An innovative approach to capability-based emergency operations planning

Mark E Keim

Office for Environmental Health Emergencies; National Center for Environmental Health; Centers for Disease Control & Prevention; Atlanta, GA USA

This paper describes the innovative use information technology for assisting disaster planners with an easily-accessible method for writing and improving evidence-based emergency operations plans.

This process is used to identify all key objectives of the emergency response according to capabilities of the institution, community or society. The approach then uses a standardized, objective-based format, along with a consensus-based method for drafting capability-based operational-level plans. This information is then integrated within a relational database to allow for ease of access and enhanced functionality to search, sort and filter and emergency operations plan according to user need and technological capacity.

This integrated approach is offered as an effective option for integrating best practices of planning with the efficiency, scalability and flexibility of modern information and communication technology.

Introduction

The leadership in each jurisdiction of the world has been described as legally, morally and politically responsible for ensuring that necessary and appropriate actions are taken to protect people and property from the consequences of emergencies and disasters.[1] Since emergencies often evolve rapidly and become too complex for effective improvisation, a government can successfully discharge its emergency management responsibilities only by taking action beforehand. This requires emergency operations planning in advance of the disaster event.

According to the US Federal Emergency Management Agency, an emergency operations plan (EOP) serves the following functions:[2]

1. Assigns responsibility to specific organizations and individuals for carrying out specific actions at projected times in any emergency that exceeds the capacity of any one agency.

2. Sets forth lines of authority and organizational relationships, and shows how actions will be coordinated.

3. Describes how people and property will be protected in emergencies and disasters.

4. Identifies personnel, equipment, facilities, supplies and other resources available.

5. Identifies steps to address specific mitigation concerns during response activities.

6. Cites legal basis, acknowledges assumptions and states objectives.

Unfortunately, EOPs that combine operational requirements with best practices are difficult to create. Most officials throughout the world have limited knowledge, experience and time for developing, evaluating or improving the quality of emergency operations plans. There is a need for not only planning guidance, but also tools that assist emergency operation planners to write well-organized, evidence-based EOPs. **Table 1** lists a series of challenges for effective and efficient emergency operations planning.

Recently, there has been a great deal of interest in designing computer tools to help people work together more effectively. In effort to meet the growing global need for an effective emergency operations planning tool, the author has conceived a process for innovative use of a relational database that applies modern theories of planning and coordination using a platform of currently available information technology. This manuscript will describe the planning tool and explore its past and potential future applications.

Background

Principles of effective emergency operations planning. Effective planning allows people's needs, preferences and values to be reflected in decisions. A basic principle of good planning is that individual, short-term decisions are coordinated in order to support strategic, long-term objectives. Planning is a social activity —that is, it involves people, and the results are affected by those who are involved and how they participate in the process. Good planning does more than simply identify the easiest solution to a particular problem. It can be an opportunity for learning, development and consensus building. How stakeholders are involved is a key factor in the effectiveness of a planning process. A good

Table 1. Challenges of effective emergency operations planning

Challenges of the planning process
Emergency operations planning is often time-consuming and difficult to sustain
Many planners throughout the world have limited knowledge and experience for developing, evaluating or improving the quality of emergency operations plans
Plans must address a broad range of hazards and contingencies, (tending toward a voluminous document), yet must also be user-friendly and easily-accessible during the disaster response phase
Response activities must be well-integrated with other governmental and non-governmental agencies and institutions and based upon scientific evidence
Populations at risk may face many vastly different hazards and threats with a nearly infinite set of scenarios
Challenges of the planning format
Many plans tend to focus on content (or tasks) rather than the process (or management/coordination system)
Many plans lack clear indicators of performance and outcome or measures of effectiveness
Many plans are cumbersome. Comprehensive EOPs tend to be extremely large documents that are difficult to navigate
Some plans describe response strategies and fulfill legal regulations, but do not address operational problems
Detailed operational-level plans are often not integrated into the overall provincial, national or international strategies or response guidelines
Paper plans are bulky and difficult to distribute

Adapted from Keim 2010.[3]

planning process usually begins with the most general concepts and leads to increasingly specific plans, programs and tasks, resulting in integration between each part.[3,4]

There are several key approaches to effective emergency operations planning that have been offered in order to improve the efficiency of plan-writing and to facilitate quality and timely execution of the plan.

