10-2019

# Disaster Documentation: The Impact of Oregon's Evolving Damage Assessment Methodology for Emergency Declarations

Henry Covey
*Portland State University*, covey@pdx.edu



Citation Details

Published as: Covey, H. (2019). Disaster Documentation: The Impact of Oregon's Evolving Damage Assessment Methodology for Emergency Declarations. In SIGDOC '19: Proceedings of the 37th ACM Conference on the Design of Communication, October, 04–06, 2019, Portland, OR. ACM, New York, NY, USA, 6 pages. https://doi.org/10.1145/3328020.3353935

# Disaster Documentation: The Impact of Oregon's Evolving Damage Assessment Methodology for Emergency Declarations

Henry Covey
Portland State University
Portland, Oregon
covey@pdx.edu

## ABSTRACT

This experience report focuses on the impact of Oregon's evolving methodology for documenting and publishing data and information about damage from natural disasters and other emergencies. In tracing public damage assessment genre sets through organizational levels and user groups, the report (a) outlines the current processes by which data and information are generated and transferred and (b) connects the potential future damage assessment methodology to a larger paradigm shift in the state's broader data-sharing approach.

## CCS CONCEPTS

**• Human-centered computing → User studies**; **• Applied computing →** *Document management*; *Document preparation.*

## KEYWORDS

Technical communication, user experience, information design, usability, localization, damage assessment, FEMA

**ACM Reference Format:**

Henry Covey. 2019. Disaster Documentation: The Impact of Oregon's Evolving Damage Assessment Methodology for Emergency Declarations. In *SIGDOC '19: Proceedings of the 37th ACM Conference on the Design of Communication, October, 04–06, 2019, Portland, OR.* ACM, New York, NY, USA, 6 pages. https://doi.org/10.1145/3328020.3353935

## 1 INTRODUCTION

In the future, from a design of communication standpoint, what will happen when (not if) a disaster like the Cascadia earthquake and tsunami strikes the Pacific Northwest [17]? What documentation methodology will be ready should this or some other natural or human-made emergency occur? How will writing, editing, and reporting function in these risk-prone moments caught in "the dynamic uncertainty of the material environment," to use Beverly Sauer's words [16]? What roles will communication specialists play? Answers to these questions are evolving in Oregon.

Today, when natural or human-made emergencies strike, they catalyze high-speed, deadline-driven, intergovernmental processes through public, private, and nonprofit sectors to quickly and accurately document magnitude and impact to human life and property. Escalating a state-of-emergency declaration to the highest echelons means completing stages of documentation at the local, county, regional, state, tribal, and federal levels within 30 days of the event, per the Robert T. Stafford Disaster Relief and Emergency Assistance Act [3]. The Federal Emergency Management Agency (FEMA) publishes a summary assessment for every major U.S. event on its website [4]. In two pages, the assessment provides the information used to factor assistance. Although mere pages in length and usually a handful of days in the making, the summary is by no means simply built. Leading up to publication, the emergent assessment process is a highly coordinated coalescence and cooperation of individual authors and editors connected to multiple jurisdictions/systems, from everyday people to sitting presidents.

An official declaration of emergency at the federal level triggers the allocation of funds to affected areas via two separate programs, if applicable: Individual Assistance (IA, for individuals, families, and businesses) and Public Assistance (PA, for local governments). In Oregon, PA claims are historically much more common than IA claims. Only 2 instances of IA have been declared since 1998 [12]. Compare this to 112 instances of PA since 1996. Even when IA is not funded, a lot can be gained from PA for localities in need during and after an emergency, due to the overwhelming collective loss of government infrastructure and services. Qualifying for PA means 75 cents back for each dollar incurred from *emergency work*, i.e., for debris removal and protective measures, and/or *permanent work*, i.e., for roads and bridges, water control facilities, public buildings and equipment, public utility systems, parks, and other key public assets and infrastructures during emergencies, like hospitals and stadiums (does not include damage related to fire or registered hazards). Especially hard-hit areas are at times provided PA funds even if county and state per-capita thresholds are not met.

