Civic Media Practice Facilitating Democratic Process in Two Environmental Community-Engaged Research in Taiwan

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Abstract

Environmental protection is an increasing concern across Taiwan. Facebook and LINE enjoy high penetration in Taiwan, are potential platforms for democratizing the research process. Citizens participate in evaluating their environment, contributing to its protection as well as having voice in decision making in the environment community-engaged research (eCEnR) than ever before. However, along with increased citizen engagement, researchers also see a decreased trust in institutions, including government, media, and news. Based on in-depth interviews with organizers and participants, the analysis of posts on Facebook group, LINE messages, and websites of two ongoing eCEnRs, we assessed the impact of civic media practice on the democratic process. This article analyzes how social networking sites or applications function in four activities of the democratic process. Network building, discussion forums, distributed ownership and persistent input help organizations overcome distrust of institutions and enhance civic media's ability to foster connections and create more usable interfaces between communities and institutions.

Keywords: Facebook, LINE, disaster-response communities, social network sites

Theoretical background

Civic media and related concepts

We live in a digital world with popular technologies such as instant messaging, video sharing, photo sharing, social network sites, podcasting and blogging. With them, we connect with friends, conduct business, study online, entertainment, and much besides. Cellphones not only make calls, but also access the Internet, create photos and videos, and share them across social network sites/apps. Social network sites (SNS) emerged as websites where users construct a public or semi-public profile with a list of other users whom they connect and interact within the systems (Boyd, 2008,). Many SNS are part of daily life, such as Facebook, LinkedIn, Twitter, Myspace, YouTube, Flickr and others (Noor & Hendricks, 2012). Social network apps (SNA) are applications for mobile devices, or website apps, accessible to personal computers, like Whatsapp, Wechat, LINE, etc. Interestingly, many SNA are integral components of SNS to strengthen the site's flexibility and user-friendliness. Messenger, for example, is a popular Facebook app. SNS/SNA have been changing the way we communicate, collaborate, share and learn with our friends, family, peers and communities, even in different times and locations. They also enable researchers to engage communities of concerned citizens.

With complex technological projects, besides SNS/A, organizers use web-based APPs which are programs accessed over a network connection, rather than a device's memory. Technologies, designs and practices that produce and reproduce a sense of working toward common goods are known as civic media. According to Jenkins (2007) civic media is any medium which fosters or enhances civic engagement and as a bridge connecting community members and make them enable to strive together for common goods, thereby facilitate the democratic process (Gordon & Mihailidis, 2016). This characteristic is a main distinction from civic technology, or technology that solves a specific civic or organizational problem and emphasizing mainly on solving that civic or organization problem. Whereas the core value of civic media is for common goods. The community, by civic media practice, evaluates not only the immediate results that solve a problem but also how the project advances the common good. This means how the project connected people and helped them to maintain, repair and improve its work over the long term (Gordon & Mihailidis, 2016). Therefore, practitioners must balance technological and organizational values, create and use civic media in negotiating power and benefits of stakeholders.

Democratic Process and Community-Engaged Research

Definitions of democracy vary, but simply put, democracy is "a system in which the government is accountable to the people, who each have roughly equal say" (Gordon & Mihailidis, 2016, p.30). In a democracy, the people have a free and informed discussion of public issues. This requires at a minimum, freedom of speech. In digital age, according to Gilman (2017), for democracy to survive, it requires civic engagement that emphasizes the role of civic media/civic technology in enhancing the democratic process—the way we make democracy happen. However, experience has shown that along with increased citizen engagement in many aspects of life, there is a decreased trust in institutions, including government, media and news (Gordon & Mugar, 2018). Therefore, it is necessary to understand if innovative civic media can counteract this tendency. Emphasis on the role of media builds on scholarship in communications and media studies that examines communication patterns and the role of media in democracies (Goldberg, 2010; Dahlgren, 2009; Levine, 2014).

In community engaged research (CEnR), researchers and citizens share mutual benefits of "a collaborative process between the researcher and community partner that creates and disseminates knowledge and creative expression with the goal of contributing to the academic discipline and strengthening the well-being of the community" (George, 2014, p.3). Citizens are empowered to participate, contribute, and make decisions thereby helping to ensure that the research's results are directly beneficial for the community. In other words, CEnR helps to strengthen the democratic process by helping citizens have roughly equal voice in community. Normally, the concerned problems of countries around the world are various with common issues like over/under population, environmental pollution and lost biodiversity, global warming, terrorism (Friedman, 2008). In Taiwan, those issues get into details with many social movements related to human rights, economic policies, public health, environment and so on (Hsiao, 2011).

The environment is an increasing concern to most Taiwanese citizens, and it is increasing as the quality of environment decreases. Engaging in environment projects is one way to facilitate the democratic process, in which citizens can participate in evaluating their environment, and contribute to its protection, as well as having voice in decision-making. Therefore, environment is one of the topics attracting the attention of CEnR. Environment is the totality of surrounding conditions in which a person, animal, or plant lives or operates; it comprises natural resources and natural process. Economic development and constant population increase lead to the overuse of environment. Therefore, research of environment and environmental issues need to be community based, because from the community, scientists will discover existing problems, the causes and effects, and the ways to overcome negative effects. Using technology would create more diverse and more effective approaches to the community. ‘‘It is not a new field by any means, but there is definitely new found energy’’ (Attygalle, 2015, p. 39). In many CEnR projects, researchers use various means to approach, cooperate and collaborate with community through games, speculative design, or digital storytelling, etc. Especially the development of SNS/SNA has made and developed effectively online community engagement.

However, increased using of digital tools brings not only opportunities but also challenges to citizen engagement processes. When researchers do not know/listen to their audience - the community and abuse of technology in CEnR; it is very likely to lead to asymmetry in power, interests and expertise knowledge of both researchers, organizers and communities (Gordon & Murga, 2018). Mismanaged technology in CenR can create conflicts between community members and their expectations and benefits, which makes it hard to reach the consensus in decision-making (Attygalle, 2015). Furthermore, improved access to information may reduce knowledge differences observed between researchers and the community, which can work against the co-learning process. Using civic media also arouses the anxiety of lacking physical co-presence in community, when people coordinate in Facebook instead of face-to-face (Gordon & Mihailidis, 2016). People no longer need to convene together to vote for a decision when they can use Facebook to make a poll, they also do not need to gather to have a march for university policy changing when they can collect signatures of students by online petitions. Those can impede caring each other and real connection for the long-term benefits and even increase irresponsibility because of its anonymity of virtual connections (Gordon & Mihailidis, 2016). Therefore, this research seeks to answer the question, how does civic media facilitate the democratic process in eCEnR in Taiwan? Knowing this can help organizations enhance engagement with community. In this way, communities can trust in organizers and create more connections between previously separate communities and institutions.

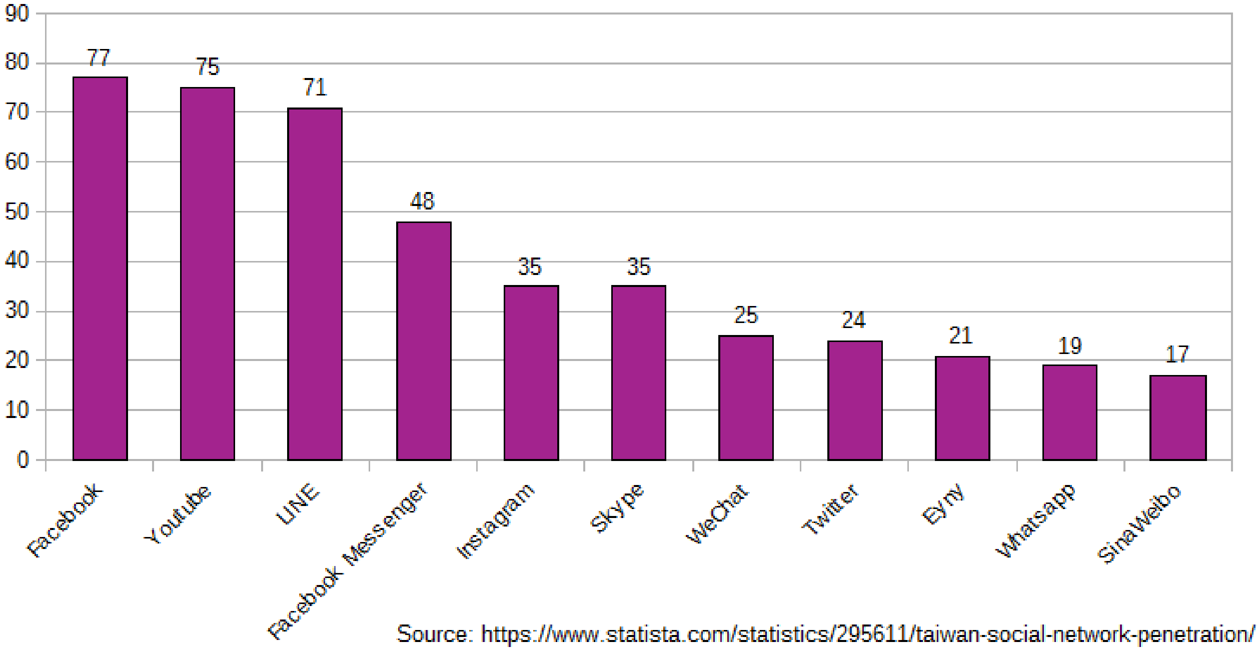
Background of Taiwan

Democratic Process and Civic Media in Taiwan

Taiwan is a democratic republic state. According to Hsiao (2011), since 1980, this country has witnessed about 20 social movements in diverse fields. Recently, there are two notable social movements namely Anti-Media Monopoly Movement (2012–2013, 反媒體壟斷運動) and the

