

Towards Dual Use of Volunteers in Small and Large Emergencies: Comparing Emerging Volunteer Initiatives

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ABSTRACT

In crisis management, most studies on Information and Communication Technology (ICT) focus on spontaneous volunteers using social media for information dissemination or self-deployment to the incident site. However, there is also growing research on more organized forms where volunteers act as first responders to small, frequent emergencies. They are potential useful but unused resources in larger crises contributing to community and society resilience. To identify their potential for dual use, we must first understand their contributions to small-scale emergencies. This study describes and compares different volunteer initiatives in Sweden in terms of recruitment, willingness to collaborate with other volunteers, tasks, ICT utilization, challenges and needs. The findings indicate that volunteers possess significant capacity for responding to small-scale emergencies, which can be utilized for large-scale crises. They demonstrate a strong willingness to collaborate with other volunteers, have dual roles with diverse skillsets and can stay a long-time span at incident sites supporting victims, e.g., distributing food and medicine.

Keywords

Volunteer initiatives, emergency and crisis management, ICT support, societal resilience

INTRODUCTION

Volunteers have become an essential part of emergency response and crisis management, as professional response organizations face increasing challenges (e.g., extreme weather events, political instability) with strained resources. Their integration has been facilitated by ICT artefacts, e.g., used to coordinate and dispatch volunteers (Yazdani et al., 2024). Much research relates volunteerism to large-scale crises, including spontaneous volunteers or established organizations like the Red Cross (e.g., Persson & Uhnöo, 2021; Fernandez et al., 2006). As to the ICT, previous studies mostly focus spontaneous volunteers using social media to organize and self-deploy themselves to the incident site (e.g., Reuter et al., 2015; Albris, 2017). However, in some countries, there is emerging research on more organized forms of volunteerism where volunteers act as first responders to small, frequent emergencies (e.g., Siriwardena et al., 2024). They may supplement emergency management services by arriving first at the incident site, aiding the affected people, saving lives and assets (Botan et al., 2022).

In Sweden, examples of the emerging forms of volunteerism include volunteer first responders (Swedish: *Civila insatspersoner* "CIP"), DELTA (Swedish abbreviation which means "participate") and SMS-lifesavers. The CIP concept emerged several years ago in sparsely populated areas in northern Sweden and has spread since. CIP volunteers are dispatched to predefined emergencies, including Out-of-Hospital Cardiac Arrests (OHCA), certain fires, drownings and single vehicle traffic accidents (Pilemalm, 2020). The SMS-lifesavers are dispatched to cases of suspected OHCA and used by the medical emergency services and city councils (Prytz et al., 2023). The DELTA initiative is new where volunteers are alerted to smaller fires. They are used by a rural rescue service covering several municipalities in south-west Sweden. The emerging forms of semi-organized, coordinated volunteerism in small-scale emergencies represent a potentially valuable yet underutilized resource also in large-scale crises. They could bring their experience in first response and, in many cases, possess training and equipment

that might prove crucial during major disasters. Their involvement may not only address immediate response needs, but could also contribute to community resilience and, eventually, to overall societal resilience. As to our knowledge, there is yet no studies explicitly focussing on dual use of volunteer first responders in small and large emergencies (likely to that the semi-organized forms are comparatively new). A first step to identify their potential in large-scale crises and community resilience, is to identify their contributions, tasks, challenges, needs and ICT-support in small-scale emergencies. In this study we do this using CIP, SMS-lifesavers and DELTA as examples, also comparing the groups.

Study Aim and Objectives

The aims of this study are to describe the volunteer initiatives CIP, SMS-lifesavers and DELTA and their contributions in smaller emergencies and to explore their potential for large-scale crisis management, community and society resilience. The related objectives include:

- To compare the three volunteer initiatives and identify similarities and differences, e.g., related to tasks, organizational challenges, needs and ICT-support
- To identify potential synergy effects of using them in complementary ways in large-scale crises

The study employs a qualitative approach, utilizing semi-structured interviews. The target group include researchers, policy makers, volunteers and practitioners interested in volunteerism in emergency response, crisis management and resilience.

BACKGROUND

In this section, we describe emergencies, large-scale crises and resilience and relate them to volunteerism. This is followed by the study context, related work and the analytical framework.

