From Concept to Reality: Operationalizing Social Media for Preparedness, Response and Recovery

Virtual Social Media Working Group and
DHS First Responders Group

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Contents

Executive Summary

The role of social media in operations and decision-making continues to evolve as it is increasingly used for communications in preparedness, response and recovery.[1] Although government agencies commonly use social media to push information to the public, there is hesitation to use information from the public for operational decision-making due to concerns relating to verification, privacy and liability.[2] While accurate information is critical for decision-making, the inability to verify the trustworthiness of sources makes decision makers reluctant to trust social media sources. Despite this challenge, information gleaned from social media has proven to be useful and support for its use will continue to expand once integrated into an agency's operational workflow in a robust and complete manner.

The development of social media solutions has historically been sporadic, disjointed, and often performed without consideration for existing technologies, best practices or lessons learned. Ongoing, iterative experimentation is essential in long-term technology development because it supports the identification of information and technical requirements, and standards. Experimentation also supports the institutionalization of social media activities. To truly integrate social media into all aspects of public safety, from preparedness to response and recovery, it must be included in the following: planning and strategy development; operational and procedural documentation; legal, security, privacy, and other related policies; education, training, hiring, and exercises; evaluation and assessment; standards development; private sector collaboration and technology development; and funding strategy (both short- and long-term). Additionally, public safety agencies, especially those with legacy technology investments and long-term purchasing strategies, must consider long-term adoption and continued use of social media. This includes the need for maintaining flexibility to adapt as technology advances and internet trends change.

Introduction

Social media and collaborative technologies have become critical components of emergency preparedness, response and recovery. From the international response efforts after major tsunamis, to hurricane recovery in major U.S. cities, many government officials now turn to social media technologies to share information and connect with the community during all phases of a crisis. Implementing these new technologies, however, requires agencies to adopt new communication strategies, policies and engagement methods.

Recognizing the need to address these challenges, the U.S. Department of Homeland Security's Science and Technology Directorate (DHS S&T) established a Virtual Social Media Working Group (VSMWG). The mission of the VSMWG is to provide guidance to the emergency preparedness and response community on the safe and sustainable use of social media technologies before, during and after emergencies.

Drawn from a cross-section of subject matter experts from federal, tribal, territorial, state and local responders from across the United States, VSMWG members are establishing and collecting best practices

[1] Past VSMWG reports provide several examples of how social media has been increasingly used for a variety of communications-driven activities, including stakeholder engagement, education, media relations, and messaging.

[2] APCO, *Apco ANS 1.112.1-2014, Best Practices for the Use of Social Media in Public Safety Communications*. 2014. <https://www.apcointl.org/doc/911-resources/apco-standards/545-apco-ans-1-112-1-2014-best-practices-for-the-use-of-social-media-in-public-safety-communications/file.html>.

and solutions that can be leveraged by public safety officials and responders throughout the nation's emergency response community. Below is a list of agencies to which the VSMWG members belong.

VSMWG Member Agencies as of February 2016

- American Red Cross
- Federal Emergency Management Agency (FEMA)
- George Washington University
- Humanity Road
- National Institutes of Health (NIH)
- New York City [NY] Office of Emergency Management
- United States Northern Command (USNORTHCOM)
- Oregon Voluntary Organizations Active in Disaster (VOAD)
- City of Palo Alto [CA] Police Department
- Sacramento County [CA] Office of Emergency Services
- King County [WA] Office of Emergency Management
- San Francisco [CA] Department of Emergency Management
- Southern Marin [CA] Fire District
- United States Geological Survey (USGS)
- University of Washington Office of Global Affairs
- Virginia Department of Emergency Management (VDEM)

Purpose

This report follows the VSMWG's last publication, ***Leveraging Social Media for Enhanced Situational Awareness and Decision Support*****,** which introduced and discussed how social media can be used for situational awareness in public safety, including:

- An analysis of current social media use as applied to situational awareness in public safety;
- Challenges associated with the use of social media for situational awareness and the perceived barriers to adoption;
- The potential for integration of social media within the operational environment; and
- Areas requiring further consideration, research and development, including the operationalization of social media within all aspects of the disaster life cycle.

The purpose of this document is to:

- Serve as follow up to the VSMWG's previous work focusing on how and why social media should be used in public safety, and the importance of operationalizing and institutionalizing its use;
- Address the need for integration of social media into all aspects of preparedness, response and recovery, to ensure its longevity; and
- Discuss social media's role in decision-making and information sharing in emergency response, how to operationalize social media in emergency response and for what purposes, and its associated challenges and barriers.

The VSMWG developed this document with input from the public safety community through online engagement hosted on the *DHS First Responder Communities of Practice* portal and through monthly group meetings and discussions via a variety of communications channels. It is intended for use by all public safety disciplines and all types of agencies to better understand and utilize social media and other web-based tools without having to duplicate effort or spend undue resources searching for examples, policy templates, or guidance.

Examples included in this document are not intended to serve as an all-inclusive list, but rather to provide a brief listing of agencies that use social media for public safety purposes. For more information on these topics and additional resources, please visit DHS First Responder Communities of Practice.

Legitimizing Social Media: Moving Beyond Communications

The role of social media in operations and decision-making continues to evolve. Social Media is commonly used to push information out, however, agencies often hesitate to use information gleaned from the public due to concerns around verification, privacy and liability.[3] Accurate information is critical for decision making, but difficulties in verifying a source's trustworthiness makes decision makers reluctant to trust social media, a barrier to integration. It is equally essential that information found in social media is contextualized against mission objectives so that it can support long-term operations. Operationally, we accept 9-1-1 information and act upon it even though it may be unverified. The challenge with social media is the volume, which can in fact work in favor of verification when utilizing certain analysis tools. Despite these challenges, however, information gleaned from social media is useful and will support operational decision-making, once integrated in a robust and complete manner. Consider the following:

What information is needed? Following an event, decision makers need to look at essential elements of information (EEI). For example, the anticipated severity and duration of severe weather (such as a coastal storm) will affect whether to order an evacuation or shelter-in-place. The demographic breakdown of areas affected by the storm, the status of transportation and critical infrastructure, the location of available shelters, the public's ability to evacuate, etc., will also affect these aforementioned decisions, as well as other key decisions.

Social Media can provide the real-time *who, what, when where, why* and *how* to help decision-making during fast-paced disasters.

What information is already available? While many of these variables are easily attained (census data, power status, etc.), data may be out-of-date, inaccurate or incomplete. Once specific needs are identified and available information is tapped the gaps become clear.

Is messaging and information effective, sufficient and useful? In order to determine whether people have received this message and are responding appropriately or accordingly, these questions require real-time insights. In addition to monitoring the number of calls to 9-1-1 about a specific emergency, insights can also be gleaned by monitoring social media and disseminating information through communication channels as needed. Once gaps are identified, officials can target the additional information they need. For example, after emergency managers give shelter-in-place orders, new variables require attention: Did the public receive this message? Was it appropriate? Was it accessible? Are they heeding the direction?

[3] DHS VSMWG. "Using Social Media for Enhanced Situational Awareness and Decision Support." June 2014.

Do they need food, water or medical attention? Will they attempt (or have they attempted) to evacuate despite the direction? Where will they go?

Social media planning must be included into all aspects of public safety and all points in the disaster lifecycle.