While IA applications are handled directly by FEMA (via the URL DisasterAssistance.gov), each state oversees its own PA programs [5]. From a high level, like most states, Oregon's current damage assessment documentation methodology for local governments follows a common operating picture statewide based on federal models. A closer look at OEM's methodology reveals three stages of assessment leading up to the two-page PDF posted on FEMA's website. The analysis of this report centers on these stages. Each stage is connected in a chain of command; however, data are generally disconnected by stage, and in one stage, data are mediated using desktop publishing applications that balloon documentation workloads and bottleneck linear workflows. The writing in these scenes and situations—in which time can be pressed and resources might already be sparse—was referred to as a "mountain of paperwork" in one interview.


*SIGDOC '19, October, 04–06, 2019, Portland, OR*

ACM ISBN 978-1-4503-9999-9/18/06…$15.00
https://doi.org/10.1145/3328020.3353935

Piles of paperwork from multiple jurisdictional sources are nothing new to emergencies or bureaucratic workflows, but both FEMA and Oregon show signs of moving the status quo away from separate, yet interdependent, communication approaches and instead toward a technologically connected overarching methodology that employs structured languages, authoritative data, shared enterprise services, and secure statewide networking—consistent to all government agencies, not just those who can afford it. Key among this momentum is legislation set to take effect January 2020 in Oregon, which promises the implementation of new data-sharing models and platforms that could change the methods of collaborative documentation, not only for damage assessments but also for other public services that might also benefit from shared data between government agencies and partners. Shared data models could mean more equitable accessibility by multiple levels of public, private, and nonprofit entities. Time and resources could be saved during reporting and auditing. Cloud-hosted and geo-enabled tools could manage data like desktop publishing software cannot.

Even with technological advancements, legislative mandates, state budget line items, social equity, changing climate, and other key motivators, a statewide enterprise damage assessment system poses a high level of size, scope, risk, and complexity—so much so that such a cooperative system does not yet exist in Oregon. However, this gap points to new horizons and opportunities, not just for damage assessment approaches but for other public issues and services, from homelessness to healthcare.

## 2 METHODOLOGY

Research activities during this yearlong case study were informed by practitioner experience, interview subjects, and genre theory.

Phone calls, in-person interviews, and correspondence with emergency management (EM) experts helped identify and understand user groups, systems, and experience with documentation. A primary user group of OEM damage assessment documentation includes local emergency management (LEM) offices, who were sought out for insight on the current disaster assessment documentation methodology. Of the more than 125 LEM individuals spread throughout Oregon's 36 counties (directors, assistant directors, sheriffs, judges, etc.), 2 representatives from northwestern coastal counties, Clatsop and Tillamook, were formally interviewed.

EM events were attended to meet, speak with, and hear from members of the EM community in Oregon (scientists, engineers, medical professionals, administrators, academics, etc.). Public talks included those from the State Geospatial Enterprise Office, Oregon Department of Transportation, Regional Disaster Preparedness Organization, Multnomah County EM, TriMet, Portland Bureau of Transportation, OHSU Department of Civil Engineering, PSU Department of Geology, and PSU EM Office. Experts interviewed and corresponded with included representatives from the Portland Bureau of EM, Multnomah County Operations, PSU College of Urban and Public Affairs, and PSU Hatfield School of Government. Cross-genre research included interviews with subject experts from the PSU Initiative for Community and Disaster Resilience on a new "bosai" preparedness manual and from the PSU School of Architecture Center for Public Interest Design, City of Portland, PGE, and MIT Risk Lab on "PREPHub" urban preparedness installations.

Garrett's elements of UX design (use strategy, scope, structure, skeleton, and surface) were used to guide general areas of inquiry during interviews and artifact analysis[7]. Developing user profiles, scenarios, epics, stories, and causal workflow diagrams framed actors/actants, tools, documents, etc. Wireframing abstracted the overall information design of current documentation layouts, interfaces, and navigational elements. Market research compared current information architectures against single-sourcing platforms, topic-based authoring methods, structured content, and data types that more easily interact with current technology standards and practices (e.g., relational databases, device agnosticism, APIs). Current documentation template layouts (forms, spreadsheets, training material) were analyzed for accessibility during input/output (adjustable text/color, alternative text, and multisensory functionality like haptic, visual, and audio feedback). Technical feedback was also provided by technical communicators and UX designers at user research/design workshops and meetups.