Sunflower Movement (18 March–10 April 2014, 太陽花學運). The movements have taken place in various aspects from economy, human rights to environment with the effective support of information and communications technologies (ICTs) (Chuang, 2004; Hsiao, 2011). According to National Communication Commission (NCC)'s Report in 2016, the percentage of people using cell phones in Taiwan is higher than one hundred percent (NCC, 2016). Although we cannot assume that every single person has a cellphone, it seems many people have more than one. People can easily access to Internet by free Wi-Fi in public places like an MRT station, on buses, at convenience stores, and other places. Among the most-used technology devices, smartphones and their features seem to be exploited as much as possible to connect to vulnerable communities and nature lovers to collect, update and process information. With so many using telecommunication services, great potential exists for citizens to communicate, collaborate, share and learn in environmental community-engaged projects.

Taiwan ranks 8th in the world for Internet penetration. Seventy-two percent of Taiwanese people use the Internet (Digital in 2017: Global Overview). Taiwan is also open to social network sites/apps, with the wide usage of social networks like Facebook, YouTube, and LINE (Figure 1), which create a favorable digital platform for information exchange and the engagement of citizen in governmental/non-governmental projects.



Source: https://www.statista.com/statistics/295611/taiwan-social-network-penetration/

Figure 1. Penetration of leading social networks sites in Taiwan as of 3rd quarter 2017 (unit: percentage) (Digital in 2017: Global Overview).

The State of Community-Engaged Research in Taiwan

After the lifting of Martial law in 1987 in Taiwan, civil society regained freedom of association, which allowed the development of community engaged research in Taiwan. In 1994, the Council of Cultural Affairs Executive Yuan launched a "Comprehensive Community Development" policy. The idea of "community" started to spread to every corner in Taiwan (Chen, 2018). For example, for the Council of Agriculture's Forestry Bureau, Executive Yuan turned this idea into a new policy of community forest management (Forest Bureau, 2002).

Under this trend, newly established community colleges provided more opportunities for academic institutions to build community partnerships. For example, the National Taiwan Normal University's Department of Adult & Continuing Education, started their ongoing partnership with Wanhua Community College in 2008 (Hsu, 2015). Since 2007, the Ministry of Education has promoted several pilot projects.

In 2017, these projects merged into a "University Social Responsibility Project". The Ministry of Science and Technology started the Humanity Innovation and Social Practice project in 2012. Both projects seek to encourage universities to work with local societies on local issues (Chen, 2018). Since then, CenR in Taiwan has spread into many different fields, including nursing (Yeh, 2010), natural resource management (Chang, 2005), rural development (Chung, 2018; Hsiao, 2018), disaster resilience, and environmental monitoring.

Environmental Community-Engaged Research

In Taiwan, in many different fields, including: ecology, astronomy and meteorology have applied eCEnR. ECEnRs inform many citizen-science projects that conduct large-scale standardized data collection to raise public awareness and knowledge of specific environmental issues. Most often, governments, academic institutions, or NGOs initiate projects. (Dali, 2018). Some are part of international efforts, such as eBirds (https://ebird.org/taiwan/home). Taiwanese team (Appendix I) initiates many more, beginning with the Taiwan Amphibian Database in 2003, led by Prof. Yang Yi-Ju of National Dong Hwa University. Similar projects targeting different species developed from this project. Here we examine the most famous citizen science project in Taiwan - Taiwan Roadkill Observation Network (Hsu et al., 2018).

Apart from the citizen-science projects listed above, thousands of community projects emerged in the last 20 years related to disaster mitigation. As Taiwan frequently suffers from typhoons, floods and landslides, the government launched programs to help local people build disaster resistant communities. For example, the Soil and Water Conservation Bureau helps communities, at high-risk for landslides build a resilient community, while the Water Resource Agency helps communities with high flood potential. With eCEnRs, technology such as geographic information systems (GIS), or closed circuit television (CCTV) also contribute to the research. Citizen media, with its capacity for real-time updates, improves Taiwan's rapid response to various combined disasters.

For this study, we chose projects having certain criteria. First of all, it is community-engaged research which: (a) is for public good; (b) responds to community identified need; (c) involves collaboration of community members, academic researchers and students; (d) is an environment project deployed in Taiwan; and (e) applies at least one social network site/app. Therefore, we selected two Taiwanese eCEnRs, one Citizen Science Project and one Disaster Risk Reduction project, to see how civic media enables community members and researchers to collaborate and disseminate knowledge together for the academic goal and the community's common good.

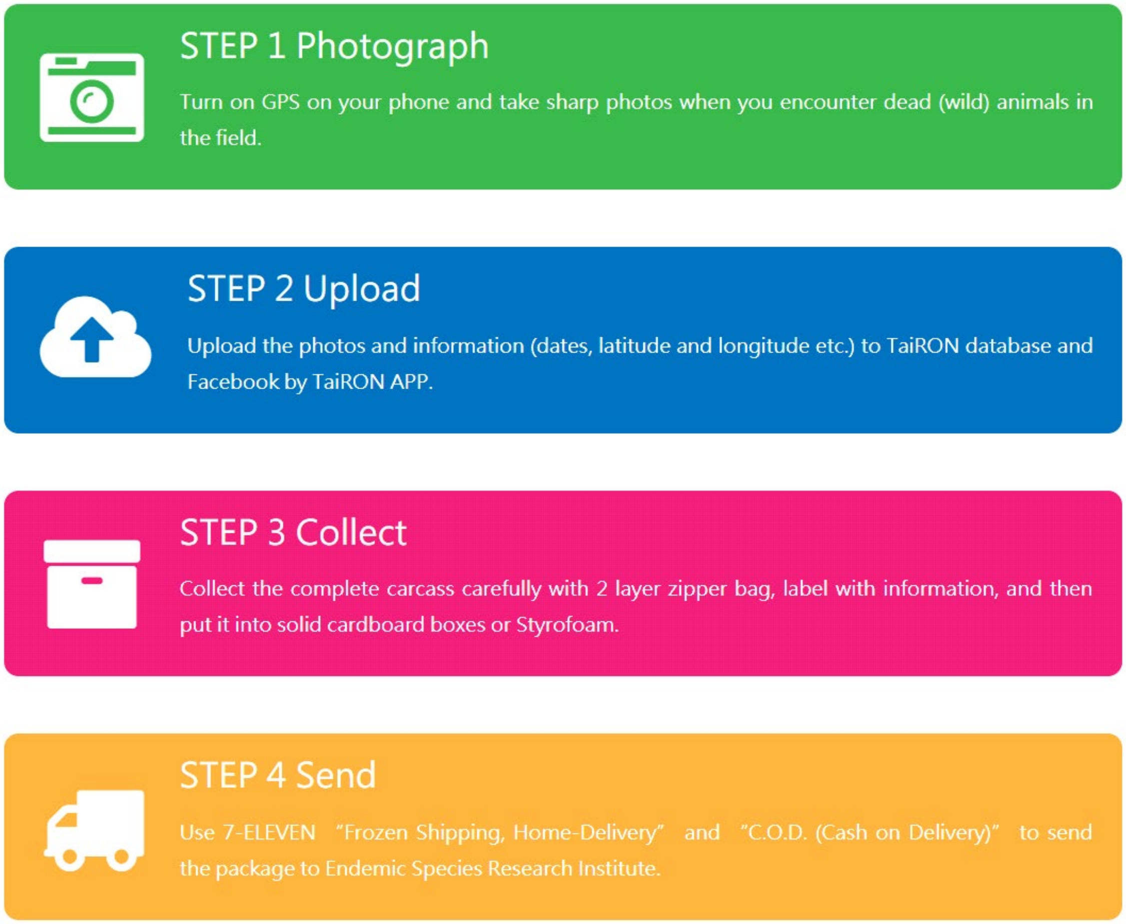
Research Social Networking Sites/Apps and Two Selected eCEnR Cases

Like all SNS/A, Facebook (FB) and LINE blur the line between personal and professional. They share many same functions to build up a platform for social connection, discussion, collaboration, and other civil engagement activities. Both offer private and group messages, news feeds, timeline posts, status updates, demographic data, polls and surveys, likes, dislikes, shares and other reactions, comments and discussions, notification, photos & videos, hash-tagging support and mood faces (Foulk, 2018 & Russel, 2016). Most importantly, useful and easy interfaces make both FB and LINE popular with thousands of social media users.

