identified needs among the citizens in the community. This is equally supported by crawling analysis and word cloud/indexing module to periodically identify major concerns among the citizens. This is followed by the citizen volunteer module that allows the citizens to collaborate or volunteer to participate in community actions and projects. Another important module in the framework is the rating of the person-in-charge as well as community member rating. For the person in charge, their speed, as well as frequency of responses, feedbacks and actions taken when needed, are considered for rating their performance. The final module is community rating, which proposes a framework for comparing and rating each community in a city based on their engagement and participation and the level of their positive engagement with their public officers and administrators, level of the citizens' volunteerism as well as several general improvement indices. The proposed framework functions by utilising the power of the crowd such as a community social media platform for reporting community problems, crowd review issues, participate in public polls on public officials, members of the communities as well as volunteer to resolve issues in the communities. The persons-in-charge, individual users, and community would be scored, rated and ranked according to their performances.

The reporting module of the framework allows members to post a problem with authentic supporting media or documents while allowing the other users to crowd review the post. If the post is not relevant, people can express their views through comments, and like and dislike options. If the post has more supportive comments and likes, then it ranks higher in the person in charge report. Hence, it has the chance to attract necessary actions as appropriate. The identity of a user can be anonymous for privacy reasons. At the beginning of a year, there should be some public suggestions of critical priority needs of the community as well as crowd voting in collaboration to ensure that the most pressing needs are addressed by the public officials in

charge of the role. Each valid complaint would be sent through the email address, Twitter, or any social media handles of the person-in-charge as well as pushed to the community homepage dashboard to garner attention from all community members as well as the person-in-charge. Any irrelevant complaints can be removed from the system depending on the evidence or crowd disapproval of the post. The person in charge would be required to review complaints on a regular basis and after resolving a problem,

to provide feedbacks thus everyone can see the improvement, hence, allowing the community members to rate the work or action taking. This rating will help to make a good portfolio, report card and performance of the person in charge. Essentially, the complaint module is designed to leverage the power of the crowd to monitor community. The overall framework is presented in Fig.1. The following subsections describe the modules contained in the framework.
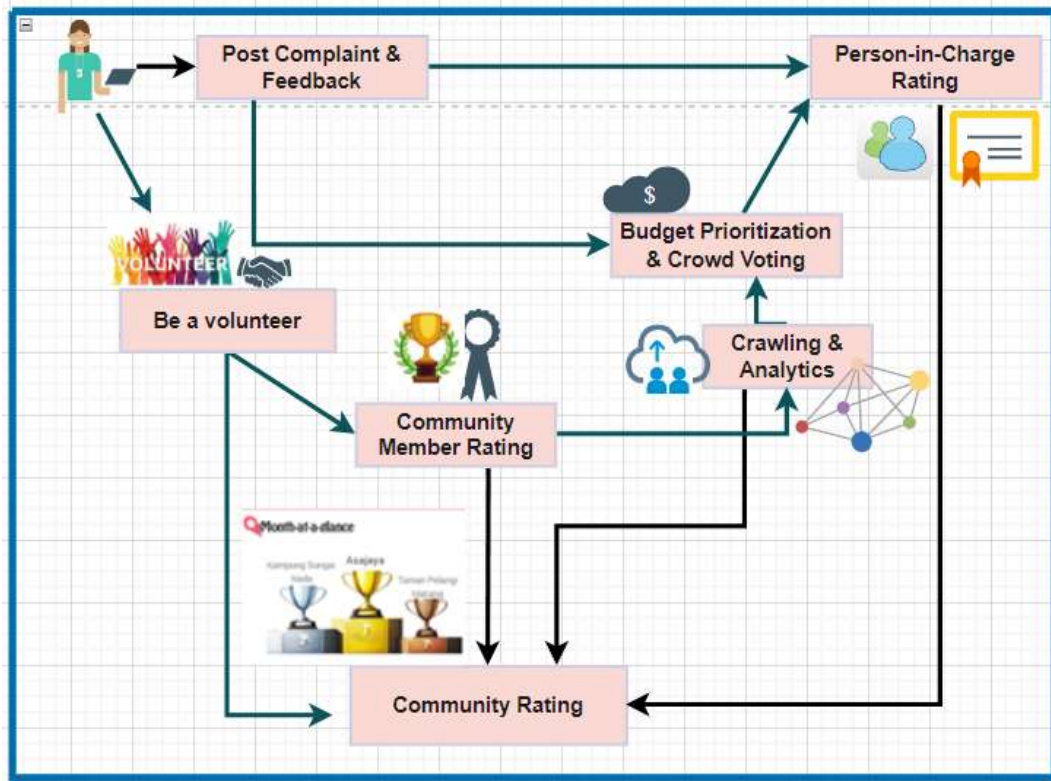
Fig. 1 Community Transformation Framework.