Are there changing actions, decisions or resource needs that were previously unknown? Once preliminary action is taken the scenario may change. In the first twelve to twenty-four hours, public safety officials triage community needs based on changing information. Information gleaned from social media may help prioritize response by providing clarity about community needs. Individuals who did not require assistance change status; medical emergencies, accidents, and crime occur; reported needs are met by unofficial resources (community and ad-hoc groups, nonprofit response partners, etc.) and more. First responders also make decisions based on trained behaviors and anticipated needs or as experienced in previous disasters. When the public's needs shift greatly from these predetermined responses, social media can more rapidly identify the gaps and enact corrections in decision-making.

Is there technology alignment? If the previous issues can be satisfactorily resolved, there is still the challenge of ensuring that technologies within Communication Centers (i.e., Public Safety Answering Points (PSAPs)) have the ability to receive the various digital mediums in an effective manner. These technologies must integrate with existing Computer Aided Dispatch (CAD) Systems and allow pushing information into the field on Mobile Data Computers (MDC) and into Records Management Systems (RMS), ensuring an end-to-end data capture.

Opportunities to partner with public safety organizations. Part of the legitimization process must include establishing partnerships with leading public safety organizations such as, but not limited to, the Association of Public-Safety Communications Officials (APCO), the National Information Officers Association (NIOA), the International Association of Fire Chiefs (IAFC) and the International Association of Chiefs of Police (IACP). These organizations often establish best practices and can become another mechanism in legitimizing the use of social media.

In addition to serving as a means through which to communicate with the public, information published to social media can provide the real-time *what, who, why, where* and *how* for enhanced situational awareness, and may even help predict the cascading effects of decisions, actions, and changing hazards.[4] Integrating social data within all aspects of the disaster life cycle, including planning and training and exercises (operationalizing it), will demonstrate the true value for the public safety community.

Operationalizing Social Media

Social media has allowed the landscape of public information to evolve from a one-way communications system -- designed solely for message dissemination purposes -- to an engaging two-way conversation. Social media tools are now leveraged for collaboration and coordination, and often serve as a mechanism through which those needing help can connect with those who have supplies and resources.[5] Information

[4] Cohen, Sara Estes, Hyjek, Bill. "Social Media as a Sensor – Leveraging Crowd-sourced Data for Early Warning and Response." *G&H International Services Blog*. 24 January 2011. <http://www.ghinternational.com/blog/social-media-as-a-sensor-leveraging-crowd-sourced-data-for-early-warning-an#.U0_vYsuYapo>.

[5] DHS VSMWG. "Using Social Media for Enhanced Situational Awareness and Decision Support." June 2014. 19.

found in social media can help to enhance general situational awareness as well. During emergencies, because the public shares their welfare status, needs, fears and more, first responders and emergency managers can sift through the data to paint a picture of the overall impacts of disaster. As the technology becomes more sophisticated, to include anomaly detection and alerting, the impact of situations can be viewed in real time.

To truly integrate social media into emergency response, it must also fit into the standard operational models leveraged by the public safety community. While social media enables new ways of communicating and sharing information, it must align with existing methods used for coordination, information gathering, processing, action-planning and other operational standards. Furthermore, to leverage social media for communications and operations, response organizations should incorporate social media into all common practices, including planning, training, exercises, education, hiring, policy development and the agency's response structure.

Social Media and the Incident Command Structure (ICS)

To move beyond using social media purely as a communications channel, the first step is identifying in which emergency support function (ESF) it should fall. Because social media is regularly seen as a tool for information dissemination and message delivery, it often falls within the purview of the public information officer (PIO) or ESF 15-External Affairs. When social media is observed as an ecosystem rich with data, other uses within an emergency response or recovery become possible as well. Within the boundaries of ESF 15 or PIO responsibilities, extracting data from the social media ecosystem allows for the verification of message delivery, including depth of dissemination. That information can also be used to support operational decisions, signifying that social media responsibilities might fall to other ESFs.

Visual and sensory data, including photos, videos and associated metadata, can be helpful for other ESFs needing additional information about how the emergency is affecting their operations. This can range from the planning section to critical infrastructure and key resources, to public safety and field operations, and therefore could be integrated across the entire organizational structure. Depending on the organization's resources, priorities and structure, social media may fit within a variety of areas within an Incident Command System (ICS). Field use of social media may be modified somewhat for use within an Emergency Operations Center (EOC), Joint Information Center (JIC) or the Joint Information System (JIS).

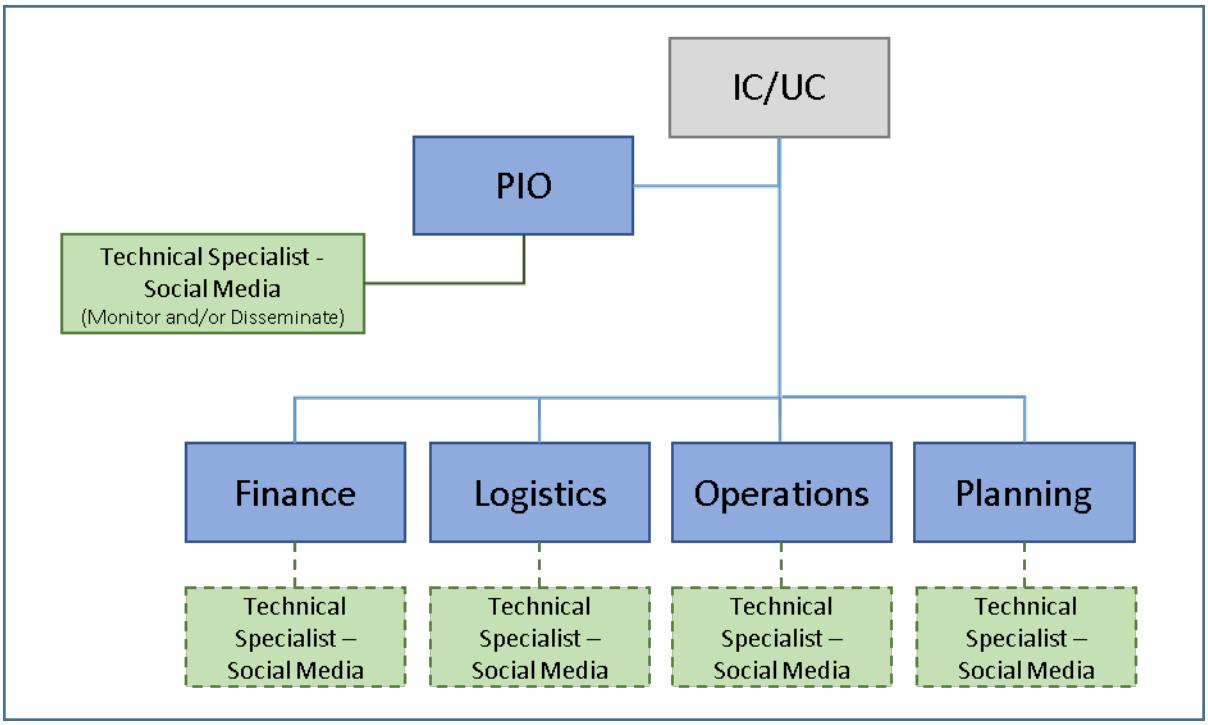
Social media is not a one-size-fits-all solution. Whether for communications or operations, each agency should determine in which ESF related responsibilities should fall.