Emergencies, Large Scale Crises and Resilience

Emergencies are sudden events that require immediate action to prevent loss of life, property damage, or environmental harm. They are characterized by urgency, uncertainty, and a need for rapid decision-making (Jiang & Yuan, 2019). Large-scale crises, on the other hand, refer to large or catastrophic events that significantly disrupt the functioning of a community or society. They may result in widespread casualties, extensive property damage, and overwhelming impacts that exceed local response capabilities, necessitating national or international support (Jiang & Yuan, 2019). In this study, we explore the capacity of volunteer initiatives in small-scale emergencies as a prerequisite for their potential use in larger crises.

Community resilience is the ability of a community to utilize its resources effectively to respond to, withstand, and recover from adverse situations (Qamar, 2024). Communities with strong resilience can recover more quickly and rebuild physically and economically. Community resilience planning involves fostering collaboration among individuals, institutions, and systems to enhance their capacity for recovery and adaptation (Madsen & O'Mullan, 2016). Societal resilience extends beyond individual communities to encompass the broader ability of a society to absorb shocks, adapt to changes, and maintain functionality in crises. It reflects society's collective capacity to withstand external stress while ensuring sustainability and well-being for its members. (Qamar, 2024). Together, these concepts form the foundation for effective emergency and crisis management strategies. In this study, we explore semi-organized volunteers as potential resources in enhancing resilience by supporting emergency response and strengthening community cohesion.

Volunteerism in Emergency Response

Volunteers in emergency response often plays a crucial role in complementing professional responders. They are individuals who provide aid without compensation and can vary in training, experience, and integration within the emergency management system (Matinrad, 2022). Volunteers can augment the capacity and reach of the response system, providing valuable during all phases of emergencies and crisis management. They can assist with various tasks, from community outreach and administrative support to more hands-on activities like light hazard mitigation and urban search and rescue in the immediate aftermath of an event (Yeo & Lee, 2020). Integrating volunteers into response systems seems increasingly important as global challenges strain professional organizations (Lyttle et al., 2023).

Volunteers range from established volunteers, such as those affiliated with the Red Cross/Red Crescent or firefighter volunteer groups, who have a structured approach to volunteerism, with clearly defined roles, extensive training programs and are registered in official systems to spontaneous volunteers to bystanders (Shi et al., 2018). Spontaneous volunteers act independently without prior organization, arriving at emergence scenes without pre-planned roles, driven by a desire to help (Harris et al., 2016). Between these types are emergent co-opted volunteers, who may have basic training but lack formal responsibilities (Granberg et al., 2017), as the emerging volunteer initiatives in this study. They represent a flexible and local approach to emergency volunteerism, leveraging information and ICTs to enable rapid response and coordination (Fernandez et al., 2006). In other words, they are not fully organized, but they are also not spontaneous. They involve local community members who are dispatched, sometimes trained and equipped with basic response tools, enabling them to act as first responders, as elaborated below. As noted in the introduction, they are an unused and unstudied potential resource, in relation to large-scale crises.

Study Context and Related Work

In Sweden, municipalities are responsible for local emergency services and rescue operations, with the primary goal of saving lives, protecting property, and preserving the environment (SFS 2003:778). The Public Safety Answering Point (PSAP) processes all emergency calls (112) and dispatches necessary resources. To improve response times, some emergency services have implemented various volunteer initiatives, i.e., CIPs, SMS-lifesavers and DELTA first responders.

The CIP initiatives have existed for over a decade and have the broadest scope. CIPs are insured collectively and receive basic training and equipment to handle pre-defined emergencies. They collaborate with the municipal rescue services, receiving alerts via mobile phones. Related work has shown that the initiatives are valuable in terms of shorter response times, saved lives and reduced material damage (Pilemalm, 2020). The volunteers also contribute to increased safety and security in local communities, both in vulnerable urban settings and sparsely populated areas (Pilemalm, 2020; Prytz et al., 2023). Identified challenges and needs include funding for expanding the initiatives and ICT-related functionalities i.e. geofencing (Pilemalm & Alkusaibati, 2024). A recent study focused on effects but also indicated that most CIPs are willing to contribute to large-scale crises and civil defense (Alkusaibati & Pilemalm, 2024) Also, two national organizations, the Swedish Civil Contingencies Agency (MSB) and the Swedish Fire Protection Association (FPA) has started up work to support the rescue services in implementing the concept, also with the large-scale setting in mind.

