Crisis Cleanup: Creating a Virtual Command Post to Support Relief Organizations on the Ground

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ABSTRACT

We report on an initial assessment of a grassroots tool developed within the Volunteer Organizations Active in Disaster (VOAD) community to support the coordination of efforts between the diverse network of relief organizations on the ground following a disaster. We look first at the problems that led to its development and the volunteer principles embodied in the tool. We then present an overview of the primary workflows and processes used to capture and manage work orders within this system. We discuss some of the benefits of centralized coordination of work across this network, opportunities for future growth, and some of the barriers that are inhibiting further growth of this tool. Finally, we conclude with opportunities for future research.

Keywords

Disaster recovery, disaster volunteers, volunteer coordination

INTRODUCTION

Effective response to large-scale disaster and crisis events requires the collective effort of a diverse community of groups and organizations, each filling important gaps and addressing the critical needs of communities in the aftermath of disaster (Dynes 1970; Tierney et al. 2001). Citizens are often the true *first responders*, initiating search and rescue efforts and providing medical attention until emergency personnel arrive on scene (Dynes 1970). In the warning and most acute phases of an emergency, formal emergency response organizations work to address the immediate impacts, minimize threats to life and property, and to restore critical infrastructure. Even in small to medium-sized events, formal response organizations may not be able to address all the needs of a community. Thus, citizens and community organizations play a critical role in filling gaps and organizing medium to long-term recovery efforts (Fritz and Mathewson 1957; Hunt et al. 2014; Voorhees 2008; Wenger 1991).

After the initial threat of the hazard has passed, Voluntary Organizations Active in Disaster (VOAD)[1] converge to form a coalition of *second responders* assisting survivors in the initial phases of recovery. These organizations serve an important community need in helping to bridge the gap where federal funding and assistance ends and community recovery begins. They also help to foster resilience by helping survivors mitigate some of the immediate impacts of the disaster more quickly than they could potentially accomplish on their own. However, as these volunteers converge to help after a disaster, researchers (Barsky et al. 2007; Schmidt et al. 2017; Voorhees 2008) have noted significant challenges to volunteer coordination, communication, information sharing, and integration within the formal response efforts. In this paper, we present a case study of an online application—*Crisis Cleanup*—designed and developed within the VOAD community to overcome many of these challenges.

VOAD

There are multiple definitions of the term VOAD ranging from a conceptual framework, to the ongoing organizational networks, to the physical and local implementation of volunteers in disaster. In this paper, we define VOAD as the broad, informal network of volunteers on the ground after a disaster. The size and diversity

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[1] https://www.ready.gov/voluntary-organizations-active-disaster

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of this network varies depending on the size and magnitude of the event. It may include established VOAD organizations (e.g., the American Red Cross, United Way, Habitat for Humanity, Amateur Radio Emergency Service, etc.) as well as spontaneous community organizations that emerge to provide assistance. VOADs operate in parallel with one another and members cannot activate, supervise, or direct one another except as defined by special agreement.

Use of Online Tools in Disaster Response and Recovery

The use of online tools and technologies to organize disaster response and recovery efforts has grown significantly in recent years. Numerous studies look at the use of social media and information communication technologies (ICTs) to organize globally distributed, digital volunteers to aid efforts on the ground (Hughes and Tapia 2015; Majchrzak and More 2011; Palen et al. 2015; Reuter et al. 2015; St. Denis et al. 2012; Starbird and Palen 2013; Zook et al. 2010). However, research looking at the potential use of online tools to coordinate the on-the-ground response of volunteer organizations is limited (de Lanerolle et al. 2010; Schmidt et al. 2017; White and Palen 2015), particularly the coordination of work across volunteer relief organizations and emergent community groups. To fill this gap, we provide an initial assessment of Crisis Cleanup—an online application designed to make visible the needs of communities impacted by a disaster and the coordination of cleanup efforts across the loosely organized network(s) of volunteers on the ground. We look specifically at the evolution and use of this tool over 7 disasters for insight into implications this has for the future evolution of Crisis Cleanup and other applications designed to coordinate volunteer resources in the recovery phase of disaster. The content of this paper is based on information gathered during a series of informal interviews with the founder and creator of Crisis Cleanup. It is also based on printed and online content provided by the creator.

