Articles

Youth-Driven, Community-Engaged Waste Management

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Abstract

The waste management process is important in Bangladesh where infectious and non-infectious diseases are common. In a resource constrained region, community engagement for waste management can add great value. A youth-initiated and engaged approach to collaboration among local communities is presented in this research. This research took place over a one and half year time frame in fifteen urban, suburban, and rural regions, consisting of 55 families and 15 individuals engaged in waste management activity. The youth leaders were eager to make changes, being frustrated at the authority's inability to solve local pollution. The collaborative teams were able to continue the work through the time period using various technology platforms. The technology leadership of youth enabled a trusted connection among youth and community members. The research work shows promise to increase communication, collaboration, and collective engagement in local problem solving. However, engagement is not gender neutral, and the work presented reflects societal gender-based challenges which requires attention. This work is expected to provide opportunities for low-resource communities towards problem solving using existing technology platforms.

Keywords: Sustainable development; gender; empowerment; Bangladesh; ICTD.

Introduction

Availability and access to digital technology have played an important role in development in the field of community informatics (CI). Williams et al. (2012) refers to CI that "*Examines the roles of information and communication technologies in community development and sustainability*" (p. 218). CI has community development and engagement opportunities in many low-resource regions considering the availability and access to technology such as mobile phones. Community engagement based on USDHHS (2015) refers to *"the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people" (p. 7).* Moore et al. (2016) seeks the critical question of ensuring a meaning engagement of communities. There have been examples where communities have played a strong role in collaborative problem solving using technology as a community platform (Harris, 2007). The community problem elaborates a broader goal of solving a community issues as Du et al. (2022) mentions. There is evidence where a concrete challenge creates a community that actively works on a problem having technology as a communication platform. The youth-based mobilization in Tunisia (Ottaway, 2011), in Bangladesh (Curtis, 2015, Ahmed, 2019) against political forces show communities formed to create voices against an ongoing problem. This case study has explored how a group of enthusiastic youth mobilized their local communities in Bangladesh to solve a problem that was not addressed by other authorities and used technology for a sustainable engagement process. The waste management problem here involves garbage collection followed by a cleaning process within the shared localities as a community problem. The strength of this work lies in the youth leadership in community mobilization and problem solving.

Research communities have looked at citizen-engagement as well as community-engagement to improve living conditions with the support of technology. The research literature has explored citizen-engagement and community-engagement, referring to individual and collaborative engagement towards addressing various challenges. In this work, we specifically consider community-engagement referring to its collective solution approach. In many of the existing solutions, citizens as well as communities are in charge through shared responsibility and monitoring the environment using technology that is accessible and easy to understand (Hsu et al., 2017; Kuznetsov et al., 2014; DiSalvo et al., 2014). There have been various efforts using community and citizen engagement to improve environmental challenges that consider air quality (Hsu et al., 2017; Kuznetsov et al., 2014), sound pollution (Ertiö et al., 2017), visualization of current environmental conditions (Hsu et al., 2017; De Lange et al., 2017; Houben, 2016) often maintained by citizen in collaboration with local governance bodies. Many low-resource regions suffer from weak governance along with a scarcity of funds, lack of planning of technology deployment. In such regions, the engagement process considers bottom-up approach of collaboration in the developmental process where technology plays the role of connecting communities (Douthwaite, 2002; Korten, 1980). Harding et al. (2015) discusses community engagement from the concerns of trust in the entire process of development where projects and technology engagement projects are developed and designed for communities.

Cotemporary studies have showed how community engagement has worked as a catalyst for empowerment in certain cases (Gaventa et al., 2010). For example, Hsu et al. (2017) discusses community-aware air quality monitoring systems where the goal is to use scientific knowledge for citizen empowerment. Democratizing data is discussed by Houben et al. (2016) towards empowerment. It must be noted that the challenges exacerbate in low-resource regions where technology acceptance is low for lack of exposure and trust related issues. For example, local sensors placed to monitor water level during flash flood season in Bangladesh faced challenges where the community struggled to accept the technology beyond their engagement in manual water level measurements; some of the senior community members were skeptical and negative about new technology (Ahmed et al., 2019). Later, the community youth were able to bridge the communication challenges. Similarly, this study involves the youth in leadership to connect to the communities for waste management, bridging the existing communication barriers.