These approaches have been described as O2C3 and include the following characteristics:[3]
• Operational-level planning
• Objective-based planning
• Capability-based planning
• Consensus-based planning
• Compliant with local, national and international preparedness strategies, guidelines and best practices.

Operational-level planning. Operational plans describe short-term ways of achieving objectives and explain how, (or what portion of), a strategic plan will be put into operation during a given period of time. Operational plans describe response operations as compared with the other functions within the incident command system. They are not intended to be administrative, intelligence or logistic plans that describe support functions.

Objective-based planning. Objective-based planning can serve as an effective tool for making progress by ensuring that participants have a clear awareness of what they must do to achieve or help achieve an objective. Homeland Security Presidential Directive 5 (HSPD-5) established a National Incident Management System (NIMS) in the US. Management by objectives is an essential component of NIMS communicated throughout the entire ICS organization and includes:[5]
• Establishing incident objectives.
• Developing strategies based on incident objectives.
• Developing and issuing assignments, plans, procedures, and protocols.

• Establishing specific, measurable tasks for various incident management functional activities, and directing efforts to accomplish them, in support of defined strategies.
• Documenting results to measure performance and facilitate corrective actions.

Capability-based planning. Capability-based planning is also the foundation for which the US Homeland Security Exercise Evaluation Program (HSEEP) and other federal preparedness initiatives are based.[6] Capabilities, (or the abilities to perform a particular task), provide the common framework used for relating and comparing disparate elements of an emergency response organization.[7] The objective-based approach, when used alone, may imply a degree of certainty regarding the disaster hazard or threat that not be attainable. This unpredictability is best met by planning to accomplish those objectives which we are actually *capable* of achieving. Homeland Security Presidential Directive 8 (HSPD 8) was the first mandate that Federal, State, local and tribal entities, their private and non-governmental partners, and the general public should adopt a capability-based planning approach for EOPs.[8]

Populations at risk for disasters face a vast range of hazards within a nearly infinite set of scenarios. This unpredictability is poorly suited to scenario-based approaches to risk management.[9] While the hazards that cause disasters may vary greatly, fortunately the potential public health consequences and subsequent public health and medical needs of the population do not.[2,10] For example, warfare, chemical releases, floods, hurricanes and earthquakes all displace people from their homes. These hazards require the same sheltering capability with only minor adjustments based on the rapidity of onset, scale, duration, location and intensity. Regardless of the hazard, disasters can be seen as causing 15 public health consequences that are addressed by approximately 35 categories of public health and medical capabilities.[10,11] And not all public health consequences are completed by public

health staff. For example, public works and other government agencies are also involved in the provision of safe water, sanitation and shelter.

Consensus-based planning. The US Federal Emergency Management Agency (FEMA) recommends a team-based approach to writing EOPs.[2] Consensus-based decision-making is a group decision making process that not only seeks the agreement of most participants, but also to resolve or mitigate the objections of the minority to achieve the most agreeable decision. Consensus is usually defined as meaning both general agreement, and the process of getting to such agreement. Consensus-based decision-making is thus concerned primarily with that process. As a decision-making process, consensus aims to be: inclusive, participatory, cooperative, egalitarian and solution-oriented. HSPD-8 charged all federal agencies involved in emergency response to participate in emergency planning on a "consensus-basis."[8]

Compliance with local, national and international strategies. It is important that EOPs are compliant with local, national and international strategies, guidelines and best practices. On an international basis, examples of these guidelines and best practices may include Standards for Humanitarian Assistance;[12] Handbooks of Disaster Medicine;[13] or Guidelines for Pandemic Influenza Preparedness and Mitigation.[14]

In the US, these national strategies are directed by Presidential directives. As a form of executive order, a Presidential Directive has the full force and effect of law. Presidential directives related to emergency operations planning include HSPD-5[15] and HSPD-8.[8] More specific guidelines are also available for diseases such as pandemic influenza.[16]

An Innovative Approach to O2C3 Emergency Operations Planning

In recent years, large numbers of people, (including emergency responders), have acquired direct access to computers. Therefore, we now have, for the first time, an opportunity for vastly larger numbers of people to use computing and communications capabilities to help coordinate their work. For example, specialized software has now been developed to (1) support multiple authors working together on the same document, (2) help people display and manipulate information more effectively in face-to-face meetings, and (3) help people intelligently route and process electronic messages.[17]

An innovative approach is here proposed that serves to integrate an all-hazard approach with widely-accepted principles of emergency operations planning, (namely O2C3).[3]

This approach is comprised of the following three components:
1. A *format* to organize plan information.
2. A *method* to collect and negotiate plan information.
3. A *platform* to deliver plan data.