Ultimately, an agency should determine the best placement for a position within ICS for social media, whether it is part of the role's overall responsibilities or its role in entirety, by considering a variety of factors. These will help to determine where and how social media can fit into an agency's workflow:

- Available resources;
- Organizational structure, roles and responsibilities;
- Priorities and planned activities;
- Capabilities of existing and available staff; and
- Available technologies and supporting policies (e.g., can staff access social media from within the EOC or is there a firewall blocking it?).

Figure 1 identifies potential placement for social media-related positions within a standard ICS organizational chart, which is typically as a Technical Specialist under the Planning Section. Additionally, many agencies have intuitively included social media positions under the PIO, or serving as a liaison or coordinator to all other sections in the EOC from within the Planning and Intelligence Section. Given that the ICS structure can expand or contract to fit an agency's needs and requirements, the Technical Specialist – Social Media and its responsibilities can be adjusted and relocated underneath any ICS position deemed appropriate by that agency. Because the common placement is under PIO or Technical Specialist, for this report it is proposed as fitting most appropriately underneath the PIO for monitoring and/or distribution of social media content.

Figure 1: Potential Placement for Social Media within ICS[6]



Within the ICS structure, an individual or team utilizing social media may fill a variety of positions. Each of these options includes a variety of responsibilities, depending on which ESF the position falls. Command and control operations in emergency response can fall short because of inefficient communication and coordination between responsible agencies, unclear chain of command or lack of participation in preparation exercises. When assigning social media responsibilities, it is important to acknowledge the varying time constraints and volume of social media data associated with the scope, type, magnitude and complexity of the incident. *Table 1* highlights these options by ESF.

[6] For discussion purposes only. Potential placement of social media should remain flexible and based on agency-defined variables, including (and not limited to) incident size, type, and severity, which influences the volume of social media activity.

Table 1: Social Media and Possible Roles within ICS by Emergency Support Function (ESF)

ICS Position	ESF	Social Media Role/Mission
PIO	15 – External Affairs	Disseminates information to the public and press. Monitors media.
Technical Specialist – Social Media*	2 – Communications	Analyze communications reports (ESF2), energy reports (ESF12) and social media messaging or lack of messaging, indicating potential communications disruptions.
	3 – Public Works and Engineering	Analyze social media data to assist in triaging locations for inspection and restoration; recover and map photos and videos of damage.
	4- Firefighting	Analyze social media data to assist in mapping and providing visual assessment of scope. Identify reports of trapped person or needing evacuation assistance; or compliance with evacuation orders.
	5 – Emergency Management	Operationalize data and include in planning discussions and actions. Incorporate data into common operational picture.
	6 – Mass Care, Emergency Assistance, Housing, and Human Services	Analyze social media data to determine if needs are being met by the resources provided.
	7 – Logistics	Leverage the capability and resources of digital volunteers (whether Federal, public, private, or nongovernmental organizations) to aid in the services of social media monitoring.
	8 – Public Health and Medical Services	Analyze social media data to determine scope of public health needs.
	9 – Search and Rescue	Analyze public images, video and commentary on missing persons, needs for rescue or assistance.
	12 – Energy	Analyze messages, or lack of messaging, indicating utility disruptions.
	13 – Public Safety and Security	Analyze messages, pictures or video to determine threats to security. Monitor crowd activity or mobilizations to offer assistance.
	14 – Long-Term Community Recovery	Analyze messages for expressed need; coordinate portal for resources and assist ESF 15 in directing to viable information sources.
	15 – External Affairs	Disseminate information originating from agency or agencies. Analyze information and interpret data to determine depth and reach of messaging. Provide feedback and return of information into situational awareness for use in operationalizing social data.
*A technical specialist per ICS initially reports to Planning, but may be reassigned within the ICS structure to support a specific mission or task; it is commonly accepted to place social media under a PIO or in Operations. As a technical specialist, they should also have a specific skill set to perform the mission or task, which may have variances depending upon the section need.		

Social Media and the Joint Information Center (JIC)

The effort within the JIC should be scaled appropriately to the complexity of the incident to ensure sufficient resources for social media mission requirements of the organization. For example, personnel resources within the JIC may be used to craft outgoing messages for approval and dissemination by the PIO, or may be leading research and collaborating on data collection and analysis. Social media data may be extracted by proficient users and data analysts in real time; enhanced by the use of a variety of search tools and technologies.

Additionally, depending upon the type of information collected, data may be routed and processed for a variety of actions, including:

- Routing to dispatch;
- Responding with official information;
- Routing to situational status unit for dissemination to personnel;
- Routing to an Emergency Volunteer Center or Donations Management Center; and
- Correcting various rumors, including outdated or "bad" information.

Part of the operational capacity of the JIC or Virtual JIC is to listen for the depth of information penetration into the community, as well as assess information reach into harder to reach communities, such as individuals with disabilities or those with access and functional needs. Social media and smartphone technologies have expanded accessibility tools for the public in which they can better receive and share information. Additionally, needs in social media surface through the advocacy actions and behaviors of social media users in contact with an individual or witnessing a specific need. Assessing these gaps in information dissemination and penetration help to generate proactive responses from both PIOs and field responders.

Social Media and the Joint Information System (JIS)

The JIS is the primary focus area for a large number of social media activities. It is the central coordination point for a single agency or multiple agencies for information dissemination, rumor management, and assisting with intelligence gathering for situational awareness and Common Operational Picture (COP). The inclusion of social media within the JIS will:

- Provide a central information dissemination system during emergencies;
- Ensure a unified message to the public from the governing body;
- Maximize use of all communications channels to disseminate information; and
- Coordinate agency public information efforts before, during and after emergencies.

Long-Term Use of Social Media

As with all activities and technologies, the longevity and success of social media use is predicated upon the sustainability and scalability of the processes and procedures that support it. It is critical that agencies, when choosing to adopt, implement, and integrate social media, consider and address the activities needed to support them. These include: personnel (job descriptions, education and training requirements, etc.); policy and plans (standard operating procedures; legal, security, and privacy concerns; etc.); guidance and direction (e.g., search parameters for monitoring, process for reporting,

decision-points, etc.); funding (short and long-term); and technology (available and appropriate tools to be used, access to them, and understanding and familiarity of them, etc.).

The Social Media Integration Maturity Model[7]

Successful integration is not dependent upon the degree to which social media is leveraged across the agency, but the degree to which it supports an agency's mission, objectives, activities and requirements. A mature social media program addresses people, process, governance (policies and documentation) and technology concerns.

Additionally, an essential part of integrating social media successfully is the inclusion of social media in all planning, training and exercise activities. Through the exercise design process, identification of core capabilities and potential social media missions and trends will emerge regarding measurable activities.8

The social media integration maturity model is predicated upon agency-wide acceptance (and partial adoption) already having occurred and is intended to support full-scale integration across the agency. Table 2 highlights the various points for consideration across a phased approach to full integration. It is important to note that the integration maturity model is adaptable to the requirements of the respective agency, based upon existing resources and conditions influenced by the scope, magnitude, and complexity of the disaster that warranted the implementation of ICS.

Early in phase development, agencies have relied upon ad hoc digital volunteers or external established partners for social media support. Established support partners, such as Humanity Road, maintain skilled social media surge support. While an agency may be at a lower level phase internally, external aid and information sharing groups like Humanity Road may move the agency up to a higher phase during disaster recovery.