The motivation of this research is based on the impacts of poor waste management process in shared regions owned by multiple communities. Unmanaged waste along with the tropical weather increases the possibilities of infectious diseases (Hossain et al., 2017; Islam et al., 2018). The challenges increase during monsoon season, where water acts as a medium to propagate diseases. For example, during the monsoon season, when water puddles are generated, the possibilities of mosquito-based diseases like Dengue and Chikungunya increase in Bangladesh (Hossain et al., 2017; Islam et al., 2018). The stagnant water on spaces not particularly owned by communities could increase the risks of these diseases. Furthermore, there are water-borne diseases that spread rapidly during and after the rainy season (Argos et al., 2010; Luby et al., 2008). The problem remains during the dry season as the waste propagates infectious elements (Black et al., 1982). The air pollution adds up to an increasing level of breathing problems like asthma (Haque et al., 2005). These concerns are often neglected by authorities or

politicized, where authorities would find someone to blame rather than solving the problem which frustrates general citizens greatly (The Daily Star, 2023). Community engagement in waste management is weak as explored by contemporary researchers, showing lack of infrastructure and resources in Bangladesh (Rifat et al., 2016; Jamall et al., 1990). This work emphasizes a youth-led community engagement process for community waste management in shared spaces or open spaces that are not owned by individuals or families. The waste management of such spaces often falls under the responsibilities of local authorities which are often ignored. The youth engagement to initiate a community-level problem is a voice raised to ensure social justice for neglected communities. Ensuring social justice through community engagement is discussed by contemporary researchers (Wolske et al., 2014).

This research has studied a youth-initiated community engagement process over a one and half year time frame in fifteen urban, suburban and rural regions of Bangladesh. The youth community was strongly connected through existing communication technology platforms while they engaged the older community members to a sporadic communication channel to engage over time. There were 55 families and 15 individuals who joined in the community engagement process of waste management in shared spaces. The young adults, age ranging from 18 to 22, referred as youth leaders, took the leadership of waste management. The youth leaders were eager to make changes being frustrated at the authority's inability to manage local waste. Communities have worked collaboratively to work out a viable solution approach contributing intellectually and economically. The communities used existing communication platforms where youth leaders were connected among themselves through social media platforms; leaders are connected to citizens through mobile phone based networks or direct communication over mobile phones. Moreover, the voices and leadership of female leaders added value where many senior women were not able to share their voices easily as was found from this research. The collectivistic nature practiced in the community added unique value and sense of responsibility (Hofstede, 2011); while the resource scarcity and lack of involvement of local governance bodies added challenges when it comes to collective responsibility. However, voices of women were suppressed in most of the cases, which requires further attention. The strength to handle a local problem empowered the youth community where the youth community included male and female participants creating a great example for others.

Framing on Social Capital

The concept of social capital requires positioning relative to concepts such as sense of community and capacity building as suggested by Hawe et al. (2000). The terminology of social capital is relatively new in the social sciences as referred by Portes and Wall et al. (Portes, 1998; Wall et al., 1998). In terms of definition, Portes (1998) refers to it as "the ability to obtain them by virtue of membership in different social structures"*(p. 7)*. The definition talks about the membership as well as the value it adds to members through this connection (Hawe et al., 2000). The central driving force is based on trust between the members (Hawe et al., 2000; Portes, 1998). Portes further emphasizes the success of social capital based on its consequences – the kinship it allows among members. Social capital also has its limitations where the non-members might be excluded and individual freedom may get restricted (Hawe et al., 2000). As Hawe summarizes,

social capital has relational, material, and political aspects which may have positive and negative effects.

The research community has presented and analyzed social capital concept in various work that leverages on community centered values. Nic Bidwell (Bidwell, 2010) looked for Ubuntu in the network from African context where the role of social media network is explored. The researcher positioned the community apart from previously defined networked individualism of Castells (Castells, 2004) where the concept practiced in the study of interest is entirely based on being human for others as the word Ubuntu defines. Here, identity relates to ancestors and roots and sharing of collective responsibility (e.g., raising a child) is presented with pride. The study emphasizes on the villager's social media presence reflects their inherent values that share and express with lack of anonymity that reflects the core values practiced in the community. Our work relates to the community feeling while individual values are prioritized in many cases.