The SMS-lifesavers initiative started in 2010. SMS-lifesavers are alerted to OHCAs collaborating with the emergency medical services and the city councils. SMS-lifesavers volunteers receive no equipment or training but verify that they have training in cardiopulmonary resuscitation (CPR). The initiative utilizes a mobile application to alert the volunteers when emergency dispatch centers suspect a cardiac arrest nearby. Related work has focused on response times and survival, showing that activation of the system was associated with higher chances of bystander CPR, bystander defibrillation, and 30-day survival, compared with no system activation (Berghlund et al., 2022). Another study focused on motivators, showing that community, self-image, and competence were the strongest positive predictors for the motivation to continue, whereas alarm fatigue and negative experience were the strongest negative predictors (Prytz et al., 2023).

The DELTA initiative is an emerging volunteer initiative applied by a rescue service in south-west Sweden, with more rescue services considering using the DELTA concept. The DELTA volunteers are alerted only to minor fires using a dedicated mobile phone application which is an adapted version of the SMS-lifesavers app. They have no formal training, equipment, or insurance. DELTA volunteers register themselves via a mobile application on their smartphones, allowing them to receive alerts and respond to fires nearby. There are no studies on DELTA available, the initiative being so new, neither any studies comparing the volunteer groups and/or explicitly taking the large-scale crisis management perspective.

All three initiatives thus utilize smartphones apps to receive dispatch alerts. A view of the different apps is provided in Figure 1.

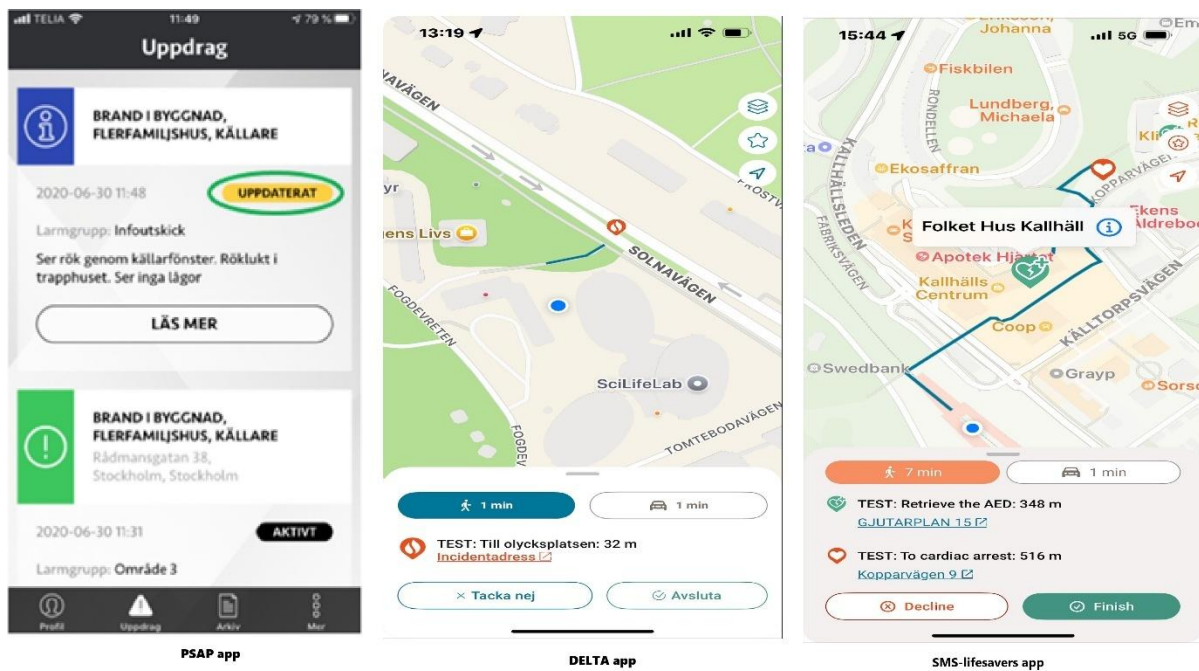


Figure 1: Smartphone apps of the three volunteer initiatives. The apps display various functions including incident types, accept/deny tasks and navigations. **Source:** Figures' courtesy of the Swedish PSAP, 2023 and the DELTA/SMS-lifesavers app supplier 2025.

Analytical Framework: Volunteer First Response as a Socio-technical System

Sociotechnical systems (STS) see a system (e.g. an information system or an organization) as a package of technology and its social context. In information systems (IS) research, according to the STS perspective, systems are comprised of (organizational) structures, tasks, people, and technology and there is an intricate interplay between social structures, technological systems, and organizational processes (Bostrom & Heinen, 1977). This study takes an STS perspective to describe the volunteer initiatives in the context of the larger (STS) emergency response system. This means that we will describe the initiatives broadly, including social aspects of organization, collaboration, training, equipment, legislation and ICT-support in terms of Smartphone apps and other technological tools used by the volunteers, and explore how various components interact.