[7] The Social Media Integration Maturity Model was developed from analysis and assessment of previous VSMWG reports and experimentation, including the Canada-U.S. Enhanced Resiliency Experiment (CAUSE) III in October 2015. It is an extension of the Social Media Maturity Model introduced in a report entitled "Digital Volunteer Support Recovery Operations Experiment," by Defence Research and Development Canada published in April 2015 <http://cradpdf.drdc-rddc.gc.ca/PDFS/unc198/p801344_A1b.pdf>. 11.

[8] Best practices for integrating social media into training and exercises will be discussed in further detail in the next VSMWG report focusing on training and exercises.

Table 2: Social Media Integration Maturity Model

	Integration Points	Phase One	Phase Two	Phase Three
People and Process	Adoption	General	General (Department-Specific)	Required
	Training	Minimal	Externally Provided/Optional	Internally Provided/Required
	Staffing	External Support	Part-Time	Full-Time
	MOU Partners	Surge Support	Surge Support	Surge Support
	ESF Placement	PIO	PIO/Intel	PIO/OPS/Intel
	Digital Volunteers	Ad-Hoc	External/Informal	Internal/Formal
Governance	Documentation	External Sources	Partial (Business Unit Only)	Full (Agency-Wide Strategy)
	Data Standards	None	Identified	Required
	Policies	None	Identified	Developed and Implemented
Technology	Information Products	PDF	PDF/Data Layers	Web Maps/Dashboards
	Tools and Licenses	Free/Trial	"Lite" Versions	Purchase/Licenses
	Applications	Communications/ Episodic Monitoring (Full EOC activation)	Communications/ Partial Monitoring (All EOC activations)	Communications/ Full Monitoring (Ongoing)
	System Integration	No Integration	Partial Integration (Data Layers)	Full Integration via COP

Phase One: Implementing a Social Media Capability

In the first phase (Table 2.1), social media is generally accepted as useful and employed for communications or general situational awareness. The agency leverages external resources for a variety of activities such as training, volunteer support (external and ad-hoc only) and documented processes. Supporting policies have been considered, but not developed or adopted, and information is shared statically while open-source software is used with a lite or trial purchase.

Table 2.1: Phase One of the Social Media Integration Maturity Model

	Phase One: Implementation of Social Media
People and Process	• Social media is considered a viable tool for communications and situational awareness; some monitoring occurs • Social media coordinator position may exist within EOC at some (not all) activation levels depending on resources available • Social media coordinator position falls within PIO function • Some training for social media use may exist (FEMA or personalized) • Agency may leverage support via digital volunteer teams (established/ad-hoc)
Governance	• Standard Operating Procedures, Concepts of Operations, and other documentation developed in limited format only and focusing on individual aspects of tools • Policies concerning security, privacy, and legal matters have not yet been considered
Technology	• General social media commercial off-the-shelf (COTS) used for monitoring (free or limited subscription model) (e.g., Hootsuite, Tweetdeck, Geofeedia, etc.) • Applicable information shared via PDF or other non-dynamic reporting method (WORD, PPT, shared licenses, etc.) • Data and multiple technologies have not been integrated and cannot be accessed from one central point (or within one central technology/common operating picture)

Phase Two: Partial Integration

In the second phase (Table 2.2), an agency has accepted social media as a useful activity and is moving towards integrating it across the departments. Social media is leveraged for both communications and situational awareness, but only by some of the business units. Some internal resources have been developed and are leveraged, such as general trainings, the development of a process for coordinating with external volunteers, or the establishment of a part-time position to oversee social media in the EOC. Policies have been considered and are in development, information and data requirements have been addressed, but have not been implemented. Information is shared dynamically, but only when tools allow. Software has not yet been purchased and remains in the lite or trial period.

Table 2.2: Phase Two of the Social Media Integration Maturity Model

	Phase Two: Partial Integration
People and Process	• Social media is considered a viable tool for communications and situational awareness; monitoring continues as standard practice • Social media coordinator position (or equivalent) exists (full-time or part) • Social media coordinator position may fall within PIO, Operations, or Intelligence • Training, job descriptions, and other HR-related materials have been developed • Digital volunteer team (or equivalent) leveraged for surge support or official support • Information requirements have been defined and shared with digital teams; monitoring is based on information requirements as appropriate
Governance	• Standard Operating Procedures, Concepts of Operations, and other documentation developed in limited format only and focusing on individual aspects of tools • Policies concerning security, privacy, and legal matters have been considered and partially addressed (e.g., firewall and access to technology) • Information requirements have been discussed and coordinated across business units; attention paid to data standards but not executed
Technology	• General social media COTS used for monitoring (free or limited subscription model) (e.g., Hootsuite, Tweetdeck, Geofeedia, etc.) • Applicable information shared via PDF or other non-dynamic reporting method (WORD, PPT, shared licenses, etc.) • Data from available technologies may have been integrated into common operating picture or daily briefing materials (if not dynamic)

Phase Three: Full Integration

In the final phase (Table 2.3) of the social media integration maturity model, social media is accepted, used and required across the agency for a variety of purposes. Roles and responsibilities have been addressed and a social media-specific position has been established. Supporting documentation has been completed, data standards have been addressed and implemented and tools have been purchased. Information is shared dynamically and tools have been linked where possible.

Once an agency has achieved the final stage of integration, social media will remain a sustainable, scalable, repeatable capability and resource for communications, information sharing, engagement, situational awareness and operational decision-making. However, technology and popular practices advance very quickly. Even now, it is essential that the organization continues to assess, reevaluate, and renew training materials, supporting documentation, policies, technology strategy and roadmaps. Flexibility is the most critical component of technology adoption. Without it, tools will become outdated, links broken, coordination disorganized, branding confused, resources underutilized and investments wasted.

Table 2.3: Phase Three of the Social Media Integration Maturity Model

Phase Three: Full Integration	
People and Process	• Social media monitoring continues as a standard practice • Social media coordinator position (or equivalent) exists (full-time or part) • Social media coordinator position falls within PIO, Operations and/or Intelligence • Training, job descriptions, and other HR-related materials have been developed • Digital volunteer team (or equivalent) leveraged for surge support or official • Information requirements have been defined and shared with digital teams; monitoring is based on information requirements as appropriate • Operational decisions and resource planning consider information from social media
Governance	• Standard Operating Procedures, Concepts of Operations, and other documentation developed and agency-wide (or department) strategy has been addressed • Policies concerning security, privacy, and legal matters have been considered and partially addressed (e.g., firewall and access to technology) • Information requirements have been discussed and coordinated across business units; data standards have been identified and universally accepted
Technology	• Social media monitoring tools/licenses have been purchased (COTS or Software as a Service) • Data from available technologies has been integrated into common operating picture via web map or other dynamic data feeds • Technical requirements have been identified and addressed • Data available from multiple sources; data is standardized upon publication or receipt • Social media data integrated with other data to produce enhanced maps (aggregation and fusion of applicable information); multiple data layers are available for consideration

The Private Sector and Technology Development

To fully leverage social media, it must fit within the confines of a restricted operating environment. Challenges associated with funding constraints, legal requirements, cultural norms, and legacy tools can render a new tool useless, despite its benefit. While commercial technology development is often informed and driven by internal research and development, objectives, goals, and priorities, it is imperative that it also incorporates input from the public safety community to satisfy needs in disaster preparedness, response and recovery. This includes the identification of public safety-specific technical, informational and procedural requirements.