Data, information, and artifacts gathered from research and discovery were analyzed using genre frameworks to read and interpret writing scenes, situations, and genres structures [1]. Because each genre in the assessment ecosystem emerged from the interaction of actor/actant-networks (or "techno-economic networks," to quote Porter's translation of Latour), tracing these genres through networks as units of analysis helped distinguish the scopes of knowledge work and activity that created them [8, 19]. Complementary to genre tracing and analysis, actor-network theory further assisted in helping frame the political-rhetorical differentials among individuals, groups, nonhuman actants, and those agents of power that shape the damage assessment and declaration genres [15, 20].

## 3 RESULTS AND FINDINGS

### 3.1 Genre analysis and tracing

In a 2019 worldwide comparison of insured losses due to natural disasters over the last 30 years, 2018 was the fourth-costliest year since 1980, 160 billion dollars of global economic impact, only half of which was insured [10]. Whenever, whatever, wherever, whoever an emergency hits, depending on the cause, this event can set off a cascade of complex communication between entities, prepared or unprepared, insured or not. This flurry of activity precipitates floods of data and information documented in various modes and genres. Damage assessments are a useful genre in emergencies for capturing data and reporting documented impact to life and property during the multiple phases of events large and small.

A damage assessment catalyzed by an event within Oregon is morphed by multiple variables as it trades hands and systems over time. Generally, damage assessments fall into three progressive developmental stages:

(1) Rapid damage assessment: local/county
(2) Initial damage assessment: local/county/state
(3) Preliminary damage assessment: local/county/state/federal

Editorially speaking, the official titles for 2 and 3, "initial" and "preliminary," do not describe how they fit into the whole and are misnomers from a local standpoint. These adjectives are based more on how assessments are viewed by the group in charge of leading, and thus naming, the stage, see below.

*Preliminary damage assessment (PDA):* FEMA names its assessment "preliminary," because the PDA starts the federal agency's workflow with a state and its localities. However, the PDA does not technically initiate the assessment process, only FEMA's. Two assessments have since come and gone before the PDA (the IDA and RDA, see below). Therefore, from a local perspective, "preliminary" seems off. FEMA is only arriving; locals have been there all along.

*Initial damage assessment (IDA):* At the state level, a similar linguistic subjectivity occurs. The state calls its damage assessment the "initial" damage assessment, and while the IDA starts the state's official process (before the PDA), it is not the first assessment either.

*Rapid damage assessment (RDA):* The most preliminary/initial damage assessment is arguably at the local level, i.e., in the communities it occurs. Here, however, the assessment stage is not referred to as "initial" or "preliminary," as in, one of chronology; instead, it has an adjective descriptive of its purpose, "rapid."

All three assessments are focused on communicating one thing, should the need exist: a formalized call for help. However, there are specific requirements to be met. The toll on human life and property must be officially measured and documented to declare the emergency and request assistance within the 30-day deadline—first *rapidly*, then *initially*, and finally, *preliminarily*. Here, the linguistically illogical nature of these three adverbs strung together is evidence editorially of the sometimes-siloed processes of government, private, and nonprofit entities' coordination during temporary documentation workflows created by emergencies.

*3.1.1 Stage 1: Rapid damage assessment.* After any emergency event, the first documented assessment of impact on life and damage to property is a "rapid" damage assessment (RDA). Emergency officials communicate with first-responders (fire, police, etc.) and coordinate field crews and other volunteer organizations via email, SMS/MMS, phone, and radio. If the event warrants it, depending on the resources available, communication is broadcast from the temporary local emergency operations center (EOC).

There are several types/genres/methods of impact/damage assessments: self-reporting, flyovers, windshield surveys, onsite visits, door-to-door surveys, geospatial information systems, and predictive modeling. The RDA might employ some or all; it depends on the incident type, programmatic requirements, assessment stage, and timeline requirements. Each method has strengths and weaknesses, but whatever documentation methods used, the data and information of these events are often created by "first-in crews," staffed with first-responders, various emergency discipline-specific professionals, trained volunteers, as well as local, regional, and/or national volunteer and/or private/public nonprofit organizations. During the assessment survey, field crews check "first-in sites" and "target sites" of vital individuals and property specific to that community. Event impact on human life and structural and/or infrastructural damage is reported back to the local EOC, which escalates data and information. Situation reports, "sit reps," also hold info/data.