Plan format. It is important to apply a standardized format for organizing plan information. This standardization of plan format allows for:
- Inter-operability of different plans and plan elements.
- Hierarchical organization of plan elements so as to avoid redundancy or omissions.

- Integration of objective-based and capability-based planning
- User-friendly plan viewing by subsequent planners and responders
- Discrete plan elements to be entered, sorted and searched within a relational database

Plan elements may be considered as essentially comprised of both relational and non-relational data.

Non-relational planning data includes items associated with a FEMA-recommended "Basic Plan"—consisting of the following elements:[2]
- Introductory material
- Purpose of the plan
- Current situation and assumptions
- Concept of operations
- Organizational diagrams and assignment of responsibilities
- Administration and logistics
- Plan development and maintenance
- Authorities and references
- Maps and figures

This information though valuable for plan development and maintenance has less utility during an emergency response when time is limited. This information is largely narrative. It is therefore not advantageous nor is it necessary to use a relational format. It is instead held summarily under a few tabs, webpages or headings in the EOP as non-relational data.

Relational data includes those plan elements described within a FEMA-recommended "Functional Annex".[2] An operational plan, (otherwise known as an OPLAN),[22] draws directly from strategic plans to describe agency and program missions and goals, objectives, and activities. An operational plan addresses the following questions: Who? What? Where? and When? **Table 2** describes the enhanced functionality offered when an operational plan is represented as discrete elements of information within a relational database.

The functional annex (or OPLAN) contains a listing of response capabilities necessary to mount an effective response to all-hazards. This information is best organized according to a cascading network of planning elements, for each individual capability. These elements include: strategic objectives; operational objectives; activities, (or tasks); responsible parties; and standard operating procedures. **Table 3** describes each one of these plan elements.

Each *capability* is associated with one or more strategic objectives that reflect the desired state of affairs intended to be achieved. Each *strategic objective* is then related to one or more *operational objectives*, which are, in turn, related to *activities* that accomplish each *operational objective*. Each *activity* is then associated with a *responsible party* and a *standard operating procedure (SOP)* for how the activity will be accomplished. This hierarchical format cascading from each capability is referred to as the acronym, "**S-O-A-R-S**" and is depicted in **Figure 1**.

Table 4 represents an example of how this S-O-A-R-S format would be used to depict the hierarchy of plan elements for the capability of "Water, Sanitation and Hygiene." This example is based upon the Sphere international standards for humanitarian assistance.[12]

Table 2. Examples of enhanced EOP functionality when formatted within a relational database

Functionality	Examples
Quick searches for specific plan elements	Planners quickly search and skip to different EOP elements during their workshop deliberations.
	Responders quickly access the specific parts of the plan without thumbing through pages of information not relevant to their own tasks.
Filtering and sorting of plan elements according to any parameter: (i.e., capabilities, objectives, activities and responsible parties)	EOP may be filtered to view at either a strategic level (objectives only) or at an operational level (activities only).
	Each response entity may sort the EOP to gather, (in one view), all of their own agency-specific activities that would otherwise be scattered in multiple locations throughout a traditional EOP
Assign and link additional indicators of performance or outcome with each plan element	Planners may correlate quality control parameters, (such as timing, cost, accuracy, % completion, etc.) to various plan elements for purposes of monitoring and evaluation.
Recombine or update discrete plan elements in order to address previously unforeseen circumstances	If procedures change during the response due to new information, (e.g., new drug availability or new response partners), the EOP may be easily updated to integrate these changes in multiple locations throughout the entire plan.
Integration of EOPs with interactive Web 2.0 posting and online applications	The planning process may be crowd-sourced for remote participation in plan preparation, EOP writing and maintenance.
	EOPs may be made available online as not only relational databases, but also as applications that interact with the responder for communication in both directions.