FB has some features that LINE does not, such as friends' recommendations, livestream, add friends by name or email address, or posting on a friend's homepage (Noor & Hendricks, 2012). On the other hand, LINE is much more convenient for adding friends by ID, QR codes, shake it, or cellphone numbers. Faster connections and photo sharing makes LINE a common tool for working group communication. LINE is also a critical tool in Taiwan's disaster prevention for message spreading, emergent contacting, and information collecting. In March of 2018, the National Science and Technology Center for Disaster Reduction (NCDR), Taiwan's authority for disaster prevention and management research, announced a new collaboration with LINE's Taiwan branch. (NCDR, 2018) They released a new official APP LINE account for Taiwan's emergency information, available to all LINE users. We chose two typical cases that use social network sites/apps for their eCEnR. One case bases its research on FB. The other uses Line for its research.

Case 1: Facebook and Roadkill Reporting Back Web APP in Citizen Science Project

Taiwan Roadkill Observation Network (TaiRON) is a citizen science project launched by Taiwan's Endemic Species Research Institute (ESRI). This project started from a FB group created in 2011 August, not originally intended for a well-planned citizen-science project. Using FB's functions, the group members helped ESRI's researchers gradually form their research goal, build an operating website, information-collection procedures, and so on (TaiRON Official Website, 2018 June 26). Community members connect their FB account with the Roadkill Reporting Back Web APP, using their smart phone, following the four steps to collect data and send it to ESRI (Figure 2). The Web APP links to the FB group. Once a community member sends a datum on the Web APP, it is instantly shared with the FB group, so that a researcher can instantly check the data with the community member. According to Dali Lin's in “Directory of Taiwan Citizen Science Communities” (Dali Lin, 2018), TaiRON is one of the earliest citizen science projects using a Facebook group to collect its research data. It has become the biggest FB-based citizen science project in Taiwan, with more than 14,000 group members and more than 100,000 data points collected. After TaiRON, many new FB-based Citizen Science projects emerged, aiming to follow its operational model. Therefore, we suppose that TaiRON is a suitable case for our study on an eCEnR relying on FB.



STEP 1 Photograph

Turn on GPS on your phone and take sharp photos when you encounter dead (wild) animals in the field.

STEP 2 Upload

Upload the photos and information (dates, latitude and longitude etc.) to TaiRON database and Facebook by TaiRON APP.

STEP 3 Collect

Collect the complete carcass carefully with 2 layer zipper bag, label with information, and then put it into solid cardboard boxes or Styrofoam.

STEP 4 Send

Use 7-ELEVEN “Frozen Shipping, Home-Delivery” and “C.O.D. (Cash on Delivery)” to send the package to Endemic Species Research Institute.

Figure 2. Participating Steps for TaiRON Community Members to Follow. Source: TaiRON Official Website (https://roadkill.tw)

Case 2: LINE and Tainan Water In-Situ Mobile APP in a Disaster Resistant Community (DRC)

As one of the Water Resource Agency promotion in the flooding Disaster Resistant Community projects to the high-flooding-potential villages all around Taiwan, Xin-Jia, located in Tainan county, is emerging as one of the most successful cases. Xin-Jia DRC project has won the premium for 3 years in the competition of flood resistant communities and their flood-mitigation skills are very mature.

As other DRC projects, the Xin-Jia assistance team from National Cheng Kung University Disaster Prevention Research Center contacted the community. The team helped community members to set up a disaster-response community team. The team provided training in recording and reporting rainfall and real-time disaster information to researchers. Local volunteers found using LINE groups to inform, connect, and cooperate made emergency response faster and more flexible. As with other DRC projects, competent authorities or local governments designed some APPs for disaster prevention, for example, Tainan Water Situ APP, or Landslide Disaster Prevention APP. These APPs use instant messaging to inform local residents. Other APPs enable DRC volunteers to report back on an evolving situation. However, unlike the Roadkill case, Tainan Water Situ APP works independently from social networking sites/apps.

Stakeholders and the role of scientists in eCenR of two case studies

To clarify the stakeholders in these two cases, we analyzed the stakeholder map for each case (Figure 3 and Figure 4). In both cases, stakeholders cluster into four groups: Researchers and/or Organizers; Community members; Governments and/or Authorities; Students/Volunteers.

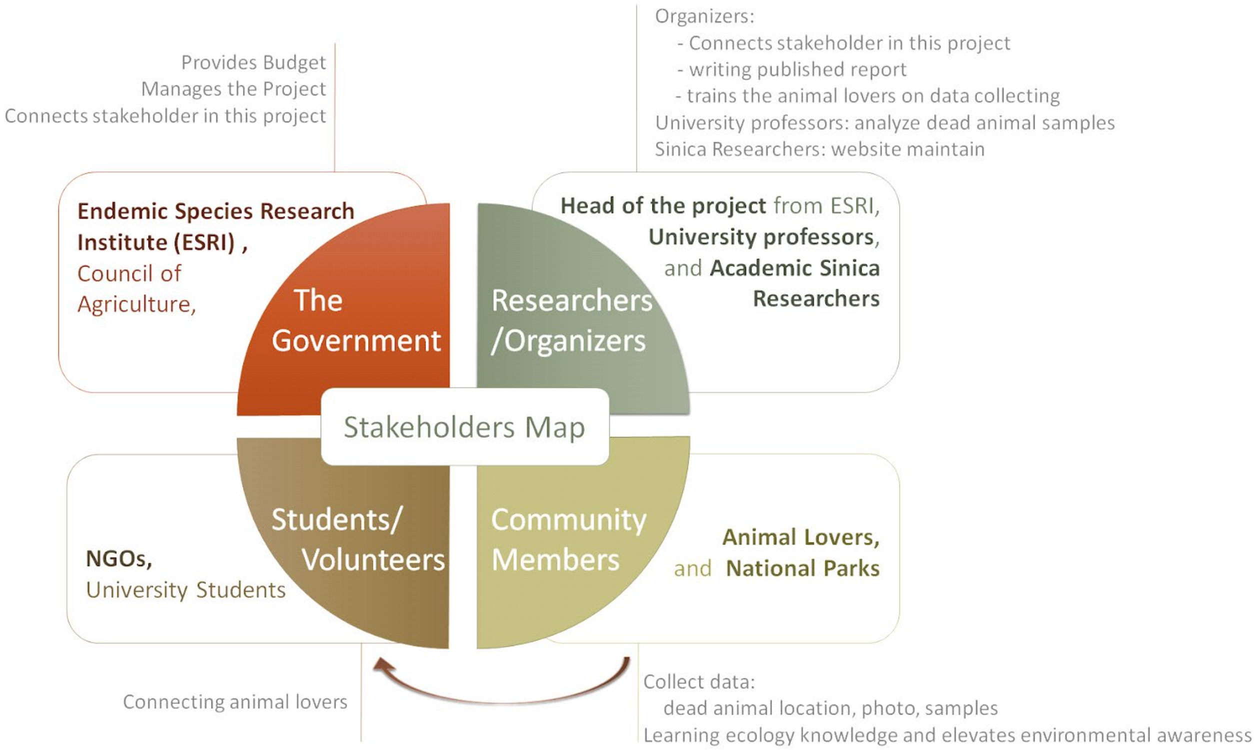

Provides Budget
Manages the Project
Connects stakeholder in this project
Organizers:
- Connects stakeholder in this project
- writing published report
- trains the animal lovers on data collecting
University professors: analyze dead animal samples
Sinica Researchers: website maintain
Endemic Species Research Institute (ESRI) , Council of Agriculture,
The Government
Researchers /Organizers
Head of the project from ESRI, University professors, and Academic Sinica Researchers
Stakeholders Map
Students/ Volunteers
Community Members
NGOs, University Students
Animal Lovers, and National Parks
Connecting animal lovers
Collect data:
dead animal location, photo, samples
Learning ecology knowledge and elevates environmental awareness

Figure 3. Stakeholder Map in Case 1 - Taiwan Roadkill Observation Network

In DRC community case, the researchers and the organizer is the assistant team from National Cheng Kung University Disaster Prevention Research Center. The community members are the villagers in Xin-Jia village, including the community leader. The volunteers are the flood volunteer team in the village. The authorities include the Water Resource Agency and local district office (Figure 4).