In Oregon, local emergency management (LEM) offices help lead RDA efforts during and after disasters and emergencies in coordination with public safety officials, elected officials, nonprofit organizations, and other government agencies. LEM staff are integral to the RDA and entire documentation cycle, relaying the data/info between the state Office of Emergency Management (OEM) and local individuals and businesses, local and tribal governments, special districts, and private nonprofits (state agencies with staff and property in the affected area report directly to OEM).

All of Oregon's current LEM offices and contact information can be found via a PDF of contact information published on the OEM website's main-menu header.[13] Here again, there is linguistic need to clarify terminology. When the state calls these coordinating offices "local," this can refer to a city level in areas of high populations and county level in less populated areas. Most counties employ a full-time LEM position, some two or more. In rural counties, the LEM office can be part of the local fire department or sheriff's office. Judges are even LEM contacts. The documentation of LEM contacts on the OEM website does not show, however, the many regional intergovernmental agreements between cities, counties, and other jurisdictions that share resources (e.g., Oregon Metro). LEM offices might have similar or separate systems for alerts and/or shared services with neighboring counties or other municipalities. More than one county might combine/use data.

Overall, analyzing rapid damage assessments in Oregon reveals a complexity of overlapping networks. Data are created on and reported from the local level to either a regional level and/or a county level, which gets used at the state and federal levels. While every LEM entity in Oregon follows the federal and state standards, policies, procedures, and best practices under a common operating picture, each LEM office throughout the state is also different in a number of ways due to various implicit and explicit factors (emergency funding, size, culture, geography, event, etc.). Many local systems remain disconnected from county and state systems.

*3.1.2 Stage 2: Initial damage assessment.* As soon as impact appears to be so great that state and/or federal assistance may be needed to augment local resources, affected jurisdictions must conduct a relatively quick but accurate "initial" damage assessment (IDA). Usually completed in 3 to 5 days using an assortment of methods (self-reporting, aerial photography, windshield surveys, etc.), the IDA is intended to be a best guess estimate of the dollar value of damages and severity of impact on potential applicants.

When conducting the IDA, LEM staff at city/county level work with affected localities and OEM on several fronts: prioritizing communities, public entities, locations, and facilities; analyzing numbers, costs, and impact; and focusing on worst-hit areas, critical facilities, and other high-priority locations. Just as in the RDA, LEM offices and their content-producing cities, public works departments, private nonprofits, and other jurisdictions are once again crucial during the IDA to the assessment process in helping define the needs of the disaster and what type of assistance is required via the documentation of the event. While each locality in Oregon faces its own types of disasters and emergency events (e.g., tsunamis and landslides in the west, flooding on coasts and inland, fire in the east, and severe winter storms across the state), the IDA document artifacts used by one LEM office are used by all in Oregon. Materials can be downloaded from OEM's public-facing site via its "Damage Assessment Forms, Templates and Resources" webpage, which includes Microsoft Word documents, Excel workbooks, and other documents that provide the framework and platform for damage assessment forms, information sheets, training manuals, and related materials in the documentation processes for PA.[11]

During the IDA stage, responsible LEM/OEM staff become communication conduits/nexuses for the content produced by affected localities. Like editors and publishers in any editorial workflow, LEM/OEM staff must track down facts and figures and compile, review, curate, and process multiple files from content producers. Contributing authors can include local jurisdictions, special service districts, certain private nonprofits, LEM/OEM staff themselves, and in some cases tribal governments. Towns and cities, public utilities, local hospitals, nonprofits, etc., are all mediated into metrics in a formalized request for assistance. The state then uses the documentation and other evidence to evaluate the amount of public infrastructure damage and emergency costs against the county-wide population to determine if the one-size-fits-all per-capita threshold assigned to the county has been surpassed. Data from all counties is then compiled to determine the total per-capita impact compared to the state's threshold. County and state per-capita figures are based on population factored against a consumer-price-index multiplier.[6] The governor's office uses the results of the IDA and other info as the basis for requesting an assessment from federal authorities, i.e., the joint PDA, outlined below.