The following should be considered in early development of social media tools:

- Long-term adoption needs
- Flexibility
- Legacy technology
- Training, education, and staffing needs
- Long-term investment plans
- Collaboration opportunities

There are a myriad of challenges that stand in the way of leveraging private sector technologies. These include: security and firewall settings; legal and data

FEMA Tech Corps (http://www.fema.gov/tech-corps): The FEMA Tech Corps program was launched to resolve critical challenges experienced during federally declared disasters through innovative applications of technology in support of state, local, tribal and territorial governments and survivors. The Tech Corps program engages private sector and nongovernmental organizations capable of providing voluntary expertise and resources during disasters. Three Technology and Innovation Advisors on FEMA's national Incident Management Assistance Teams coordinate with recognized organizations to build a national network of skilled technology volunteers. Through Tech Corps, trained technology volunteers can complement ongoing disaster response and recovery by working with state, local, tribal and territorial governments to:

- Install temporary networks
- Enable internet connectivity, telephone and radio communications
- Provide other support, such as geographic information system (GIS) capacity, coding, and data analytics
- Provide surge support for social media situational awareness reports

In June 2015, Cisco Systems, Google, Humanity Road, Information Technology Disaster Resource Center, Intel, Joint Communications Task Force and Microsoft signed a Memoranda of Understanding with FEMA. The public-private partnership brings technology organizations already contributing to disaster support and assists in the coordination of that effort.

concerns; legacy technology and integration concerns; funding and investment history; agency culture and familiarity with technology; target demographics and access to technology; and many more. Identifying and addressing these challenges within the development cycle will help to mitigate future concerns.

Private sector partners can play a key role in the development, experimentation, and exercising of new tools, helping to facilitate coordination across multiple stakeholder groups. Establishing and maintaining partnerships between the private sector and public safety agencies is critical to the long-term success of social media and related technologies, and ultimately to the safety and resilience of the community.

Challenges to Social Media Integration

Despite the usefulness and value of social media, there are challenges that may impede the integration of social media. These may include sorting through a large volume of information, deciding which platforms or tools to use, technical limitations, and engaging stakeholders—to name a few. The following section provides guidance and examples for how to address these challenges.

Information Identification and Aggregation

There is already an abundance of chatter taking place on social media, so chatter during an event is no different. However, during events this can be multiplied exponentially or concentrated geographically. This is why it is important to determine ahead of time what information is pertinent and what are the best methods for collection. It is also essential that organizations determine how "normal" activity is characterized to quickly recognize anomalies. This is not the same for everyone, so each agency must make these decisions based on the needs and unique characteristics of their community.

Characterizing "normal" social media activity helps in recognizing potential issues more quickly.

Once a baseline has been determined, it is important to then determine what type of information is most important to monitor during an event. This should be based on the organization's mission, priorities and

responsibilities. Having a pre-determined set of information requirements will help to effectively find and integrate information from social media to support operations and resource allocation in a timely manner. For example, to a public health department, monitoring the status of hospitals (e.g., evacuation, generator power), skilled nursing facilities and outbreaks/disease control is important. For others, coordination of personnel, equipment, supplies, mass fatality management, mass sheltering, schools and status of disaster events (natural, manmade, and terrorist) are equally important.

The type and level of information required also needs to be clearly articulated and prioritized. Those aiding in a Virtual Operation Support Team (VOST) or digital volunteers (internal or external), for example, need to know exactly what they are looking for, as well as how to "rank" the information in accordance with the needs of the responding agency. Life threatening reports may seem apparent; however, reports of fallen trees or a damaged roof may be of relatively low priority during a large-scale event. Information needs should be clearly documented and shared with those watching social media. Some analysis can be quantified and ranked in advance through mitigation and all-hazards planning.

Once information requirements have been determined, agencies should identify what social media reporting tools are already available that can answer the necessary information requirements during an incident. There will not always be a need to build a new tool to collect data; there are response agencies and industry partners who have already created tools for this purpose.

Coordination and Collaboration

Emergencies begin locally. Depending on the scope and nature of the emergency, county and state agencies may also have responsibilities. For this reason, it is important for the local, county, and state agencies to work together on how social media is monitored and the expectations for reporting. Depending on the nature of the event, response partners can provide surge support. Conversely, in a larger-scale event, because local and county government agencies know their communities best, they will be the best equipped to vet information before it is reported to the state EOC (if done). It is then up to the state EOC to inform the local, county, and state agencies of what type of information they will need. By identifying which type of information is needed and by whom, a gap analysis can be conducted to identify any information that is not being collected. Alternately, this process can also identify duplicate efforts, for which the agencies can decide how to delegate monitoring and reporting responsibilities.

While duplicating efforts is not beneficial, redundancy is helpful. With local agencies focused on their specific communities, the state EOC can help to maintain overall situational awareness by monitoring and identifying patterns and can sometimes even foresee potential issues. For example, if the state EOC receives information that several counties have had to evacuate hospitals due to power outages, a map can be generated as to where patients can be redirected, surge issues at local hospital can be anticipated or mobile field hospitals stood up.

Technical Challenges

Even when an agency has accepted and adopted social media, technical challenges remain that can hinder its integration. Internet security is a challenge frequently faced, but one that does not always appear until mid-activation. Specifically, firewall configurations can hinder agency access to specific social media applications and necessary websites. As "social sites" were introduced into the workplace environment, the typical standard approach of computer security officials was to err on the side of caution and block these social sites, initially categorized for personal use only. In the last few years, however, these sites

have emerged as valuable communication tools in emergency management. Organizations must assess Internet security policy and access in advance, granting special access when necessary. Bandwidth is equally important. It is essential that organizations address standard and surge capacity for all online tools, dependent upon their intended uses and level of activity. It is useful to establish methods for adding surge bandwidth when needed.

Integrating multiple systems is another challenge, and one that is not easily approached. Significant strategy, planning, coordination and collaboration is necessary to achieve integration across an agency, even more so across a jurisdiction or area. Stakeholder engagement and ongoing collaboration with response partners and the community is essential in identifying information and technology requirements. Solutions meant to assist stakeholder groups will fall short if the technology used does not sufficiently meet group needs or address group challenges (like familiarity, access, level of understanding, network availability, etc.) As with all emergency preparedness, response and recovery planning, a whole of community approach is best. Further consideration is necessary to address specific technical challenges associated with integrating multiple platforms and systems. Integrating multiple sources of data will also require further research. These points are discussed in the VSMWG's previous report, "*Leveraging Social Media for Enhanced Situational Awareness and Decision Support*."

Building comprehensive Geographic Information Systems (GIS) operation dashboards for tracking disaster events (such as wildfires, earthquakes, floods, and hurricanes) is very important for many city and local government agencies. However, the integration of GIS operation dashboards with other systems, such as Web EOC, is another major technical challenge because of missing standardized protocols or data transfer formats between heterogeneous systems. Many local government agencies may not have enough technical staff to combine or integrate multiple systems into a single platform. Currently, ESRI, a GIS software company, provides an out-of-box solution, called ArcGIS Operations Dashboard. These web GIS tools are difficult to be integrated into the existing Web EOC, which is a mainly text-based message portal with limited mapping functions).

Another technical challenge is how to integrate multiple social media services together (with the concept of data fusion) and how to create intelligence or insights from the multiple social media analytic results. The following table lists the current popular social media services (SMS) and their potential analytic value for EOC operation needs.