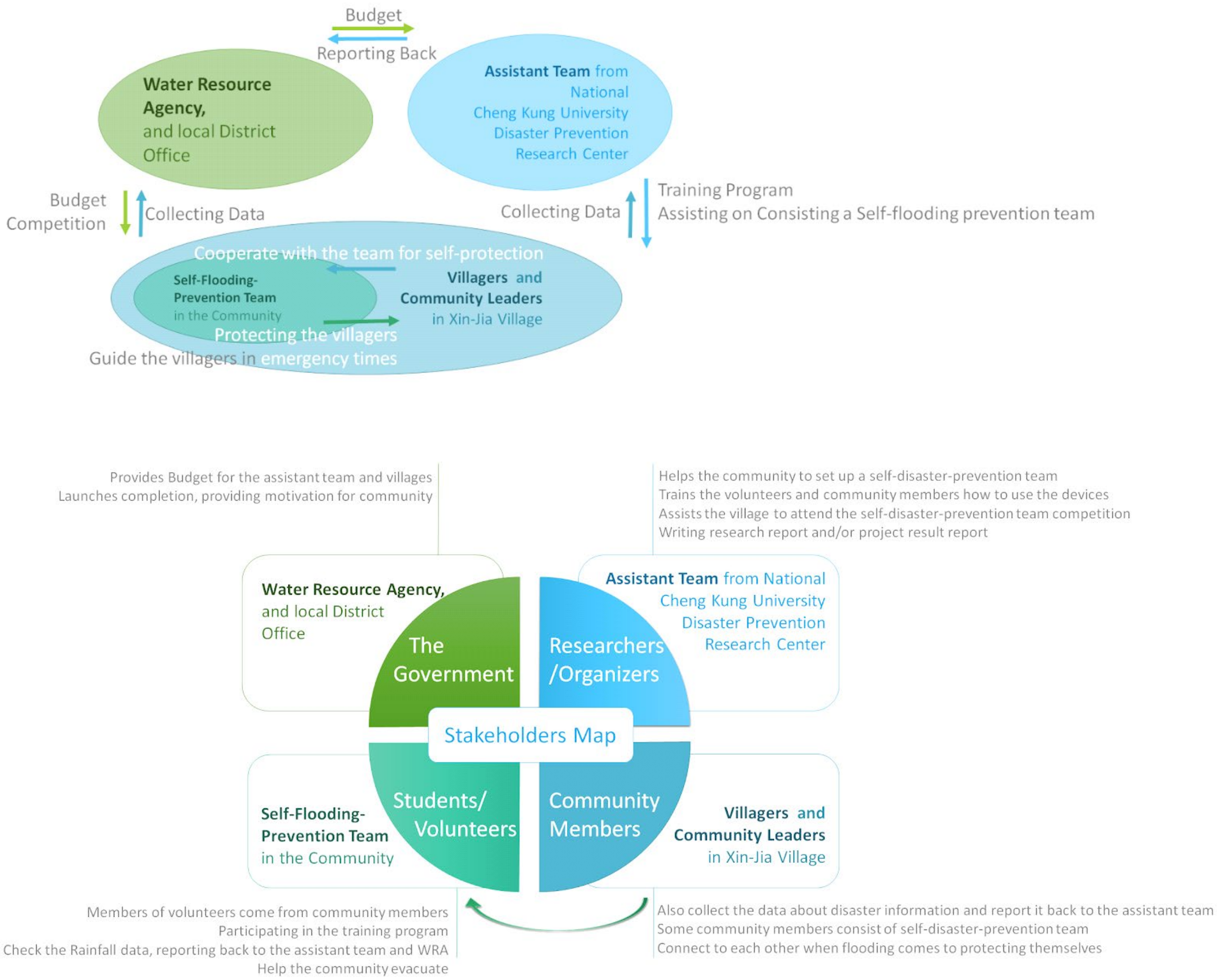

Budget
Reporting Back
Water Resource Agency, and local District Office
Assistant Team from National Cheng Kung University Disaster Prevention Research Center
Budget Competition
Collecting Data
Collecting Data
Training Program
Assisting on Consisting a Self-flooding prevention team
Cooperate with the team for self-protection
Self-Flooding-Prevention Team in the Community
Villagers and Community Leaders in Xin-Jia Village
Protecting the villagers
Guide the villagers in emergency times
Provides Budget for the assistant team and villages
Launches completion, providing motivation for community
Helps the community to set up a self-disaster-prevention team
Trains the volunteers and community members how to use the devices
Assists the village to attend the self-disaster-prevention team competition
Writing research report and/or project result report
Water Resource Agency, and local District Office
The Government
Researchers /Organizers
Assistant Team from National Cheng Kung University Disaster Prevention Research Center
Stakeholders Map
Self-Flooding-Prevention Team in the Community
Students/ Volunteers
Community Members
Villagers and Community Leaders in Xin-Jia Village
Members of volunteers come from community members
Participating in the training program
Check the Rainfall data, reporting back to the assistant team and WRA
Help the community evacuate
Also collect the data about disaster information and report it back to the assistant team
Some community members consist of self-disaster-prevention team
Connect to each other when flooding comes to protecting themselves

Figure 4. Stakeholder Map in Case 2 - Disaster Resistant Community (DRC) in Xin-Jia Village.

The interesting similarity both cases is that they are ongoing research projects that have been lasting for more 7 years. Thus, both cases have gone through a period of trial and error. However, while the DRC is a government-funded project, TaiRON was initially a self-funded project. Thus, different budget considerations influenced selection of appropriate digital tools. DRC chose LINE, a formal collaboration between National Science and Technology Center for Disaster Reduction (NCDR) and LINE's Taiwan branch. TaiRON chose Facebook because, “Facebook is free. If it fails, we have no loss or stress.” (According to Mr. Lin, 26 March 2017 in Hsu et al, 2018). Furthermore, the boundaries among TaiRON's stakeholders such as people, community, and volunteers often blur, owing to the participants’ initiative and higher willingness to take part. DRC’s participants are residents of the disaster-affected village and their participation is not only voluntary but also their responsibility. Moreover, the complexity of DRC’s APPs, coupled with the villagers’ lower education level, require more support and intensive training from project assistants. We compared the two to see how different civic media influence the research's democratic process.

The roles of participating scientists are distinct based on each project’s goals and features (see Table 1). In TaiRON, scientists organized stakeholders, raised funds, managed personnel, collected data, wrote reports and hosted conferences (figure 3). The project’s nature is spontaneous and derives from the demands of a specific group—in this case, activists, socialists, and environmentalists who care about environmental issues and desire to raise public awareness. At the same time, in their university roles as teachers or researchers, they inspire, connect and inform other potential participants, and attract attention from government and the general public.

DRC derived from urgent demand to prevent and mitigate flooding in a specific community. The government acted to organize the project and collaborate with a local university. Here, university scientists are participants rather than organizers. They provide knowledge, technical support and skills training for the community (figure 4). They also benefit from data collection and sustaining funds from the government. This project is amply structured, and scientists do no fundraising, but they train communities in data collection and flood prevention.

The facts show that in DRC the role of scientists has blurred in the last three years, as the local community gained confidence in its ability to gather data and act for themselves. However, in TaiRON, as more community members engage, the more scientists engage the community. Simply put, in TaiRON, scientists are distinct and respected parts of the community.

Table 1. *Basic Comparisons between the Two Cases*

Project Name	Taiwan Roadkill Observation Network (TaiRON)	Distance Resistance Community (DRC)
Type	Citizen Science Project	Disaster resistance community project
Funding Source	Self-funded on startup with sustaining Government funds	Water Resource Agency
Social Media	Facebook – Roadkill Reporting Back Web APP	LINE – Tainan Water In Situ mobile APP
Focus	Road-killed animals	Disaster Prevention
Goals	Research and education to raise the Taiwanese population's awareness on environmental issues	Flooding prevention awareness and data collection
Organization	Network of independent scientists and activists.	Government funds with technical and scientific assistance of a local university
Geography	Large scale, covering the whole of Taiwan	Small scale, covering Xin Jia Village (Tainan)

Methodology

Framework for Civic Media Practice Evaluation

The first step in evaluating civic media practice is plotting the starting point, which is based on social structure (weak or strong relation with community), and the short-term or long-term objectives (Gordon & Mugar, 2018). Thereby, practitioners can evaluate the existing situation and developing process of their project. In this research, we used the technique of plotting the starting point with questions to identify the general process of practicing civic media in two projects from beginning (2011) to current (2018). Below are questions using to plot the existing project point:

Social infrastructure (X axis)

- What level of connection do you have to real or perceived end users?
- How strong are your current relationships?
- Have you been working with or in the community for a long time?
- If you are new to the community, are there trust brokers in place (NGOs, community groups) that can facilitate connections?

Objectives (Y axis)

- Do organizers intend this particular project to be short-lived or long-term?

- Will the media or technology developed remain available for an extended period?
- Is the media or technology designed to capture attention through its novelty?

If responses to the first set of questions are generally negative, your starting point will be towards the left. If they are generally affirmative, it will be towards the right. If responses to the second set of questions are generally negative, your starting point will be below the X axis. If affirmative, then it will be above it.

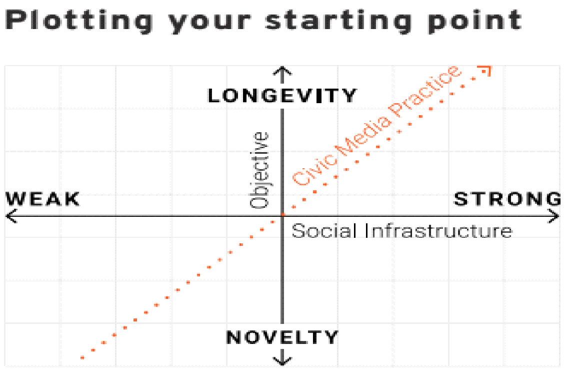


Figure 5. Civic media practice takes place over time across two dimensions (Adapted from Gordon & Mugar, 2018, p.14)

In our research, we evaluated the starting point relatively by interviewing organizers of two projects. After that, we assessed progress based on 4 activities. There are 4 activities that represent civic media practice in facilitating democratic process being network building, holding space for discussion, distributing ownership and persistent input (Table 2).