A. Complaint Reporting and Feedback Tracking:

This system can be used by any user from the same community. Once registered and logged in into the system, they can post complaints, they may select categories from the list provided and include details of the complaints such as supporting documents, location, pictures of the spot, etc. as well as refer to the details of the person-in-charge such as their designated email or social media handle. Additionally, community users are allowed to like or dislike a post and can give both positive and negative comments on a post. The system aims to provide democratize priority-based actions. Consequently, the posts having more positive supporting comments and likes will be regarded as authentic posts and rated higher. After appropriate actions are taken, on the other hand, the before and after situation of the complaints would be observed and confirmed by everyone. the community would then rate the positive

action taken by the official in charge, and overall ratings are made available periodically to observe the performance of the in-charge persons. Consequently, for every good effort, the representative would be evaluated and rated by the users. In this way, users will be able to monitor the activities of the authority and collaboratively create awareness about the current situations for all.

The main function of this module is to allow citizens to notify the appropriate authorities of urban non-urgent problems that occur in a locality by uploading real-time photos of the problem after pointing a location on the map. They can also view other community issues happening around them and give vote-ups or ratings to the problem posted by other people.

This is one of the modules that have been almost fully functional, hence, an overview is presented in the next few paragraphs on how it works.
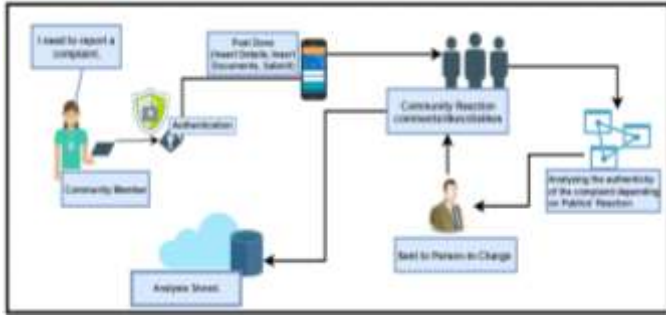
Fig. 2 Complaint Reporting and Feedback Tracking

The module is designed and developed based on the selected main features. New users can sign up for a new account in Fig. 3(a) while registered users can directly log in into their account in Fig. 3(b).
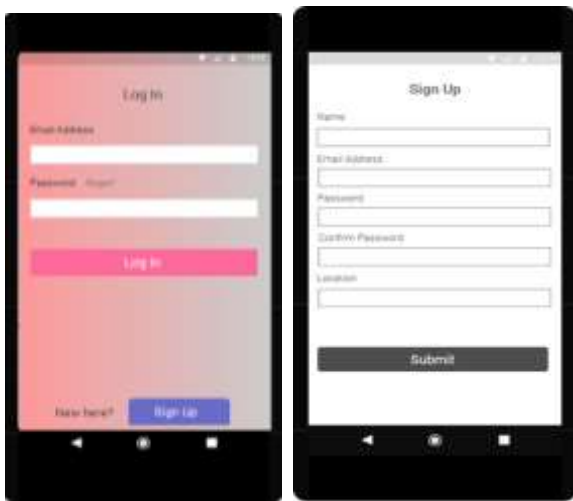