Table 3. Working definitions for plan elements

Planning element	Working definition	Simple description
Capability	Ability to achieve a desired operational effect under specified standards and conditions through combinations of means and ways to perform a set of tasks	Ability
Objectives	A projected state of affairs which a person or a system plans or intends to achieve	Goal
Strategic objective	A general statement of the end goal	Why
Operational objective	Specific goals that constitute the means for attaining the strategic goal	What
Activity	A set of actions which accomplish specific goals	How
Responsible parties	Individuals or groups assigned responsibility for accomplishing an activity	Who
Standard operating procedure (SOP)	A set of instructions covering those features of operations that lend themselves to a definite or standardized procedure without loss of effectiveness.	When Where

Planning method. A planning method is a logical and reproducible way to write a plan. Guidelines for this standardized approach should be taught to all participants of the planning workshop. Ideally use of a training curriculum for local planners and trainers appears to impart sustainability of planning efforts using this standard approach. There are two main steps in the planning method: preparation and plan-writing. **Figure 2** depicts the six main steps necessary to prepare for plan-writing.

Preparation for planning. Creation of a planning workgroup. Creation of a planning workgroup comprised of local planners is a critical step to ensure adequate preparation, a sustained progress and on-going maintenance of the planning process. The workshop should be comprised of 5–10 individuals able to represent discussions regarding all of the capabilities. Workgroup members should have a general working knowledge of the response capabilities of the institution or jurisdiction doing the planning. Workgroup members should also receive a brief training involving the principles of O2C3 planning as well as the method, format and platform for this intended approach

to planning. This workgroup will then perform the following tasks:

1. Collect background data and references.
2. Perform an inventory of capabilities.
3. Draft strategic and operational objectives for each of the capabilities.
4. Develop the EOP template in a standardized format.
5. Convene and lead plan-writing workshops among a larger group of planners.

Data collection. The planning method begins with a collection and review of any pre-existing EOPs for that jurisdiction. This important step is responsible for instilling an evidence-base for assumptions, capabilities and objectives of the plan. Other planning references, guidance and best practices should also be gathered together. In developing nations, the Sphere Project handbook[12] or the UNHCR Handbook for Emergencies[19] are good general references. In the US, this may include the National Preparedness Guidelines[8] and the CDC Public Health Preparedness Capabilities list.[11] At the institutional level this

may include documents such as HICS[20] or proprietary business continuity planning guides. These guides may be augmented with hazard-specific guidelines such as the DHHS guidelines for pandemic planning and preparedness,[16] or guides related to mass casualty management, bioterrorism response, etc. Data collection should also include the performance of a risk assessment. Recognizing that the planning process will apply an all-hazard, capability-based approach, it is not necessary, (nor is it always possible), to accurately prioritize or quantify the probability and impact of potential hazard scenarios. It is merely necessary to identify a list of potential hazards that may threaten the population. By using an all-hazard, capability-based approach, communities prepare for and respond to disasters by applying their own capabilities to address *any* hazard.

Capability inventory. The next step in preparation for plan-writing is to perform a capability inventory. Capability-based planning involves a functional analysis of critical operational requirements according to scenarios. In the case of health sector EOPs, capabilities are based on the potential public health consequences caused by the disaster hazard. Once the required capability inventory is defined, the most cost-effective and efficient options to satisfy the requirements, (i.e., objectives and activities), can then be sought.[7,21]

Table 5 lists consequences and public health capabilities that are most commonly addressed in a disaster response. The range of public health consequences actually varies little among disaster hazards.[2,3] The implementation of public health capabilities varies more according to the severity of disaster consequences, (a.k.a. hazard impact), of the disaster, rather than according to the hazard itself.

Other sources for listings of capabilities exist in the form of Sphere Handbook.[12] These capabilities may also evolve over time according to changing demands and resources made available before, during and after the disaster response. Thus, planning should be seen as an iterative and on-going process that is easily revised and updated.