Furthermore, a sociotechnical analysis might reveal the importance of boundary-spanning activities and knowledge integration across diverse volunteer groups and professional emergency management organizations. As volunteers from different backgrounds and with varying levels of expertise come together, they may create new sociotechnical configurations that can enhance community resilience. With these emergent sociotechnical systems, we can better understand how volunteer engagement in small-scale emergency management contributes to building adaptive capacity and strengthening resilience (Carayon et al., 2015).

METHODS

In this section, we provide a description of the data collection and analysis methods used.

Data Collection and Analysis

The study is qualitative, utilizing 9 semi-structured interviews. The interviews were conducted using both face-to-face and online meetings during the period June 2024 and November 2024. Semi-structured interviews allow a flexible yet focused approach to gathering data. It enables researchers to explore predetermined topics while also allowing for spontaneous follow-up questions based on participants' responses (Cresswell & Cresswell, 2017). We employed a purposive sampling strategy, focusing on the initiatives rather than individual respondents to explore the various experiences of volunteerism in emergency response systems (Coyne, 1997). The interview questions were developed based on prior research/experience and related work, also in combination with the aim to include the dual use/large-scale crisis management perspective. Questions related to e.g., types of incidents, tasks, collaboration, ICT support, future challenges/needs and willingness to contribute to larger crises. We aimed to include perspectives of various stakeholders involved in the three volunteer initiatives of CIP, SMS-lifesavers,

and DELTA as listed in Table 1. It should be noted that the app supplier for SMS-lifesavers and DELTA is the same person (but two interviews). Several of the volunteers had dual roles as CIP and SMS-lifesaver. For DELTA, neither the rescue service using this nor the project leader at the region level were willing to provide contact information to the volunteers, claiming that they do not organize them. As a result, we had to rely on the app supplier and the rescue services project coordinator perspectives and had in total 4 volunteers as respondents (we aimed for 6).

Table 1: Interviewee information table

CIP	Volunteers (2)	Project leader (1)	Firefighter (1)	4
SMS-lifesavers	Volunteers (2)		App supplier (1)	3
DELTA		Project coordinator (1)	App supplier (1)	2
Total number of respondents				9

The interviews lasted approximately 90 minutes. They were recorded and transcribed by the study's first author. We analysed the data using thematic analysis (Cresswell & Cresswell, 2017). First, we coded the data, categorizing chunks of texts under various interview questions, then we merged emerging sub-themes into overall themes, instantiating STS technical, human-related and structural/organizational factors. Both authors collaborated in conducting interviews and analyzing the data, with the first author taking main responsibility.

RESULTS

In this section, results of this study are presented in the following five themes: 1) *Recruitment of volunteers*, 2) *Types and incidents and tasks*, 3) *Collaboration with other volunteers*, 4) *ICT support* and 5) *Challenges and needs*. **Theme 1** ties to social structures and organizational strategies for engaging volunteers. **Theme 2** relates to task allocation, workflow coordination, and adaptability in complex environments. **Theme 3** emphasizes the human aspect in terms of team dynamics, communication, and shared decision-making. **Theme 4** addresses the role of technology in facilitating volunteer coordination, and information sharing. **Theme 5** reflects organizational, social and technical limitations, such as resource constraints and volunteer retention.

Recruitment of Volunteers

The recruitment process across the volunteer initiatives is different. For the CIP initiative, the rescue services use social media, home visits and community outreach. They provide recruited CIPs with basic training covering, e.g., first aid, CPR, extinguishing small fires and acting in single-vehicle traffic accidents, and follow-up exercises. CIPs receive a backpack containing a first-aid kit, reflective vests, pocket masks and hand-held fire extinguishers. They are insured and sign an agreement with the fire association, e.g. on conduct at the incident site. Currently about 600 CIPs exist in about 25 out of 290 rescue services. The comparatively low number highlights the difficulties in expanding CIP initiative due to recruitment costs and resources, as exemplified by the CIP project leader:

...the recruitment process requires a local CIP coordinator. The training includes an initial digital course, followed by modules offered through local coordinators.

