Three Emerging Technologies To Improve Emergency Management

BY NANCY TORRES • JUNE 14, 2018

The National Oceanic and Atmospheric Administration reported that 2017 was the most expensive year on record for disasters in the U.S., estimating $306 billion in total damage. The FBI also reported 2017 as having the most incidents and the most people killed in any one year by active shooters.

With this rise in crises across the United States, data and technology have an increasingly important role in improving emergency management departments across the country. Approximately 240 million calls are made to 911 in the United States each year, with at least 80 percent coming from wireless devices, yet many emergency management systems still operate on legacy systems made for wireline phones. As a result, people in need are unable to easily share precise locations or send media messages to responders, making emergency communication and resource coordination more costly and difficult.

City and national government entities are already making strides in using analytics to improve emergency response operations, from Google's 911 study in San Francisco to the Office of Management and Budget's (OMB) work with FEMA to crowdsource real-time information during emergencies. Yet, emerging technologies present even greater opportunities to make our emergency management systems more intelligent, secure, and effective. While cities have long sought to integrate tech into disaster response, the available technologies and opportunities are constantly evolving. Today, artificial intelligence (AI), the Internet of Things (IoT), and blockchain offer the potential to generate, transmit and read emergency-related data for better decision-making in crises.

ARTIFICIAL INTELLIGENCE

Industry and government leaders today are discussing—and seeing firsthand—how AI can change the way we work, get around, serve residents, and much more. In emergency management, AI can help predict, evaluate, and simulate incidents to improve response times and streamline resource dispatch processes.

The City of Los Angeles, City of San Francisco, and multiple San Mateo County cities are now using the One Concern platform, which employs artificial intelligence through analytical disaster assessment and calculated damage estimates. Specifically, One Concern assigns a "unique, verified 'digital fingerprint'" to every element in a city, modeling the entire system, and monitoring the impact of each disaster and climate change on a location. The team leverages data on city infrastructure and former disasters to predict the damage when different disasters hit, accomplishing 85 percent accuracy within 15 minutes on a city block-level basis. In Santa Clara County, One Concern worked with Woodside Fire Protection District, Portola Valley, and Woodside to gather jurisdiction-specific critical infrastructure data and model their Seismic Concern product, providing a bigger picture of risks in the area.

For 911 call evaluation, the Association of Public-Safety Communications Officials (APCO) and IBM Watson recently partnered to use speech-to-text analytics software to help agency directors better analyze conversations and compare them to pre-scripted content in real-time. As a result, directors can learn from real-time conversations between callers and dispatchers, and iterate training materials to help improve the performance of 911 staff. The City of Memphis also used Watson Analytics to reveal trends in emergency medical services. The IBM team conducted 80 stakeholder interviews and gathered relevant data from various city departments on the 911 process, including 911 call volume and use of emergency services. IBM helped the different city agencies pool and analyze information to identify challenges and improve joint decision-making and enlisted the help of third parties—such as health insurance companies and health care clinics—for non-emergency calls. Based on the analysis, the city determined that about 64 percent of ambulance callers would be better served by long-term care for chronic conditions rather than emergency room visits, and was thereby able to reduce emergency service costs by $20 million.

The Cincinnati Fire Department has started using a new predictive analytics system to surface recommendations to dispatchers on appropriate responses to emergency calls based on a number of different variables including location, weather, and inputs from similar types of calls. The AI software helps the department prioritize and respond more effectively to the 80,000 requests they receive annually, reportedly improving emergency response times for the department.

INTERNET OF THINGS (IoT)

IoT refers to a network of physical objects embedded with sensors and software that collect data and communicate with one another. As it relates to emergency management, IoT can be used to enhance data collection from the physical environment and quickly communicate this data to different city departments.

Weather-related disasters such as hurricanes or floods sometimes prevent emergency response teams from reaching certain locations. This obstruction reduces teams' ability to track damage, notify the public with up-to-date information, and respond in a timely manner. However, if IoT devices were present in these areas, they would be able to more easily broadcast signals and communicate critical data such as temperature, water quality, or smoke. With this data, government can make more informed decision on how to deploy resources during a disaster situation. Today, the Rio de Janeiro City Hall Operations Center uses sensors to collect real-time data about weather, traffic, police, and medical services in the city. In the United

States, the city of Houston worked with AT&T after Hurricane Harvey to deploy IoT technology for identifying damage and communicating information.