Drafting objectives. Once capabilities have been identified, objectives are then written that describe the desired goals for implementing each capability. Using existing planning guidance and references, the planning workgroup should draft strategic and operational objectives for each of the capabilities in the EOP. These draft objectives will then be reviewed by the larger group of plan-writers during the subsequent planning workshop. In some cases, (e.g., for capabilities included in the Sphere handbook), it may be possible for the workgroup to also draft some of the activities as well. Following are examples of useful resources for drafting public health and medical objectives and activities:

• Sphere international standards for humanitarian assistance.[12]
• Hospital Incident Command System (HICS).[20]
• Critical benchmarks of the US Department of Health and Human Services (DHHS) National Hospital Preparedness Program (HPP).[22]
• HHS Pandemic Influenza Planning and Preparedness Guidance.[16]
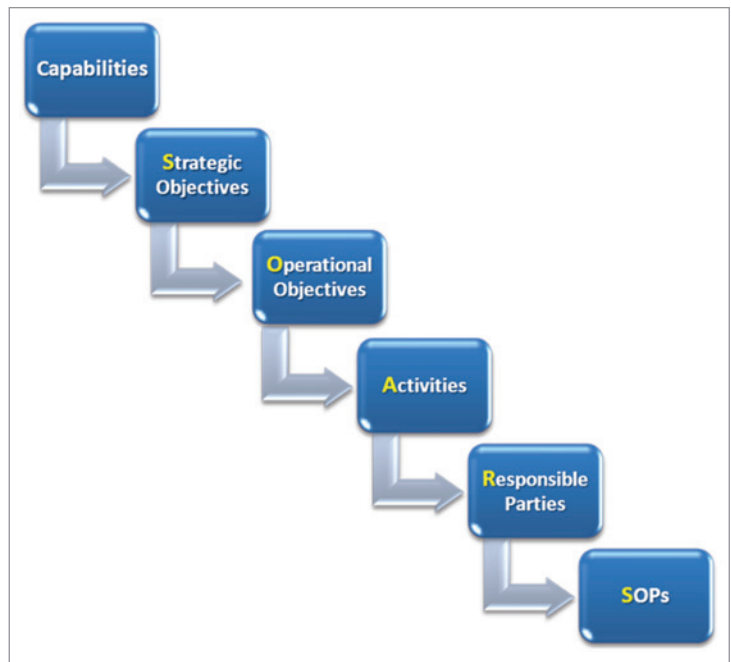
Figure 1. Cascade for S-O-A-R-S formatting of EOP relational plan elements.

Developing the EOP template. Once capabilities and their associated strategic and operational objectives are drafted, the next task for the planning workgroup is to place these plan components into a template for use during the plan-writing process. This EOP template will then be used to guide the work of a larger group of plan stakeholders during subsequent plan-writing workshops. In its simplest form, this template may be developed as a matrix like the example in Table four. Such matrices allow for easy viewing by workshop planners of the relationships between the capabilities, objectives, activities, responsible parties and SOPs. This template is then completed by the participants during subsequent planning workshops.

In this application, the subject matter content of the EOP template serves as a dynamic platform for delivery of *planning guidance* for the end-user/planner(s) to review, and revise according to local conditions, capability and capacity. As a general rule of thumb, planning input cascades from international/national input down to locally originated input planning proceeds from strategic objectives, to operational objectives, to activities and then finally to responsibilities and SOPs. Typically over 90% of strategic objectives and operational objectives can be acceptably generated from national and/or international standards. Most commonly, around 50% of activities may be derived from national or international guidance. Sections for responsible parties and SOPs are left entirely open in the EOP template since nearly 100% of these are specific to the local jurisdiction writing the EOP.

Convening the plan-writing workshop. Participants of the workshop. After the background materials and references are collected and plan template is complete, it is time to convene a larger group of stakeholders to write the plan. According to O2C3 principles, these stakeholders should be comprised of persons

Table 4. Example of S-O-A-R-S plan format the capability of "Water, Sanitation and Hygiene"

Capability	Strategic objective	Operational objective	Activity	Responsible party	SOP
Water, Sanitation and Hygiene	An adequate supply of clean water is accessible to all people.	A sufficient quantity of water is available to all people.	Ensure that the maximum distance from any household to the nearest water point is 500 m.	Public works	Etc.
			Ensure that the average water use for drinking, cooking, and personal hygiene in any household is at least 15 L per person per day.		
		Water is of sufficient quality to be potable and used for hygiene.	Ensure there is low risk of fecal contamination.	Sanitarian	Etc.
			Use a sanitary survey to indicate the risk of fecal contamination.		
			Ensure there are no fecal coliforms per 1000ml at the point of delivery.		
		People are able to safely collect, store, and use sufficient quantities of water.	Ensure each household has at least two clean water collecting containers of 10–20 L	Central supply	Etc.
			Ensure water collection and storage containers have narrow necks and/or covers (or other safe means of storage, drawing, and handling).		