To recruit SMS-lifesavers, individuals must be at least 18 years and have self-reported CPR training which is a requirement but not checked or provided. There is no equipment provided, and until recently, no insurance. However, the latter has changed since the study period and SMS-lifesavers are now collectively insured. Recruitment efforts are often grassroots, with information available on the app suppliers' website and with current volunteers encouraged to inform others about the initiative. Unlike CIPs, which collaborate at municipal level, the SMS-lifesavers initiative operates at regional level. Currently over 150 000 SMS-lifesavers registered in 14 out of 24 Swedish counties and the initiative expanded to Denmark, where it has national coverage. This highlights the ease of recruiting SMS-lifesaver volunteers compared to CIPs, the reason likely being that they are less organized, i.e., associated with less resource investment.

In the DELTA initiative, the age requirement is also 18 years. The initiative started in 2024, currently, only one municipal rescue services (including two minor cities and surrounding rural areas) use DELTA. However, 822 volunteers are already registered in the DELTA app and several other rescue services currently consider the initiative, again, likely reflecting less resource investment which lowers the threshold both for the rescue services and the volunteers. The rescue services market DELTA on their website showcasing volunteers' experiences, the

incidents they were alerted to and the tasks they performed. The DELTA project coordinator stated clearly that they do not organize or take responsibility for the volunteers. Once volunteers register in the DELTA app, they start to receive alerts on minor fires. GDPR compliance is ensured through a signed agreement during profile registration. Table 2 summarizes and compares volunteers initiatives in the recruitment phase.

Table 2: Recruitment of volunteers

Initiatives Description	CIP	SMS-lifesavers	DELTA
Channels	Local associations, home visits, community outreach, social media	Suppliers' website, social media, grassroot	Rescue services website
Training	Yes	Acknowledge training in CPR but no verification	No
Equipment	Yes	No. May use defibrillator (AED) in their city. Some volunteers use their own private AED.	No. Some volunteers use their own fire extinguishers.
Contracts and insurance	GDPR, contract of conduct, insurance	GDPR, insurance (but previously uninsured)	GDPR, no insurance
Operational level	Municipal	Regional	Municipal
Operational coverage	About 10% of rescue services	2/3 of regions, (national coverage in Denmark)	One rescue service

Types of Incidents and Tasks

As mentioned, CIP volunteers respond to a broader range of emergencies than the other initiatives. There are also occasions where CIPs responded to other types of incidents and have supported the rescue services in emergencies of larger scale such as snowstorms and floodings. At the emergency site, they engage in tasks such as extinguishing small fires, ventilating smoke-filled houses, performing CPR and first aid:

When a fire broke out in a garbage bin near a garage wall, we saved the garage and surrounding houses. We've also responded to a smoke-filled house where a resident had left something burning. We extinguished the fire, ventilated the house, arriving 15 minutes before the fire department – which is often the case. (CIP volunteer).

SMS-lifesavers are alerted for OHCA, and their major task is to perform CPR until the ambulance arrives. Other tasks of SMS-lifesavers include retrieving defibrillators and providing initial care. DELTA volunteers are alerted for small fires, and their task is to extinguish it. Other tasks of DELTA volunteers include warning citizens to avoid the fires and assist the affected individuals. Most volunteers desire to broaden their operational scope to enhance community preparedness and address emerging social needs. It is notable that CIPs already consider tasks in large-scale crises and civil defense, while the other initiatives mainly related expansion of tasks to small emergencies, as illustrated in Table 3.

Table 3: Types of incidents and tasks volunteers perform

Initiatives Description	CIP	SMS-lifesavers	DELTA
Alerted for	Fires, OHCA, traffic accidents, drownings, sometimes larger emergencies	OHCA	Minor fires
Tasks	First aid, extinguish fires, provide care to people involved in traffic accidents	CPR, retrieve defibrillator, comfort patients	Extinguish fires, warn occupants
Suggestions to be alerted to more incidents	E.g., suicide-related alarms, civil defense and large-scale emergencies, contributing first response/aid, transportation and supply tasks	Child lifesaving	Traffic accidents and drownings

ICT Support

The three initiatives utilize different smartphone apps (see Figure 1). CIPs use an app developed by the PSAP. The app provides essential functions for alerting, mission acceptance, displaying the distance and travel time to incident locations. The CIP respondents reported challenges in relation to the app such as battery drain, lack of geofencing and occasional automatic logouts:

The PSAP alarm app unexpectedly logged me out after updates, causing me to miss alerts. Our volunteer group now uses a Facebook Messenger group to communicate if such technical issues happen (CIP volunteer).