Table 2. *Activities of civic media practice (Gordon & Mugar, 2018, p.14)*

Activity	**Definition**	**Explanation**
Network building	The act of convening either in person or online for the purpose of social connectivity	Practitioners create online or offline space for stakeholders share experiences knowledge and acknowledge the intersectionality of constituent identity
Holding space for discussion	Assuring that there is time and space for discussion that makes room for multiple viewpoints and is tolerant of dissent	Media can help to hold regular meetings, workshops where the interests and needs of stakeholders can be articulated and increase the responsibility of stakeholders to the issues of the community by supporting work to directly address those issues
Distributing ownership	The designer or convener builds capacity of all	To reduce the asymmetric in power and expertise knowledge among stakeholders by sharing and encouraging power

	stakeholders to reproduce or modify designed activities.	dynamic of stakeholders in taking the rein of practices. The participants can have equal opportunities in co-design process and distribute expertise across multiple stakeholders
Persistent input	Inputs into products or process from stakeholders continue beyond initial release or implementation.	The long-term relationships of practitioners and community which influence the design and entire practice of civic media, building mutual trust and closer proximity to community problems.

In our research, based on civic media practice evaluation guidance (Gordon & Mugar, 2018) and the functions and features of the social media sites used (Facebook and LINE), we selected hypothesized indicators based upon three major criteria: ease of understanding, relationship to the four activities, and data availability (Table 3). Beyond this, we also added one dimension – digital tool selection. This actually stems from the first four aspects, but we argue that this also can be a significant clue of democratic process in CEnR.

Table 3. *Adopt civic media practice in facilitating democratic process in two selected projects (Adapted from Gordon & Mugar, 2018, p.25-26)*

Activity	**Framework questions**	**Relevant functions of Facebook, LINE & APPs**	**Questions for Each project**
Network building	• Have you developed new connections in your host community? • Do you believe you can form further connections with this community? • Would you undertake further projects with this community?	a. Connect members b. Interaction among community members and organizers c. Inform, listen, and disseminate information d. Stay informed by messages and sharing e. Invite people for conferences and events	- How do you use Facebook/LINE in developing the new connections/ interactions/ inform/ disseminate information in community you are working in? - How do you use Facebook/ LINE in calling on community members to make further connections (conferences/events)? - How do you use Facebook/ LINE in doing survey/starting a new project in the future with this community?
Holding space for discussion	• Do you take steps to engage people outside of your immediate network?	a. Public/message space for discussion b. Admin roles c. Topics of discussion d. Conflict	- How does FB or LINE's public wall and private inbox help people in the community to engage in the immediate network?

	- Do you ensure non-expert perspectives or lived experiences are heard?		- How does the admin decide the topic and facilitate discussion (especially when conflicts occur)? - How are the voices of all stakeholders listened in FB/LINE discussions, polls, or information sharing?
Distributing ownership	- Do you create opportunities for stewardship by members of the community? - Do you share the process and outcomes of your work to encourage adoption of your ideas by external stakeholders? - Do you address power asymmetries by creating pathways for non-experts to influence the project's shape and objectives?	a. Sharing/training knowledge b. Learning from each other c. Feedback / complain / solution d. Empowering e. Photo's responsibility/ownership	- How do you use FB/LINE for creating opportunities for members in community sharing/training/learning from each other? - How do you use FB/LINE in sharing the process and outcomes of your work to encourage adoption of your ideas by external stakeholders? - How do you use FB/LINE to addressing power asymmetries in feedback/complain/ empowering and photo's responsibility/ownership?
Persistent Unit	- Do you keep the feedback loop open after the project's initial phase? - Do you engage in long-term conversations about local issues and challenges? - Are you collaborating with people that have long-term relationship with the problem space?	a. Long-term relationship concerns/ between members, b. Connection between virtual platform and reality (activity) c. Mutual benefits d. Constant support/emergency information to/from community	- How does the FB/LINE help in keeping long-term conversation/relationships (constant support/emergency information) between members about local issues and challenges? - How does the FB/LINE help the connection between virtual platform and real activities? - How does the FB/LINE help to collaborate with people that have long-term relationship with the problem space? - How does the FB/LINE help to get further mutual benefits?

Digital tools' selection	a. Function b. Budget c. Terms & Policy (APP, Facebook) d. Convenient to use e. Time f. Localization	- Why does your project select FB/LINE? - What are pros and cons of this tool? - How has it changed since you first used it? Why? What were your solutions?

Data Collection and Content Analysis

Because the project platforms are social network sites (Table 1), it is a favorable condition for collecting data to analyze both projects' reality, historical development, stakeholders mapping of two projects. Based on the framework of civic media practice evaluation (Table 2), we modified a list of semi-structured questions (Table 3) for in-depth interviews with different stakeholders.

Firstly, in each project, we collected information from websites, organizations, Facebook fan pages, and Facebook groups. Besides, we also analyzed raw text from messages (LINE), social media posts (Facebook) to evaluate content and interactions between stakeholders. Thirdly, after the in-depth interview, we converted the resulting transcript into a verbatim document and coded it to identify starting point and also to analyze it according to the five characteristics of civic media practices listed in our table (Table 3).

Semi-Structured Interview

We used semi-structured interviews with the organizers of the project and volunteers in each project (Appendix II). In the DRC case, we attended the disaster-response community exercise and interviewed the village leader and a government official. In our questions we focused on how the civic media (FB, LINE, APPs) help them on their collaboration with the communities and the researchers, and also the limitation and difficulties they have encountered during the project. From the answers and observations, we find the answers that respond to our framework in table 3 and our research questions.

Results

In spite of having different types of civic media practices, both cases achieved a measure of lasting impact in their respective communities. Our analysis found that no single SNS/SNA meets all project demands in terms of functions, effective budget, efficiency, or time. Organizers' flexibility plays an important role in selecting tools or organizing off-line training to operate smoothly in our four activities of civic media practices of network building.

Plotting starting point of civic media practice in two projects (from 2011-2016)

In the TaiRON project, according to the interview with Te-En Lin (Personal Interview, July 5th, 2018) he mentioned 3 milestones of the process based on the breakthroughs in the number and diversity of members, as well as contributions and recognition from communities to projects. In the initial year, 2011, there were about 200 people in Roadkill Facebook Group. These people were in the "Ecology Circle's Stratosphere[1]," including biology professors, high school teachers, ecology lecturers, and nature-group participants. This relatively small circle extended their network by inviting their classmates, families, and friends to join. From 2011 to 2012, the number of people in Roadkill FB group rose; however, its growth slowed at the end of 2012, because almost all the people in the Stratosphere are already in the group, until 2013 when the Rabies Outbreak in Taiwan brought media's attention to TaiRON. That event made TaiRON "go viral," attracting social media attention and public influencers. Thus more people joined in. Since 2016, about 1,300 people annually join the Roadkill data collecting process with strong connections with other nature-groups, for example, the Society of Wilderness, or Wild Bird Associations around Taiwan. Today, about fourteen thousand people participate in Roadkill Facebook group. An average three thousand people per day actively participate[2] in discussions. In general, the civic media practice process of TaiRON shows a positive trend with strong social infrastructure and long-term objectives (figure 6).

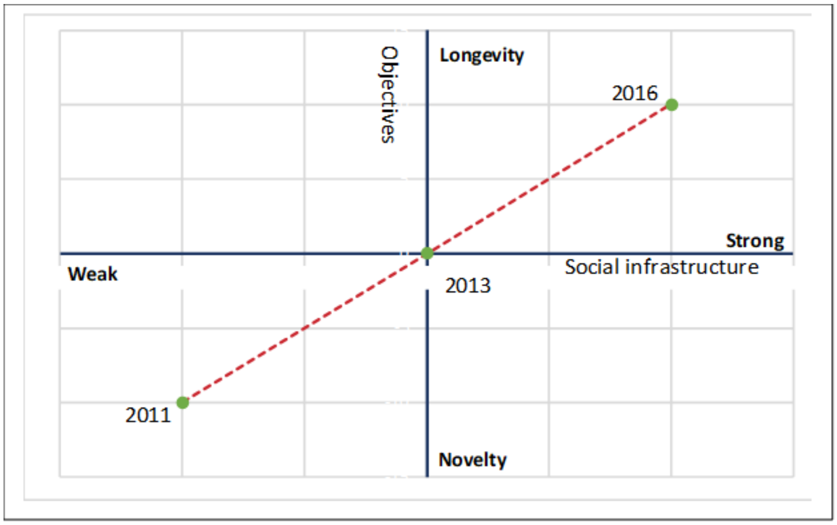


Figure 6. Civic media practice takes place over time cross two dimensions in the TaiRON.

In the case of DRC, there are no significant milestones in the civic media practice process as in TaiRON. According to the project organizer, Chen-Chian Li (李鎮, personal interview, July 5,

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[1] The phrase "in the Stratosphere" (在同溫層) is a common phrase in Taiwan describing a small group of people sharing similar values and caring about the same issues. It also implies that these people have difficulties explaining or raising concern among people who are "outside of the Stratosphere".