*3.1.3 Stage 3: Preliminary damage assessment.* FEMA celebrated its 40th anniversary April 2019, but the agency publishes data from disaster declarations going back to 1953. Relative to this decades-long history, the PDA summary itself has only been publicly available online since 2008, when at the direction of Congress, FEMA began to post PDA reports on its website.[18] The declaration process as we know it today dates to key legislation from 1988, with the passing and enactment of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (an amended version of the Disaster Relief Act of 1974), providing the statutory authority for most activities related to federal disaster assistance pertaining to FEMA.

The primary purpose of the PDA is for a joint team (e.g., local, county, state, tribal, federal representatives) to identify and evaluate the incident, the results of which FEMA uses to determine whether supplemental federal and other assistance is necessary for recovery of local communities. At its core, a PDA is a quick inspection of damage, typically 3 to 5 days, again focused on magnitude and severity, like the assessments before it, but more specifically to identify scope and degree of damage, staff and funding needs, community relations and disaster recovery centers requirements, and other target/special areas, including any unmet needs that require immediate attention during response and recovery operations.

LEM offices become crucial coordinators during the PDA stage, as FEMA bases its findings and recommendations on their previous RDAs/IDAs. LEM staff help joint-government teams comprised of federal, state, and local representatives conduct a thorough assessment of the impacted area to determine the extent of the disaster, its impact on individuals and public facilities, the types of federal assistance that may be required, the level of insurance coverage in force in the area, and hazard mitigation made by local authorities. This could also include the participation of other federal agencies.

As the PDA concludes, it is clear how precious time, resources, and communication are from RDA to IDA to PDA; however, there are also identifiable issues with some of the modes and tools provided. The discussion section further explores these issues, user requirements, and what the future might hold for Oregon.

## 3.2 Discussion

Tracing Oregon's current PA damage assessment genre sets through organizational levels reveals documentation scenes and settings that can be composed of hard-to-get data, time-consuming forms and spreadsheets, and editorial workflows that can create a "mountain of paperwork." RDA, IDA, and PDA data are siloed in different systems that do not communicate with one another seamlessly, requiring conversion from one system to the next by typing, copying and pasting, using custom macros, and/or employing other customized programming. As the magnitude of the event increases, so do the number of reporting entities, facts and figures, and files to manage.

What benefits would an enterprise data management system create, in which data and information published in downstream workflows were connected to upstream workflows? What if, instead of three damage assessments for one event, there was only one damage assessment with three phases? What if data calculation and manual tasks were automated, e.g., using tax lot data for predictive damage modeling? And what of the drawbacks to digitized documentation, such as connectivity issues, low resiliency, job insecurity and resistance to new technology, cyber-security issues with centralization efforts, etc.? The sections below discuss some of the impact of a new methodological paradigm.

*3.2.1 New data-sharing paradigms.* Data management systems need a host of resources to succeed and thrive: economic, intellectual, social, symbolic, and human capital. They also need legislative inertia. Granted, there are already examples of enterprise systems at the regional and statewide government levels. For example, "navigatOR" is a portal hosted and maintained by Oregon Health and Science University, overseen by the Joint Legislative Committee on Information Management and Technologies (JLCIMT), Oregon Geographic Information Council (OGIC), Geospatial Enterprise Office (GEO), Department of Administrative Services (DAS), and Office of the State Chief Information Officer (OSCIO). Another example is the Oregon Spatial Data Library (OSDL), a joint effort of DAS/OSCIO/GEO and Oregon State University. There is also OEM's "Real-time Assessment and Planning Tool for Oregon" (RAPTOR) to share information on a common operating picture as part of the Department of Homeland Security's Virtual USA Northwest Pilot Project program. RAPTOR enables access to live data in combination with traditional map layers to create a space-time model.