CRISIS CLEANUP BACKGROUND

The creator of Crisis Cleanup conceived of an online framework for coordinating the cleanup efforts of volunteer groups on the ground after working as a volunteer following Hurricane Irene in New Jersey, USA in August 2011. As a member of a faith-based volunteer group, he was struck by the overall inefficiency and disconnection in the process. Volunteers, eager to help, would congregate at various locations and often spend hours waiting for a work order. Once completed, they either travelled back to the command center or contacted the coordinator for a new assignment. Communication break downs and time spent standing around resulted in significant attrition among volunteers because they either thought there was no remaining work or they grew frustrated with the wait time. Additionally, no mechanisms existed for incorporating assessments and information gathered in the field back into the volunteer framework. With numerous organizations working in parallel, multiple groups often canvased the same neighborhoods while others were completely ignored. Finally, there was no efficient way to funnel and manage the help requests from the 2-1-1 Helpline Centers to the volunteer organizations on the ground. The 2-1-1 Help System is a reserved number in the United States and Canada that provides free, confidential information and referrals at the community level[2]. During a disaster, they work with emergency management to offer support and disseminate information. Crisis Cleanup's creator saw the potential for a solution that could 1) provide an effective mechanism for capturing information and requests from those affected by a disaster event, 2) share the big picture across the loosely coupled network of organizations and volunteers, and 3) empower individual volunteers and organizations to use this information to organize and inform their response.

The initial prototype of Crisis Cleanup was deployed for the first time following a destructive windstorm in June, 2012 in Southern New Jersey. Members of the public called the New Jersey 2-1-1 Call Center where operators created work orders that were then copied to a map. Cleanup crews claimed work orders electronically and began work based on their schedule and availability without having to coordinate with a central command center or work coordinator. This simple workflow helped to organize and coordinate the work of over seven hundred volunteers and to aid several hundred impacted residents. Operators within the call center also used the map to check the status of work orders and provide that information back to the affected residents.

The system was used four months later to support cleanup efforts following 2012 Hurricane Sandy, where it was used by over 120 voluntary relief organizations (Titus 2017). During Hurricane Sandy, a team of software developers expanded this concept. They re-wrote the platform to further automate the workflow and to make the code and interface more robust and stable. Since then, Crisis Cleanup has been used to manage seventy-eight disasters in thirty-four states and six countries.

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[2] http://www.211.org

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OVERVIEW OF CRISIS CLEANUP

What makes Crisis Cleanup interesting is not the underlying technology, but rather the principles of volunteerism and cross-organizational coordination supported by its simple interface. The interface is designed to support several key principles of volunteerism. First, it provides equal access to big-picture information across all active relief organizations and the means for members of this group to update relief data as they gather new information or complete work. This mechanism ensures that all organizations and volunteers have the most up-to-date and complete picture of the relief effort. Second, volunteer organizations operate independently from one another, even though they often work towards the same goals, so the system must allow volunteers to organize themselves and solve problems in their own way. Finally, the system must empower the community to help itself and support the spontaneous volunteer groups that emerge within the chaos on the ground.

Crisis Cleanup supports two primary workflows. The first is the assessment process. This process lets volunteers gather information about needed work, contact information, and location information used to pin the work order to the Crisis Cleanup map. The map interface supports work order management (see Figure 1). The symbols and color of work orders on the map indicate the type of work and current status. Volunteers can view, claim, un-claim, or change the status for a work order by selecting the work order icons on the map.