[2] According to data provided by Facebook. The company's algorithms define "actively participating" by likes, shares and comments.

2018), in the project's initial period, organizers focused on attracting public attention (novelty) by designing a user-friendly APP. Given the project's urgency and complexity, stakeholders built strong connections with frequent meetings and trainings. "DPR team members meet volunteers from village at least 1 time/1 month," Chen-Chian Li told us. Since 2016, as Xin-Jia village improved its disaster prevention practices, almost running the project independently, DPR made plans to work with a new village, spending less time in Xin-Jia. Thus, community-engaged projects gain the highest level of success when communities continue to operate a project independently after the researchers leave. It also reaches the highest level of longevity. Therefore, although outwardly the social infrastructure weakens, it is a positive indication of civic media practice in facilitating a democratic process for this project (figure 7).

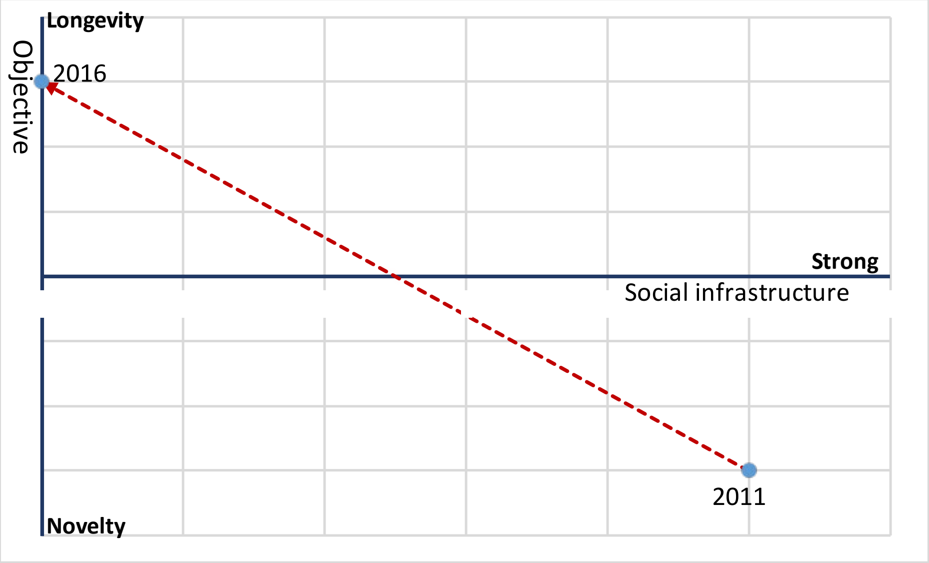


Figure 7. DRC project at Xin-Jia village: Civic media practice takes place over time, across two dimensions.

There is No Perfect Digital Tool

Selecting the right eCenR tools for any project needs to consider time, budget and data quality as well as ease of use and range of functions. Based on each project's features (fund sources, data features, participants, and common goals), organizers select and build workflows around the functions of their respective digital tools. Interestingly, both projects combined digital tools. TaiRON used Facebook and a web APP, and DRC used LINE and mobile APPs.

On the matter of budget, mentioned above, TaiRON used FB to increase participation and broadly disseminate messages. However, data quality depends on the time the users devote to uploading the photo. This may take time, or users may elect to send lower resolution photos. Either choice will influence the timeliness or quality of data. Therefore, the web APP or mobile APP is necessary to deal with the weakness of FB in this regard. The web APP in this case benefits from an engineer voluntarily designing and maintaining it. The Web APP connecting with Facebook can help the researchers improve data quality by checking data with the uploaders on Facebook, pick up samples (dead bodies) in time. However, after getting government funding, organizers decided to use it for designing a mobile APP, which they believed would be more user-friendly. However, mobile APPs depend strongly on the policies of Apple and Android systems, which are costly to maintain. Therefore, because of frequent changes to mobile APPs, the organizers decided to use the web APP. Other users complained and suggested the project should stick to FB. Nevertheless, that approach cannot guarantee the quality of data, so the organizers have decided to use FB and web APP for now.

In the DRC project, localized function is important in a disaster-prevention case so that mobile APPs for different counties and mobile APPs for different disaster-potential areas are provided to the users. Because of the support of government for designing and operating mobile APPs, the combination of LINE and 2 mobile APPs work very effectively. LINE is free for users and the change of system policy is not frequent. LINE is good for instant / emergent contact, and message disseminating in a small group of people. Nevertheless, some weaknesses of LINE are it is not convenient for discussion and the users can miss information in the discussions:

> For us [the assistant team] if we want to discuss something with the community, we do not discuss it by Facebook or LINE. Sometimes we call each other, or we just meet-up. As far as I know, most villages also choose to meet up for discussing things. Because for the important online messages, we still need a checking process, to make sure that it is correctly conveyed to our message receivers — Chen-Chian Li (Personal Interview, May 25, 2018).

With mobile APPs, the main weakness lies in the changing system policies of Apple or Android as well as resources for designing and maintaining the system. However, the mobile Apps are easy to use and can guarantee data quality (the accuracy and currency). Therefore, combination of LINE and mobile APPs helps the project work well especially in special projects like DRC.

Balance the mutual benefits in selecting digital tools is the clear sign of democracy. Digital tool selection takes place throughout the whole life of a project with replacement of unsuitable tools and update new ones, in which participants can propose opinions, influence/engage to the decision of using this digital tool not another. To benefit all stakeholders and avoid further conflicts, organizers must listen and learn what is needful, so that participants have equal voice and share of agency. To specify, with the participants, they care the convenience in using tools and the outcome of data to which they contributed:

> In my survey, yes, you can see some feedback that are negative comments. There are participants who complain of not seeing the research results of this project. In such a case, they will have no willingness to continue their participation. —Chia Hsuan Hsu (Personal Interview, May 30, 2018).

TaiRON also made changes to its array of digital tools. Facebook alone was convenient for participants but not for organizers (data not accurate or timely enough; hard for manage data). Facebook and web APP yielded more accurate data, and was less expensive, but not very convenient for users. With funding, Facebook and mobile APP improved data quality and they worked better for organizers and users. However, this solution imposed higher costs. Finally, it went back to Facebook and web APP (cheaper, still convenient for organizers but some users complain about its unfriendliness). TaiRON addressed the democracy problem by enhancing the quality of outcomes to prove the data effectively improves the environment. It lets citizen scientists know that "Your data Matters". Therefore, only a small proportion of participants has left the group because they thought their actions did not help on the environment. Besides, the organizers with their great effort in keeping Facebook open, although it runs the risk of being reported and blocked due to FB's policy (the bloody dead animal photos may be reported by some FB users as violent message). FB helps TaiRON broadens to its audiences quickly, those are main reasons make the outstanding success of this project in eCEnR in Taiwan

> Because TaiRON is an open Facebook group, it is unique. Other groups collect beautiful photos, only we collect bloody photos. It attracts many people's attention. Some of them are specialized in information engineering ... actively contacting us, asking us what they can do to help us ... and so that why we insist on keeping it open, although we are considered disgusting by some people.—Te-En Lin (Personal Interview, 2018).

By comparison, in the DRC, participants give two reasons why mobile APPs (landslide and flood App) are not user-friendly. Firstly, they are digital tools for specialists, which require knowledge and familiarity with disaster phenomena to use effectively. Secondly, these apps also need specialized technical skills, so the organizers devote part of their training time to make participants more knowledgeable about natural disasters and improve their technical skill.

In brief, the democracy can be trade off by the quality of data. However, to decrease the weakness of digital tools in convenience of using without impacting the quality of data, budget, function and time, the organizers in two eCEnRs spend more efforts in maintaining the open platform for member to check the project effectiveness and connecting among members as well as helping the participants in getting familiar and using proficiently the tools. As a result, it can help all stakeholders get their mutual benefits in those eCEnRs.

Civic Media Facilitates Network Building

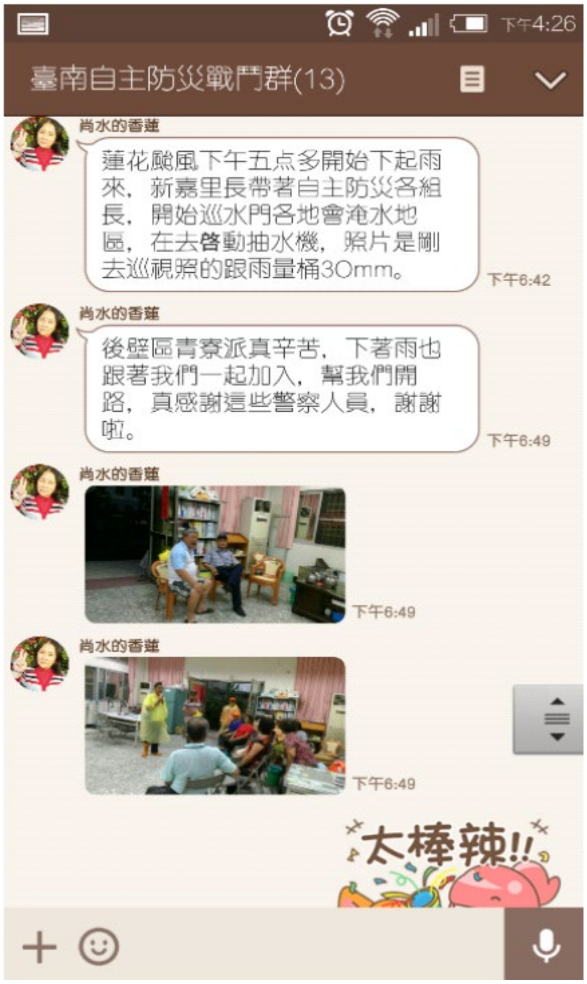
Networking building is an important step in the democratic process when the organizers "convene members to create the engagement of citizens in projects either in person or online for the purpose of social connectivity" (Gordon & Mugar, 2018, p. 14). In both projects, digital tools work in diverse ways to connect, inform and disseminate information to citizens.