However, public bodies are not mandated to share data with these systems, for disaster assessment documentation or other. New Oregon legislation set to pass might change this and thus affect the overall strategy, methodology, and platform that emergency management staff and others use. Currently, public bodies charge other public bodies fees to use their GIS data, but January 2, 2020, the last part of Oregon Revised Statute 276A.509 goes into effect, meaning state government bodies, local government bodies, and special government bodies will have a "duty to share geospatial framework data" with the Oregon Geographic Information Council (OGIC), which includes data pertinent to the state-wide geospatial preparedness layer.[9] Under a new paradigm, equitable access could expand the abilities to create, edit, track, and publish damage assessment data/info. New systems built for the mandate could relieve some of the stress of managing different user workflows via a shared platform in a collaborative work environment. IT systems could more easily coordinate the data and information matriculating down levels, across adjacent levels, and up the chain of analysis.

*3.2.2 Data and information management systems.* Damage assessments are largely form-based and assessment-centric reporting structures. The state methodology already has the genre structures; the ecology of forms just lacks the dynamics that come with programming, relational geodatabasing, and component content management system (CCMS) architectures. None of the MS Word documents or Excel spreadsheets are connected to localities' or others' systems. The forms and spreadsheets rely on the emergency apparatus of the state to pull them together each time a small or large emergency strikes. An enterprise-level CCMS assisting the damage assessment publication process would better connect data, share content, and manage workflows between content producing reporters/applicants and content reviewing management/governance. Disaster data could also be connected to geographic information systems (GIS) capability and managed via a shared geodatabase.

There are a number of different content/document management options on the market that emergency management could choose from, technological approaches with built-in workflows that go beyond MS Word and Excel and allow emergency operations centers to capture, analyze, and report field collected data in real-time, enabling better decision making. There are state-run systems to build from, e.g., the state's RAPTOR, navigatOR, OSDL, and other systems. There are also numerous deployment kits that come commercially available off the shelf, as well as software as an infrastructure, platform, or service. State meeting minutes from the Oregon GEO Framework Implementation Team charged with oversight of the preparedness layer mentions a "Data Catalog Tool: Metadata (+ArcIS Template) assessment tool...Xray (data solutions at ESRI)? OSDLData Harvest?" [14]. Indeed, Esri is a prime example, FEMA released the "FEMA Preliminary Damage Assessment Templates" in 2018, based on Esri's Survey123 platform, part of ArcGIS Online (AGOL).[2] There are benefits and drawbacks. While Esri/AGOL and other private-industry software platforms use proprietary models, this typically means their product alone is needed to create and configure assessments. On the other hand, anyone with a mobile device can download the app and complete/upload an assessment survey. These forms use XLSForms, which can be configured using spreadsheet software like MS Excel, Google Sheets, etc. There are also data dictionaries of structured content for use in assessments and other declaration documentation.

*3.2.3 Structured content and architecture.* Given connectivity and battery issues that come with digitized documentation workflows, pencils/pens, paper, and clipboards for assessments remain hardy, resilient backups and based on interviews are preferred by some. However, the risks of handwriting and processing handwritten text from documentation are lack of accuracy, precision, and consistency converting the analog data to digital form. This process introduces unnoticed mistakes and errors. Structured data (XML, XHTML, SQL, C++, Python, JavaScript, etc.) provide more consistency, as assessment architecture is designed to guide assessors through a workflow of required data/information (e.g., question/answer, lists, uploading photos, fill-in the blank). Even typed "notes" fields, while sometimes catchalls filled with unstructured data, are not only more legible than handwriting but can also be searched more easily for keywords. Assessments can be signed digitally by contributors and kept track of with unique IDs or blockchains. The whole process is relatively more measurable and traceable.

The biggest benefit of a structured content approach is that the PDA process relies largely on the data and information gathered during the RDA and IDA. Structured content would help not only inform writers, editors, and publishers but also set up their content to be more easily extracted, transformed, and loaded from earlier assessments into later assessments. Each assessment would build on the assessment before and transform easily in the phase shift, as the emergency declaration escalates.