Jolynna Sinanan (Sinanan, 2008) discusses social capital in the Australian indigenous culture where the value of reciprocity is important through which one can pass the benefits received, forward, often through generations. A platform named Moola, designed to improve financial literacy is presented here that operates based on the concepts of social capital. Here community comes together in understanding the economic process. Prasetyo et al. (2020) discusses how entrepreneurship; and small business opportunities can be sustainable based on the concepts of social capital. Similarly, Douglas Kibirige (2008) explains the concept of community farming from developing considering the same underlying theme. This exploration relates to the concept here of collective efforts coming from the community, in this case, the social connectivity is used to collectively clean up the locality.

Almohamed and team (Almohamed et al., 2017; Almohamed et al., 2019), discuss rebuilding social capital in refugee and asylum seeker communities which could facilitate them to get access to resources such as healthcare, education, employment etc. The displacement impacting their existing connection, fragmented families required support in rebuilding social capital and the role of social network sites was observed here. In this study, we related to the network but used the communication platforms such as WhatsApp, Viber, Imo over traditional SNS platforms. The preference was based on the perception of elderly community members. Tawanna Dillahunt presents the concept of understanding sustainability referring to creating connections (Dillahunt, 2014). A higher-level collaboration can be based on harnessing the strength of social capital, as referred in the scholarly work. This study considers the engagement of general citizens into the design process which is complimentary concept to the proposed one.

This study is framed around social capital where the sense of community is strong considering the collectivistic social framing (Hofstede, 2011). However, the urbanization has created distances in collective problem solving and decision making as we have seen during the research work. Reinitiating the values based on social capital is expected to add value to the community.

Methodology

The methodology is discussed in following subsections.

Study Design

The study considered small localities with shared spaces among community members. The participants and interaction among participants are presented here.

Community: Community in the study consisted of families or individuals that shared a common space living in the same apartment (e.g., a colony for Government officials) or owning a shared property (e.g., a shared pond, backyard).

Community Youth Leaders: The project involved four community youth leaders – two males and two females, young adults all in the age range of 18 to 22. The community leaders were self-motivated to make positive changes by taking initiative in the waste management process. The researchers were in touch with the community leaders through shared drives and social media contact at the later phase of the work. The community leaders initiated the process of local-level problem solving as previously mentioned.

Community Members/Participants: There were fifteen different locations covered in the project and within each region. A total of sixty-three groups (e.g., families, individuals) were involved in the process. The fifteen regions involved 15 individuals and 55 families engaged in the process of cleaning up and garbage collection from primary sources, as can be seen in Figure 1. Among the community residents, more than 80% of the residents were male, who conducted the communication. The leaders were in touch with citizens through networks over mobile phones (e.g., WhatsApp, Viber). Fifteen shared regions, considered for cleaning up and garbage collection, are introduced here as G1 to G15. The initial set of groups to introduce are from urban shared spaces among individuals or families while others involved sharing among outdoor shared spaces as presented in Table 1 and few indoor and outdoor shared spaces are shared in Figure1 covering urban, rural and semi-urban regions.

Urban, suburban, rural regions before cleaning

Community cleaning up process

Rural Region *Rural Region* *Semi-Urban Region* *Urban Region*

After Waste Management Process

Figure 1: The waste management process

Participants group. Region. Time to do Waste Management.	**Description of Shared Spare. Challenges. Opportunities.**	**Was it Sustainable?**
Group 1 (G1): 4 individuals. Urban area. Took 3.5 hours.	Shared apartment. Challenges: Rented place, requiring permission of owners. Opportunities: Initiative was appreciated	Yes
Group 2 (G2): 8 families. Sub-urban area. Took 2 hours.	A canal links that Dhaka-Narayanganj-Demra. Challenges: Government property placed in the neighborhood. Opportunity: Army took over work.	Yes
Group 3 (G3): 3 families. Urban area. Took 5 hours	A shared apartment house. Challenges: Interaction challenges. Opportunities: Easy agreement.	No
Group 4 (G4): 4 families. Urban area. Took 5 hours.	Shared common space front of an apartment. Challenges: Interaction challenge, gender restrictions. Opportunities: Female leadership was present.	No
Group 5 (G5): 5 families. Rural area. Took 1 hours.	Cleaned a shared pond used by villagers. Challenges: Resource constraint. Gender restrictions. Opportunities: The financial burden was shared and minimal.	Yes
Group 6 (G6): 3 families. Sub-urban area. Took 1.5 hours.	Shared apartment. Challenges: Rented place, requires permission of owners. Opportunities: Easy agreement.	Yes
Group 7 (G7): 4 families. Sub-urban area. Took 1 hour.	Common space in a colony. Challenges: Property of local authorities. Gender restrictions. Opportunities: Support from authorities.	Yes