In TaiRON, Facebook connects people from different fields, from real to virtual network and vice versa. Chia Hsuan Hsu, a participant of TaiRON, is also conducting research about TaiRON participants' learning experience:

> [In my survey] It is clear that many people want to continue engaging into this project because they can make new friends here… Actually not many members join TaiRON's offline activities. However, it matters a lot that so many people still consider making new friends here. It means that even if you do not attend offline activities, you can still meet new friends in this platform—(Personal Interview, May 30, 2018).

However, organizers focused and condensed the information disseminated in Facebook. "We share those messages related to TaiRON's purpose. If it is too broad, there will be too many junk messages. The group members… willingness to participate would decline "—Te-En Lin (Personal Interview, May 23, 2018)"

DRC members use LINE particularly to support a LINE group that connects people from different communities instantly in disasters and different LINE groups act to contact or gather different groups of stakeholders. Community members in each disaster zone use their LINE group to report situation to the organizer. Therefore, LINE is an important approach for sharing emergency/disaster information. Because the LINE group's function is so well defined, there is seldom junk information. This feature makes information more accurate and timely, which is most important to the disaster resistance community (Figure 8). However, although the mobile APPs used are important devices for community members and the general public to check disaster information, the landslide APP does not work well because people seldom know it well enough. The organizers said it was because of too little promotion.



尚水的香蓮

蓮花颱風下午五点多開始下起雨來，新嘉里長帶著自主防災各組長，開始巡水門各地會淹水地區，在去啓動抽水機，照片是剛去巡視照的跟雨量桶30mm。

下午6:42

尚水的香蓮

後壁區青寮派真辛苦，下著雨也跟著我們一起加入，幫我們開路，真感謝這些警察人員，謝謝啦。

下午6:49

尚水的香蓮

下午6:49

尚水的香蓮

下午6:49

Figure 8. A representative situation report to the online community during Tropical Storm, Linfa 2015. Source: Xin-Jia Village (2014) Tainan Flood Disaster Resistant Community Annual Review - Community autonomy evaluation Xin-Jia Village (Chinese)

In each project, the level of engagement differs according to segmentation in citizen engagement. In TaiRON, the interaction depends on their perception of how they benefit, their ability and their available time. Chia Hsuan Hsu (Personal Interview, May 30, 2018) shared that he did not get involved in TaiRON deeply until he began his research. Most participants have varying levels of interaction, with twenty percent of members who are active and twenty to thirty percent more who interact very little. “Frankly, although this Facebook group has more than 14 thousand members, I believe deeply engaged people only account for about 10-20%.” — Chia Hsuan Hsu (Ibid., 2018).” For the participants, FB is the channel to help them improve knowledge or collect data for their own research”. He also supposed that FB group helps members improve ecological knowledge and most participants agree that join into TaiRON makes them care more about the environment. Most participants agree that join into TaiRON increases their sense of achievement. “Regarding the skill of operating technical devices, we can also see a trend that there is some old people learning to use technical devices after joining into this project.” (Ibid.

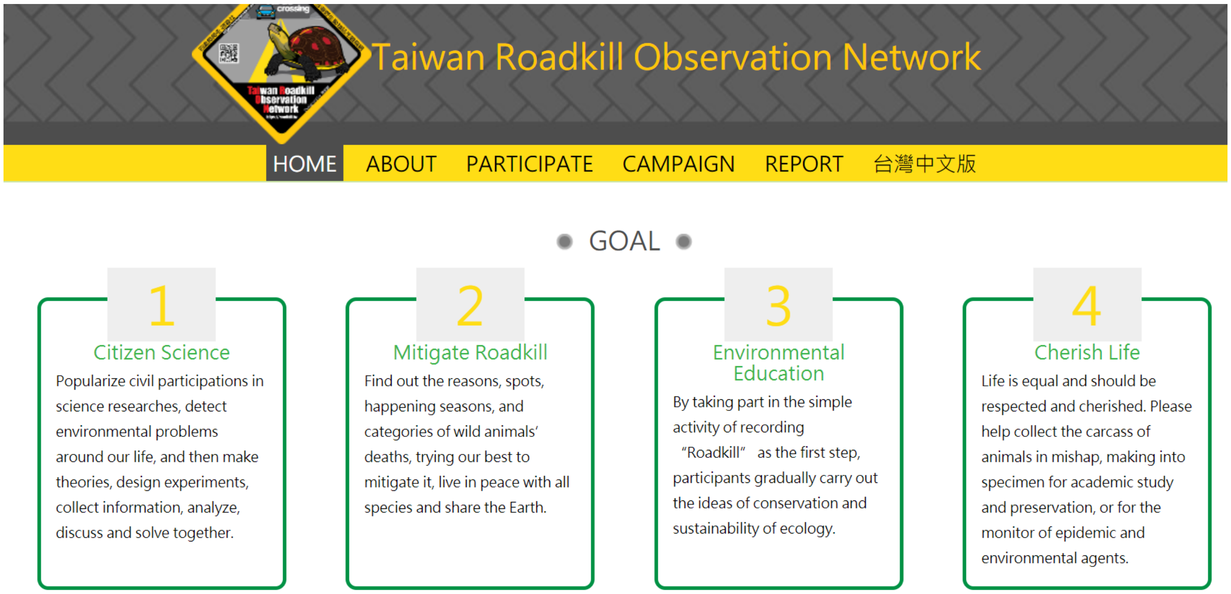
May 30, 2018).” In other words, Facebook is a great channel to meet the needs of most participants’ different levels of engagement, along with the administrators’ open management style that facilitates network building.

In DRC, the most involved people using digital tools are community representatives and assistance team members, mostly because that is their duty. Therefore, personal responsibility is the most important factor deciding their engagement. The community representatives provide information about the real-time disaster situation, report back when there are disasters, and share activities’ information to invite other community members to take part. At the same time, the assistant team will only use LINE group to convey information. If they need to discuss with the communities, they would gather for discussion, to make the discussions efficient, complete, and avoid misunderstanding. Conversely, the community members seldom use LINE to disseminate information, because they live in the same area and they prefer to gather and share information face-to-face or use the public megaphone system. However, during flooding everyone is busy with his or her own disaster-prevention duties, especially the flood volunteer team. At such times, it is difficult to meet face-to-face because of the bad weather situation, so at this time LINE creates a good channel for instant contact.

In brief, both projects, beyond building an on-line platform, needed to give members clear expectations of what kind of information and discussion would take place, so that they will be willing to continue to follow each group.

Holding Space for Discussion

Both projects minimize anonymity, to make users accountable, and therefore, maintain data quality. Accordingly, TaiRON requires every uploading material to put their real name on record, and in the disaster resistant community, only those who have accounts can reply. However, anonymity “promises freedom and equality” (Gordon & Mihailidis, 2016, p29), therefore, this practice in some ways inhibits freedom in expressing personal opinions. TaiRON, in respect to holding space for discussion, they have four main goals which orient the contents of each discussion (Figure 9). If anyone discusses problems out of scope or in an aggressive manner, admins have the right to delete comments or posts, and to block members (at present, they have not blocked any members). For organizers, admins represent the best way to guarantee a democratic space where people listen and have a voice. The admin are there to moderate tense exchanges and maintain a friendly discussion environment, i.e. deleting hostile comments. Participants also have the "right" to report inappropriate comments/posts. Experienced members can guide the discussion and provide necessary knowledge to explain any misunderstanding.



GOAL

1
Citizen Science
Popularize civil participations in science researches, detect environmental problems around our life, and then make theories, design experiments, collect information, analyze, discuss and solve together.