*3.2.4 Extreme human-computer interaction.* In further digitizing and connecting disparate parts of the disaster-assessment process, from a design of communication standpoint, human-computer interactions in extreme conditions require streamlined designs that take into consideration journeys through earthquakes, floods, fires, etc. Damage/impact data are deadline driven, input quickly at times, under adversity and/or duress possibly (e.g., flyovers or windshields surveys during inclement weather). User interfaces might need to function with other equipment (e.g., when the author/assessor is wearing personal protection equipment during an event). Complicated, intricately designed, and hard-to-use interfaces and/or architectures can be difficult to navigate, leading to loss of data. Workarounds can end up being easier than fixing design gaps when redesign or scope changes might lead to higher development costs. As a solution to usability problems, simply framed screens for handheld devices help mitigate issues. External handheld input devices also have the ability to be synced with laptops and PCs, not to mention voice command. Additionally, the app can guide the user (e.g., make selections from lists of configured parent-child selections, enter an alphanumeric code in preflight, create searchable text entries), and provide multisensory feedback via haptic, audio, and visual modes that follow accessibility standards (e.g., alternative text), plain language, and other state/federal guidelines.

The connectivity needs of users must be taken into consideration, as well. Data transmission and internet access in remote locations can be weak and unreliable in emergencies without a satellite link. Inability to transmit information compromises timeliness of data received and increases risk of data loss, with both immediate and subsequent effects. Careful consideration must be paid to the software's data storage and data redundancy to ensure data are not lost during disconnection. Assessors must be able to save input and edits. Storage and redundancy are reasons to create a native application for installation on individual devices. The program is able to run on the device independently of online software services, thus managing local storage of data input, tracking edits/versions, and uploading data in WiFi range or otherwise connecting to the web. While the prospect of downloading state software onto private devices garners some resistance, this type of methodology can be used by self-reporters in public, private, and nonprofit spheres. Data collection devices that assume a "device-agnostic" approach allow for the maximum number of types and manufacturers.

Multi-functionality and data usage come with added capabilities in the documentation management software. However, it should also be considered against the necessities of device performance and battery drain. There is always critical need for the devices to function through assessment sessions. A powerless device renders it relatively useless, if not burdensome. Optimizing applications saves energy consumption. The device should have backup batteries and allow for a quick change in a low-charge scenario.

*3.2.5 Local subject experts matter.* Expediting the digital transformation of damage data/info from an event has the promise of streamlining the assessment process and taking the toll off a subset of the Oregon government workforce dedicated to stewarding the data to higher levels while juggling the core responsibilities of their roles during that event. Helping localities helps the whole documentation process. After all, disaster response and recovery start at the local level, with affected individuals all responding to the needs of their communities as members of them first and foremost, regardless of the level of government they work at. Data collection and retention on a digital level at the local stage (RDA) is already working toward completion of the state (IDA) and federal (PDA) assessments before they are even set in motion, with the hope that neither will be, but in anticipation that they might.

When revising or replacing an old system with a new or updated one, subject experts at all echelons of emergency management are critical for input during the whole developmental cycle, especially early in the planning phase, since localities are producers of content during emergencies, reviewers of content before merging data with the state, and applicants for aid. Familiarity with the technical and design standards of the local software stack and conventions, business rules, security, etc., is therefore critical. Some localities may not be as financially well heeled and/or actively abreast as others with regard to changing disaster documentation technologies and methods. This will vary from locality to locality. Involving as many local users as possible in the process reduces risk as the project develops. By developing/configuring the functionality iteratively with local users, the risk of extensive final training is also mitigated during implementation. If not involved early in the development process, the design effort is exposed to risk of non-adoption. Inadequate training and unfamiliarity with any new applications can lead to less than optimal usage patterns and potential dissatisfaction with the system. When input from local users is disregarded, any difficulty of use can lead to workarounds by users, who would have rather done it the "old way," with paper and pencil. To reduce the risk of non-localization, subject matter experts must be clearly identified and notified early when they might be required and coordinate with project management to ensure availability. Emergency management offices often schedule training events all year, and interactions can be planned around these events.

## 4 CONCLUSION

Change is coming to disaster documentation methodologies by way of technological augmentation. Oregon must move carefully and communicatively toward any future statewide content/document management solutions and/or shared geodatabase models for emergencies large and small. The ability to control and streamline local data will only serve to help quicken and clarify response and recovery. However, the documentation of emergency incidents is not easily digitized and automated and must be paired with other disaster documentation methods that assess damage and impact. Battery-free, paper-based methods are inexpensive, easy to use, and resilient, but the transition of analog data to digital form is also then made more difficult and can be error-prone. The current digital platform used to communicate data/info currently relies heavily on desktop publishing software that promotes ballooning paperwork, but the efficiency and expediency of newly structured information architecture and automated workflows for desktop/mobile devices must be weighed against their relative fragility.