Table 3: List of Popular Social Media Services (SMS) and Potential for the EOC Operation Needs[9]

Tool	Content Type and Format	Data Collection Methods	Potential Values for EOC Operations
Twitter	Texts (140 characters), photos, short videos.	Free public Application Program Interface (APIs) (Stream and REST) or the purchase of historical tweets from Twitter.	Monitoring public opinions, situational awareness with geo-tagged tweets and pictures, multi-channel evacuation or emergency announcement, effective community-based communications, recruiting volunteers and helpers, marketing
Flickr	Pictures and texts	Free public APIs with many metadata fields.	

[9] Ming-Hsiang Tsou, Ph.D., San Diego State University. Information provided November 2015.

Tool	Content Type and Format	Data Collection Methods	Potential Values for EOC Operations
Instagram	Pictures and limited texts (2200 characters)	Free public Instagram APIs (spatial search for location IDs).	and promotion tools.
Foursquare	Check-Ins and Reviews	Free public Foursquare APIs (search for "venues").	Dynamic population density model with check-in data. Shelter capacity measurement and real-time estimation of shelter usages and feedback.
YouTube	Videos, text content, and comments	Free public APIs	Emergency information announcement, situation awareness videos, marketing and promotion tools.
Facebook	Texts (5000 characters for regular messages) photos, videos, check-ins	Only very limited public data access (Graph API) and no purchase of historical data.	Combined all potential values from the previous social media platforms (if Facebook data becomes available to researchers or EOC staff).
Reddit	Pictures, user-generated discussion threads	Open-source API for developers.	A high-impact platform with substantial influence on large-scale incidents and sourced curation could be a substantial resource for emergency managers and law enforcement.

The Role of Experimentation

The development of social media solutions has historically been sporadic, disjointed, and often done without consideration for existing technologies, best practices or lessons learned. Furthermore, until recently, social media-related work was, more often than not, focused on communications. As technology advances, so do the possible applications for social media technologies. This is clear with each major disaster, as the public and the public safety community turn to social media in new and innovative ways. Following each disaster, there is a burst in activity around research and development – solutions are developed to solve the problems identified in the last event. While useful, this approach only addresses how technology could have been used, not how it could be used in the future. This approach ensures that the necessary solutions will not be available to support future response efforts and needs.

In order to support future disaster efforts, it is critical that ongoing, iterative experimentation occur to support the identification of information and technical requirements, stakeholder engagement and public-private partnerships, while also helping to ensure these requirements are integrated into future technology development. Ongoing experimentation will also help to identify and gain support for the development of standards that are necessary to support operationalization of the technologies. Designing and implementing initiatives around these principles will help to avoid disparate outcomes, inconsistencies with implementation and sustainability models, redundancy of efforts, and the creation of activities that offer only short-term value., Ultimately the goal of experimentation is to drive future value for operationalized solutions.

Areas for Future Research

As social media and its application in public safety expand in popularity and practice, so too must the efforts to institutionalize social media activities. The advances made in technology in recent years have enabled unprecedented collaboration and information sharing. Significant research and development is still necessary, however, to fully operationalize both social media tools and the information found as a result of the communications enabled by them.

Table 4 offers several areas for future focus, including integrating social media into training and exercise, which will be addressed in the VSMWG's next report on best practices for integrating social media into training and exercises.

Research Area	Description
Event Evolution	During emergencies, social media information has a time decay, where beyond a certain timestamp, information data without interpretation no longer aids the situational awareness of the decision makers. Interdisciplinary computing and organizational behavior research is required, therefore, to model evolution of event related multimodal data stream. Such an event evolution model needs to continuously update information and knowledge organization for situational awareness, both during the exercises as well as real world scenarios.
Accessibility	In the existing research on practices during real world response and exercises, information needs of accessibility and people with disabilities and others with access and functional needs have been undetermined. As the types of multi-modal data access is evolving, there is a need for research on integration and adding it as a testing capability in the exercise design (e.g., autism community, preparedness for people with access and functional needs, 508 compliance, etc.).
Content	One major challenge with training and exercises is the content creation of the planned exercise. Although operations of the training exercise can remain static, the content of communication and resources being employed often does evolve and it is highly dependent on the context.[10] Therefore, more research attention is needed for developing databases of disaster messaging by types of disaster contexts (e.g., wildfire, hurricane, flood) and types of data sourcing platforms (e.g., news, social media) that can be used by others in the public safety community for exercises.
Social Media Data	Given the increasing interest toward incorporating social media in the preparedness exercise, research is needed to answer fundamental questions of what data source to use, how much of it to use, how to develop such data sources, and how to train the exercise stakeholders to be adaptive.[11] There are at least three kinds of factors to incorporate while researching this type of content creation and adaption in the exercise workflow. The first is new-scripted posts specific to the scenario, second is contextualization of generalized pre-scripted posts from other events and third is the noise.[12] It is important to have noise mixed with the signals in the content in order to efficiently train our practitioners with the eco-system of the real world. Furthermore,

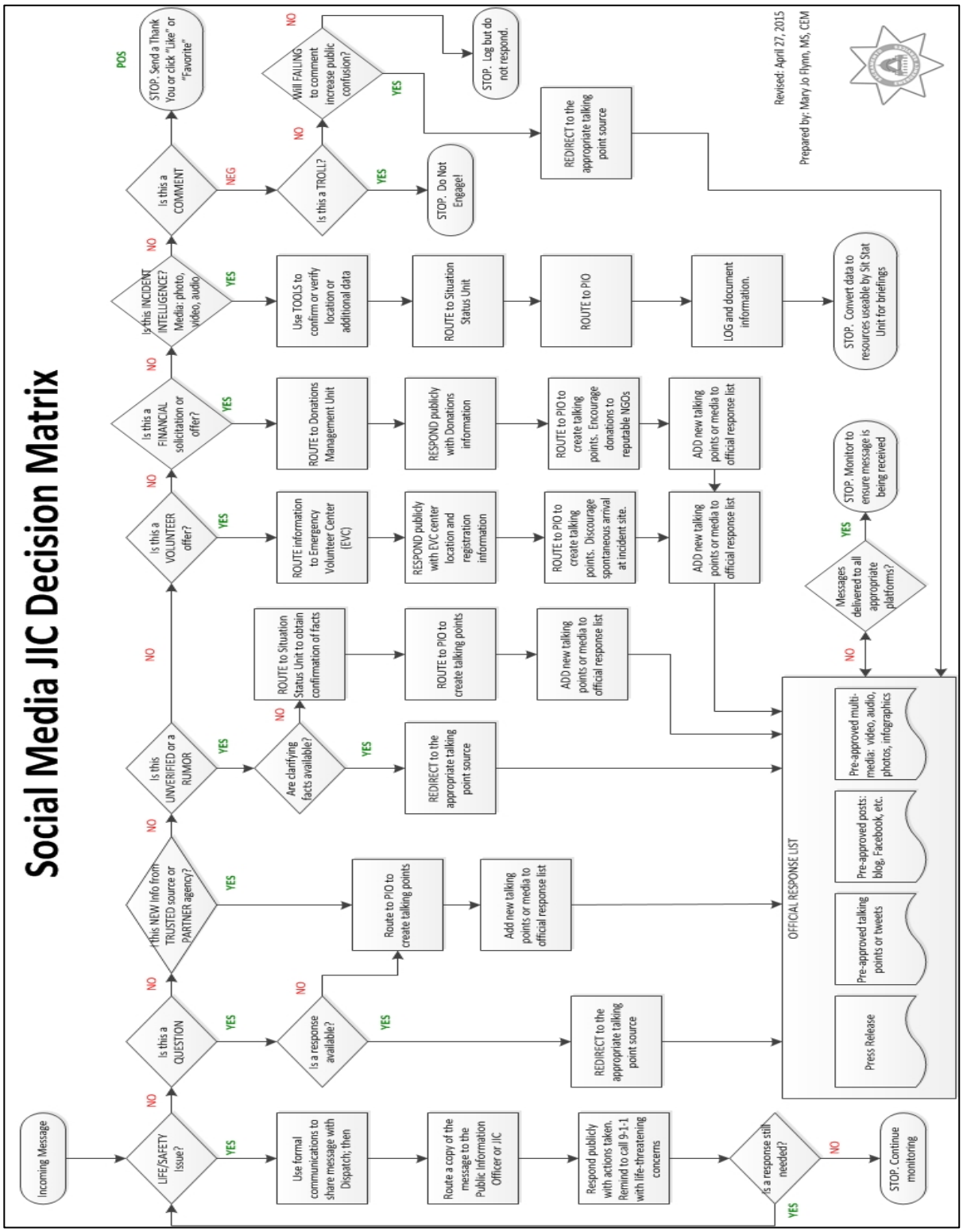
[10] Hampton, A., Bhatt, S., Smith, A., Brunn, J., Purohit, H., Shalin, V. L., Flach, J. M., & Sheth, A. P. "On Using Synthetic Social Media Stimuli in an Emergency Preparedness Functional Exercise." *arXiv.org*. 2 March 2015. <http://arxiv.org/abs/1503.00760>.