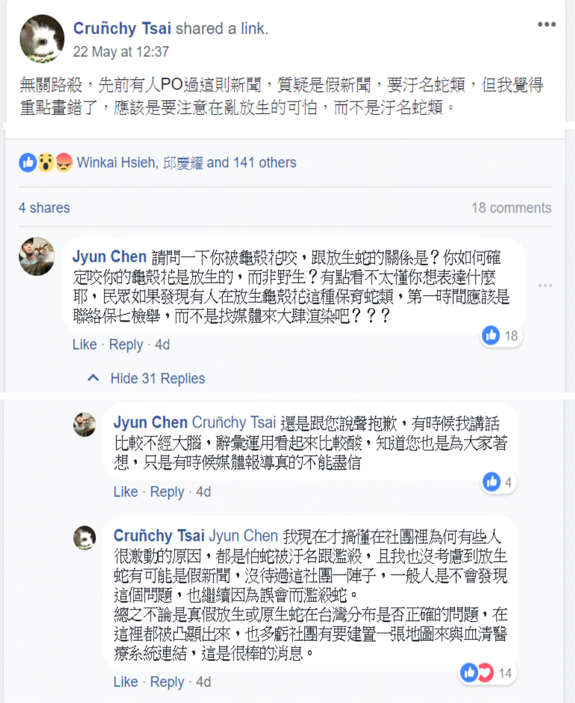
2
Mitigate Roadkill
Find out the reasons, spots, happening seasons, and categories of wild animals' deaths, trying our best to mitigate it, live in peace with all species and share the Earth.

3
Environmental Education
By taking part in the simple activity of recording "Roadkill" as the first step, participants gradually carry out the ideas of conservation and sustainability of ecology.

4
Cherish Life
Life is equal and should be respected and cherished. Please help collect the carcass of animals in mishap, making into specimen for academic study and preservation, or for the monitor of epidemic and environmental agents.

Figure 9. The four goals of TaiRON that the admins follow for group management.
Source: TaiRON Official Website (https://roadkill.tw).

In addition, certain elements help create a better discussion space among a diverse array of members. For example, discussions between pet-lovers and wild-animals-lovers can help them better understand opposite viewpoints. This quality rarely appears in other animal lover Facebook groups in Taiwan. The organizers maintain the open discussions and (Figure 10). Te-En Lin shared that "conflict can improve the quality of member of knowledge – eliminating some animals stereotype (pet-lovers versus wild animal-lovers, snakes)" (Personal Interview, May 23, 2018).



Cruñchy Tsai shared a link.
22 May at 12:37

無關路殺，先前有人PO過這則新聞，質疑是假新聞，要汙名蛇類，但我覺得重點畫錯了，應該是要注意在亂放生的可怕，而不是汙名蛇類。

Winkai Hsieh, 邱慶耀 and 141 others

4 shares 18 comments

Jyun Chen 請問一下你被龜殼花咬，跟放生蛇的關係是？你如何確定咬你的龜殼花是放生的，而非野生？有點看不太懂你想表達什麼耶，民眾如果發現有人在放生龜殼花這種保育蛇類，第一時間應該是聯絡保七檢舉，而不是找媒體來大肆渲染吧？？？

Jyun Chen Cruñchy Tsai 還是跟您說聲抱歉，有時候我講話比較不經大腦，辭彙運用看起來比較酸，知道您也是為大家著想，只是有時候媒體報導真的不能盡信

Cruñchy Tsai Jyun Chen 我現在才搞懂在社團裡為何有些人很激動的原因，都是怕蛇被汙名跟濫殺，且我也沒考慮到放生蛇有可能是假新聞，沒待過這社團一陣子，一般人是不會發現這個問題，也繼續因為誤會而濫殺蛇。
總之不論是真假放生或原生蛇在台灣分布是否正確的問題，在這裡都被凸顯出來，也多虧社團有要建置一張地圖來與血清醫療系統連結，這是很棒的消息。

Figure 10. A screenshot of TaiRON participants' discussion on snake stereotypes.
Source: collected by the authors.

Interestingly, in Facebook, users can use private message to create a private space for more personal opinions without exposure to other members' judgement. Many participants prefer to privately message the admins or the experienced members to show their respect and avoid unintentional tensions Therefore, in TaiRON FB, although the anonymity is limiting, it helps the information focus, and the discussions occur more effectively and responsibly.

By comparison, DRC, because of the difference in geographic scale, holds discussions primarily during offline, in-person training. LINE is not efficient for discussion about the research and projects because messages are often misunderstood. In this case, researchers and community members meet each other face-to-face rather easily, because they are located in the same county.

Distributed Ownership

Distributed ownership implies that the designer or convener takes time to build capacity of all stakeholders to reproduce or modify designed activities. In these projects, that distribution of ownership emerges from the feedback the organizers acquire to improve the quality of digital tools and respond to the difficulties of participants. In the TaiRON, Facebook provides a good platform for both researchers and participants to collect feedback by surveys such as collecting suggestions for the TaiRON project, annual meeting themes, speakers, or events. The organizers also contacted other researchers on FB for assistance during the web APP development process

> In 2012, a Taiwanese working in New York, whose job was APP development, saw us on Facebook. S/He thought that the way we collect data was too cumbersome. Therefore, s/he contacts us directly, asking what s/he can do to help us. This is how we began the development of our first APP. —Te-En Lin (Personal Interview, May 23, 2018).

Although DRC organizers do not conduct surveys using LINE or APP, they regularly collect feedback from the mobile APPs during training programs. Community members use LINE to learn and ask disaster knowledge. Furthermore, after community members are trained in disaster knowledge, they can use the APP correctly in checking and reporting on evolving conditions. Thus empowered, community members will use the APP to provide disaster-related information for the assistance team. In other words, from being a passive receiver, the community member can transform into a supplier of information. This mutual reinforcement is the highest level of community engagement research in general and eCEnR in particular.

Persistent Input

In both cases, the use social media (Facebook and LINE group) help on the eCEnR's persistent input by keeping mutual benefits between participants and the community members in different ways.

In TaiRON, many participants are eco-lovers, through Facebook, they can connect their real life and virtual life, learning eco-related knowledge and marking new friends who share same interests in the group. What is more important, they want to know how the data they collect has its policy influence. To maintain the persistent input from the participants, TaiRON's organizer disseminating research result and research data application to appreciate the participants' contribution in many ways, including through social media, newspapers, delivering lectures and holding annual citizen scientist meetings. Facebook is an important channel in this case, because the participants would receive message directly in their Facebook group and share this information to their social networks circles. In Chia Hsuan Hsu's survey, a few participants left FB group because “I cannot see my contribution in this project.” More often, participants left because of personal time limitation or technical problems (having difficulties on uploading data).

DRC community members live in a potential disaster area; therefore, their main concern is mitigating the impact to their village and fellow villagers. That being the case, LINE has advantages on reporting new conditions and making the right contacts. LINE can help community members rapidly mobilize and cooperate. It can also help them quickly check messages, asking relevant questions and getting instant replies from the assistance team. For the organizers, they can obtain disaster photos instantly from the communities and can track mobilization in each community, which can help them collect disaster data and better judge the situation (i.e. a potential river breakout or communities most in need) in a very short time.

Using digital tools in different ways, both projects maintain long-term relationships, aligning a given community’s main concern with the wider community of social media participants.

Discussion

Digital tool selection is a dynamic balance between budget, data quality and democracy. Maintaining data quality and managing volunteers and community members without wasting their time or labor are among the biggest concerns when choosing digital tools. Organizers need to consider not only time, budget, data quality, user convenience, but also the changing policies of digital platform suppliers. By comparison, the community members care whether the group's benefits directly answer their needs to maintain their participation. In addition, digital tools should be friendly to the users. Because there is no perfect tool, it is important to have the broadest possible range of options. However, in each case, we still see disagreements between organizers and participants regarding the choice of online tools. The solution for both became a trade-off between data quality and democratic process. With each request for higher data quality, community members requested and required additional training.

Social media facilitates democratic processes and APPs work towards distributing ownership

In both cases, the organizers choose to use APPs to maintain data quality. By operating the digital tools in engaging the projects, they learn specific knowledge related to the research topic (in our cases: disaster-related and ecology-related), which improve their knowledge and awareness. Training community members to operate the APPs, and report scientific data are ways to empower the participants. From the democratic process aspect, it is not only about data accuracy but also about distributing ownership between the researchers and the communities.

With the high penetration in Taiwan compared to other SNS/SNA, Facebook and LINE can improve a research's democratic process in diverse ways. For eCEnRs that have different features and scope of community members, Facebook group is more suitable for projects that collaborates people from different places with dynamic discussions; meanwhile LINE is more suitable for instant information. Both Facebook and LINE group help the community members build their new networks. However, Facebook works better for holding space for discussion, especially with cooperation between admins and participants. In the aspects of distributing ownership, both Facebook and LINE are good for members to learn from each other; yet, Facebook is a better platform for collecting feedback. Finally, yet importantly, Facebook and LINE helped each project's persistent input, responding to concerns, thereby maintaining long-term relationships.

Conclusion

Although TaiRON project started on a shoestring budget, the organizers skillfully used SNS to build networks into a stable and strong community worthy of external support. Besides creating a good space for discussion where netizens may voice their concerns, a transparent and fair cooperation between admins and participants is necessary. Based on the first case, we can conclude that understanding more about the cooperation mechanism would help us to improve the democratic process of a research project.

The second project is an object lesson in making use of government supports in training and empowering vulnerable communities. This project succeeded not only in increasing the adaptive capacity of local villagers in the digital era but also transformed them to agents for disaster risk reduction. We observed in each case some disagreements between organizers and community members about using digital tools. It is worthwhile to gather more case studies about this kind of disagreement. Further research will help us mitigate the harm to democratic processes and find a better balance for choosing digital tools.

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