Figure 2. Six main steps necessary to prepare for plan-writing.

that will actually be expected to participate in the emergency response.[3] These individuals should also be of sufficient seniority and authority in the response system that they can make commitments for their own respective areas of responsibility as they negotiate and write the plan during the workshop. This is a critical requirement since it may be tempting to assign more junior staff to participate in the plan-writing workshop. However, more junior members may not have as complete understanding of their own department or have the authority to speak on its behalf. Having the right people involved in the plan-writing workshop

is therefore critical to the success of the EOP during a real response.

Process for the workshop. Workgroup leaders will serve as facilitators for consensus-based approach to planning. During the plan-writing workshop, workgroup leaders will facilitate a step-by-step review and discussion of each capability and associated *strategic* and *operational objectives*. The draft *capabilities* and *objectives* will be accepted, accepted with revision, or rejected by the workshop participants.

The next step will involve populating the plan with further details to include activities for accomplishing each operational objective, responsible parties for each activity and when appropriate standard operating procedures (SOPs) for performing each activity. The facilitators will guide the participants through an orderly consensus-based process of reviewing objectives and then proposing, discussing and writing activities for each objective. It is extremely important that the facilitation ensure that there adequate discussion and negotiation of each point in the plan. It has been said that, "the process of planning is more important than the resultant plan."[3] That is to say that the elements of discussing, informing, learning and negotiation that take place during the planning process are much more valuable for ensuring a well-coordinated response than any subsequent plan intended to merely document this critical decision-making. This point allows for a more centralized planning

Table 5. Public health consequences and capabilities associated with all disasters

Public health consequences	Capabilities that promote health
Common to all consequences	Emergency Operations Coordination § Resource management Information Sharing § Social services Responder safety and health §/Occupational health and safety Business continuity Volunteer management
Deaths	Fatality management §/Mortuary care Social services Mental health services
Illness and injuries	Health services Mental health services Injury prevention and control Public health surveillance § / Epidemiological investigation Disease prevention and control Medical countermeasure dispensing § Medical material management and distribution § Public health laboratory testing § Medical surge § Non-pharmaceutical interventions §
Loss of shelter	Mass Care §/Shelter and settlement Social services Security
Loss of personal and household goods	Replacement of personal and household goods
Loss of sanitation and routine hygiene	Sanitation, excreta disposal and hygiene promotion Non-pharmaceutical interventions §
Disruption of solid waste management	Solid waste management
Public concern for safety	Risk communication Public information Security
Increased pests and vectors	Pest and vector control
Loss or damage of health care system/services	Health system and infrastructure support Reproductive health services Health services
Worsening of chronic illnesses	Health services
Loss of water	Water, sanitation and hygiene (WASH) Health services (e.g., hospitals, dialysis units)
Loss of power	Food safety Health services (e.g., healthcare facilities and home care)
Food scarcity	Food safety, security and nutrition
Toxic exposures	Risk assessment Population protection measures (evacuation/shelter-in-place) Health services Hazmat emergency response Responder safety and health §/Occupational health and safety

(Table adapted from Keim, 2006[10] Entries marked as § are adapted from CDC 2011[11]).

guidance to be developed according to national standards and strategies in the form of objectives and activities that may then be iterated locally to develop more specific actions that will implement the guidance.

Plan platform. A plan platform is the media used to store and display plan data. The ideal platform is one that is:
- Easy to use and distribute.
- Accessible when needed.
- Preserves plan data and.
- Technologically appropriate for the user.

Different plan users have different needs regarding how they can and should look at a plan. When the SOARS format is used to organize the EOP, it may then be represented in a variety of platforms according to the needs and preferences of the user. Using a simple matrix or a more complex version of relational database, the plan is also easily revised and updated through an iterative process before, during and after the disaster. Since 2001, this approach has been used in a variety of platforms with increasing levels of complexity.