Much remains to be seen as Oregon enters and navigates this new methodological territory. The success of a new paradigm shift in damage assessments could set the stage for potential shifts in other similar areas that might also be impacted by, and successfully leverage, statewide data-sharing models. With fundamental changes in approach, however, come fundamental shifts in perspective and behavior. New conceptual territory calls for thinking across multiple boundaries: social, methodological, theoretical, and pedagogical alike.

## ACKNOWLEDGMENTS

Thanks to ACM-SIGDOC, the editors, my reviewers, Gretch, et al.

## REFERENCES

[1] M. J.; Bawarshi, A.; Reiff and A. Devitt. 2018. *Writing Scenes: Strategies for Composing with Genres.* Pearson Education.
[2] I. Chivite. 2017. Using FEMA's Survey123 Preliminary Damage Assessment Templates. https://community.esri.com/groups/survey123/blog/2018/09/11/using-fema-s-survey123-preliminary-damage-assessment-templates
[3] FEMA. 2016. Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities as of August 2016. https://www.fema.gov/media-library/assets/documents/15271
[4] FEMA. 2018. Preliminary Damage Assessment Reports. https://www.fema.gov/preliminary-damage-assessment-reports
[5] FEMA. 2019. Disasters. https://www.fema.gov/disasters
[6] FEMA. 2019. Per Capita Impact Indicator and Project Thresholds. https://www.fema.gov/public-assistance-indicator-and-project-thresholds
[7] J. J. Garrett. 2011. *The Elements of User Experience* (2nd ed.). New Riders.
[8] C.(trans.) Latour, B.; Porter. 1996. *Aramis: or, the Love of Technology.* Harvard University Press.
[9] Oregon State Legislature. 2017. Public body duty to share geospatial framework data with council; conditions and exceptions; methods for sharing; limitations of liability. https://www.oregonlegislature.gov/bills_laws/ors/ors276A.html
[10] P. Low. 2019. The natural disasters of 2018 in figures: Losses in 2018 dominated by wildfires and tropical storms. *Munich Reinsurance Company* (January 2019). https://www.munichre.com/topics-online/en/climate-change-and-natural-disasters/natural-disasters/the-natural-disasters-of-2018-in-figures.html
[11] Oregon Emergency Management. 2019. Damage Assessment Forms, Templates and Resources. https://www.oregon.gov/oem/emresources/disasterassist/Pages/Damage-Assessment.aspx
[12] Oregon Emergency Management. 2019. Disaster Assistance for Individuals, Families and Businesses. https://www.oregon.gov/oem/emresources/disasterassist/Pages/Individual-Assistance.aspx
[13] Oregon Emergency Management. 2019. Local and Tribal Emergency Managers. https://www.oregon.gov/oem/Documents/locals_list.pdf
[14] Oregon Geographic Enterprise Office. 2018. Joint Hazards / Preparedness FIT. ftp://ftp.gis.oregon.gov/MINUTES/FIT/TEAMS/PREPAREDNESS/_PREPAREDNESS/2018/2018.12.04.pdf
[15] L. Potts. 2008. Diagramming with Actor Network Theory: A Method for Modeling Holistic Experience. *IEEE International Professional Communication Conference* (July 2008). https://doi.org/10.1109/IPCC.2008.4610231
[16] B. Sauer. 2003. *The Rhetoric of Risk: Technical Documentation in Hazardous Environments.* Lawrence Erlbaum Associates.
[17] K. Schulz. 2015. The Really Big One: An earthquake will destroy a sizable portion of the coastal Northwest. The question is when. *New Yorker* (July 2015).
[18] Congressional Research Service. 2017. Preliminary Damage Assessments for Major Disasters: Overview, Analysis, and Policy Observations. (2017), 2.
[19] C. Spinuzzi. 2003. *Tracing Genres Through Organizations: A Sociocultural Approach to Information Design.* The MIT Press.
[20] C. Spinuzzi. 2008. *Network: Theorizing knowledge work in telecommunications.* Cambridge University Press.