Managing Work Orders

As assessments are completed, new work orders are pinned on the incident map with the icon depicting the type of work and the color indicating the current status (Figure 1) Volunteers can claim an individual work order that matches their skills or a type of work within their local work area. As work orders are claimed and completed, the system updates the work order status. Volunteers staffing the 2-1-1 Helpline and the Crisis Cleanup Hotline can check on status of the work orders.

At a higher level, organizations can target areas where they are most needed and avoid duplication of effort with other organizations. They can also download a report of the Crisis Cleanup work orders claimed by their organization to coordinate their work and document their efforts.
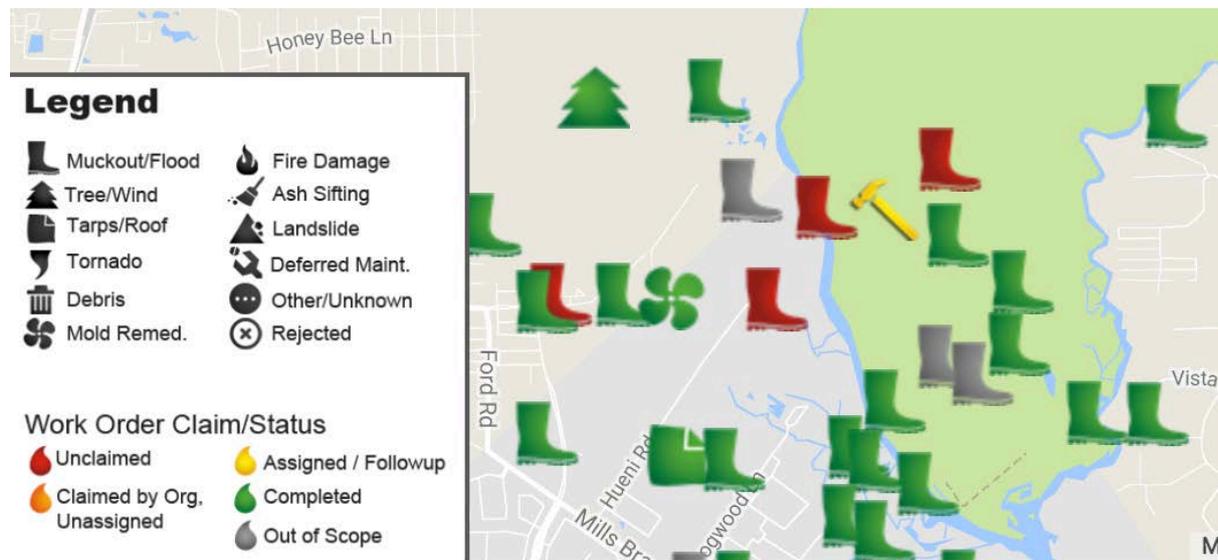

Figure 1: Sample Crisis Cleanup Map with Legend

Building the Local Relief Network

A new relief network is constructed for each deployment of Crisis Cleanup. Membership is open to any reputable relief organization, provided they meet the following criteria. First, the organization must have a physical presence in the disaster area or interact directly with those affected by the event. Second, they must perform relevant operations, such as canvassing, assessments, cleanups, muck-outs, or rebuilding. Finally, organizations must be reputable and have no financial interest in the cleanup (e.g., contractors or construction agencies). The network includes both established relief agencies and emergent community groups. Inclusion of emergent community groups is critical to local community response, giving community members a broad picture of what is needed and the means to organize their response and long-term recovery.

A local coordinator or a designated local agency oversee the vetting and approval of new organizations. They

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are not officially "in charge" nor do they manage and assign work orders. They have the vital knowledge and insight to make sure that only voluntary relief organizations active on the ground are admitted to the network.

New organizations are added to the network after they have been vetted to confirm that they meet the criteria given above. Once accepted, the initiating contact logs in and invites trusted colleagues from within their organization to be part of the cleanup. Crisis Cleanup has a workflow that allows coordinators to onboard volunteers quickly. Once in, volunteers can begin to organize and plan their efforts self-sufficiently.