Additionally, CIP volunteers utilize a system portal developed by the previously mentioned FPA which provides personal login and information on how to act on an incident site. The portal is a first release where anyone can sign up their interest to become a CIP volunteer. In the future, it is intended to successively add functionality and be used for coordination of CIP volunteers, also in larger crises.

The SMS-lifesavers and DELTA initiatives utilize commercial apps developed and supplied by the same supplier but adapted to respective contexts. The commercial apps have similar features to PSAP, and include e.g., alert location, distance to incident, information on the nearest defibrillator, CPR training review and test alerts. A major difference is that the commercial apps provide geofencing functionality. The SMS-lifesaver volunteers, like CIPs, wish the app to display detailed real-time information and the ability to see if other volunteers near the incident site have accepted alerts:

The app should include real-time updates if another volunteer retrieved the defibrillator and first responder arrivals, and the ability to display case-specific information like apartment door codes. These updates would improve the response process, making critical information readily accessible (SMS-lifesaver volunteer).

The commercial app supplier also seems committed to improve the app’s functionalities and introduce new features:

We collect feedback from the dispatched volunteers to improve the app. We’re currently developing new features that allow flexible logouts, such as at nights or when caring for children. We prioritize app features based on what’s critically important (commercial app supplier).

Table 4 summarizes and compares the ICT support features of the three volunteer initiatives.

Table 4: ICT support

Initiatives Descriptions	CIP	SMS-lifesavers	DELTA
Dispatch	PSAP app	Commercial App	Commercial App
App Functions	Accept/decline alerts, navigation support, withdrawal, test alert	Accept/decline alerts, navigation support, geofencing, distance to incident site (walking and driving), test alert and nearest AED locator	Accept/decline alerts, navigation support, geofencing, distance to incident site and test alert
Geofencing	No	Yes	Yes
System portal	Initial version with personal logins	No	No
Functionality to contact others during dispatch and on-site response	No	No	No
Ability to see if others have accepted the alert during dispatch and on-site response	No	No	No

Collaboration With Other Volunteers

Collaboration among response volunteers is crucial for effective emergency management and community support. Several CIP volunteers also serve as SMS-lifesavers, some respondents even reported that they had triple roles, functioning as ambulance nurses, CIP volunteers, and SMS-lifesavers. This highlights the dedication of volunteers to help. Volunteers agree the importance of collaborating, regardless of organizational background:

When we're at an incident site, it shouldn't matter if you're a firefighter, a medical professional, or just a concerned citizen who showed up to help. We're all there for the same reason – to assist those in need. Let's break down the barriers between different groups and collaborate, regardless of our backgrounds or affiliations (SMS-lifesaver volunteer).

Being a dual role holder as both CIP and SMS-lifesavers was viewed useful by volunteers as they install both apps on their devices which ensures receipt of all OHCA alerts without missing any critical alerts, if i.e., emergency management forget or delay alerting one volunteer group. At the same time, it is important to bring structure and define various roles seeing them as complementary, as argued by the rescue services project leader:

While it's great that people can take action, there are risks in allowing untrained individuals to respond to fires or traffic accidents. Some volunteer initiatives are more like spontaneous volunteers who could potentially become CIPs. All volunteer initiatives complement each other rather than compete (CIP project leader).

Challenges and Needs

In relation to both organizational, human and technology factors, there are several significant challenges that all three volunteer initiatives face resulting in corresponding needs. The main organizational one is funding (but to different extents):

Financial resources are the main challenge now. The pressure is enormous, but funding is essential. We need...manage the large number of volunteers already in the system (system portal). It's not good to keep them waiting (CIP project leader).

Funding is needed, not the least for regular training and refreshment courses, which were deemed crucial by respondents of the three initiatives. The CIP volunteers also mention improved equipment, e.g., weather-appropriate clothing.

As to the human aspect, the risk of individuals with malicious intent joining volunteer groups is a concern across the initiatives. The CIP project leader mentions examples where they had to remove individuals, including sponsors seeking profit, and those with excessive ambition. There is also a need for better post-incident support, including feedback after interventions, evaluation systems, and trauma counselling, reflecting both human and organizational factors.

Technology challenges, are described in the ICT support theme. It is also notable that even though peer-to-peer collaboration is deemed crucial by the volunteers, the current ICT support provides no such functionality. Table 5 summarizes and compares organizational and human related challenges and needs for improvements.