From a more proactive standpoint, cities can place IoT on city infrastructure to monitor risk factors and surface data about potential emergencies. For example, The Lower Colorado River Authority (LCRA) uses 270 sensors to measure how fast water is moving across a stream and models what water may do at different touch points. From this, LCRA can proactively manage floods and easily get ahead of water-related disasters in the area.

Cost, security, and interoperability challenges are still barriers to scaling IoT solutions across a city for emergency management. However, the power to share data during emergency situations—as well as a number of other use cases, from monitoring air quality to locating parking spots—make these challenges worth overcoming.

BLOCKCHAIN

Of these three technologies, blockchain is in the earliest stages of development, but is a tool that some claim will be transformational for how we transact data. Blockchain is a distributed and immutable digital ledger, secured by cryptography, which can be programmed to record a series of transactions. Its most scalable application today is bitcoin, a cryptocurrency and payment system still growing in its use around the world.

The benefit of blockchain in emergency management is that it provides interoperability and transparency. In terms of interoperability, blockchain can be adopted as a universal system across organizations—similar to the internet—and allow multiple parties across that system to coordinate resources in an emergency. In a disaster relief scenario, multiple parties are often contributing resources to aid an affected area. If all parties involved in this scenario were to adopt a blockchain-based shared system of record, they could coordinate more efficient disaster responses, ensuring resources were allocated to the areas where they are needed most. The Center for Disease Control (CDC) is now looking to pilot blockchain for the use case of public health data surveillance, where it will collect and communicate data to entities who treat patients in disaster relief scenarios, including local public health agencies, hospitals, and pharmacies.

Regarding transparency in the disaster relief scenario, blockchain could provide an immutable record, accessible by everyone, to illustrate what resources have been dedicated to an area and by whom.

This transparent record—to which anyone could submit an entry—would reduce the possibility of resource diversion and corruption in these types of scenarios.

UNICEF is testing blockchain technology to track the status of international grants in a secure way that is accessible by the public. Along these same lines, FEMA's Public Assistance program could be another great use case for blockchain, tracking where resources are going after a disaster. Seeing the potential of blockchain, the Department of Homeland Security's Science and Technology Directorate awarded $1.3 million in grants to explore blockchain technology through their Small Business Innovation Research program. Several technical limitations prevent blockchain from scaling across any industry today, but emergency management departments across cities should take the opportunity to learn about the technology and its various applications to plan for future IT systems.

Above all, a city's ability to collect, analyze and communicate data is critical to effective and efficient emergency management. AI, IoT and blockchain are all technologies that enable more sophisticated data processes and can improve the capacity and efficiency of emergency staff.

TOPICS DISASTER MANAGEMENT INTERNET OF THINGS

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Nancy is a joint MBA/MPP candidate at the Harvard Business School and Harvard Kennedy School, focused on applying emerging technologies to public sector challenges within the areas of mobility, infrastructure and urban development. Previously, she spent five years working in the technology space conducting research and designing solutions for how communities access information, transportation and income.

At Google, Nancy managed projects that informed the company's people strategies relating to diversity, behavioral economics and organizational behavior. She also consulted the San Francisco Mayor's Office of Civic Innovation and Department of Emergency Management on 9-1-1 call center technical and data operations, identifying key drivers of increasing call volume and forecasting future center demand. At Uber, she analyzed and strategically advised the company's cross-sector partnerships, contributing to a $1 billion dollar run-rate while providing hundreds of thousands of individuals in cities greater access to economic opportunity. Committed to the advancement of Latinos in Technology, she led Hispanic business development and community outreach efforts at Google and Uber. As a fellow at IDEO, she designed ventures applying emerging technologies such as Blockchain, IoT and AI to human systems such as mobility, energy and work.

Nancy graduated from The University of North Carolina at Chapel Hill with a B.S. in Business Administration and has completed coursework at Copenhagen Business School in Denmark, the Chinese University of Hong Kong in Hong Kong, and Universidad EAFIT in Colombia.