Group 8 (G8): 4 Individuals. Urban area. Took 1 hour.	Shared apartment space. Challenges: Rented place, requires permission of owners. Opportunities: Easy agreement.	Yes
Group 9(G9): 4 families. Sub-urban area. Took 3 hours.	A lake beside residence. Challenges: Government property. Opportunities: Youth volunteers joined	Yes
Group 10 (G10): 4 families. Sub-urban area. Took 2 hours.	A front yard of a building. Challenges: Gender based challenges. Opportunities: Easy agreement.	Yes
Group 11 (G11): 3 families. Urban area. Took 1 hour.	Cleaning after Eid ul Adha. Challenges: No challenges. Opportunities: Community appreciated the effort	No, needed external leadership
Group 12 (G12): 4 families. Urban area. Took 1.5 hours.	Cleaning after Eid ul Adha. Challenges: No challenges. Opportunities: Community appreciated the effort.	No needed external leadership
Group 13 (G13): 10 families. Urban area. Took 4 hours.	Shared staircase space of female residents. Challenges: Rented the place, requires permission of owners. Opportunities: Easy agreement. Female leadership.	Yes
Group 14 (G14): 7 Individuals. Sub-urban area. Took 3 hours.	A road and an open space besides a pond. Challenges: initial conversation was difficult. Opportunities: A politician joined	No
Group 15 (G15): 3 families. Rural area. Took 5 hours.	Cleaning of a shared pond. Challenges: Opinion from female members not considered. Opportunities: Shared financial burden & physical labor.	Yes

Table 1: Details of Participants and Shared Space

The Waste Management Process: The work initiated in hostel settings where graduate and undergraduate students share residences and require shared responsibility to clean up open spaces (e.g., staircases, common areas etc.) in urban areas. These spaces involved engagement with individuals sharing a particular apartment for shared engagement. The work continued in ponds that are shared across residents in rural areas and shared common spaces in rural or semi-urban regions. The same process was used to engage communities after the celebration of Eid ul Adha, a religious festival that requires slaughtering of a cattle. The shared spaces often remain unclean until the authority imposed forces arrive, which is limited in resources. The details of the community spaces are presented in Table 1.

Community Interaction: The community interaction involved interaction among community members along with youth leaders and member communication in physical spaces and virtually. The interaction is presented through a schematic presented below in Figure 2. The youth leaders were connected among themselves using social media platforms. The community members were from same physical region and had direct interaction among themselves. The youth leaders initially interacted with community members through physical interaction and continued the connection using internet based communication platforms such as WhatsApp, Imo etc. that are popularly used in Bangladesh.