Fig. 3 (a) Log in page (b) Sign up page

Upon signing up, users must verify their account to make sure the email address is valid.
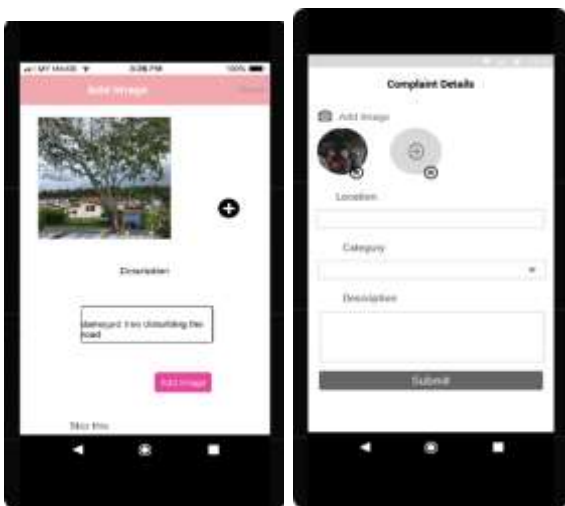

Fig. 4 (a) Add image page (b) Complaint details page

To add a report, a user is required to upload a real-time photo taken at the event location as can be seen in Fig. 4(a). Then, the user must fill up all the details on the complaint details page as shown in Fig. 4(b) as well. On this complaint location page, the user will be connected to Google Map in Fig. 5 to select the 'location' and detect the current location of the user and store it in the system.

Fig. 5 Complaint location page

After completing the complaint details, all the information entered will be displayed on the next page which is my complaints page as seen in Fig. 6 where all complaints reported by the user will be shared with the public.

Fig. 6 My complaints page

Users can also view other complaints posted by other people in other areas of the community. Other than that, users can help to upvote other posts by liking them. This can be done by pressing the like button on Fig. 8.

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Fig. 7 Discover page

B. Budget Prioritization & Crowd Voting:

Every democratic country has a time when they decide their budget, an annual financial document that details the government's estimated spending and revenue generation for the fiscal year. The government presents it to the parliament at the start of each fiscal year to give an estimate of its expenditures and receipts for the coming fiscal year. In this framework, it is proposed that users should participate in projects' prioritization for budget allocation. This voting will determine what the demand of the public is, which should guide the representatives on what types of projects the users or community needs. Thereby, helping the community desired development by ensuring that the government gives priority based on the people's choices not without it.
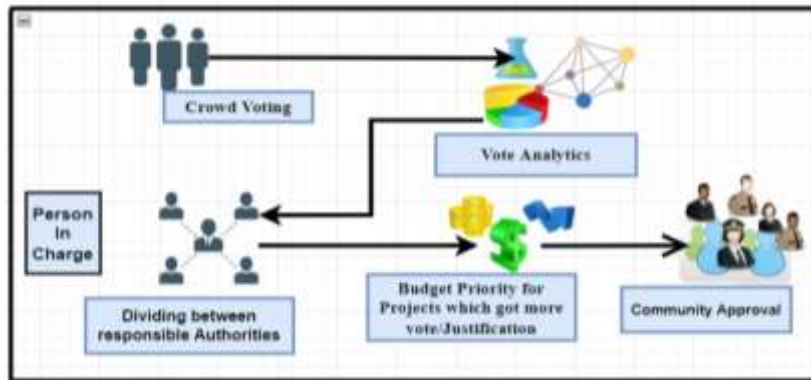

Fig. 8 Budget Prioritization & Crowd Voting

C. Online Comments Crawling & Analytics

The crawler examines a page's content for links to subsequent pages to fetch and index. In the system, we will try to observe the public about what they are looking for. If users are talking more about unemployment problems, this will lead the person in charge to put more focus on unemployment problems. The crawling analysis will inform what the people are talking about currently.
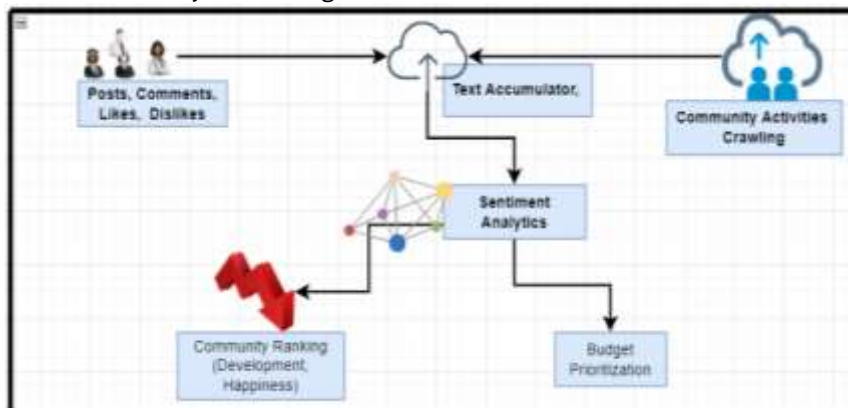