Performing Needs Assessments

Needs assessments are performed both over the phone and in person. When requested by local relief organizations, Crisis Cleanup opens a toll-free hotline staffed by virtual volunteers from participating organizations. These volunteers answer calls from home, often in multiple states. For example, during the height of the 2017 hurricane season, this hotline fielded 60,000 calls, and up to 3,000 calls per day. Survivors can contact either the Crisis Cleanup Hotline or the local 2-1-1 Helpline to request assistance. The Crisis Cleanup Hotline and local 2-1-1 helplines are staffed by trained volunteers who capture relevant work details from survivors and create new work orders (Figure 2). Relief organizations continue to canvas neighborhoods on foot and can create work orders as well. The traditional practice of canvasing neighborhoods on foot still takes place, but now organizations can clearly see which areas have been canvased and avoid duplication of effort. Additionally, volunteers can also input work orders directly from the field as they identify gaps in the cleanup process and new areas of need.

Figure 2: The Crisis Cleanup Work Assessment Form

Protecting Survivor Information

The vetting process of Crisis Cleanup is meant to limit the collection of survivor data and to limit exposure to only reputable relief organizations and vetted volunteers interacting directly with survivors. Data collection policies are meant to protect exposure of this vulnerable population even further. Data collected during the needs assessment focuses primarily on property information. Ideally, only basic contact information or key pieces of information may be noted in the work order. This information is used to prioritize the request and may include data about whether the resident is elderly, without insurance, or a first responder. Volunteers are trained not to collect sensitive data, such as date of birth, immigration status, social security numbers, race/ethnicity, religion, profession, income level, insurance settlements, or personal health status. The assessment form can be modified or customized, but organizations are asked to think carefully about whether the information collected is necessary to prioritize, prepare for, or execute the work order. Data collected by Crisis Cleanup volunteers is never monetized or sold.

While maintaining the privacy of survivor information is a critical consideration, Crisis Cleanup developers recognize the value of sharing carefully de-identified information with a broader audience. Consequently, the information displayed on the public maps only shows the type of work, and the location of the work order has been randomized within the local area so that the exact location cannot be identified. In the future, developers would like to support more diverse levels of data access (see Table 1).

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Table 1: Future Data View/Access Levels for Crisis Cleanup

Access level	Data access	Description
Recovery	Access to client database and maps	Organizations that *interact directly* with survivors either doing assessments or cleanup work
Coordination	Access to client database and maps claimed or reported by affiliates	Organizations that *do NOT interact directly* with survivors but *directly supervise* organizations that do
Situation Awareness/ Preliminary Damage Assessment	Access to damage assessment and situation awareness data without personally identified information	Organizations that *do NOT interact directly*, but need general situational awareness and statistics
Public	Access to de-identified public maps and data	Members of the public/general audience

DISCUSSION

Crisis Cleanup is an interesting system because it was started by volunteers who recognized a need. Since its original proof-of-concept in 2012, the system has been adopted widely and deployed in 75 events to date. It functions as a virtual command post coordinating the efforts of the broad network of relief agencies and volunteers on the ground. It was designed to address some of the key inefficiencies inherent in coordinating the efforts of a diverse and independent network of relief agencies working independently but towards the same goals. While Crisis Cleanup is unlikely to fully replace volunteer command posts on the ground, it has been shown to be an important complement to on-the-ground work. In the remainder of this discussion section, we start by identifying some of the benefits provided by this online system. Next, we offer ways that this solution could be extended and some of the barriers preventing further development. We conclude with some of the key questions we would like to address moving forward.