In its simplest iteration, both non-relational and relational components of the plan can be represented in narrative form. In this form, the SOARS format is depicted as text with cascading headings and subheadings for capabilities, objectives, activities, responsible parties and SOPs. In this example, word processor software, (such as Microsoft Word©), and paper print-outs become the main platform for storing and displaying EOP data. Responders engaged in highly austere field conditions may need waterproof hard copies, with checklists and tools related to their particular role. Plan users at all levels in underdeveloped areas or users that possess limited computing skills may prefer this platform.

The SOARS format also easily lends itself to representation as a spreadsheet-based interface for quickly viewing and manipulating the plan. In this case a spreadsheet software program, (such as Microsoft Excel©), would serve as the main platform for the EOP. This platform is particularly useful for facilitating the planning workshops, when users need easy access and clear viewing of the plan hierarchy and an ease of movement throughout the plan.

The scalable and modular characteristics of the SOARS format also allows for ease of use in relational databases that have search/sort/filter capabilities. In this case the platforms may range from simple more static forms of databases, (such as Microsoft Access©), to more sophisticated and dynamic web-based databases, (such as Microsoft .NET© framework and Microsoft SQL 2000 Enterprise Manager© Software).

Utilizing a simple form-based interface, which can be accessed globally through a secure Internet interface, users are now able to design custom surveys and easily distribute these surveys to a handheld format on a pocket PC platform.

In a more sophisticated application, use of the SOARS format to organize the EOP has also accommodated a platform use of Microsoft .NET© framework and Microsoft SQL 2005 Enterprise Manager© software to deliver a combined online knowledgebase and document management interface based on portal user management, form-based questionnaires, document management and XML/XSL content integration mechanisms without enhanced full-site search functionality.

Discussion

In the long run, the dramatic improvements in the costs and capabilities of information technologies are changing, (by orders of magnitude), the constraints on how certain kinds of communication and coordination can occur. Together, these changes may soon lead us across a threshold where entirely new ways of organizing human activities become desirable.

In 2006, for example, the US Department of Homeland Security based development of a National Planning and Execution System on the following likely assumptions: that 'net-centricity' will continue to evolve and mature and that "a net-centric architecture" "will enable *secure, collaborative, web-enabled, parallel planning*" And, furthermore that, "Technology and tools that save significant time and increase the quality of planning will be developed and fielded."[18]

Since 2001, prototypical models using this system of standardized planning format, method and platforms have proven as a useful adjunct for facilitating an efficient process of EOP development and execution. This innovative use of a relational database has been used successfully in over 100 planning workshops to write local, state, provincial and national level EOPs in the US and abroad. This same process has been used to facilitate emergency operations planning among 20 different nations, and in ten different languages. The approach is widely scalable according to the size of jurisdiction. At its smallest application, this process has been applied at the single-community level in the USA, at the district-level in several eastern Africa nations and at the national-level for small island developing nations with populations spanning from 15,000 to 150,000. This same approach has also been used for developing provincial-level plans in SE Asia and for planning mass gatherings with 70 million visitors in China.[18-20] Finally, the same process was recently used to develop a national contingency plan for the entire USA.[21]

The expected outcome of this approach is to integrate the following critical elements of an effective EOP:[2,3,5,6,8,11,22]
- Inter-operability of different plans and plan elements.
- Hierarchical organization of plan elements so as to avoid redundancy or omissions.
- Integration of objective-based and capability-based planning.
- Facilitation of a consensus-based approach among operational-level plan-writers.
- User-friendly plan viewing by subsequent planners and responders.
- Discrete plan elements to be entered, sorted and searched within a relational database.
- Use of information technology to improve distribution, access and utilization of EOPs.
- Improving practical approaches to management by objectives as mandated by the National Incident Management System.
- A framework for improving integration of National Preparedness Guidelines, Target Capabilities and the National

Incident Management System within local, state and national planning efforts.

Conclusion

An innovative approach to emergency operations planning is necessary in order to fully engage the utility and efficiency of modern information and communication technology. An O2C3 approach that uses a standardized, objective-based format, along with a consensus-based method for drafting capability-based operational-level plans applies is the currently-held best practice for planning. Use of a relational database for O2C3-based emergency operations planning offers an effective option for integrating best practices of planning with the efficiency, scalability and flexibility of modern information and communication technology.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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