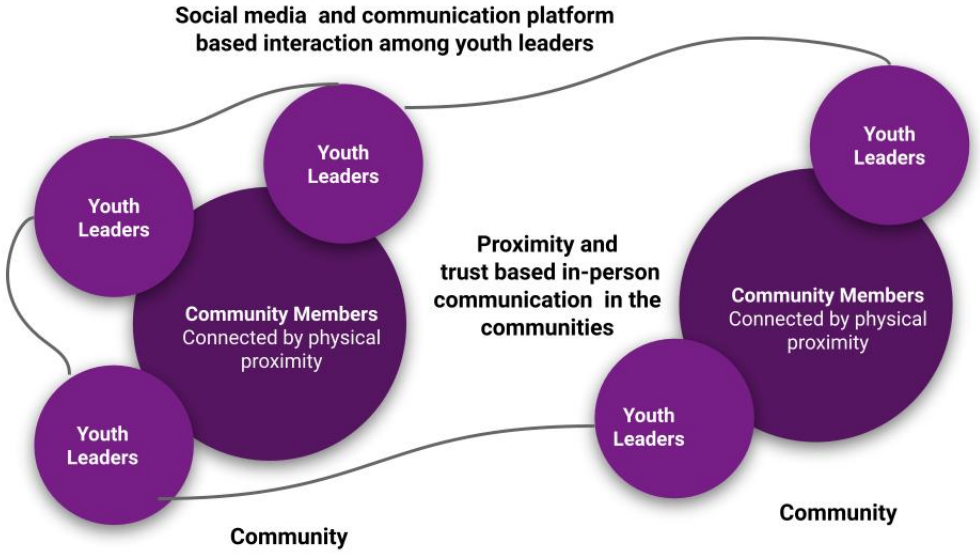

Figure 2: Community members and community youth leader interaction

Data Collection and Analysis

The research data collection took place through three different phases after which analysis took place.

Phase 1: This phase involved understanding the process of cleaning. The community youth leaders engaged in the initial conversation about cleaning and observed the process taking notes, voice recordings and photographs with the permission of participant cleaners (there were two locations were participants did not agree to take photos and one location where participants were not comfortable about voice recording). The youth leaders later wrote down their own observations and experiences and shared it with the research team.

Phase II: This study involved focus group discussion with community youth leaders. The researchers engaged with the community youth leaders – the first focus group discussion took place after the first five cleaning sessions took place and the second one was done after the entire 15 locations were cleaned up. The interviews took more than one and half an hour followed by dinner at a place agreed upon by all the youth leaders.

Phase III: This involved a final focus group discussion with youth leaders to know about continuation and sustainability of the process at the end of a one and half year time frame. This discussion took more than two hours where the entire process was reviewed again along with the discussion around sustainability of the cleaning process.

The discussion conducted in native language and then we transcribed into English. We have used an inductive content analysis method to identify key responses from notes reported by community leaders and follow up interviews (Braun, 2006). First author coded all the transcripts in the inductive analysis phase. The last author analyzed the codebook analysis

through this phase. Finally, we followed a thematic analysis of the initial codebook to formalize the findings (Elo et al., 2008).

Moderation, Incentive, and Ethics

Community leaders initiated the work from their interests and were not paid. The cleaners were paid by collaborative process where citizens of shared spaces distributed the cost. There was food arranged for youth leaders, followed by the focus group discussions. This research work was approved by the institutional review process. The youth of various communities discussed the engagement process with local communities and were able to disengage from the work if they wanted.

Findings

The findings present the engagement and empowering leadership of youth and the gender role is presented that affects the waste management process. It is followed by the existing challenges and opportunities to sustain the waste management activity in the future.

Youth-driven Engagement and Empowerment

This research work has shown an increase in community engagement around the waste management process. The escalation of engagement here is notable as there is a recent decline in community engagement due to urbanization when individuals lack time for collaborative (de la Peña McCook, 2000). The youth leadership was effective for their straight forward vision in solving a community problem. On top of that, the technology proficiency of youth leaders added positive value to the elderly community members.

This study showed how technology adopted in a community can influence the existing power dynamics, particularly in regions where strict hierarchical relationships are maintained based on age and gender. The community engagement process was initiated by young male and female young adults engaging in conversations with older community members. The leadership towards problem solving and the technology involvement of the young leaders allowed communication, decision making beyond the society defined hierarchy in few cases. It relates to existing observations by Harris (2007) as "*Traditional communities have hierarchical social structures, but the modernizing influences of global media, universal education, individual economic power and democracy mean that subordinate groups, which include women and youth, are striving for greater representation of their views in the nation's development" (p. 30).* The local problems that were ignored for a long time were owned by the local community after the waste management process initiated. The youth leaders mentioned a particular case of cleaning up of a pond that was shared among several community members in one of the rural sites. The pond was dirty and could be a source of infectious diseases. The youth-initiated conversation allowed the community members to realize their collective strengths when the responsibilities were shared. Engagement of female members added additional values towards empowerment which we discuss in following subsection. The feelings of empowerment were visible among the youth leaders as well. The leaders supported the community members with technology learning

and engagement. Many of the community members later engaged in technology enabled discussion after their initial hesitations. The trust from older community members provided confidence to the youth leaders as they shared their feelings as, "*it felt great*", "*I felt valued*" etc. Many of the senior community participants realized the collective strength of technology.