Benefits

The clearest advantage that Crisis Cleanup provides is the shared big-picture view of what is needed and what is happening on the ground. The relief agency and the volunteers themselves collectively build and maintain this informational picture in real-time. Individual agencies decide where to position themselves, allowing them to avoid both duplication of effort and provide assistance more evenly across affected areas. Volunteers no longer have to waste time waiting for the next assignment and the inefficiency of traveling back to the command post. They can claim a work order and coordinate directly with survivors. When a work order is complete, they can claim another within the area they are working. This improvement alone likely results in more work being completed more quickly. It may also minimize attrition since volunteers can see what remains to be done and are empowered to step in and perform the work. Volunteers also contribute to the big picture by submitting new work orders based on needs assessments done in the field and updating the status as they claim and complete work. Another key advantage is that volunteers staffing the Crisis Cleanup and the local 2-1-1 help lines can work directly with survivors to create work orders that are shared across organizations. There is no guarantee of assistance, but sharing maximizes visibility of the request and optimizes chances that someone will claim and complete the work order. Finally, this system captures and reports on both the current needs of the community and the support provided by relief organizations in a unique and comprehensive way. During the immediate response and recovery efforts, this comprehensive picture is potentially valuable for identifying important trends and gaps that require the shifting of resources and creative community solutions. Longer term, detailed damage information may help communities plan better for future events and may help researchers better understand the complex relationship between social decision-making and the impacts of a disaster.

Future Enhancements

The developers of Crisis Cleanup have identified several ways to extend Crisis Cleanup in the future. For example, Crisis Cleanup currently only works through a web browser and the system would be more flexible if it could also be used as a smart phone or tablet application in the field. The underlying database design and analytics tools also need improvement. Additionally, the developers want to create an application programming interface (API) to support communication with other programs and systems involved in the response effort. This

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API would also provide the ability to import data from other sources directly into Crisis Cleanup and export cleanup information for integration with other maps and websites. Developers would also like to add a phone interface that would allow survivors to log requests for assistance and check on the status of the requests themselves.

Moving forward, the creator of Crisis Cleanup wants to construct a trusted relationship directory that is collectively maintained and work through issues related to data sharing so that other agencies and collaborators can view the appropriate level of information related to the relief effort. He would also like to explore extending Crisis Cleanup for longer-term recovery and rebuilding operations.

Challenges

Crisis Cleanup is an open-source software package intended to help survivors of a disaster. Its use is free to volunteers and organizations contributing to the relief effort. However, the nature of its use precludes monetization. Members of CrisisCleanup.org have raised limited funding from within the VOAD community to support the tool, but not enough to accomplish some of their broader development objectives. It is unlikely to attract government funding because Crisis Cleanup starts where the government scope of responsibility ends. While the services may be invaluable for a disaster survivor, it does not save the government money, nor can Crisis Cleanup provide any sort of guarantee about services provided. Crisis Cleanup grew out of grassroots efforts from within the VOAD community and it remains to be seen if this application can attract the sponsorship it needs to grow into a more robust solution.

Future Research

We see Crisis Cleanup as a potential rich site of study to understand how online tools enhance on-the-ground coordination of volunteer work. More research is needed to understand both the strengths and weaknesses of recovery work managed through a virtual command post model. Crisis Cleanup appears to work best when disaster spans a large geographic area and there are many relief agencies responding. However, the completion rate for work orders can vary widely, which is illustrated by two recent disasters. Hurricane Irma and Hurricane Harvey were both highly destructive events that covered a wide geographic area and prompted strong response from the VOAD community. However, the reported completion rate for claimed work orders for Hurricane Harvey was considerably higher than it was for Hurricane Irma. As a next step, we plan to perform a detailed workflow analysis of these two events as well as interviews with users of Crisis Cleanup to better understand the factors that influence the completion of work.

CONCLUSION

Crisis Cleanup is an innovative grassroots solution that explores the use of online tools to enhance the productivity and coordination of highly local volunteer work in response to a disaster event. It strives to enhance rather than replace inter-organizational communication and collaboration. Successful use on over seventy-five disasters demonstrates that the use of a carefully designed inter-organizational information sharing and collaboration platform is a critical component of a successful on the ground response.

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