[11] Ibid.

[12] Ibid.

Research Area	Description
	research needs to further focus on identifying what kinds of information categories (e.g., warning templates) can be generic and adaptable across the events from one exercise to the next, in different regions. We require development of human-in-the-loop computational models for contextualization of messages from other events in the historical real-world data sets, and transform parts of the content to actual incident related information, such as by replacing with exercise hashtags; and appropriately mapped geo-tags, etc. Research on creating a library of such recycled, testable data for a variety of incidents, and grounding the content creation to reflect the real-world past event information category distribution will be a first step toward making reusable exercises. After content creation, research on the information interface is a key to successfully integrate the social media into functional exercises. One research challenge and direction for future work of a socio-technical system of people, process and new technologies is the mapping between actions of the end users and the information provided via data technologies. These research components need to fundamentally integrate the aspect of information assurance, and measure trust with the content that will serve as the reasoning base for the actions of the exercise stakeholders.
Metrics and Evaluation	Evaluation is a key component of measuring the processes and technologies, and also provides a means to highlight deficiencies in the existing proof of concepts. Therefore, future research needs to better integrate post-exercise analyses to identify the pockets where technology integration into the exercises works versus need for further improvements. Another direction for the exercise tool development research is a self-scoring mechanism of sophistication, to identify what exercise level is available and how it can meet the requirements of the function exercise planning. One example of such a step is the Canadian social media maturity model.
Gaming	Gaming principles are increasingly getting attention from all the human computer interaction areas. For a socio-technical system of preparedness exercises, we anticipate research on developing incentive-based gaming mechanism with the interface development of the exercise tools.
SimCell	Future research needs to also move toward the recommended collaborative environments for the exercise stakeholders, including the aspects of collaborative information system development for multimodal data integration and facilitation for exercise participants. For example, generating social media messaging in real-time during an operations based exercise, and pre-scripting and scheduling of messaging streams can be a good starting point for such collaborative systems.

Appendix A: Social Media Decision Matrix for a Joint Information Center[13]



[13] Flynn, Mary J. "Social Media JIC Decision Matrix." *Social Media JIC Decision Matrix*. Sacramento County Office of

Appendix B: Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) Case Study

On April 15-17, the First Responders Group (FRG) and the DHS Virtual Social Media Working Group participated in the State of Louisiana Governor's Office of Homeland Security & Emergency Preparedness (GOHSEP) Annual Hurricane Exercise at the State Emergency Operation Center (SEOC) in Baton Rouge. The goal of this collaboration was to determine and refine a process to integrate social media into the agency's operational workflow, in a manner scalable enough to support decisions being made across the entire state.

For this experiment, the VSMWG leveraged lessons learned from previous experimentation, such as the Joint Inter-Agency Field Exploration (JIFX), the Central U.S. Earthquake Consortium (CUSEC) Capstone exercise and the Canada U.S. Enhanced Resiliency Experiment Series (CAUSE) III. During each of these events, the VSMWG worked with stakeholders and collaboration partners at all levels of government and across all sectors to identify gaps and requirements in policy, process and technology. These gaps, in tandem with discussion with GOHSEP, were used to inform the development of the objectives, a plan of action and a proposed process for integrating social media into GOHSEP's existing operational workflow. The process was then discussed during the exercise, specifically "how do we streamline the identification of essential information in social media in order to better assign and deploy resources?"

Following the exercise and subsequent evaluation, GOHSEP operations tweaked the proposed process to better follow the current operational flow and chain of command, with minimal changes and disruptions. Additionally, GOHSEP discussed plans to further consider:

- Moving the social media coordinator seat next to the Fusion Center representative to streamline coordination and verification of information as it is found in social media in order to mitigate duplication of efforts between law enforcement and emergency management;
- Leveraging a digital volunteer team to support identification of applicable information across multiple social media channels;
- Leveraging Google Docs as a place to capture and publish information found in social media, and integrating Google Docs into WebEOC as a board for easier access;
- Leveraging a geoform, developed in previous FRG-led experimentation, to facilitate guided input of information found in social media across the state;
- Publishing information submitted through the geoform as a data layer;
- Configuring an operations dashboard (a feature of the ESRI ArcGIS Online toolkit already owned and operated by GOHSEP), and integrating into WebEOC as a board for easier access, to visualize the results of the geoform submissions, including:
    - Types and volume of issues identified (bar chart);
    - Reports requiring follow-up;
    - High-level visualization of issues presented geographically;
    - Detailed information for each when clicking on a map point;

Emergency Services, 27 April 2015. <http://www.slideshare.net/mjflynn001/sm-jic-decision-chart>.

  - Thresholds (e.g., an alert is produced when more than X reports are submitted about a specific issue type); and
  - Time elapsed since submission of report.

- Asking the state's Regional Coordinators to facilitate submission of information from their regions through the geoform;
- Once information is identified as actionable, operations will review and determine in which parish the issue resides, then contact the local Office of Emergency Preparedness or the Regional Coordinator to advise and verify; and
- Ownership remains at the local and state regional level, which will address the issue or determine if they should make a WebEOC request.

For the event, FRG and the VSMWG collaborated with GOHSEP operations, the public information officer, state and parish government representatives, and staff from the Louisiana State Analytical and Fusion Exchange.

The VSMWG and GOHSEP took and documented the following steps in order to identify, assess and determine the best process for integrating social media into GOHSEP's operational workflow.

STEP ONE: IDENTIFY AND REPORT

- Identify partners;
- Identify operational processes;
- Identify technologies used and for what purposes;
- Identify information requirements (EEI);
- Identify reporting requirements; and
- Identify technical requirements.

STEP TWO: ASSESS AND VERIFY

- Given requirements identified in first step, identify possible methods for:
  - Analysis;
  - Information products; and
  - Integration considerations.
- Identify verification requirements.
- Identify opportunities for coordination with others monitoring and using social media.