Fig. 9 Online Comments Crawling & Analytics

D. Person-in-Charge Rating:

Users can rate the person in charge or politicians, or the public authority based on how responsive and responsible they are, in terms of feedback to complaints, taking satisfactory actions, and general attitude to solving the community problems. It would also include assessing whether they are giving priorities to the results of voting on budget, users feedback on their work, and so on. This will allow the users' voice to be heard and their participation acknowledged. In situation where the person-in-charge takes opposing views, a justification must be provided and proper feedbacks and buy-in provided.
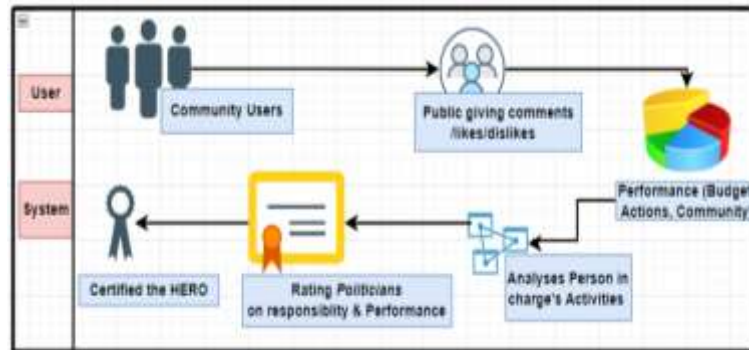

Fig. 10 Person-in-Charge Rating

E. Community Member Rating:

Every user can rate other users. This method will help to identify which user is more aware of his community. The active user will deserve a good rating. By judging their responsible posts or authentic complaints they report complaints, online activities such as likes and dislikes as well as comments, how is his response to others' posts can mention potential community members, and their participation as volunteers in fixing problems would be utilised rating. This is important because rating the community members besides politicians would help the users to be more active, honest, and responsible about their reviews, and the intention to post fake reports would be discouraged.
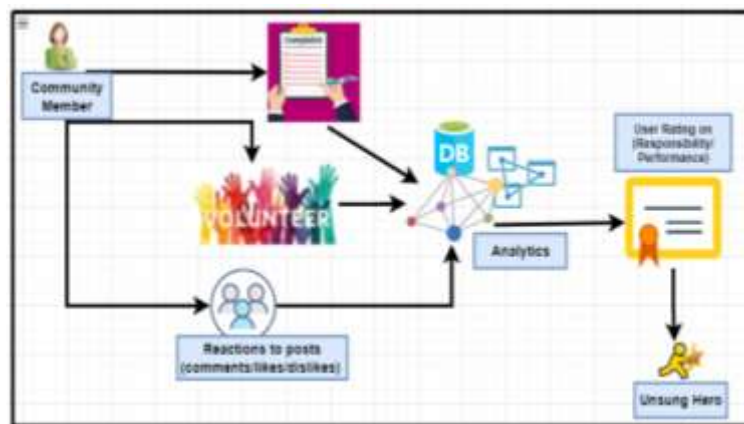

Fig. 11 Community Member Rating

F. Be a volunteer:

Often, many community issues can be resolved by the community members themselves without having to complain to the person in charge. This can leverage the skills and useful ideas of the community members to solve basic needs and improve the community. The framework is designed in a way that volunteers fix the problems and get points. The volunteer may help to do a list of project suggestions. They can repair a damaged road, offer tuition, and take care of the homeless, without the help of the main authority. There are so many people doing good work in the society, they are identified and there is a reward system for their efforts, other residents will be encouraged to help their community.