The fluent communication worked for the waste management teamwork beyond the technology platform usage. The youth leaders were able to break traditional hierarchy of seeking support from governmental or nongovernmental authorities. They were able to seek support from local youth volunteers as well as senior volunteers who had political affiliation and authority. For example, a local politician joined and engaged others in the process in a semi urban region. The youth leaders' effort was appreciated by a senior community member as: "*We wanted to do something good for this community - you leaders (community youth leaders) made the process easy."* Male, Volunteer, Urban region, Phase I. The continuation of the communication showed the trust of the community participants over simple connection. One of the community youth shared the following experience:

> *"That uncle was skeptical about me and our work, although we were related to another family of this community. After the place was clean, he was really happy. His entire attitude changed. It felt like he valued me." - Community youth leader, Male, Urban region, Phase II.*

Majority of the community members joined the initiatives and appreciated the effort of youth leaders.

Impact of Gendered Role in Community

The study findings showed gendered societal barriers that hampered sharing of opinion. The voice of women was not prominent in certain regions during the study. In one certain case, a female community member shared her interest to get the common space clean considering wellbeing of her own family, but still she did not have the authority to make the decision to contribute in waste management. In a suburban region, the voice of women was not appreciated or acknowledged by the other male community members. It was shared by a community leader as follows:

> *"She wanted to say something but her husband stopped her. He said he would handle the conversation." - Community youth leader, Female, Urban region, Phase II.*

There was an incident where a female participant shared her inability to make decisions although she wished for a clean space:

> *"Sorry, I cannot pay any amount for the cleanup. It is up to him (husband) to decide and he is not at home. I wish the place was clean since I am the one who face the consequences since I am staying home." Female, Rural region, Phase I.*

A female community youth leader shared how she faced some negative and rude behavior in a suburban region when she was involved in contacting cleaning personnel. She continued the discussion without showing her feelings as she discussed during Phase II and later was able to get the support with the help from local community people. The young researcher explained her experience by sharing:

> "*Probably they did not think I was serious about it (cleaning)." Community youth leader, Female, Urban region, Phase II.*

However, there were cases when the presence and voice of female participants added positive value in the study. The involvement of female leaders in the team allowed more voices from female members of households as shared by a community leader:

> *"The landlord was not interested to clean up the staircase area. When we explained about mosquitoes, health and looks of the area – his wife joined the conversation in positive tone. We supported her and she supported us. At the end, the landlord agreed and allowed us to continue the work." Female, Urban region, Family sharing a shared space, Phase I.*

Sharing voices and opinions enabled a level of empowerment through decision making, particularly including the voices of women to the female youth leaders as shared during Phase II of the interview session. There were few conversations where the female household members had a private discussion with the community leaders. Gendered observation came out by the female youth leaders as they have experienced some resistance during the cleaning process as shared in the next subsection.

Challenges impacting Community Empowerment

The challenges revolved around lack of exposure to youth driven initiatives, resource limitations and concerns around trust among youth leaders and community members.

Lack of exposure to youth leadership: The participants shared about initial difficulties considering the existing generational gap where seniors and juniors can have an open conversation. The youth leaders shared a major challenge regarding initiating conversations to discuss the waste management activity. Several groups such as G3, G4 and G14 from mostly regions showed initial interaction challenges while G5, G10 and G15 from rural and suburban regions showed gendered challenges (as can be seen in Table 1). Several youth leaders struggled to initiate the waste management conversation while there was disrespect shown to female youth leaders. For example, there was a conversation where a female youth leader felt her ability was questioned. Moreover, there were community members who did not engage at all. The process was emotionally difficult and humiliating in few cases as the youth leaders shared: "*In one case, a community member shut down the door on my face."* The youth leaders referred to the cases based on lack of exposure to youth driven initiative that is gender neutral. Also, there were cases where the community members did not engage at all in the waste management process, shared as follows:

"Two of the families among eight, did not even want to talk to us, they did not open their doors." - Youth leader, Female, Urban region, Phase II.

However, there were other community participants who were interested in the process of waste management led by others. There were few members who were concerned about making the associated arrangements and organizations. Some community members agreed to continue, provided others from the same community were involved with good leadership. There were interests in joint waste management process among citizens once the process is streamlined as we have found from our studies. A participant shared the views as:

"I agree but not sure if others would. But if you can convince them, I will help". Male, Family shared space, Urban region, Phase I.