Table 5: Challenges and needs

Initiatives Descriptions	CIP	SMS-lifesavers	DELTA
Funding challenges	Major challenge for expansion and sustaining the initiatives	Sometimes, but regional level has more financial resources than municipal level.	Challenge for expansion since app is deemed expensive
Risk of individuals with malicious intent	Yes	Yes	Yes
Need for appropriate clothing	Yes	No	No
Need for training and skills refreshment	Yes	Yes	Yes
Need for improved post-incident support	Yes	Yes	Yes

DISCUSSION

In this section, we first discuss the potential of dual use of the volunteer groups in large-scale crises and as part of community and societal resilience, and then the need for ICT support in the light of socio-technical systems, followed by the study transferability and limitations.

IMPLICATIONS FOR DUAL USE OF SEMI-ORGANIZED VOLUNTEERS

Volunteer first responders engaged in smaller emergencies, as exemplified in the study, have valuable skills and experience that may be applied to large-scale crises, contributing to community and societal resilience. They serve in roles such as ambulance nurses, anesthetists, SMS-lifesavers, and firefighters, and have dual ability to provide immediate assistance (first response) and sustain long-term support, including distributing food and shelter. The overlap of professional and volunteer roles may thus expand the skillset available during emergencies and strengthen interconnectedness between formal and informal emergency responses. This is in line with Whittaker et al. (2015) who suggested that volunteer first responders might play a role in extended emergencies and with Nilsson (2021), claiming that their integration may support a more adaptable societal response to crises and enhance community resilience. The three volunteer initiatives in this study showed willingness to take on more tasks than they currently do. Therefore, efforts could be made to translate their commitment into contributions to larger crises.

At the same time, the initiatives differ in their scale, integration, and deployment methods. CIP involves fewer volunteers due to the higher level of integration and training- and thereby - funding required, as well as more stringent regulatory concerns from the state-owned app supplier. This results in a smaller number of CIP volunteers but with a broader range of capacity. The involvement of CIP volunteers in some past crises and the expressed readiness to participate in major emergencies, show most “maturity” to take on large-scale crisis response and related tasks. In contrast, DELTA and SMS-lifesavers have lower barriers to entry, allowing for rapid expansion and a larger volunteer base, thus exemplifying how localized initiatives can scale up to benefit wider geographical regions (in the case of SMS-lifesavers also to Denmark). On the other hand, they might need more support than CIP for use in crisis management. While each of these initiatives has its strengths and limitations, they all might have the potential to contribute and complementing spontaneous volunteers (who of course will continue to be important resources in crisis management). CIP volunteers with their specialized skills and deeper integration with official emergency services, may contribute to complex crisis situations. SMS-lifesavers and DELTA, with their larger volunteer pools, might provide rapid response in cases of cardiac arrests and fires (which may both occur in crises and worst-case scenarios). As to community resilience, it is evident that the volunteer initiatives have created a sense of belonging and safety in the communities where they exist. This is in line with the Madsen & O’Mullan (2016) claim of community resilience involving fostering collaboration among individuals, institutions, and systems to enhance their capacity for recovery and adaptation.

While effective coordination among different volunteer initiatives may create a more comprehensive and flexible emergency response system capable of addressing both small- and large-scale emergencies, such development will likely come with its own challenges, particularly in terms of coordination and responsibility. Currently, there is a lack of clear oversight for the volunteer initiatives, with various stakeholders avoiding taking responsibility. This is exemplified by the DELTA project coordinator explicitly referring to DELTA volunteers as “spontaneous” and showing reluctance to provide contact information for data collection, despite them being dispatched through an organized system. To make use of semi-affiliated volunteerism, it is essential that someone takes a lead role in organizing the various volunteer groups. Two potential ways of organizing them could include: (1) coordination by established organizations like the FPA (who has expressed interest and are those behind the initial version of the system portal) or the Red Cross, which may provide structure and resources; and (2) a network-based approach similar to Finland’s Vapepa initiative (Nahkur et al., 2022) which connects numerous organizations i.e., from the Finnish Red Cross to local organization (Rantavuo et al., 2021). Both types could be adapted to fit specific needs and existing volunteer infrastructures.