G. Community Rating:

Community rating is based on how fast a community is progressing using the community members' happiness index. This can be determined using sentiment analysis to process their online complaints and comments.

Fig. 12 Community Rating

Besides, their level of cooperation among themselves as well as with their government representatives in solving their community problems. In a state there are several many communities, consequently, identifying the best community, the most improved, and the worst, should inspire the other communities to strive to improve together. This method will create a positive competitive mentality among the communities. The communities having poor ratings can be inspired to build and improve into better communities. The system is like a result card of all the people who are living in the communities in a state.

IV. DISCUSSION

The modules in the framework were implemented as a mobile app prototype and were tested to find any defects or confusion that should be fixed based on target users' feedback. The target users include residents of any local community. For the evaluation process, 10 respondents were asked to perform the same task which is to report a community complaint they faced by following all the steps required in the application. The time taken for each respondent to complete the task was recorded and the number of errors made while using the app were recorded. Six users managed to complete the task given in less than 5 minutes while the other four took more than 5 minutes.

1) Icon used: Four respondents admitted having problems in understanding the icons used to take some action. Respondents 2, 4, 7, and 9 complained about the icon on the complaint details page where users have to fill in all three boxes of the complaint location, type of complaint, and the description.

2) Instruction: According to respondents 1, 7, and 8, the instructions on the complaint location page are not very

clear. It is not very straightforward, hence respondents might be confused about what they should do on this page. In the interview session, some of the respondents proposed to add a label that directly tells users about what action should be taken after arriving at the page.

3) Background design: Respondents 1 and 6 suggested changing the background of the homepage as it looks too simple and silly. However, we believe that communities can customise their background to suit their culture.

A. Improvement

Some improvements have been made to the application based on the user's feedback and suggestions. The first change was made based on the comments from Respondents 2, 4, 7, and 9, regarding problems in understanding the icon used on the complaint details page. To improve this, a label was added in each section along with their icon to help users to understand what they meant.

Next, a change has been made to the complaint location page where a label to indicate the user's current location was added. This has been solved and Figure 10 shows the page before and after the label was added.

Lastly, the background of the homepage has been changed into a more realistic picture as seen in Figure 11.

V. CONCLUSIONS

A comprehensive framework for community transformation leveraging the power of the crowd – the community members – has been proposed. The approach utilised to develop the exploratory based on existing disjointed systems. It is hoped that with the proposed framework community members would be able to relate and communicate better with their government representatives to achieve inclusive governance that takes input from the citizens of a community. The proposed framework should equally foster collaboration among the citizens of a community themselves in form of joint selection of projects for their community, communicate community challenges to their government representatives, volunteer to solve some of the issues in their community, and participate in nomination processes that involve their representatives. The current framework consists of about 7 modules, namely, Complaint and Feedback, Budget Prioritization & Crowd Voting, Online Comments Crawling & Analytics, Person-in-Charge Rating, Community Members Rating, Community Rating, and Be a volunteer modules. One additional module envisaged and considered but not included yet in the current arrangement is the Nominate a Hero module to identify individuals for elective positions in the community and other committees. In the attempt of this framework, it is believed that this would be included. Overall, the

complaint and feedback module has been developed and evaluated by 10 users for usability. Other modules are in the process of being developed and would be evaluated together.

Future work includes a comprehensive evaluation of all the frameworks as well as each of the modules to fine tune how best the framework would work in real situation. To achieve this, the comprehensive evaluation would involve all the stakeholders expected in a community, namely, selected community members, government and public organisations as well as researchers and academics. Each component would be developed and tested for usability in the final product using a greater sample size of respondents, only 10 targeted users, evaluated part of the current study. More variety of classes of respondents should also be taken into account such as the age, living period in the community and residential area. More contents or functions would be added into the modules if especially including sharing posts to community social media and generating performance reports for both communities and politicians as well as nominating for critical positions for the progress of the community.

VI. ACKNOWLEDGEMENT

VII. CONFLICT OF INTEREST

The authors declare that there is no conflict of Interest

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