It clearly showed that some participants wished for leadership initiatives while a few were not ready to accept the initiatives of youth leaders to address waste management process.

Economic Challenges: The youth leaders shared another major barrier around taking economic responsibility. The waste management required shared responsibility in terms of payment of the cleaners along with other associated costs. The economic challenges were more evident in the rural communities. They were eager to join the cleaning process positively using their labor instead of monetary promises. For example, a rural community engaged in cleaning their nearby pond rather than paying for it. One of the participants explained his limitations to the youth leaders sincerely as:

"Look, son, I am a middle class, middle income person. I cannot think about moral issues. Cost of living is increasing every day. I will not pay for it." Male, Family shared space, Rural region, Phase I.

This showed the resource limitations as a major barrier for implementation of community engaged projects.

Trust Issues: The youth leaders shared about skepticism about the intention behind the waste management process itself coming from a few community members. There were assumptions about the spontaneous response of political persons whether their engagements have any other motive in it or not. This participation was viewed with anticipation of possible future political campaign described by a community leader:

"Once he collected fund for managing waste: He would probably try out for election next year. Male, Roadside shared space." Sub Urban region, Phase I

The lack of trust was also about taking responsibilities. For example, some community members were concerned about the responsibility of authorities (e.g., local governance or the Government) in the waste management of public places showing resistance towards taking shared responsibility. They were concerned that the authority may not take the responsibility if the problem is locally solved by community members. A member mentioned the following as he later agreed to contribute to the process with others:

"Why should we think about this problem? It is the Government's responsibility". Male, Family shared space, Sub Urban region, Phase I.

This showed difficulties in interaction among youth, community members and governing bodies created mistrust hampering collaboration.

Possibility towards Sustainable Contribution

The study showed continuing waste management initiatives during a follow up study where most of the communities participated. Only three groups did not continue the process as presented in Table 1. The youth leaders created a communication channel with local citizens over WhatsApp, Viber or Imo as preferred by the senior members of the communities which worked as a vehicle of continuous communication and sharing of activities. The community members shared mostly photos or short description of their continuing progress. The continuous sharing of activities increased the interaction among the members and youth leaders. The youth leaders mentioned about sharing their appreciation towards the ongoing work using the platforms. The interactions were often beyond the waste management process, continuing social interactions and sharing of events. Moreover, there were evidences of increased awareness and facilitation to ensure better waste management through the interactions. For example, a community participant asked the youth leaders to continue their work to engage in waste management leadership as follows:

"The area is really clean now. Will you please manage the process? We are willing to pay the money". Male, Landowner, Phase I.

A youth leader shared the experience and the intention for it to continue it as follows*:*

"The families enjoyed the clean space in front of the colony and appreciated our effort. They contacted the cleaner to continue the work on regular basis. Uncle said, he wished he had thought about this earlier." Community youth Leader, Female, Phase II.

The local community engaged in the process of waste management where the youth leaders required higher level support from senior members. There was a requirement for a permission to cleanup a particular area near a riverbank and one of the community members extended the support to the youth leaders. The paper-works and formal permission from the authority is often time consuming as shared by the youth leaders sharing their experience as follows:

"Local authority required a meeting to take place before granting cleaning permission. It took only 10 days to get the permission (with the help from community member) for lake clean up in a lake area". Community youth Leader, Male, Phase II.

Engagement of the local authority was frequent in the semi urban and rural regions while it was missing from urban regions as we have seen in this study. One of the local authority enjoyed the process of being involved with the community cleaning process. Voice of authority was shared as follows: *"I enjoyed the task and also it gives me a mental satisfaction that I am*

doing something for the Welfare of my society." Male, Authority, Suburban region, Phase I. A lake side region was handled by the Army and is well maintained by the authority. Similarly, a politician's engagement has engaged authority led cleaning up in another location. There have been collaborative efforts in eleven different areas with presence of trash cans, community awareness and shared responsibilities among citizens without the direct intervention of youth leaders.

Discussion

This research shows youth driven community engagement; the engagement that is a baseline requirement of social capital (Harris, 2007). Community based activities around an important social problem of waste management added values to the community members. There was a sense of ownership of the problem, once the community members were able to focus on the solution.