STEP THREE: UNDERSTANDING VOLUME AND CRITICALITY OF REPORTS

- A heat map view can be used to visualize the density of data. A data aggregation function can be used to 'roll-up' data from points to county or parish polygons. A user can click on a county or parish to identify associated source records (individual reports).
- Further development is required to normalize counts based on demographic data.
- Further development is also required to define count thresholds by jurisdiction to assign

appropriate color status.

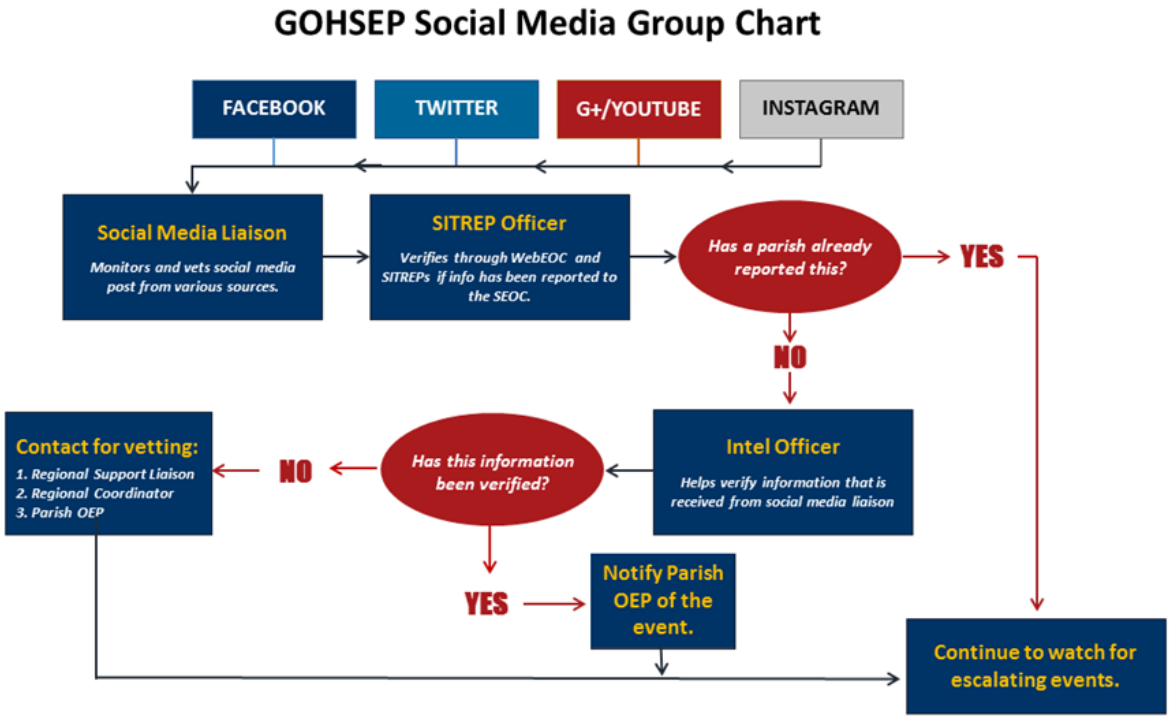
STEP FOUR: ASSIGNMENT

- Method for determining if information is actionable;
- Process for coordination across jurisdictions and government levels; and
- Process for integrating social media information and need into operational process (Web EOC).

STEP FIVE: ACTION

- Once assigned, identify feedback loop; and
- Identify partners involved.

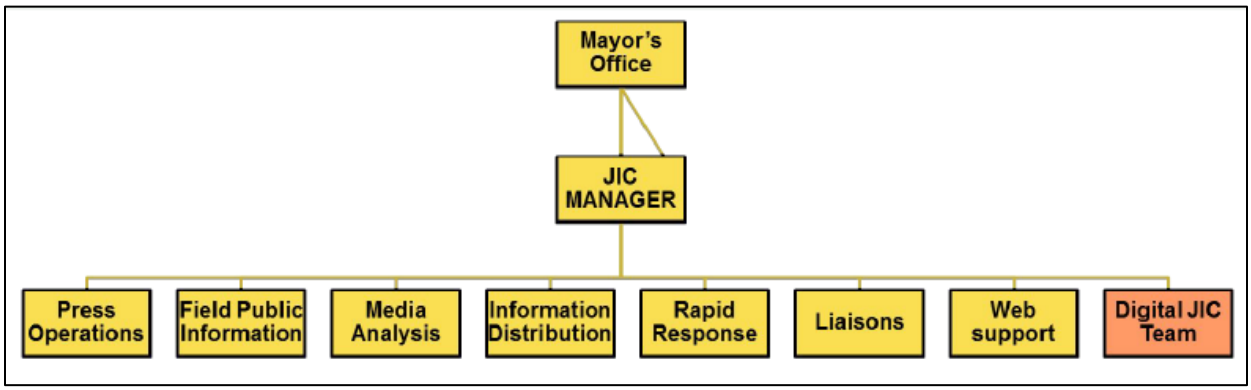
Figure 2: GOHSEP Process for Operationalizing Social Media



Appendix C: New York City Joint Information Center Case Study[14]

Both in theory and in practice, New York City has successfully incorporated social media into the Joint Information Center structure. To address the real-time coordination and dissemination needs of a successful social media strategy during a larger-scale emergency, the City amended its Joint Information Center structure to formally incorporate social and digital communication. A "Digital JIC Team" was added to the Joint Information Center structure to allow social media monitors and managers to work in real time with public information officers to address the monitoring, development and dissemination of information in a collaborative and structured environment. This ensures that all messaging is coordinated and consistent, regardless of the outlet. In addition to training and exercising this new structure with both public information officers and social media managers who may be assigned to work in a JIC activation, this new role was tested and proved successful during the September 2015 Papal visit to NYC.

Figure 3: NYC JIC Structure



The JIC for the Papal visit included public information and social media staff from a variety of city, state and federal agencies. At its peak, the JIC was staffed with 20 representatives, six of whom were dedicated to social media monitoring, response and message creation. "Having a social media presence in the JIC during the Papal visit was a successful model," said Brandon Pender, communications specialist for New York City's Emergency Management Department. The information streaming was crucial for NYC Emergency Management and the other agencies present in the JIC. Having city, state, and federal partners engage in a real-time dialogue about social media messaging showed the true importance of the role it plays during emergencies."

By incorporating the digital team into the JIC structure, several emerging issues were quickly addressed. For example, in the hours before Pope Francis visited Central Park, several media outlets were reporting overcrowding and lines of thousands of people waiting to get past security to see the Pope's motorcade. Simultaneously, social media users shared photos and posts of the lines to get in.[15] Those monitoring

[14] Pennisi, Allison and Nancy Silvestri, New York City Office of Emergency Management. Information provided October 2015.

[15] (rachelnewsnyc). "Line of people waiting to go thru security to catch a glimpse of the Pope in Central Park. #PopeinNYC." Instagram. 25 September 2015. <https://instagram.com/p/8EBZvuBuBS/>.

social media were able to work seamlessly with PIOs to provide situational awareness to the EOC. The JIC quickly received information that security lines were long yet moving, and all participants were expected to gain entry before the start of the motorcade. PIOs communicated this information to media outlets, while the digital team relayed the same message via social media channels. The seamless integration of the digital team ensured that information was developed, cleared and shared as efficiently as possible.

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