ICT SUPPORT FOR COORDINATION: THE STS PERSPECTIVE

From the STS perspective, we can see that the effectiveness of the volunteer initiatives depends on the integration of human factors (recruitment, training, collaboration) with technological support (apps, ICT infrastructure). In fact, people/humans, organization, structure and technology re-appeared in various themes and could not be separated from each other. This underscores the interplay between social and technical elements (Carayon et al., 2015) and highlights the need for a broad perspective when developing the initiatives for potential use in the large-scale crisis context, including when designing ICT support. Also, the study illustrates how volunteers, especially the CIP initiatives, engage and want to collaborate also between incidents, and how the volunteers sometimes engage in several initiatives simultaneously reflecting how they start boundary-spanning activities and knowledge integration in emergent constellations/socio technical systems, as suggested by Carayon et al. (2015). Their will and efforts in this respect could be seen as an opportunity to expand the socio-technical volunteer first responder systems further for dual use in various types of emergencies.

In relation, study’s findings suggest that ICT solutions play a pivotal role in enabling volunteer dispatch and (lack of) coordination. While the apps provide essential functionalities, they also face limitations that impact volunteer

effectiveness (Pilemalm et al., 2020). The PSAP app's problems with geofencing, battery drain, and automatic logouts highlights how technical challenges may hinder volunteer responsiveness. In contrast, the commercial apps used by SMS-lifesavers and DELTA offer specialized features like geofencing and defibrillator location information, adjusted to their emergency mission. Volunteers' feedback on the desired app improvements reveals a trend towards more sophisticated, real-time information sharing capabilities. This aligns with the concept of interdependent digitalized co-production, where emergency response volunteers actively contribute to shaping the tools, they use (Alkusaibati and Pilemalm, 2024) and reflects the need for active user participation in IS development, associated with the STS view (Carayon et al., 2015).

The varying features across smartphone apps utilized by CIP, SMS-lifesaver, and DELTA volunteers reflect the specific needs of each initiative and the adaptability of apps to different types of emergencies but also demonstrate the potential for a unified technological approach that may scale from routine incidents to crisis situations (Ramsell et al., 2019). The system portal for training and reporting under development, might be one way ahead. In the long run, SMS-lifesavers and DELTA volunteers might be added to this resource pool, in coordination efforts for large-scale crises. A unified system portal for coordinating volunteer initiatives could address many of the challenges posed by the current diversity of apps. It would provide technological integration and might also facilitate the development of the emergent STSs combining the agility of informal volunteer networks with the established processes of professional emergency services (Kim et al., 2012). This solution might harmonize the human and technological elements of the STS, potentially leading to dual use of volunteers in small- and large-scale emergencies. It could also serve as a bridge between the flexibility of emerging initiatives and the structure of traditional response organizations, fostering a more adaptive and resilient emergency management.

STUDY TRANSFERABILITY AND LIMITATIONS

The study's results might be transferable to similar initiatives and settings in other countries where we see similar initiatives of co-opted volunteerism emerge (Siriwardena et al., 2024; Lyttle et al., 2023). Furthermore, the use of mobile phone applications for volunteer dispatch and coordination is also a transferable element as this technology-driven approach can be adapted to different emergency response systems worldwide, enhancing response times and efficiency. The challenges identified, such as funding issues, risk management, and the need for improved ICT support, are universal concerns in emergency management. Here, other countries might learn from Sweden's experiences and develop more robust volunteer-based emergency response systems.

This study has several limitations. The major one is that we could not access the DELTA volunteers but were only able to reach the app supplier and the project coordinator who gave us mediated information, i.e., we could not gather first-hand experiences of these volunteers, potentially limiting and biasing our findings. Also, this is work-in-progress and more data collection from more respondents, especially volunteers, is needed.

CONCLUSIONS AND FUTURE WORK

This study explored the contributions of semi-organized volunteer first responders in smaller emergencies to understand their potential contribution in large-scale crises, community and societal resilience, using the STS perspective as a lens. We found that volunteers demonstrate a strong willingness to collaborate, take on dual roles with diverse skill sets, and provide sustained support at incident sites from first response to assisting victims with food and medicine distribution. Some volunteer initiatives have already participated in large-scale emergencies, demonstrating their adaptability to contribute beyond their current roles. The study also highlighted similarities, differences, challenges and needs of the volunteer initiatives. Major challenges/needs include funding and resources, robust ICT solutions and ISs for coordination of the volunteers. On the other hand, should these needs be sustained, the volunteers might constitute a valuable complement to spontaneous volunteers in crises, where various levels of organization, from spontaneous volunteers to DELTA/SMS-lifesavers to CIP each contribute to the overall emergency response system.

Future research will focus on expanding the sample size, including additional volunteer respondents, perform scenario-based workshops with volunteer initiatives and evaluate whether/how current digital platforms can be utilized in large-scale crises.

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