This work involving the community that engaged youth, local community and in few cases authorities, it eventually incorporated values discussed in social capital based frameworks where the strength of the work lies on the network a community holds (Hawe, 2000; Portes, 1998; Wall et al., 1998). It has shown a kinship across the senior and junior members that was based on kinship and trust. The elderly members were relieved to see how the youth engaged in problem solving and appreciated their work; this appreciation on the other hand, has created confidence among the younger members. The social capital is expected to sustain only when the outcome is positive which we have seen through the waste management process. The activities of female youth leaders are examples for other community members. There were cases where female community members shared their informal desires of waste management to female leaders. In few cases, the youth leaders conveyed the messages in their combined discussions. There were female leadership among the community members who have supported the initiatives of the youth leaders. The incidents were shared with enthusiasm to the researchers showing long term impact on the minds of the youth. Moreover, the female youth leaders along with male ones actively supported the community members with technology platforms. The community members greatly appreciated the technology engagement related support. Existing research has shown how technology leadership increases social values for women in Bangladesh (Biswas et al., 2022).

The empowerment through community providers refers to the social capital framework where the communities gain values through the support network. According to Portes (1998), "*To possess social capital, a person must be related to others, and it is those others, not himself, who are the actual source of his or her advantage*" (p. 9). This research work has shown how the members of communities were empowered, particularly, the youth leaders. Technology played an important role for the youth leadership and valuation process. The young adults, taking the lead in the problem-solving, were inspired to be able to initiate positive changes. The communication between the community members and youth leaders continued through popular internet based communication platforms such as Imo, WhatsApp etc. The communication over the social media platforms were preferred by the younger groups who could leverage on the

internet availability in their hostels and campus. Many of the community participants were eager to stay in touch with the young group and this platform allowed asynchronous communication at their convenience. The young leaders shared their preferences of existing platform where they can easily share text and photos. The young group shared about their group interaction using social media. In low resource regions on global south, we have seen examples of community initiated healthcare, finance and technology support approaches (Kilby, 2004; Chowdhury, 2018; Johns, 2016; Sakil, 2018). Bangladesh having a majority of youth population (Sakil, 2018), requires the positive engagement of youth. The generational communication gap appeared as a challenge when the youth leads approached community members which later turned out to be spontaneous and respectful in both directions (youth to senior community members and vice versa).

However, there were community members who were not empowered as the study illustrated. The voices of women were not considered seriously although many of the consequences are faced mainly by them. As the community-based waste management process involved cost, the male community members were in charge of the deciding whether or not to participate in it. There were cases where the voices of female members were not reflected in the collective decision making. Existing studies show evidence of poor decision making authorities of women in this region (Jahan, 2008; Sambasivan et al., 2018; Sambasivan et al., 2019). While our study unveiled the empowered youth-based community, it also showed the powerlessness of few women in their corresponding houses. There is emerging need to incorporate the missing voices and decision making in the problem-solving process. Harris (Harris, 2007) explains it as *"But to harness the full potential of ICT, it is imperative that communities, including the most marginalised, have meaningful engagement with the relevant technology to be able to effectively express their needs and aspirations."*. Technology proficiency and its leadership is an enabler for social respect for women as recent studies have shown in the same regional context (Biswas et al., 2022). This research shows the importance of ensuring gender-based empowerment – a process requiring awareness and support from various stakeholders of the local community as well as the national level agenda.

The communities have embraced the waste management process as it added value and technology as a vehicle that continued to inspire community members through sharing their ongoing activities. In low-resource regions with weak governance, the collective strength and problem solving attitude can be a resource to mitigate the challenges. This study has shown continuation of the community based activities which shows promises towards possible broader initiative in future. The inclusion of voices of women and minority communities and utilization of existing technology availability (e.g., mobile phones) can be an enabler towards sustainable problem solving process.

Conclusion

This study has considered a one and half year long process, where young community leaders worked on waste management in various communities. It covered fifteen different rural and urban locations engaging over fifty five families and fifteen individuals using technology as a

platform. There has been a greater level of awareness and community engagement in various regions which was shown as the waste management process continued in majority of the regions (ten out of fifteen sites) as explored in follow up studies. The work showed how collective effort from communities can lead in local problem solving. Moreover, the continuation of the work among the groups showed a sustainable ongoing communication mechanism which can be of interest for resource constrained communities.

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